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CP-200901566
Log # TXNB-09069

Ref. # 10 CFR 52

November 16, 2009

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 3183

Dear Sir:

Luminant Generation Company LLC (Luminant) herein submits the response to Request for Additional Information No. 3183 for the Combined License Application (COLA) for Comanche Peak Nuclear Power Plant Units 3 and 4. The affected COLA pages are included with the response.

Should you have any questions regarding these responses, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

The only commitment made in this letter is specified on page 3.

I state under penalty of perjury that the foregoing is true and correct.

Executed on November 16, 2009.

Sincerely,

Luminant Generation Company LLC

Rafael Flores

Rafael Flores

Attachment 1. Response to Request for Additional Information No. 3183 (CP RAI #88)

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NRO

Electronic Distribution w/Attachment

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Regulatory Commitments in this Letter

This communication contains the following new or revised commitments which will be completed or incorporated into the CPNPP licensing basis as noted. The Commitment Number is used by Luminant for internal tracking.

Number	Commitment	Due Date/Event
6751	Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification, and will be submitted to the NRC following certification. Changes were proposed via letter TXNB-09069 dated November 16, 2009 in response to questions posed by RAI No. 3183 (CP RAI #88) including Questions 13.03-18 through 13.03-27.	June 30, 2010

Attachment 1

Response to Request for Additional Information No. 3183 (CP RAI #88)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-17

ETE-1: Estimated Population Growth
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Regulatory Guide 1.206, Appendix 4 to NUREG-0654 Section II.A.

A. Population estimates in the evacuation time estimate (ETE) were based on data from the 2000 U.S. Census and projected to the year 2007 using census growth rate projections. In combined license application (COLA), Part 5, Table 3-1, "EPZ Permanent Resident Population by Zone," the 2007 Population is 33,435. The 2007 population in Table 3-1 differs from the Comanche Peak Nuclear Power Plant Units 3 and 4 COL Application Environmental Report (ER) Table 2.5-1, "The Projected Permanent Population for Each Sector 0-16 Km (10 mi) for Years 2007, 2016, 2026, 2036, 2046, and 2056," and the Final Safety Analysis Report (FSAR) Table 2.1-202, "Projected Permanent Population for Each Sector 0-16 Km (10 mi) for Years 2007, 2016, 2026, 2036, 2046, and 2056," which provides a 2007 population of 32,451. Discuss the differences in permanent population growth estimates between the values provided. Revise the ETE report as needed.

ANSWER:

A. Environmental Report Table 2.5-1 and FSAR Table 2.1-202 each provide permanent resident populations within a 16 km (10 mile) radius of the Comanche Peak site center point. The Evacuation Time Estimate (ETE) report considers the population within the plume exposure pathway Emergency Planning Zone (EPZ) boundary. As shown in Figure 3-1 of the ETE report, portions of the EPZ extend beyond the 10-mile radius while other portions of the EPZ boundary are within the 10-mile radius. Therefore, the EPZ boundary and the 10-mile radius are not coincident.

As shown in Figure 3-2 of the ETE report and in Table 1 below, there are 662 people living within the EPZ who are more than 10 miles from the proposed units, while there are 15 people who live within 10 miles of the proposed units, but are not within the EPZ.

Table 1. Permanent Resident Population (Year 2007)		
Within EPZ	**Within EPZ and outside 10 mile ring**	**Within 10 mile ring and outside EPZ**
33,435	662	15

Considering their location, 32,788 persons live within 10 miles of the site, regardless of whether they live within the EPZ boundary.

33,435 – 662 + 15 = 32,788

The difference between this number and the FSAR/ER estimate is approximately 1%:

(32,788 – 32,451) / 32,451 = 1%

Both population estimates are accurate when the methods used to develop the estimates are considered. These differences are not statistically significant and thus would have no effect on the results of the ETE. Therefore, no change to the ETE is required.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-18

ETE-2: ETE Methodology
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section I.C.

A. COLA, Part 5, ETE Report, Section 4, "Estimation of Highway Capacity," describes the approach for estimating highway capacity and provides the algorithm and equation used for the approach to a signalized intersection. Explain how the variables are derived for the Mean Duration of Green Time and Mean Queue Discharge for the capacity of an approach to a signalized intersection.

B. Discuss how traffic control is included in the intersection analysis using the equation presented on COLA, Part 5, page 4-1.

C. COLA, Part 5, ETE Report, Appendix D, "Detailed Description of Study Procedure," identifies the steps to perform the ETE calculations. Step 10 in Appendix D discusses that changing control treatment at critical intersections can improve service and expedite movement of traffic. Discuss any model treatments that were used to expedite movement of traffic through intersections, and revise the ETE report as needed.

D. Discuss the effect on the ETE if the county specific traffic management plans were used in the analysis. Revise the ETE report as needed.

ANSWER:

A. The saturation flow rate estimates for every link in the analysis network are presented in Appendix K of the ETE report. These values are based on observations made during the field survey and on the principles embedded within the 2000 Highway Capacity Manual (HCM). The HCM, as discussed in Section 4 of the ETE report, presents procedures for estimating capacity based on the type of facility and the facility characteristics. The mean queue discharge headway

per lane for through vehicles is computed as h = 3600 sec per hour ÷ saturation flow rate. Saturation flow rate is expressed in terms of vehicles per hour per lane in Appendix K.

The mean durations of all signal intervals at each signalized intersection are input to the DYNEV simulation model. This is accomplished by estimating the ratio, (G - L) / C, which is the fraction of a cycle length which provides service to each approach (L is the "lost time" per phase; g is the effective green time, G – L; G = green phase duration or "mean duration of green time"). The model is then executed and the volumes serviced by the competing approaches to each intersection are computed. The green time allocated to each direction of traffic is then recomputed in proportion to the dominant competing traffic volumes at that intersection. By way of illustration, consider a signalized intersection where the total number of vehicles serviced over the course of the evacuation is found to be as follows:

$$N_E = 2500\ vehicles;\ N_W = 1200\ vehicles;\ N_N = 4000\ vehicles;\ N_S = 1000\ vehicles$$

The subscripts represent the direction of travel along each approach. If the number of lanes are the same for all approaches, the higher value of vehicles serviced in each direction of travel are identified. In this example the eastbound and northbound demands exceed the values for the westbound and southbound approaches, respectively. The ratio of green time to cycle length (g / C) is then computed as follows:

$$\left(\frac{g}{C}\right)_{E,W} = \frac{2500}{(4000+2500)} = 0.38$$

Therefore, for a two-phase signal,

$$\left(\frac{g}{C}\right)_{N,S} = (1-0.38) = 0.62$$

This calculation is done at every intersection and the model is executed again with these revised inputs to compute new ETE and traffic routing. The number of iterations that need to be performed is generally not more than two or three. Such auxiliary considerations as "start-up lost time" are specified by the analyst (a default value of 2.0 seconds per approach was used for this study); also the "lost time" associated with the signal switching from one phase to the next (i.e. losses, L, in service time due to the yellow and all red intervals) are computed internally by the simulation model. In addition, any losses due to queue spillback and other operational difficulties encountered by the traffic are likewise represented by the model.

This approach is justified by the following considerations:

1. Signal controllers, particularly in urban and suburban environs, are typically traffic actuated and adjust their timing in a manner that is responsive to the competing demands.
2. Any existing inefficiencies in the timing plans of signals along the analysis network will be compensated for by driver behavior. During an evacuation, evacuees will generally respect the signal timing indications in the presence of competing flows in the interest of their personal safety. However, in the absence of any competing traffic movements, it is reasonable to expect that evacuees will pass through the intersection even if the signal indication is red.

3. No attempt is made to "optimize" signal timing to respond to cycle-by-cycle fluctuations in demand volume.

When there are competing traffic movements at an intersection or juncture, the real-estate within the intersection must be timeshared by these competing movements in order to afford safe passage. This is implemented in the simulation model by the analyst determining the allocation of effective green time as described above. Thus, depending upon circumstances, one or more of the competing traffic flows may be delayed at the intersection as it would be in the real world.

The DYNEV model is applied as an analysis tool rather than as a "single pass through" calculation of ETE. In particular, this tool is used to identify points of congestion and locations where Traffic Control Points (TCPs) could be helpful to the evacuating public. In addition, the detailed results of the simulation are analyzed to identify any locations where the specified control policy at at-grade intersections is not commensurate with the attendant evacuation traffic volumes. At these locations, the allocation of green time is adjusted so that it services the competing traffic volumes and the movement of traffic under evacuation conditions. In this manner, the model is executed in an iterative procedure so as to provide assurance that the allocations of "effective green time" at intersections appropriately represent the operating conditions during an evacuation.

This iterative procedure does not attempt to "optimize" traffic operations at an intersection but rather to represent a reasonably efficient operation under evacuation conditions. The establishment of a TCP at an intersection could well provide greater operational performance than is represented by the model. Thus, if all TCPs are manned in a timely manner by experienced personnel, it is possible that the ETEs predicted by the model might be slightly longer than achievable in the real world under these circumstances. Therefore, no allowance is made for TCP operations.

NUREG/CR-4873 and NUREG/CR-4874 provide additional detail on the IDYNEV model. References to these reports will be added to Section 1 of the ETE report.

B. The DYNEV simulation model represents the actual implementation of traffic signal displays (i.e. green, yellow and red) in accordance with the timing specified by the analyst, as described in the response to Part A. The model simulates the movement of traffic along the intersection approaches. When a red signal indication is exhibited the approaching vehicles will stop as they do in the real world. When the signal indication changes to green, the queue developed during the red will discharge at the saturation flow rate given in Appendix K. The simulation output records the number of stops and the delays experienced as well as the queue lengths on all approaches during the course of the evacuation. The animation "snapshots" shown in Figures 7-3 through 7-6 of the ETE report are taken directly from the model output.

As discussed in the response to Part A, the ETEs represent reasonable, but not optimal expectations. Therefore, no allowance is made for TCP operations. The access control points (ACPs) are assumed to restrict and divert travelers who wish to travel through the plume exposure pathway Emergency Planning Zone (EPZ), following activation after 90 minutes following the Advisory to Evacuate. Section 2.3, Section 9 and Appendix G of the ETE report will be revised to provide additional detail on the treatment of TCPs in this study.

The equation on page 4-2 relates approach capacity to discharge headway and to the control at a signalized intersection. The response to Part A, above, describes how the control is specified.

C. For more congested EPZs, "special treatments" requiring the presence of traffic guides may be considered. These treatments may involve contra flow ("reverse-laning") procedures or special

turn control treatments to expedite the movement of people - particularly those who live in high density population areas close to the nuclear power plant. These locations are identified by the model in the form of extensive queuing and delays. The Comanche Peak EPZ does not require special treatments given the fairly expeditious ETE of about four hours, which primarily reflects mobilization time rather than the effects of excessive congestion.

D. As discussed above, if all the traffic control points identified in the county plans were manned, the ETE may be less than that predicted in this study. This assumes, however, that sufficient manpower and equipment resources are available and that all traffic control points can be manned in sufficient time to support the evacuation process.

As mentioned above, no "credit" is taken for the expected improvement in traffic operations at those intersections where traffic personnel are located. Consequently, the conservative approach adopted is to avoid the assumption of expedited treatment at these locations. Therefore, any departure from the traffic management plan in Appendix G would not influence the computed ETE. As noted on pages ES-4 and G-1 of the ETE report, the traffic management plan presented does not supersede existing plans, but presents information that may be used in updating existing plans in the future.

Section 1 of the ETE report will be revised to include references to NUREG/CR-4873 and CR- 4874, which provide additional information on the IDYNEV model.

Item 6 in Section 2.3 of the ETE report will be revised to provide additional information on TCPs.

Section 9 of the ETE report will be revised to provide additional information on TCPs and ACPs.

Appendix G of the ETE report will be revised to provide additional information on TCPs.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 1-6, 2-5, 9-2, G-1 and two pages of inserts (total of 6 pages).

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

Developing the Evacuation Time Estimates

The overall study procedure is outlined in Appendix D. Demographic data were obtained from several sources, as detailed later in this report. These data were analyzed and converted into vehicle demand data.

Highway capacity was estimated for each highway segment based on the field surveys and on the principles specified in the 2000 Highway Capacity Manual (HCM[1]). The link-node representation of the physical highway network was developed using Geographic Information System (GIS) mapping software and the observations obtained from the field survey. This network representation of "links" and "nodes" is shown in Figure 1-2.

Analytical Tools

The IDYNEV System that was employed for this study is comprised of several integrated computer models. One of these is the PC-DYNEV (DYnamic Network EVacuation) macroscopic simulation model that was developed by KLD under contract with the Federal Emergency Management Agency (FEMA).

IDYNEV consists of three submodels:

- A macroscopic traffic simulation model (for details, see Appendix C).
- An intersection capacity model (for details, see Highway Research Record No. 772, Transportation Research Board, 1980, papers by Lieberman and McShane & Lieberman).
- A dynamic, node-centric routing model that adjusts the "base" routing in the event of an imbalance in the levels of congestion on the outbound links.

Another model of the IDYNEV System is the TRAD (TRaffic Assignment and Distribution) model. This model integrates an equilibrium assignment model with a trip distribution algorithm to compute origin-destination volumes and paths of travel designed to minimize travel time. For details, see Appendix B.

Still another software product developed by KLD, named UNITES (UNIfied Transportation Engineering System) was used to expedite data entry.

The procedure for applying the IDYNEV System within the framework of developing an update to an ETE is outlined in Appendix D. Appendix A is a glossary of terms.

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[1] Highway Capacity Manual (HCM2000), Transportation Research Board, National Research Council, 2000.

Insert A

2.3 Study Assumptions

1. The Planning Basis Assumption for the calculation of ETE is a rapidly escalating accident that requires evacuation, and includes the following:
   a. Advisory to Evacuate is announced coincident with the siren notification.
   b. Mobilization of the general population will commence within 10 minutes after the Advisory to Evacuate.
   c. ETE are measured relative to the Advisory to Evacuate.
2. It is assumed that everyone within the group of Zones forming a Region that is issued an Advisory to Evacuate will, in fact, respond in general accord with the planned routes.
3. It is further assumed that:
   a. Schools may be evacuated prior to notification of the general public.
   b. 40 percent of the households in the EPZ have at least 1 commuter; 45 percent of those households will await the return of a commuter before beginning their evacuation trip, based on the telephone survey results.
4. The ETE will also include consideration of "through" (External-External) trips during the time that such traffic is permitted to enter the evacuated Region. "Normal" traffic flow is assumed to be present within the EPZ at the start of the emergency.
5. Access Control Points (ACP) will be staffed within approximately 90 minutes of the siren notifications, to divert traffic attempting to enter the EPZ. Earlier activation of ACP locations could delay returning commuters. It is assumed that no vehicles will enter the EPZ after this 90 minute mobilization time period.

Insert B

6. ~~Traffic Control Points (TCP) within the EPZ will be staffed over time, beginning at the Advisory to Evacuate. Their number and location will depend on the Region to be evacuated and the resources available. It is assumed that drivers will act rationally, travel in the directions identified in the plan (as documented in the public information material), and obey all control devices and traffic guides.~~

RAI 13.03-18

7. Buses will be used to transport those without access to private vehicles:
   a. If schools are in session, transport (buses) will evacuate students directly to the assigned Host Schools.
   b. Medical facilities are required to have a detailed evacuation plan and to provide adequate transportation for all residents. Buses needed to evacuate special facilities are provided through private contracting.

Page 1-6:

INSERT A:

The following references provide additional detail on the IDYNEV model:

- NUREG/CR-4873 – Benchmark Study of the I-DYNEV Evacuation Time Estimate Computer Code

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- NUREG/CR-4874 – The Sensitivity of Evacuation Time Estimates to Changes in Input Parameters for the I-DYNEV Computer Code

Section 2.3, Assumption 6:

INSERT B:

6. Traffic Control Points (TCP) within the EPZ will be staffed over time, beginning at the Advisory to Evacuate. Their number and location will depend on the Region to be evacuated and the resources available. In calculating ETE, it is assumed that drivers will act rationally, travel in the directions identified in the plan (as documented in the public information material), and obey all control devices and traffic guides. The objectives of these TCP are:

   a. Facilitate the movements of all (mostly evacuating) vehicles at the location

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   b. Discourage inadvertent vehicle movements towards the power station.

   c. Provide assurance and guidance to all travelers. This guidance is provided by the deployment of traffic cones and by the user of hand signals by the traffic guides.

   d. Act as local surveillance and communications center.

   e. Provide information to the emergency operations center (EOC) as needed, based on direct observation or on information provided by travelers.

   These TCP serve many useful functions, but are not considered in specifying the inputs to the DYNEV model used to calculate ETE. Consequently, the results presented in Section 7 and in Appendix J are conservative in that they do not reflect an incremental enhancement in traffic performance due to the presence of these TCP. The time needed to mobilize personnel or equipment to staff the TCP will not influence ETE results.

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 law 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.

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 plant. 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.

Insert C

RAI 13.03-18

Page 9-2:

INSERT C:

As discussed in Section 2.3, these TCP are not credited in calculating the ETE results. Access control points (ACP) are deployed near the periphery of the EPZ to divert "through" trips. The ETE calculations reflect the assumptions that all "external-external" trips are interdicted after 90 minutes have elapsed after the advisory to evacuate (ATE). RAI 13.03-18

All transit trips and other responders entering the EPZ to support the evacuation are assumed to be unhindered by personnel manning ACPs.

Study Assumptions 5 and 6 in Section 2.3 discuss ACP and TCP staffing schedules and operations.

APPENDIX G: TRAFFIC MANAGEMENT

This appendix presents the traffic control and access control tactics implemented in developing evacuation time estimates for the Comanche Peak Nuclear Power Plant. Suggested Traffic Control Points (TCP) and Access Control Points (ACP) are listed, recognizing that existing plans are in place and have been tested. **This Appendix provides information that may be considered in updating the existing plans, but does not supersede them.** TCP and ACP should be manned according to priority, manpower and available equipment resources – not all TCP and ACP need to be activated.

Pages G-2 through G-43 detail the TCP, which are typically within the EPZ or just outside the EPZ. TCP are established to facilitate the flow of evacuating traffic from the Region being evacuated. Figure G-1 presents an overview map of the TCP, while Figures G-2 through G-4 depict the TCP in the more populated areas of the EPZ. Table G-1 summarizes the TCP and the manpower and equipment needed to implement traffic control. The table is sorted by county and by priority.

Pages G-44 through G-61 detail the ACP, which are typically on the periphery of the EPZ; these points are established to divert vehicles from entering the EPZ. Doing so provides all of the available roadway capacity within the EPZ to the evacuees. Table G-2 summarizes the ACP and the manpower and equipment needed to establish access control, while Figure G-5 provides a detailed map of the location of each ACP.

Manpower and equipment shortages are likely to arise; as such, prioritization of TCP and ACP was established to make the most efficient use of manpower and equipment in the event of an emergency. The use of ITS technologies, as outlined in Section 9, can also aid in overcoming resource constraints.

With reference to the discussion of Section 2.3, these TCP serve many useful functions, but are not considered in specifying the inputs to the PC-DYNEV model used to calculate ETE. Consequently, the results presented in Section 7 and in Appendix J do not credit the presence of these TCP.

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-19

ETE-3: Demand Estimation, Permanent Residents
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section II.A.

A. COLA, Part 5, ETE Report, Section 2.1, "Data Estimates," states that population estimates are projected to 2007 using regression analysis on County-specific projections. Discuss the regression analysis method used in the development of the county-specific population projections and include this information in a revision to the ETE report.

B. The population growth rate between 2000 and 2007 is identified as 11.8 percent in Table 3-1, "EPZ Permanent Resident Population by Zone." Table 6-4, "Vehicle Estimates By Scenario," provides extrapolated vehicle estimates to 2015 when the construction workforce will be at its peak and indicates that the growth rate between 2007 and 2015 for residents is 26 percent. Discuss the approach used to determine the permanent resident growth rate from 2007 to 2015. Revise the ETE report as needed.

C. COLA, Part 5, ETE Report, Section 8.1, "Transit Dependent People – Demand Estimate," identifies 259 people registered with local authorities as transit dependent or as having a special need. Table 8-1, "Transit Dependent Population Estimates," identifies 593 residents requiring transportation.
   1. Discuss if Table 8-1 includes the 259 residents who have registered as having a special need. Revise the ETE report as needed.
   2. Discuss whether any of the transit dependent residents have special needs that may require specialized transportation. Revise the ETE report as needed.

ANSWER:

A. County level population estimates were obtained from the State of Texas for the 2000-2040 timeframe, using the Cohort Component projection method. According to the US Census Bureau website[1], "in the cohort-component method, the components of population change (fertility, mortality, and net migration) are projected separately for each birth cohort (persons born in a given year). The base population is advanced each year by using projected survival rates and net international migration by single year of age, sex, race, and Hispanic origin. Each year, a new birth cohort is added to the population by applying the projected fertility rates by race and Hispanic origin to the female population. The components of change are individually applied to each of the race/ethnic groups to project the next year's population."

The census 2000 block data set is the highest resolution data set available for permanent population. Block data can be loaded directly into Geographical Information System (GIS) software, which has more capabilities than other methods that do not use GIS. The fine resolution of Census block data allows a more accurate representation of population, especially in the smaller radii. The population projection equation used is:

1. **(Block Data Summed for Each Sector)*([Regression Equation Ratio])**

Where Block is the number of people in that block (this also represents the base population number), the sector is an area defined by distance and direction, and the regression equation ratio is derived from the county level population estimates. The sectors were loaded with 2000 census block population numbers prior to any further manipulation using GIS and Microsoft Excel.

In some cases the sector lines cross the census block boundaries. In this event, area weighting ratios are derived with the following assumptions:

- There is an even spatial distribution of people in each block.
- There is an even spatial distribution of population growth in each county.
- No one lives in identified water areas. (Water areas will be subtracted out of the land area to have a more accurate density value for any density studies.)
- No one will be living inside the CPNPP property boundaries.

The county level population estimates are curves fitted by linear or least squares regression techniques in Microsoft Excel to compute a linear equation for each county. The excel formulas used are:

2. **=INDEX(LINEST(B2:N2,B$1:N$1),1) {Slope}**

3. **=INDEX(LINEST(B2:N2,B$1:N$1),2) {Y Intercept}**

Where B2:N2 are the population values and B$1:N$1 are the years. The regression equation is linear:

4. **Y=mX+b**

[1] http://www.census.gov/population/www/projections/aboutproj.html

Where Y is the estimated permanent population in the county for any year X, m is the slope computed in Equation 2, and b is the Y Intercept computed in Equation 3.

The regression equation ratio can be found by simply dividing the results from Equation 4 by the county level Census 2000 population count. The equation becomes:

5. **Regression Equation Ratio = (mX+b)/[Census 2000 County Data]**

Where mX+b is from Equation 4 and Census 2000 County Data is take directly from the census for each county. This ratio is the percentage of growth (or decline) that is experienced by the county based on the regression equation. An exception was made for counties predicting a negative population growth. In such a case, a value of one was assumed to produce the most conservative population estimates. Substituting Equation 5 into Equation 1 yields:

6. **(Block Data Summed for Each Sector)*((mX+b)/[Census 2000 County Data])**

Where the summed block data is based on its geographic sector and the regression ratio is based on the county area. The geographies are combined using GIS software and an area weighting ratio is used for any sector that contains multiple counties. The final equation is:

7. **(Summed Block Data)*(Area Weight Ratio)*((mX+b)/[Census 2000 County Data])**

A brief summary of this population estimation methodology will be added to Section 3.1 of the ETE report.

B. Section 3.1 of the ETE Report presents population growth rates by county from Year 2000 to Year 2007. These growth rates are 10% for Somervell County and 13% for Hood County. These values were applied to each Zone, depending on which county the zone is in. A blended growth rate was determined for the "CP" Zone because this Zone is partially in both counties. The population within the Somervell County portion of the "CP" Zone is higher than the population within the Hood County portion of the "CP" Zone. As a result, a growth rate of 11% was used for the "CP" Zone, with the 10% growth rate for Somervell weighted more heavily than the 13% growth rate for Hood County.

The Zone specific growth rates were then multiplied by 15/7 in order to compute a growth factor to 2015 from the 2007 population estimate. This growth factor was then applied to each source in the input stream to project evacuating vehicles to 2015. The "roundup" function in Microsoft Excel was used when doing these projections to ensure fractions of vehicles were not included. This methodology resulted in a 26% growth in permanent resident population from 2007 to 2015. Given that an 11.8% growth rate is shown in Table 3-2, applying a 15/7 factor results in a 25.3% growth rate, which was rounded up to 26%.

During preparation of this response, the calculations in the input stream were reviewed and an error in the projection formula for 1 source in Zone 4F and 5 sources in the Tolar Zone was discovered. This error resulted in the vehicles for these sources remaining in year 2007, rather than being projected to 2015. This oversight resulted in a difference of 112 vehicles for the year 2015. As shown in Table 6-4, there are 40,948 vehicles evacuating for Scenario 12. Thus, this difference of 112 vehicles equates to approximately 0.25% of the evacuating vehicle stream and has no impact on the ETE.

As a result of the error identified in the projection formula, Table 6-4 has been revised to indicate 9,972 vehicles for residents with commuters, 14,810 vehicles for residents without commuters, 4,323 shadow vehicles and 41,060 total scenario vehicles for scenario 12.

Section 3.2 has been revised to further discuss the procedure used to extrapolate resident and shadow vehicles to 2015.

C. The estimate of transit-dependent people in Table 8-1, "Transit Dependent Population Estimates," considered residents who would not likely have access to a vehicle at the time of an evacuation. The methodology used the following responses from the telephone survey:

- Household size
- Vehicles available for an evacuation
- Percent households with commuters
- Percent households with non-returning commuters

These estimates do not include the 259 registered special needs population from Hood County; this data included people with all disabilities. The following more recent data was provided by representatives from the offices of emergency management for the EPZ Counties:

Somervell County – 32 special needs persons requiring transportation:

- 0 bedridden
- 6 wheelchair bound
- 26 ambulatory

Hood County – 52 special needs persons requiring transportation:

- 0 bedridden
- 4 wheelchair bound
- 47 ambulatory

As discussed in Section 8.3 of the ETE report, buses can transport up to 30 persons, wheelchair buses can transport 15 persons, and wheelchair vans can transport 4 persons. Section 3.5 of the ETE report has been revised to be consistent with Section 8.3.

The following text discussing ETE for special needs persons has been added to the ETE report as a new subsection 8.6, "Evacuation Time Estimates for Special Needs Population." The first paragraph in Section 8.1 will be deleted as more recent data will be provided in subsection 8.6.

<u>ETE for Special Needs Persons</u>

<u>Buses</u>

Assuming no more than one special needs person per household implies that 73 households (HH) need to be serviced. If 9 buses are deployed to service these special needs HH, then they each would require about 8 stops, on average. The following outlines the ETE calculations:

1. Assume 9 buses are deployed, each with approximately 8 stops, to service a total of 73 HH.

2. The buses evacuating school children would subsequently be deployed to service special needs persons.
   a. Buses arrive at the school reception center at 1:40 (see Table 8-5A)
   b. Discharge passengers and driver rests: 5 + 15 = 20 minutes
   c. Travel to EPZ, to first pickup: 35 minutes (average of travel time from EPZ Boundary to reception center in Table 8-5A)
   d. Load HH members at first pickup: 5 minutes
   e. Travel to next pickup locations: 7 @ 6 minutes = 42 minutes
   f. Load HH members: 7 @ 5 minutes = 35 minutes
   g. Travel to EPZ boundary at free speed from last pickup (assume 8 miles @ 40 mph – EPZ is clear of congestion at this time): 12 minutes.

ETE: 1:40 + 20 + 35 + 5 + 42 + 35 + 12 = <u>4:10</u>

Rain ETE: 2:00 + 20 + 43 + 5 + 49 + 35 + 14 = <u>4:50</u>

The estimated travel time between pickups is based on a distance of 2 miles @ 20 mph = 6 minutes. If planned properly, the pickup locations for each bus run should be clustered within the same general area. The travel time to the EPZ to the first pickup in rain is 43 minutes (average of travel time from EPZ Boundary to reception center in Table 8-5B). It is further assumed that travel speeds are 10% lower in rain – travel time to the EPZ boundary at free speed from last pickup requires 14 minutes (8 miles @ 36 mph) in rain and that travel time between pickups is 7 minutes (2 miles @ 18 mph). All ETE are rounded up to the nearest 5 minutes.

If school is not in session, then the first pickup would occur at 90 minutes and ETE are computed as follows:

ETE: 90 + 5 + 42 + 35 + 15 = <u>3:10</u>

Rain ETE: 100 + 5 + 49 + 35 + 18 = <u>3:30</u>

Travel to EPZ boundary: 8 miles @ 30 mph at 2:55 in good weather, 8 miles @ 27 mph at 3:10 in rain.

The average household (HH) size in the EPZ is 2.21 persons according to Figure F-1 of the ETE report. Assuming all HH members travel with the disabled person yields 8 x 2.21 = 18 persons per bus.

From the perspective of bus capacity, fewer buses could be deployed. For example, 6 buses, each servicing 12 HH could accommodate 2.21 x 12 = 27 people, but the additional 4 stops would add 4 x (6 + 5) = 44 minutes to the ETE.

<u>Wheel-Chair Vans</u>

Based on a wheelchair van capacity of 4 wheelchairs per trip, 3 wheelchair vans are needed to evacuate the 10 wheelchair bound persons within the EPZ. Assuming one special needs person per household, each wheelchair van will service about 4 households. It is conservatively assumed

that the households are spaced 5 miles apart and that van speeds approximate those of school buses = 20 mph between households.

a. Assumed mobilization time for wheelchair van resources to arrive at first household: 1:30

b. Loading time at first household: 15 minutes

c. Travel to next household: 3 @ 15 minutes (5 miles @ 20 mph) = 45 minutes

d. Loading time: 3 @ 15 minutes = 45 minutes

e. Wheelchair van travel time to EPZ boundary at 3:15: 5 miles @ 20 mph = 15 minutes

ETE: 1:30 + 15 + 45 + 45 + 15 = <u>3:30</u>

Rain ETE: 1:40 + 15 + 51 + 45 + 17 = <u>3:50</u>

It is assumed that mobilization is 10 minutes longer in rain = 1:40. Travel speeds are 10% lower in rain; thus, travel time is 5 miles @ 18 mph = 17 minutes.

<u>Impact on R-COLA</u>

See attached Estimate Draft Revision 3, pages 3-2, 3-18, 6-7, 8-2, 8-11 and 4 pages of inserts (total of 9 pages).

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

<u>Impact on S-COLA</u>

None.

<u>Impact on DCD</u>

None.

Estimates of the population and number of evacuating vehicles for each of the population groups are presented for each Zone and by polar coordinate representation (population rose). The CPNPP EPZ has been subdivided into 31 Zones as shown in Figure 3-1.

3.1 Permanent Residents

Permanent population data was provided by Enercon Services personnel for the years 2000 and 2007. ~~The average household size (2.21 persons/household) and the number of evacuating vehicles per household (1.29 vehicles/household) were adapted from the telephone survey results.~~ RAI 13.03-19

The County population growth between 2000 and 2007, for areas within 15 miles of CPNPP, are as follows:

- Hood, 13%
- Somervell, 10%
- Erath, 12%
- Johnson, 12%
- Bosque, 8%.

Insert A

The data in Table 3-1 shows that the EPZ population has increased, on average, by 11.8 percent, over the last 7 years. Insert B RAI 13.03-19

Permanent resident population and vehicle estimates for 2007 are presented in Table 3-2. Figures 3-2 and 3-3 present the permanent resident population and permanent resident vehicle estimates by sector and distance from the CPNPP.

3.2 Construction

A "special event" scenario (Scenario 12) which represents a typical summer, mid-week, midday with construction workers on-site at the time of the emergency, was considered. The peak construction period – based on discussions with Enercon Services – would be in the year 2015, with workforce estimates of 4,300 workers. An average vehicle occupancy of 1.02 workers per vehicle (adapted from telephone survey results) was used to convert workers to vehicles – 4,202 total vehicles. The existing roadway system was used for the construction scenario; no roadway improvements were considered. Permanent resident population and shadow population were extrapolated to 2015 for this scenario. RAI 13.03-19

Insert C

Section 3.1:

INSERT A:

The population for Year 2007 was estimated using regression analysis. County level population estimates were obtained from the State of Texas for the 2000-2040 timeframe, using the Cohort Component projection method. According to the US Census Bureau website, "in the cohort-component method, the components of population change (fertility, mortality, and net migration) are projected separately for each birth cohort (persons born in a given year). The base population is advanced each year by using projected survival rates and net international migration by single year of age, sex, race, and Hispanic origin. Each year, a new birth cohort is added to the population by applying the projected fertility rates by race and Hispanic origin to the female population. The components of change are individually applied to each of the race/ethnic groups to project the next year's population."

RAI 13.03-19

These county level population estimates were curve fitted by linear or least squares regression techniques in Microsoft Excel to compute a linear equation for each county. A regression equation ratio was then computed by dividing the linear equation by the county level Census population estimate for Year 2000. Census Block data were summed by sector (defined by direction and distance from CPNPP) for the Year 2000 using GIS software and then multiplied by the regression equation ratio to estimate the population for Year 2007.

Section 3.1:

INSERT B:

The average household size (2.21 persons/household) and the number of evacuating vehicles per household (1.29 vehicles/household), adapted from the telephone survey results, were used to estimate the number of evacuating vehicles using the 2007 population.

RAI 13.03-19

Section 3.2:

INSERT C:

Population growth rates by county from Year 2000 to Year 2007 are presented in Section 3.1. These values were applied to each Zone, depending on which county the zone is in. The "CP" Zone is partially in both EPZ counties; a blended growth rate of 11% was used for this Zone. The Shadow Region includes portions of 5 counties; a blended growth rate of 12% was used for this Zone. The Zone specific growth rate was then multiplied by 15/7 in order to compute a growth factor to 2015 from the 2007 population estimate. This growth factor was then applied to each source in the input stream to project evacuating vehicles to 2015.

RAI 13.03-19

3.5 Medical Facilities

Data request forms were completed for each of the medical facilities within the CPNPP EPZ. Chapter 8 details the evacuation of medical facilities and their patients. The number and type of evacuating vehicles that need to be provided depends on the state of health of the patients. ~~Buses can transport up to 40 people; vans, up to 12 people; ambulances, up to 2 people.~~

Buses can transport up to 30 people; wheelchair buses, up to 15 people; wheelchair vans, up to 4 people; and ambulances, up to 2 people.

RAI 13.03-19

3.6 Pass-Through Demand

Vehicles will be traveling through the EPZ (external-external trips) at the time of an accident. After the Advisory to Evacuate is announced, these through travelers will also evacuate. These through vehicles are assumed to travel on the major routes through the EPZ (e.g. US Hwy 67 and US Hwy 377) and on some minor routes. The loading rates are 300 vehicles per lane per hour for major routes and 100 vehicles per lane per hour for the minor routes. It is assumed that this traffic will continue to enter the EPZ during the first 90 minutes following the Advisory to Evacuate. We estimate approximately 1,700 vehicles per lane per hour enter the EPZ as external-external trips during this period.

Local officials brought attention to the recent increase in truck traffic, largely due to oil discovery drilling in the area. In particular, US Hwy 377, US 67, FM 56 and STHY 144 are affected by this influx of truck traffic. Discussions with local officials indicate that his truck traffic generally has origins and destination outside of the EPZ and would only be passing through the EPZ. It is assumed that the pass-through demand already accounts for this truck traffic.

Table 6-4. Vehicle Estimates By Scenario

Scenarios	Residents with Commuters	Residents without Commuters	Employees	Transients	Shadow	Special Events	School Buses	Transit Buses	External Traffic	Total Scenario Vehicles
1	7,874	11,643	1,330	4,665	3,475	-	18	40	1,700	30,745
2	7,874	11,643	1,330	4,665	3,475	-	18	40	1,700	30,745
3	787	18,730	665	5,362	3,364	-	-	40	1,700	30,648
4	787	18,730	665	5,362	3,364	-	-	40	1,700	30,648
5	787	18,730	139	4,343	3,276	-	-	40	1,020	28,335
6	7,874	11,643	1,385	3,539	3,484	-	174	40	1,700	29,839
7	7,874	11,643	1,385	3,539	3,484	-	174	40	1,700	29,839
8	787	18,730	693	4,075	3,369	-	-	40	1,700	29,394
9	787	18,730	693	4,075	3,369	-	-	40	1,700	29,394
10	787	18,730	139	3,485	3,276	-	-	40	1,020	27,477
11	787	18,730	665	5,362	3,364	1,563	-	40	1,700	32,211
12*	~~9,927~~ 9,972	~~14,742~~ 14,810	1,330	4,665	~~4,324~~ 4,323	4,202	18	40	1,700	~~40,948~~ 41,060

RAI 13.03-19

***Permanent Resident population and Shadow population have been extrapolated to the Year 2015, which is when the construction workforce will be at its peak.**

8.1 Transit-Dependent People - Demand Estimate

~~Hood County maintains a list of residents who are transit-dependent or have special needs. A total of 259 people are currently identified, with the majority residing in Granbury. The location of these residents was considered in identifying likely bus routes needed to service the transit dependent. KLD suggests the following methodology for estimating transit-dependent population, which includes those people who may be transit-dependent because a commuter in the household is using the only available vehicle to travel to work outside the EPZ.~~

RAI 13.03-19

The calculations that follow provide a reasonable estimate for the number of transit dependent people in the EPZ during regular working hours. Insert D

RAI 13.03-19

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 advised.

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 advised, 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

route used to exit the EPZ will depend on the extent of the emergency and the wind direction. For this analysis the evacuating buses are assumed to travel the quickest route out of the EPZ, which is eastbound on US Highway 67. The need for security will largely dictate the number of buses required to transport the [up to] 57 inmates and accompanying corrections officers out of the EPZ. If the jail was filled to capacity, 3 buses would be required; for the current (August 2007) occupancy of 32 inmates, 2 buses would be required.

It is reasonable to estimate the arrival of these buses at 2:45 after the Advisory to Evacuate. This estimate reflects the 1:55 required to evacuate schoolchildren, 15 minutes for de-boarding and a break for the driver, followed by travel time (22 miles from Cleburne) to Somervell County Jail at an assumed average speed of 40 mph.

To maintain security, it is expected that both buses will evacuate in a single group (or convoy) with an escort of law enforcement vehicles. It is estimated that each bus can be boarded and secured in 10 minutes. It is reasonable to assume that 2 buses can be loaded in parallel, consistent with the need to maintain order and security.

For Scenario 6 (winter), Region 3 (entire EPZ), the average speed output by the model at approximately 2:45 after the Advisory to Evacuate is 48 mph. The distance to the EPZ boundary is 8 miles; it will take approximately 10 minutes to travel out of the EPZ.

The ETE for Somervell County Jail is:

Mobilize the buses:	2:45
Board the Inmates:	0:10
Travel out of EPZ:	0:10
ETE	**3:05**

RAI 13.03-19

Insert E

Section 8.1:

INSERT D:

This estimate includes those people who may be transit dependent because a commuter in the household is using the only available vehicle to travel to work outside the EPZ.

RAI 13.03-19

Section 8.6:

INSERT E:

The following special needs registration data were provided by representatives from the offices of emergency management for the EPZ Counties:

Somervell County – 32 special needs persons requiring transportation:

- 0 bedridden
- 6 wheelchair bound
- 26 ambulatory

Hood County – 52 special needs persons requiring transportation:

- 0 bedridden
- 4 wheelchair bound
- 47 ambulatory

As discussed in Section 8.3, buses can transport up to 30 persons, wheelchair buses can transport 15 persons, and wheelchair vans can transport 4 persons.

<u>ETE for Special Needs Persons</u>

<u>Buses</u>

Assuming no more than one special needs person per household (HH) implies that 73 households need to be serviced. If 9 buses are deployed to service these special needs HH, then they each would require about 8 stops, on average. The following outlines the ETE calculations:

1. Assume 9 buses are deployed, each with approximately 8 stops, to service a total of 73 HH.

RAI 13.03-19

2. The buses evacuating school children would subsequently be deployed to service special needs persons.

a. Buses arrive at the school reception center at 1:40 (see Table 8-5A)

b. Discharge passengers and driver rests: 5 + 15 = 20 minutes

c. Travel to EPZ, to first pickup: 35 minutes (average of travel time from EPZ Boundary to reception center in Table 8-5A)

d. Load HH members at first pickup: 5 minutes

e. Travel to next pickup locations: 7 @ 6 minutes = 42 minutes

f. Load HH members: 7 @ 5 minutes = 35 minutes

g. Travel to EPZ boundary at free speed from last pickup (assume 8 miles @ 40 mph – EPZ is clear of congestion at this time): 12 minutes.

ETE: 1:40 + 20 + 35 + 5 + 42 + 35 + 12 = 4:10

Rain ETE: 2:00 + 20 + 43 + 5 + 49 + 35 + 14 = 4:50

The estimated travel time between pickups is based on a distance of 2 miles @ 20 mph = 6 minutes. If planned properly, the pickup locations for each bus run should be clustered within the same general area. The travel time to the EPZ to the first pickup in rain is 43 minutes (average of travel time from EPZ Boundary to reception center in Table 8-5B). It is further assumed that travel speeds are 10% lower in rain – travel time to the EPZ boundary at free speed from last pickup requires 14 minutes (8 miles @ 36 mph) in rain and that travel time between pickups is 7 minutes (2 miles @ 18 mph). All ETE are rounded up to the nearest 5 minutes.

If school is not in session, then the first pickup would occur at 90 minutes and …

ETE: 90 + 5 + 42 + 35 + 15 = 3:10

RAI 13.03-19

Rain ETE: 100 + 5 + 49 + 35 + 18 = 3:30

Travel to EPZ boundary: 8 miles @ 30 mph at 2:55 in good weather, 8 miles @ 27 mph at 3:10 in rain.

The average household size in the EPZ is 2.21 persons according to Figure F-1 of the ETE report. Assuming all HH members travel with the disabled person yields 8 x 2.21 = 18 persons per bus.

From the perspective of bus capacity, fewer buses could be deployed. For example, 6 buses, each servicing 12 HH could accommodate 2.21 x 12 = 27 people, but the additional 4 stops would add 4 x (6 + 5) = 44 minutes to the ETE.

Wheel-Chair Vans

Based on a wheelchair van capacity of 4 wheelchairs per trip, 3 wheelchair vans are needed to evacuate the 10 wheelchair bound persons within the EPZ. Assuming one special needs person per household, each wheelchair van will service about 4 households. It is conservatively assumed that the households are spaced 5 miles apart and that van speeds approximate those of school buses = 20 mph between households.

a. Assumed mobilization time for wheelchair van resources to arrive at first household: 1:30

b. Loading time at first household: 15 minutes

c. Travel to next household: 3 @ 15 minutes (5 miles @ 20 mph) = 45 minutes

d. Loading time: 3 @ 15 minutes = 45 minutes

e. Wheelchair van travel time to EPZ boundary at 3:15: 5 miles @ 20 mph = 15 minutes

RAI 13.03-19

ETE: 1:30 + 15 + 45 + 45 + 15 = 3:30

Rain ETE: 1:40 + 15 + 51 + 45 + 17 = 3:50

It is assumed that mobilization is 10 minutes longer in rain = 1:40. Travel speeds are 10% lower in rain; thus, travel time is 5 miles @ 18 mph = 17 minutes.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-20

ETE-4: Demand Estimation, Transient Populations
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Sections II.B.

A. Table 3-3, "Summary of Transients by Zone," provides a total of 13,541 transients. The Comanche Peak Environmental Report (ER) Table 2.5-3, "The Current Residential and Transient Population for Each Sector 0-16 km (10 mi)," lists a current resident and transient EPZ population of 71,261 persons, and ER Table 2.5-1, "The Projected Permanent Population for Each Sector 0-16 km (10 mi) for Years 2007, 2016, 2026, 2036, 2046, and 2056," identifies 32,451 permanent residents within the 10 mile emergency planning zone (EPZ). The difference between the values in the ER indicates there are 38,810 transients in the EPZ. Discuss the difference between the transient population estimates provided. Revise the ETE report as needed.

B. COLA, Part 5, ETE Report, Section 8.4, "Summer Camps and Retreats – Transit Demand," indicates 5 summer camps with a population of 2,020 children. Provide an estimate of the number of buses and drivers needed to support evacuation of the summer camps, and include this in a revision to the ETE report.

C. COLA, Part 5, ETE Report, Appendix I, "Evacuation Sensitivity Studies," identifies the Granbury 4th of July Celebration as a special event with an attendance of up to 50,000 people, but Table 6-2, "Evacuation Scenario Definitions," identifies a smaller event at the amphitheater for the Scenario 11 special event analysis. Discuss whether the Granbury 4th of July Celebration should be used as the peak tourist volume special event in the analysis. Revise the ETE report as needed.

ANSWER:

A. As discussed in Section 3.3 of the ETE report, peak attendance at transient facilities were provided by County emergency management offices, supplemented by data obtained through phone calls to facilities and from internet searches. A similar methodology was used in the Environmental Report (ER), as documented in Section 2.5.1.3. Sections 3.3.1 and 3.3.2 of the ETE report provide additional details on the major recreational areas and lodging facilities within the plume exposure pathway EPZ. Pages E-8, E-10 and E-11 also provide detail on the number of transients in the EPZ. Table 3-3 of the ETE report indicates that there are 13,541 transients in the EPZ at peak times, versus 38,810 in the ER, a difference of 25,269 transients.

The ER considers people attending the Fourth of July Celebration in Granbury in the transient estimate, as shown in Figure 2.5-4 of the ER. According to Table 2.5-9 of the ER, the Fourth of July Celebration in Granbury is a two-day event with a total attendance of 50,000 people. As stated in Section 2.5.1.3 of the ER, "[t]he peak transient population is derived from summing maximum one-day transient counts (if known) with daily totals derived from the annual total to obtain the peak transient count for any given day." Therefore, a peak one-day estimate of 25,000 transients is considered in the ER for the Fourth of July Celebration.

The ETE study does not consider those people attending the Fourth of July Celebration in Granbury in its transient estimates. The transient influx for this celebration is not typical as it occurs only 2 days of the year. The ETE study considers this as a special event, as discussed in the response to Part C below, and does not include it in the transient population estimates. The inclusion of the people attending this event as transients in the ER accounts for the large difference in the transient estimate between the ER and the ETE.

B. Assumption 10 in Section 2.3 of the ETE report states that school buses have a capacity of 50 children per bus for middle and high schools. Using this capacity, the following buses and drivers are needed to evacuate summer camps:

- Camp Arrowhead: 6 buses and drivers
- Riverbend Retreat Center: 14 buses and drivers
- Camp Tres Rios: 14 buses and drivers
- Steven's Ranch: 5 buses and drivers
- Glen Lake Methodist Camp: 2 buses and drivers

Since theses camps and retreats operate in the summer or on weekends, when school is not in session, school buses and drivers in the area will be available to evacuate the transients at each facility.

Section 8.4 has been revised to include the number of buses and drivers needed to evacuate each facility.

C. As discussed on page I-3 of the ETE report, the Fourth of July Celebration in Granbury attracts 30,000 to 50,000 people. An event at the Amphitheatre (Scenario 11), however, only attracts 5,000 people. The Fourth of July Celebration in Granbury will be added as a special event that will be identified as Scenario 13 on a summer, weekend, good weather, midday in a future revision of the ETE report as it represents the peak tourist volume special event in the EPZ.

The addition of the Fourth of July Celebration in Granbury as Scenario 13 resulted in the following changes to the ETE report:

- Revised all references to "12 scenarios" in the report to "13 scenarios".
- Revised all references to "756" evacuation cases to "819" evacuation cases.
- ETE values for Scenario 13 have been computed and added to Tables 7-1 and J-1.
- Revised Tables 7-1C and 7-1D in the Executive Summary to include Scenario 13.
- Revised Tables 6-2 through 6-4 to include Scenario 13. Also, the "Special Events" footnote to Table 6-3 was revised to include the Fourth of July Celebration in Granbury.
- Revised the table on page 2-3 and Table 6-2 in the Executive Summary to include Scenario 13.
- Revised pages 7-4 and J-2 to include Scenario 13 under "Special Event (if any)"
- The discussion of the Fourth of July Celebration sensitivity study in Appendix I was deleted as this event is now considered as Scenario 13.
- Section 3.3.3 was added to discuss the Fourth of July Celebration.

Revised Section 8.4 to discuss the number of buses and bus drivers needed to evacuate summer camps and retreats in the EPZ.

Revised assumption 7 on page 2-3 to indicate that three special event scenarios are included and added the Fourth of July Celebration in Granbury to the discussion.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 1-11, 2-3, 3-11, 6-1, 6-5, 6-6, 6-7, 7-1, 7-4, 8-5, I-3, J-1, J-2, J-25, ES-3, ES-4, ES-9, and 2 pages of inserts (total of 19 pages).

The following have been identified to be changed to incorporate Scenario 13 but have not been updated yet. These changes will be made in Revision 3 to the ETE Report:

- Add Figure J-13, "Evacuation Time Estimates, Scenario 13, Region R03 (Entire EPZ)."
- Update time estimate on pages 7-7 through 7-14
- Update time estimate on pages J-4 through J-11
- Update time estimate on pages ES-10 through ES-13

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

Table 1-1. ETE Study Comparisons (continued)		
Traffic and Access Control	Traffic Control recommended for at least 3 locations.	Traffic and Access Control used in all scenarios to facilitate the flow of traffic outbound relative to CPNPP.
Weather	Adverse. The capacity of each link in the network is reduced by 25% for adverse weather.	Normal or Rain. The capacity and free flow speed of all links in the network are reduced by 10% in the event of rain.
Modeling	Evacuation Simulation Model (ESIM) – part of Oak Ridge Evacuation Modeling System (OREMS).	IDYNEV System: TRAD and PC-DYNEV.
Special Events	None considered.	Two considered – Construction of new unit at CPNPP site and a major event at the Amphitheatre.
Evacuation Cases	7 Regions: 4 quadrants, 2, 5, and 10-mile rings. 2 Scenarios considered.	63 Regions (central sector wind direction and adjacent sector(s) technique used) and ~~12~~ 13 Scenarios producing ~~756~~ 819 unique cases.
Evacuation Time Estimates Reporting	ETE reported only for 90th percentile population. Results presented by Region and Scenario.	ETE reported for 50th, 90th, 95th, and 100th percentile population. Results presented by Region and Scenario.
Evacuation Time Estimates for the entire EPZ	90th percentile, Summer Weekday, Good weather = 2:29	Summer Weekday, Midday, Good weather: 100th percentile = 4:20 95th percentile = 2:50 90th percentile = 2:10 50th percentile = 1:10

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6. The models of the IDYNEV System were recognized as state of the art by Atomic Safety & Licensing Boards (ASLB) in past hearings. (Sources: Atomic Safety & Licensing Board Hearings on Seabrook and Shoreham; Urbanik[2]). The models have continuously been refined and extended since those hearings and have been independently validated by a consultant retained by the NRC.

7. A total of ~~12~~ 13 "Scenarios" representing different seasons, time of day, day of week and weather are considered. ~~Two~~ Three special event scenarios are considered: the peak construction period of a new unit at the CPNPP site ~~and~~ , a major event at the Texas Amphitheatre and the Fourth of July Celebration in Granbury. These Scenarios are tabulated below: RAI 13.03-20

Scenario	Season	Day of Week	Time of Day	Weather	Special
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Weekend	Midday	Good	None
9	Winter	Weekend	Midday	Rain	None
10	Winter	Midweek, Weekend	Evening	Good	None
11	Summer	Weekend	Midday	Good	Event at Amphitheatre
12	Summer	Midweek	Midday	Good	Peak Construction of New Unit (2015)
13	Summer	Weekend	Midday	Good	Fourth of July Celebration in Granbury

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[2] Urbanik, T., et. al. Benchmark Study of the I-DYNEV Evacuation Time Estimate Computer Code, NUREG/CR-4873, Nuclear Regulatory Commission, June, 1988

3.3.2 Hotels and Motels

There are 13 major hotels (50 or more rooms) and many smaller motels and cottages, and cabins within the EPZ. The peak attendance at the hotels and motels is estimated as 2,393 people evacuating in 1093 vehicles.

Insert C

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Table 3-3. Summary of Transients by Zone

Zone	Transients	Transient Vehicles
CP	NO TRANSIENTS	
1A		
1B		
1C	98	44
1D	928	397
2A	NO TRANSIENTS	
2B		
2C	10	5
2D	30	18
2E	56	25
2F	NO TRANSIENTS	
2G		
2H		
2J	1,388	671
3A	NO TRANSIENTS	
3B	1,191	539
3C	NO TRANSIENTS	
3D	117	48
3E	2	1
3F	998	428
4A	106	53
4B	NO TRANSIENTS	
4C	10	5
4D	NO TRANSIENTS	
4E		
4F		
4G		
4H		
Glen Rose	8,062	2,833
Granbury	545	295
Tolar	NO TRANSIENTS	
TOTAL	**13,541**	**5,362**

6. DEMAND ESTIMATION FOR EVACUATION SCENARIOS

An evacuation "case" defines a combination of Evacuation Region and Evacuation Scenario. The definitions of "Region" and "Scenario" are as follows:

Region — A grouping of contiguous evacuation Zones, that forms either a "keyhole" sector-based area, or a circular area within the EPZ, that must be evacuated in response to a radiological emergency.

Scenario — A combination of circumstances, including time of day, day of week, season, and weather conditions. Scenarios define the number of people in each of the affected population groups and their respective mobilization time distributions.

A total of 63 Regions were defined which encompass all the groupings of Zones considered. These Regions are defined in Table 6-1. The Zone configurations are identified in Figure 6-1. Each keyhole sector-based area consists of a 2-mile circular area centered at the Comanche Peak Nuclear Power Plant (CPNPP), and three or five adjoining sectors, each with a central angle of 22.5 degrees. These sectors extend to a distance of 5 miles from CPNPP (Regions R4 to R17 and R34 to R47), or to the EPZ boundary (Regions R18 to R33 and R48 to R63). The azimuth of the central sector defines the orientation of these Regions.

A total of ~~12~~ 13 Scenarios were evaluated for all Regions. Thus, there are a total of ~~12x63=756~~ 13x63=819 evacuation cases. Table 6-2 is a description of all Scenarios. In addition, numerous cases were created to determine the sensitivity of ETE to variations in the mobilization time and extent of shadow population evacuation, and also to investigate the impact of the Granbury 4th of July celebration on ETE. These sensitivity studies are detailed in Appendix I. RAI 13.03-20

Each combination of Region and Scenario implies a specific population to be evacuated. Table 6-3 presents the percentage of each population group assumed to evacuate for each Scenario. Table 6-4 presents the vehicle counts for each Scenario.

Table 6-2. Evacuation Scenario Definitions					
Scenario	**Season**	**Day of Week**	**Time of Day**	**Weather**	**Special**
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Weekend	Midday	Good	None
9	Winter	Weekend	Midday	Rain	None
10	Winter	Midweek, Weekend	Evening	Good	None
11	Summer	Weekend	Midday	Good	Event at Amphitheatre
12	Summer	Midweek	Midday	Good	Peak Construction of New Unit (2015)

Note: Schools are assumed to be in session for the winter season (midweek, midday).

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13	Summer	Weekend	Midday	Good	Fourth of July Celebration in Granbury

13	4%	96%	48%	100%	31%	100%	0%	100%	100%

Table 6-3.

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~~Table 6-3.~~ Percent of Population Groups Evacuating for Various Scenarios

Scenarios	Residents With Commuters in Household	Residents With No Commuters in Household	Employees	Transients	Shadow	Special Events	School Buses	Transit Buses	External Through Traffic
1	40%	60%	96%	87%	32%	0%	10%	100%	100%
2	40%	60%	96%	87%	32%	0%	10%	100%	100%
3	4%	96%	48%	100%	31%	0%	0%	100%	100%
4	4%	96%	48%	100%	31%	0%	0%	100%	100%
5	4%	96%	10%	81%	30%	0%	0%	100%	60%
6	40%	60%	100%	66%	32%	0%	100%	100%	100%
7	40%	60%	100%	66%	32%	0%	100%	100%	100%
8	4%	96%	50%	76%	31%	0%	0%	100%	100%
9	4%	96%	50%	76%	31%	0%	0%	100%	100%
10	4%	96%	10%	65%	30%	0%	0%	100%	60%
11	4%	96%	48%	100%	31%	100%	0%	100%	100%
12	40%	60%	96%	87%	32%	100%	10%	100%	100%

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Resident Households With Commuters..... Households of EPZ residents who await the return of commuters prior to beginning the evacuation trip.

Resident Households With No Commuters.... Households of EPZ residents who do not have commuters or will not await the return of commuters prior to beginning the evacuation trip.

Employees..... EPZ employees who live outside of the EPZ.

Transients..... People who are in the EPZ at the time of an accident for recreational or other (non-employment) purposes.

Shadow..... Residents and employees in the Shadow Region (outside of the EPZ) who will spontaneously decide to relocate during the evacuation. The basis for the values shown is a 30% relocation of shadow residents along with a proportional percentage of shadow employees. The percentage of shadow employees is computed using the scenario-specific ratio of EPZ employees to residents.

Special Events..... ~~Additional vehicles in the Comanche Peak Nuclear Power Plant area for 2 special cases: when an event is being held at the Texas Amphitheatre and during the construction phase of the new unit.~~

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School and Transit Buses..... Vehicle-equivalents present on the road during evacuation servicing schools and transit-dependent people (1 bus is equivalent to 2 passenger vehicles), respectively.

External Through Traffic..... Traffic on local highways and major arterial roads at the start of the evacuation. This traffic is stopped by access control approximately 90 minutes after the evacuation begins.

Insert B

Table 6-4. Vehicle Estimates By Scenario										
Scenarios	Residents with Commuters	Residents without Commuters	Employees	Transients	Shadow	Special Events	School Buses	Transit Buses	External Traffic	Total Scenario Vehicles
1	7,874	11,643	1,330	4,665	3,475	-	18	40	1,700	30,745
2	7,874	11,643	1,330	4,665	3,475	-	18	40	1,700	30,745
3	787	18,730	665	5,362	3,364	-	-	40	1,700	30,648
4	787	18,730	665	5,362	3,364	-	-	40	1,700	30,648
5	787	18,730	139	4,343	3,276	-	-	40	1,020	28,335
6	7,874	11,643	1,385	3,539	3,484	-	174	40	1,700	29,839
7	7,874	11,643	1,385	3,539	3,484	-	174	40	1,700	29,839
8	787	18,730	693	4,075	3,369	-	-	40	1,700	29,394
9	787	18,730	693	4,075	3,369	-	-	40	1,700	29,394
10	787	18,730	139	3,485	3,276	-	-	40	1,020	27,477
11	787	18,730	665	5,362	3,364	1,563	-	40	1,700	32,211
12*	9,927	14,742	1,330	4,665	4,324	4,202	18	40	1,700	40,948

***Permanent Resident population and Shadow population have been extrapolated to the Year 2015, which is when the construction workforce will be at its peak.**

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13	787	18,730	665	5,362	3,364	10,023	-	40	1,700	40,671

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 63 regions within the CPNPP EPZ and the ~~12~~ Evacuation Scenarios discussed in Section 6. RAI 13.03-20

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, and then interpolated to the nearest 5 minutes. 13

7.1 Voluntary Evacuation and Shadow Evacuation

We define "voluntary evacuees" as people who are within the EPZ in 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 CPNPP 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 CPNPP.

Traffic generated within this Shadow Evacuation Region, traveling away from the CPNPP 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 (Scenario 1).

7.4 Guidance on Using ETE Tables

Tables 7-1A through 7-1D present the ETE values for all 63 Evacuation Regions and all ~~12~~ 13 Evacuation Scenarios. They are organized as follows: RAI 13.03-20

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
   - Special Event (if any)
     - Event at the Amphitheatre
     - New Plant Construction
     - Fourth of July Celebration in Granbury

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8.4 Summer Camps and Retreats – Transit Demand

There are several recreational areas within the EPZ that host summer camps, weekend camps, and frequent public events. The families and individuals who visit these recreational areas in their personal vehicles are included as transients. However, in the case of a summer camp or weekend retreat, people arrive in buses, which subsequently depart. It is prudent to calculate an ETE for these transit dependents.

~~The following facilities will require transportation in the event of an emergency:~~

- ~~Camp Arrowhead – approximately 270 children (ages 6-17)~~
- ~~Riverbend Retreat – as many as 700 children (ages 8-17)~~
- ~~Camp Tres Rios – as many as 700 children (ages 11-17)~~
- ~~Steven's Ranch – as many as 250 children~~
- ~~Glen Lake Methodist Camp – approximately 100 children.~~

Insert A

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8.5 Evacuation Time Estimates for Transit-Dependent People

Schools are given first priority for bus resources in the event of an emergency at CPNPP. School buses will be used to evacuate transit dependents if additional buses remain after an adequate number of buses have been dispatched to each school. If there are not adequate buses to service the school and the transit dependent population in a single wave, a "second wave" of transportation must be provided. After transporting the children to the host schools, buses will return to the EPZ, to complete this "second wave". The ETE will be calculated for both a one wave transit evacuation and for two waves (Table 8-7). Of course, if the Evacuation Region is other than R03 (the entire EPZ), then adequate transit resources will likely be available to evacuate all transit dependents in a single wave.

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 rain. 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.

Section 8.4:

INSERT A:

Assumption 10 in Section 2.3 states that school buses have a capacity of 50 children per bus for middle and high schools. Based on the age ranges provided for the facilities below, a capacity estimate of 50 children per bus is appropriate. The following summarizes the peak population at the summer camps and retreats in the EPZ, and the number of buses and bus drivers needed to evacuate these facilities:

- Camp Arrowhead – approximately 270 children (ages 6-17), 6 buses and bus drivers needed
- Riverbend Retreat – as many as 700 children (ages 8-17), 14 buses and bus drivers needed
- Camp Tres Rios – as many as 700 children (ages 11-17), 14 buses and bus drivers needed
- Steven's Ranch – as many as 250 children, 5 buses and bus drivers needed
- Glen Lake Methodist Camp – approximately 100 children, 2 buses and bus drivers needed

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Since theses camps and retreats operate in the summer or on weekends, when school is not in session, school buses and drivers in the area will be available to evacuate the transients at each facility.

Table 6-3:

INSERT B:

Additional vehicles in the CPNPP EPZ for 3 special cases: when an event is being held at the Texas Amphitheatre, during the construction phase of the new units at the CPNPP site and during the Fourth of July Celebration in Granbury.

Section 3.3.3:

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INSERT C:

3.3.3 Fourth of July Celebration

Granbury hosts a 4th of July celebration each year, with the center of activity around the courthouse square. A parade temporarily closes some roadway sections within the city limits. The number of attendees varies (between 30,000 and 50,000), according to the weather and day on which the holiday falls. Those people attending the event who are not residents of Granbury drive to the event in private vehicles and park on the street and in nearby shopping center parking lots. Many people stay overnight in the area. A special event (Scenario 13) is considered to compute the ETE during this event. It is assumed for this special

event that the residents of Granbury (5,700 people – not all are EPZ residents) walk to the event and that each family travelling into the area arrives in one vehicle. From the telephone survey results, the average household size is estimated to be 2.21 persons. The number of additional transient vehicles evacuating under these circumstance is therefore:

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$$(50{,}000 - 5{,}700)/2.21 = 20{,}045.$$

Following an Advisory to Evacuate, Granbury residents will return home, pack their belongings and then evacuate. It is assumed that the time to return home is negligible; as such, the trip generation is not modified for this special event.

~~Fourth of July Celebration~~

~~Granbury hosts a 4th of July celebration each year, with the center of activity around the courthouse square. A parade temporarily closes some roadway sections within the city limits. The number of attendees varies (between 30,000 and 50,000), according to the weather and day on which the holiday falls. Those people attending the event who are not residents of Granbury drive to the event in private vehicles and park on the street and in nearby shopping center parking lots. Many people stay overnight in the area. A sensitivity study is considered to measure the impact on ETE of this influx of transient population. It is assumed for this sensitivity study, that the residents of Granbury (5,700 people – not all are EPZ residents) walk to the event and that each family travelling into the area arrives in one vehicle. From the telephone survey results, the average household size is estimated to be 2.21 persons. The number of additional vehicles is therefore:~~

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~~(50,000 – 5,700)/2.21 = 20,045.~~

~~The case considered is Scenario 3, Region 3; a summer, weekend, midday, good weather evacuation for the entire EPZ. Table I-3 presents the results of this study. The ETE for the 2-Mile Region is not affected, the ETE for the 5-Mile Region increases by 50 minutes and the ETE for the Entire EPZ increases by two hours and twenty minutes due to the increased congestion in and around Granbury.~~

~~Following an Advisory to Evacuate, Granbury residents will return home, pack their belongings and then evacuate. It is assumed that the time to return home is negligible; as such, the trip generation is not modified for this sensitivity study.~~

~~Table I-3. Evacuation Time Estimates for the Granbury 4th of July Sensitivity Study~~			
~~Transient Vehicles~~	~~Evacuation Region~~		
	~~2-Mile Region (R01)~~	~~5-Mile Region (R02)~~	~~Entire EPZ (R03)~~
~~5,362 (Base)~~	~~2:50~~	~~3:10~~	~~4:00~~
~~25,407~~	~~2:50~~	~~4:00~~	~~6:20~~

APPENDIX J: EVACUATION TIME ESTIMATES FOR ALL EVACUATION REGIONS AND SCENARIOS

AND

EVACUATION TIME GRAPHS FOR REGION R03, FOR ALL SCENARIOS

This appendix presents the ETE Results for all 63 Regions and all ~~12~~ 13 Scenarios (Tables J-1A through J-1D). RAI 13.03-20

Plots of Evacuating Vehicles vs. Elapsed Time leaving the 2-mile and 5-mile circular areas around CPNPP and the entire EPZ, for Region R03, for all ~~12~~ 13 scenarios, are presented. Each plot has points indicating the evacuation times corresponding to the 50th, 90th, and 95th percentiles of evacuated population. RAI 13.03-20

J.1 Guidance on Using ETE Tables

Tables J-1A through J-1D present the ETE values for all 63 Evacuation Regions and all ~~12~~ 13 Evacuation Scenarios. They are organized as follows: RAI 13.03-20

Table	Contents
J-1A	ETE represents the elapsed time required for 50 percent of the population within a Region, to evacuate from that Region.
J-1B	ETE represents the elapsed time required for 90 percent of the population within a Region, to evacuate from that Region.
J-1C	ETE represents the elapsed time required for 95 percent of the population within a Region, to evacuate from that Region.
J-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
- Special Event (if any)
  - Event at the Amphitheatre
  - New Plant Construction
  - Fourth of July Celebration in Granbury

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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 J-1A through J-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 J-1A through J-1D. For these conditions, Scenario (9) 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 CPNPP. The applicable distances and their associated candidate Regions are given below:
     - 2 Miles (Region R01)
     - 5 Miles (Regions R02, R04 through R17, and R34 through R47)
     - to EPZ Boundary (Regions R03, R18 though R33, and R48 through R63)
   - Enter Table J-2 and identify the applicable candidate Region based on the wind direction and on the distance that the selected Region extends from CPNPP. Select the Evacuation Region identifier in that row from the first column of the Table.

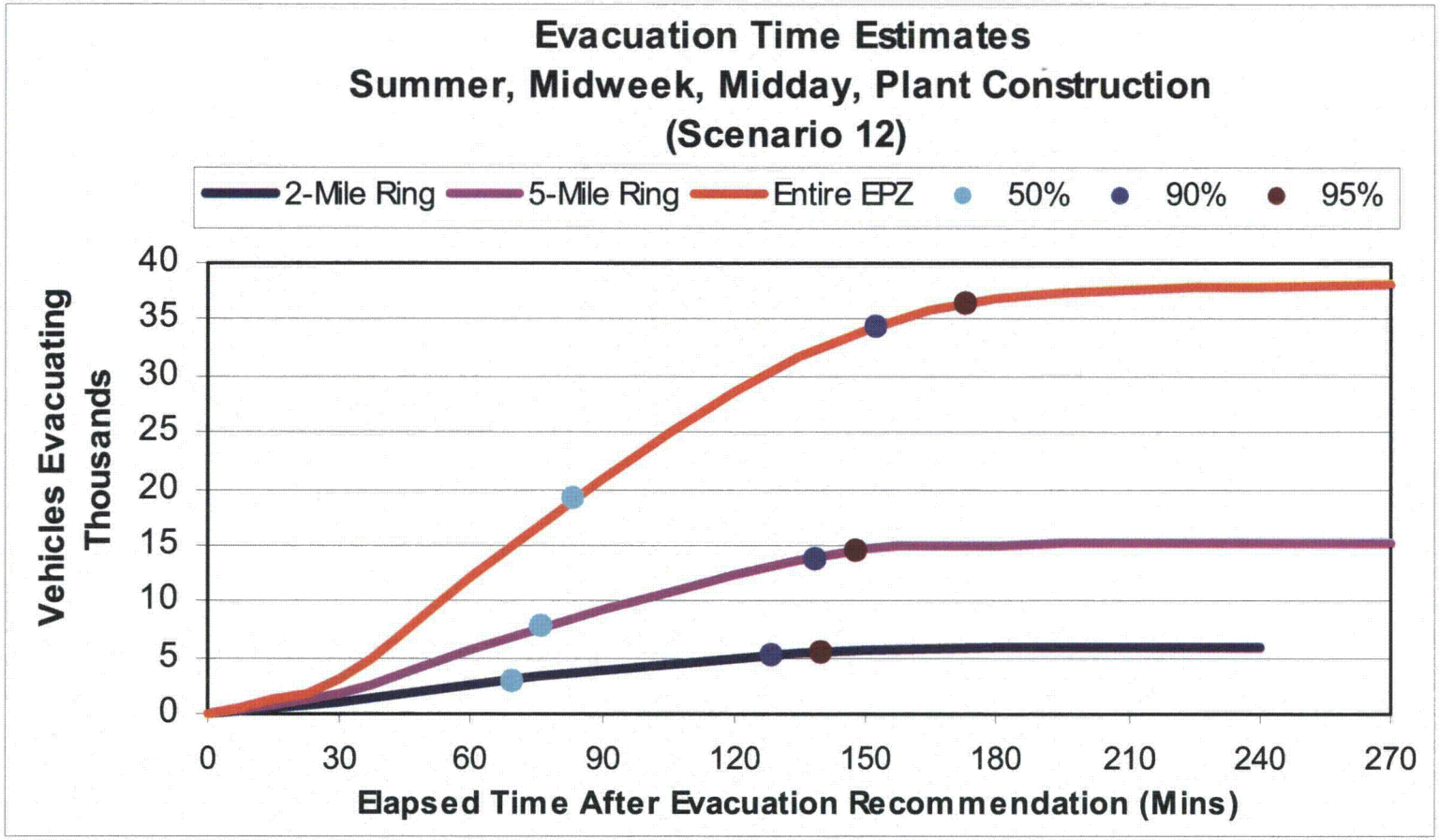

Figure J-12. Evacuation Time Estimates
Scenario 12, Region R03 (Entire EPZ)

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Figure J-13. Evacuation Time Estimates Scenario 13, Region R03 (Entire EPZ) will be added after this figure on new page J-26.

63 x 13 = 819

819

Computation of ETE

A total of ~~756~~ ETE were computed for the evacuation of the general public. Each ETE quantifies the aggregate evacuation time estimated for the population within one of the 63 Evacuation Regions to completely evacuate from that Region, under the circumstances defined for one of the ~~12~~ Evacuation Scenarios (~~63 x 12 = 756~~). Separate ETE are calculated for transit-dependent evacuees, including school children for applicable scenarios.

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13

Except for Region R03, which is the evacuation of the entire EPZ, only a portion of the people within the EPZ would be advised to evacuate. That is, the Advisory to Evacuate applies only to those people occupying the specified impacted region. It is assumed that 100 percent of the people within the impacted region will evacuate in response to this Advisory. The people occupying the remainder of the EPZ outside the impacted region may be advised to take shelter.

The computation of ETE assumes that a portion of the population within the EPZ but outside the impacted Region will elect to "voluntarily" evacuate. In addition, a portion of the population in the "Shadow Region" beyond the EPZ that extends a distance of 15 miles from CPNPP will also elect to evacuate. These voluntary evacuees could impede those who are evacuating from within the impacted region. The impedance that could be caused by voluntary evacuees is considered in the computation of ETE for the impacted region.

The computational procedure is outlined as follows:

- A link-node representation of the highway network is coded. Each link represents a unidirectional length of highway; each node typically represents an intersection or merge point. The capacity of each link is estimated based on the field survey observations and on established procedures.
- The evacuation trips are generated at locations called "zonal centroids" located within the EPZ. The trip generation rates vary over time reflecting the mobilization process, and from one location (centroid) to another depending on population density and on whether a centroid is within, or outside, the impacted area.
- The computer models compute the routing patterns for evacuating vehicles that are compliant with federal guidelines (outbound relative to the location of CPNPP), then simulate the traffic flow movements over space and time. This simulation process estimates the rate that traffic flow exits the impacted region.
- The ETE statistics provide the elapsed times for 50 percent, 90 percent, 95 percent and 100 percent, respectively, of the population within the impacted region, to evacuate from within the impacted region. These statistics are presented in tabular and graphical formats.

Traffic Management

This study includes the development of a comprehensive traffic management plan designed to expedite the evacuation of people from within an impacted region. It is also designed to control access into the EPZ after returning commuters have rejoined their families. **The traffic management plan presented does not supercede existing plans, but provides information that may be considered in updating them**.

The plan is documented in the form of detailed schematics specifying: (1) the directions of evacuation travel to be facilitated, and other traffic movements to be discouraged; (2) the traffic control personnel and equipment needed (cones, barricades) and their deployment; (3) the locations of these "Traffic Control Points" (TCP); (4) the priority assigned to each traffic control point indicating its relative importance and how soon it should be manned relative to others; and (5) the number of traffic control personnel required.

Selected Results

A compilation of selected information is presented on the following pages in the form of Figures and Tables extracted from the body of the report; these are described below.

- Figure 3-1 displays a map of the CPNPP site showing the layout of the 31 Zones that comprise, in aggregate, the Emergency Planning Zone (EPZ).
- Table 3-1 presents the estimates of permanent resident population in each Zone as provided by Enercon Services.
- Table 6-1 defines each of the 63 Evacuation Regions in terms of their respective groups of Zones.
- Table 6-2 lists the ~~12~~ 13 Evacuation Scenarios. RAI 13.03-20
- Tables 7-1C and 7-1D are compilations of Evacuation Time Estimates (ETE). These data are the times needed to *clear the indicated regions* of 95 and 100 percent of the population occupying these regions, respectively. These computed ETE include consideration of mobilization time and of estimated voluntary evacuations from other regions within the EPZ and from the Shadow Region. **It is recommended that the ETE for the 95th Percentile of Population (Table 7-1C) be used in making Protective Action Decisions.**
- Table 8-5A presents ETE for the schoolchildren in good weather.
- Table 8-7A presents ETE for the transit-dependent population in good weather.

Table 6-2. Evacuation Scenario Definitions					
Scenario	**Season**	**Day of Week**	**Time of Day**	**Weather**	**Special**
1	Summer	Midweek	Midday	Good	None
2	Summer	Midweek	Midday	Rain	None
3	Summer	Weekend	Midday	Good	None
4	Summer	Weekend	Midday	Rain	None
5	Summer	Midweek, Weekend	Evening	Good	None
6	Winter	Midweek	Midday	Good	None
7	Winter	Midweek	Midday	Rain	None
8	Winter	Weekend	Midday	Good	None
9	Winter	Weekend	Midday	Rain	None
10	Winter	Midweek, Weekend	Evening	Good	None
11	Summer	Weekend	Midday	Good	Event at Amphitheatre
12	Summer	Midweek	Midday	Good	Peak Construction of New Unit (2015)

Note: Schools are assumed to be in session for the winter season (midweek, midday).

RAI 13.03-20

13	Summer	Weekend	Midday	Good	Fourth of July Celebration in Granbury

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-21

ETE-5: Demand Estimation, Special Facility Population
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Sections II.C.

A. Table 8-4, "Special Facility Transit Demand," uses the current facility population in determining resources needed to support an evacuation. Discuss the impact on the ETE if peak populations are considered for the special facilities. Revise the ETE report as needed.

B. COLA, Part 5, ETE Report, Section 8.3, "Special Facility Demand," states on page 8-4 that some facilities can share buses and states on page 8-9 that several buses will pick up evacuees at more than one facility.
   1. Discuss the basis for the assumption that facilities can share buses that are obtained through private contracting. Revise the ETE report as needed.
   2. Discuss the effect on the ETE if facilities cannot share buses. Revise the ETE report as needed.

C. COLA, Part 5, ETE Report, Section 8.5, "Evacuation Time Estimates for Transit Dependent People; Activity: Mobilize Drivers," identifies 60 minutes to contact and mobilize school bus drivers and 90 minutes to contact and mobilize buses serving the transit dependent population. Discuss factors that contribute to the difference in mobilization times for school buses and buses that serve the transit dependent population. Revise the ETE report as needed.

ANSWER:

A. Table 1, included as Attachment 13.03-21A to this response, provides the transportation requirements for special facilities if capacity population is considered rather than the current census. The percentages of ambulatory, wheelchair bound and bedridden patients based on the current census were applied to the capacity population to determine the transportation

requirements for each facility. Comparing Table 1 and Table 8-4 (Table 8-4 has been revised as discussed in the response to Part B, below), indicates 11 additional ambulance runs, 2 additional wheelchair bus runs, and 3 additional wheelchair van runs would be required when considering special facilities at capacity populations.

However, as discussed in Section II.C of Appendix 4 of NUREG-0654/FEMA-REP-1, an estimate for this special population group shall usually be done on an institution-by-institution basis. The means of transportation are also highly individualized and shall be described.

Table 8-4 of the ETE report provides the population and needed transportation at special facilities on an institution-by-institution basis and is therefore responsive to the regulatory criteria. No revision to the ETE report is needed as a result of this response.

B.1. As noted in the last paragraph on page 8-4 of the ETE report, some facilities have contracts with transportation providers. Removing the consideration of sharing buses provides better information to the county offices of emergency management. As such, Table 8-4, Section 8.3 and Section 8.5 of the ETE report was revised to remove any indication that buses would be shared amongst facilities.

Based on a review of the data provided by the county offices of emergency management and the data obtained through phone calls to the medical facilities, the following additional changes have been made to Table 8-4:

- Acorn Manor in Zone 1D, Southern Concepts in Zone 1D and Southern Concepts in Granbury have facility owned vehicles which will be used for evacuation.
- The number of wheelchair van runs for Granbury Care Center has been changed to 2. Based on the assumed capacities of 15 wheelchair bound persons per wheelchair bus and 4 wheelchair bound persons per van, 4 wheelchair buses will only service 60 wheelchair bound persons. The facility has a current census of 65 wheelchair bound persons; therefore, 2 wheelchair vans are needed to service the additional 5 persons.
- The number of bus runs for Granbury Care Center has been changed to 4. The previous computation divided the capacity by 30, rather than the current census by 30.
- Changed heading "Max Bus Runs" to "Bus Runs".
- Changed "Total 15 Buses" to "20" in the final row of the table. Previously, buses were shared and were designated Bus A through Bus O, for a total of 15 buses. As discussed above, buses are no longer shared and "20" reflects the total number of buses needed when each facility evacuates using separate buses.

B.2. As documented in the first paragraph under the "School Evacuation" sub-heading on page 8-7, there are 137 school buses available in the EPZ. The following buses are needed to evacuate the plume exposure pathway Emergency Planning Zone (EPZ):

- 87 buses for school evacuation – see Table 8-2 of the ETE report
- 20 buses for medical facilities – see final bullet in the response to RAI 13.03-21B.1, above.
- 20 buses for transit-dependent population – see Table 8-6 of the ETE report
- 9 buses for special needs population – see response to RAI 13.03-19C.

- 41 buses for children at camps and retreats – see response to RAI 13.03-20B; however, note that these buses are needed on weekends and during the summer, when schools are not in session.

Therefore, 136 total buses (87 + 20 +20 + 9) are needed to evacuate the EPZ population in a single wave; there are sufficient buses available to accomplish this.

The ETE will decrease if buses are not shared amongst facilities. The "Evacuation of Ambulatory Persons from Special Facilities" section on page 8-9 discusses ETE for the facilities identified in Table 8-4 and provides a sample ETE computation for bus "L". Bus "L" services 11 ambulatory persons at Granbury Villa Nursing Center and 18 ambulatory persons at Victoria's Place. Using the ETE assumptions of 90 minute mobilization time, 1 minute per person loading time and 7 minutes travel time to the EPZ boundary, the ETE for each of these facilities if separate buses are used for an evacuation is:

Granbury Villa Nursing Center: 90 + 11 x 1 + 7 = 1:50 (hr:min), rounded up

Victoria's Place: 90 + 18 x 1 + 7 = 1:55 (hr:min)

Both of these ETE are less than the 2:15 value for the sample bus "L" computation provided in the ETE report. The ETE report includes 5 minutes of travel time between facilities which share buses and the loading time at both facilities is included when a bus is shared. When buses are not shared, there is no additional travel time and loading times. As a result, the ETE are reduced.

The "Evacuation of Ambulatory Persons from Special Facilities" section was revised to remove any indication that buses would be shared.

C. The fourth paragraph of Section 8 of the ETE report states that the buses for schools in the EPZ remain on or close to school property throughout the day. Thus, mobilization time for school buses when school is in session consists only of the time needed to contact bus drivers and have them return to their bus. The ETE assumes 60 minutes will be needed to complete this activity.

As stated in Section 8.5 of the ETE report, the assignment of buses to service the transit-dependent population should be sensitive to the mobilization time of the transit-dependent population. The buses are typically 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.

As stated on page 8-7 in the first paragraph under the "Evacuation of Transit-Dependent Population" heading, the 90 minute mobilization time for buses used to evacuate the transit dependent population was determined from the trip generation distribution for "Residents without Commuters" provided in Table 5-1 of the ETE report. At 90 minutes, 94% of the evacuees will have completed their mobilization activities when the first buses will begin their routes. If the same 60 minute mobilization time used for schools were used for transit dependents, only 70% of residents without commuters will have completed their mobilization activities and be ready to board when the first buses begin their routes.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 8-4, 8-9, 8-17, and 1 page of inserts (total of 4 pages).

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and

certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

- 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.

Some parents will likely pick up their children at school, although they are asked to pick children up at the host 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 host schools for each school in the EPZ. Those students not picked up by their parents, will be transported to these facilities where they will be subsequently retrieved by their respective families. In the event of an emergency, the Emergency Operations Center will determine which host schools will be used; buses will be routed accordingly. For the purpose of obtaining an ETE estimate, it is assumed that Glen Rose and Tolar schools go to Stephenville Junior High School and Granbury Schools go to Cleburne High School.

8.3 Special Facility Demand

Table 8-4 presents the census of special facilities in the EPZ as of September, 2007. Approximately 729 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. In the unlikely event that all the facilities need to be provided transportation, Table 8-4 shows the number of buses and wheel chair vehicles that would be needed. The number of bus runs estimated assumes 30 ambulatory patients per trip. Wheelchair buses can transport 15 patients while wheel chair vans can transport 4 patients. ~~Some facilities can share buses – for example, the residents of the Southern Concepts facilities in Granbury could share one bus.~~ It is estimated that ~~15~~ 20 buses, ~~5~~ 7 wheelchair vans, 18 wheelchair buses, and 30 ambulances are needed to evacuate special facilities. RAI 13.03-21

Each special facility has an evacuation plan, as required by law. Some facilities have contracts with transportation providers for transporting patients in the event of an emergency. It is recommended that the counties implement procedures whereby special facilities are contacted in an emergency to assess their transportation needs.

minutes, with 30 additional minutes needed for pickups. The last bus will exit the EPZ at 2:50.

Route 4

The bus on this route will pick up evacuees living within the Pecan Plantation, and then travel northbound out of the EPZ. The bus will begin its trip at 90 minutes after the ATE and exit the EPZ at 2:15.

The ETE for good weather for all routes and buses are given in Table 8-7A. Table 8-7B provides the ETE for rain.

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.~~ RAI 13.03-21
- Buses are assigned on the basis of ~~25~~ 30 patients per bus 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. Insert A RAI 13.03-21

It is estimated that mobilization time averages 90 minutes. In the event there is a shortfall of transit vehicles for a single wave evacuation, the buses used to evacuate schools will have to return to evacuate the special facilities. The school ETE to the Reception Centers is 1:55 (hr:min) on average, and 20 to 40 minutes of additional inbound travel time to the special facility from the Reception Center would be required. It follows, therefore, that about one hour should 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 within Granbury or Glen Rose, with the exception of one small facility in Tolar. It is estimated that buses will have to travel 4 miles, on average, to leave the EPZ. The average speed output by the model at 90 minutes for Region 3, Scenario 6 is 35 mph; thus, travel time out of the EPZ is 7 minutes.

~~Those buses assigned to pick up at multiple facilities have these facilities clustered within a mile or two of one another. 5 minutes travel time is allocated between facilities. For example, the calculation of ETE for bus "L" servicing 2 facilities, picking up 18 patients from one facility, and 11 from the other (18+11 minutes loading time), is:~~ RAI 13.03-21

Insert B

~~ETE: 90 + 29 + 5 + 7= 131 min. or 2:15 rounded up (3:15 for "second wave").~~

Table 8-4 indicates that 18 wheelchair bus runs and ~~5~~ 7 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 RAI 13.03-21

Page 8-9:

INSERT A:

For those facilities with more than 30 ambulatory patients, it is assumed that buses load concurrently and that loading time is equal to 30 minutes for the entire facility.

Page 8-9:

RAI 13.03-21

INSERT B:

Courtyards at Lake Granbury has 60 ambulatory patients and requires 2 buses for evacuation. As noted above, buses will load concurrently; thus, loading time is 30 minutes for the facility. The ETE for this facility is:

ETE: 90 + 30 + 7= 127 min. or 2:10 rounded up (3:10 for "second wave").

Merge cells and insert text "Facility owned vehicle"

RAI 13.03-21

Table 8-4. Special Facility Transit Demand

ZONE	Facility Name	Municipality	Capacity	Current Census	Ambulatory	Wheelchair Bound	Bedridden	Ambulance Runs	Wheelchair Bus Runs	Wheelchair Van Runs	~~Max Bus Runs~~	~~Bus Assignment~~
HOOD COUNTY												
1D	Acorn Run Manor	Granbury	2	2	2	0	0	~~0~~	~~0~~	~~0~~	~~1~~	~~H~~
1D	Courtyards at Lake Granbury	Granbury	112	112	60	52	0	0	3	2	2	~~A,B~~
1D	Southern Concepts	Granbury	6	6	6	0	0	~~0~~	~~0~~	~~0~~	~~1~~	~~H~~
4F	Granbury Villa Nursing Center	Granbury	93	81	41	30	10	5	2	0	2	~~L,I~~
4F	Victoria's Place	Granbury	19	18	18	0	0	0	0	0	1	~~L~~
Granbury	Gables	Granbury	77	77	54	23	0	0	2	0	2	~~C,D~~
Granbury	Granbury Care Center*	Granbury	178	170	91	65	14	7	4	~~0~~ 2	~~6~~ 4	~~E,F,G~~
Granbury	Lake Granbury Medical Center	Granbury	59	25	8	9	8	4	1	0	1	~~H~~
Granbury	Southern Concepts	Granbury	6	6	6	0	0	0	0	0	1	~~J~~
Granbury	Southern Concepts Day Activity Center	Granbury	20	20	19	1	0	0	0	1	1	~~J~~
Granbury	Southern Concepts*	Granbury	3	2	2	0	0	~~0~~	~~0~~	~~0~~	~~1~~	~~J~~
Tolar	Southern Concepts	Tolar	6	6	6	0	0	0	0	0	1	~~K~~
SOMERVELL COUNTY												
Glen Rose	Cherokee Rose Manor	Glen Rose	102	70	10	45	15	8	3	0	1	~~M~~
Glen Rose	Glen Rose Medical Center Hospital*	Glen Rose	16	16	9	6	1	1	0	2	1	~~M~~
Glen Rose	Glen Rose Medical Center Nursing Home*	Glen Rose	118	118	64	45	9	5	3	0	4	~~M,N,O~~
		Total:	**817**	**729**	**396**	**276**	**57**	**30**	**18**	**~~5~~ 7**	**~~Total 15 buses~~**	

*For these facilities, the breakdown of patients into ambulatory, wheelchair-bound, and bedridden is not available. The average percent in each category, calculated from those facilities which had data available, is applied.

~~**Buses H, J, and M will make multiple stops as indicated.~~

20

Merge cells and insert text "Facility owned van"

The cleaned-up table is shown on the next page

Merge cells and insert text "Facility owned van"

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-22

ETE-6: Demand Estimation, Emergency Planning Zone (EPZ)
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section II.D.

A. Sub-areas, which are defined as Zones, are identified in Figure 3-1, "Comanche Peak Nuclear Power Plant EPZ," and are described in COLA, Part 5, ETE Report, Appendix L, "Zone Boundaries," but it is not clear that these zones encompass the entire EPZ area. Discuss whether the zones presented in Appendix L encompass the entire area of the EPZ and include this information in a revision to the ETE report.

B. COLA, Part 5, ETE Report, Appendix L describes the northern boundary of Zone 1D to include Highway 377, the 10-mile limit, and the north boundary of the Descordova Bend development. The northern boundary of Zone 1D, as described in Appendix L, bisects the densely populated area of Granbury which is inconsistent with the "Texas Emergency Plan – Annex D." Annex D states that the incorporated communities of Granbury and Tolar are in the Hood County portion of the 10-mile EPZ and although some parts of Granbury and Tolar are more than 10 miles from Comanche Peak, the boundary of the EPZ includes everyone living within the city limits of these two communities. Clarify the northern boundary limits for Zone 1D.

C. The zones in Appendix L are generally bounded by roadways, geographical features, and limits of jurisdictional areas, but information is needed to clarify those zones that are described as bounded by the 10-mile limit. Clarify all zone boundaries in Appendix L that include the '10-mile limit' as part of the definition of the zone boundary. Revise the ETE report as needed.

D. Table 8-5A, "School Evacuation Time Estimates – Good Weather," and Table 8-5B, "School Evacuation Time Estimates – Rain," identify a distance of 14 miles from Mambrino Elementary School to the EPZ boundary and 10 miles from Happy Hills Farm to the EPZ boundary. Discuss how traveling this distance through the EPZ reflects a generally radial evacuation. Revise the ETE report as needed.

E. Provide a map that identifies the locations of special facilities and schools in a revision to the ETE report.

F. Section 6, "Demand Estimation for Evacuation Scenarios," discusses use of 22.5 degree sectors used to establish the keyhole based areas identified in Table 6-1, "Description of Evacuation Regions." Table 6-1 includes a column titled "Central Sector," but a map that identifies these sectors is needed. Provide a map of the Comanche Peak Nuclear Power Plant EPZ with 22.5 degree sectors in a revision to the ETE report.

ANSWER:

A. The Comanche Peak Nuclear Plant has two operating units with an established plume exposure pathway Emergency Planning Zone (EPZ) boundary. The same EPZ will be used for the proposed new nuclear plants. This EPZ consists of 31 zones and has previously been approved by the NRC. The descriptions of the zones provided in Appendix L of the Evacuation Time Estimate (ETE) report were obtained from the public information available at the Comanche Peak Emergency Information website[2] accessed on June 1, 2007. The website is no longer active, however, a copy of the website content is provided as Attachment 13.03-22A. The zones described in Appendix L encompass the entire EPZ. Additional information concerning EPZ boundaries is provided in the response to Part B of this RAI.

B. As shown in Figure 3-1 of the ETE, Granbury is a Zone located north of Zones 1D and 4E. In a letter to the NRC dated July 13, 2007, Luminant requested that the existing northern boundary of the EPZ, which had included the entire City of Granbury, be changed to "Granbury South of Pearl Street". Since the EPZ was originally reviewed and approved, the Granbury city government has annexed considerable territory (much of which lies outside the 10-mile EPZ) that was not included in the original licensing submission. Figure 2.2 in Attachment 1 to the July 13, 2007 letter provides a map of the proposed EPZ; the EPZ and Zone boundaries shown in Figure 2.2 exactly match those shown in Figure 3-1 of the ETE report.

In a letter dated January 9, 2008 from the NRC to Luminant, NRC concluded that the change in the EPZ boundary did not decrease the effectiveness of the Comanche Peak Units 1 and 2 Emergency Plan and therefore did not need NRC approval. The EPZ and Zone boundaries (including Zone 1D) shown in ETE Figure 3-1 and described in Appendix L of the ETE are accurate.

No revision to the ETE is required.

C. Refer to the response to Part A of this RAI. As shown in Attachment 13.03-22A, several zone boundaries are defined in terms of the "10-mile limit". The EPZ boundaries are those currently in use for the operating Units 1 and 2 as agreed to with State and local officials and approved by NRC.

D. According to Section 2.10, "Radial Dispersion", of NUREG/CR-6863:

> Evacuation planning should be based on moving the population away from the hazard in the most expedient manner possible. This generally equates to a radial dispersion away from the NPP. The local road network will, to a large extent, dictate the evacuation direction in the

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[2] http://comanchepeakemergencyinfo.com

> immediate vicinity of the NPP. It may be impractical or not possible for all routes to be radially away from the hazard.
>
> As the distance from the NPP increases and additional roadways are available within the EPZ for routing of traffic, calculations may show that balancing the traffic load to optimize the evacuation routing requires travel in the direction of the hazard for a given distance. Justification should be provided for any routing that is not radially away from the hazard.

As indicated in the "Activity: Travel to EPZ Boundary (D→E)" sub-section on page 8-6 of the ETE report, the distance from a facility to the EPZ boundary is measured using Geographical Information Systems (GIS) software along the most likely route out of the EPZ.

According to the School table on page E-2 of the ETE Report, Mambrino Elementary School and Happy Hills Farm are 6.9 and 3.1 miles away from the plant as measured radially. Based on an EPZ radius of about ten miles, these facilities are thus 3.1 and 6.9 miles, respectively, away from the EPZ boundary, also measured radially. As there are no roads that travel radially from the schools directly to the EPZ boundary; the distance traveled to the EPZ boundary, provided in Table 8-5 of the ETE Report, is greater than the radial distance to the EPZ boundary. All evacuating paths of travel are radial outbound relative to the Comanche Peak site location, to the extent permitted by the existing highway network, and subject to the requirement that the direction of travel is toward the assigned host facility.

Figure 1, included as Attachment 13.03-22B, illustrates the likely evacuation routes between Mambrino Elementary School and Happy Hills Farm, and the EPZ boundary, The designated reception center for each of these schools, Cleburne High School, is also depicted on the figure. The lengths of the routes (measured in GIS) between Mambrino Elementary School and Happy Hills Farm and the EPZ boundary are 14 and 10 miles, respectively. While Mambrino Elementary School could travel a shorter route through Pecan Plantation to exit the EPZ, Pecan Plantation is a private gated community and Rev. 2 of the ETE study avoided routing evacuees through Pecan Plantation.

As noted in the response to Part B of this RAI, the EPZ boundary was changed in January, 2008. As a result of the EPZ boundary change in Granbury, buses evacuating the schools in the Granbury Independent School District (GISD) are re-routed as follows:

- Mambrino Elementary School evacuates to Acton Middle School
- Brawner Intermediate School evacuates to Granbury Middle School
- Emma Roberson Elementary School evacuates to Crossland 9th Grade Center

Although the Pecan Plantation is a private gated community, GISD has an agreement with the community to allow those buses evacuating Mambrino Elementary School to travel through the community en-route to Acton Middle School. The following changes were made as a result of these new routes:

- Revised Table 8-3 to show the correct host school for schools in the GISD. Also, change the Zone for Happy Hills Farm to "2D" to be consistent with Table 8-2 and with the table provided on page E-2 of the ETE report.
- Revised the "Dist. To EPZ Bndry", "Travel Time to EPZ Bndry", "ETE", "Dist. EPZ Bndry to H.S.", "Travel Time EPZ Bndry to H.S." and "ETE to H.S." entries in Tables 8-5A and 8-5B for schools in the GISD.

- Revised the "Mobilization" and "ETE" for the second wave in Tables 8-7A and 8-7B. The mobilization time for the second wave transit-dependent evacuation is equal to the average ETE to the host school for those buses evacuating schoolchildren.
- Replaced Tables 8-5A and 8-7A on pages ES-14 and ES-15, respectively, of the Executive Summary.
- Page 8-7 – School Evacuation – sample ETE for Brawner Intermediate School was updated accordingly.
- Page 8-9 - Evacuation of Ambulatory Persons from Special Facilities – 2nd paragraph and parenthetical statement at the end of the 4th paragraph was updated to reflect the new average ETE to Host School of 1 hour and 40 minutes in good weather.
- Page 8-11 – 2nd and 4th paragraphs was revised to reflect the new average ETE to Host School of 1 hour and 40 minutes in good weather.

E. As requested in the RAI, maps were provided in the ETE report identifying the locations of special facilities and schools. The following revisions will be made in a future revision of the ETE:

- Added new Figure E-1 which maps the schools and day care facilities in the EPZ.
- Added new Figure E-2 which maps the medical and correctional facilities in the EPZ.
- Former Figure E-1, which identifies the major employers in the EPZ was re-numbered as Figure E-3. Also, labels identifying each of the major employers was added.
- Former Figure E-2, which identifies the recreational areas in the EPZ was re-numbered as Figure E-4.
- Former Figure E-3, which identifies the lodging facilities in the EPZ was re-numbered as Figure E-5. Also, labels identifying each of the lodging facilities were added. Due to the high density of lodging facilities in Granbury and Glen Rose, insets were drawn around these areas in Figure E-5. Maps of these inset areas are added as Figures E-6 and E-7 for Granbury and Glen Rose, respectively.

F. As requested in the RAI, Figure 6-1 will be revised to include 22.5 degree sector lines and will be included in a future revision of the ETE. A revised version of this Figure is included with this RAI response.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 6-4, 8-7, 8-9, 8-11, 8-16, 8-18, 8-19, 8-21, 8-22, E-4, E-7, E-9, E-11, E-14, E-15, E-16, ES-14, and ES-15 (total of 18 pages attached).

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

Attachments

Attachment 13.03-22A- "Comanche Peak Emergency Info Website" (contains 4 pages)

Attachment 13.03-22B- "Figure 1. School Evacuation Routes"

Your Safety is Important . . . Plan Ahead

Hood County Zones	Boundaries		Evacuation Routes
Zone 1A Hood County and Somervell Co.	North: East: South: West:	FM 2425 & River Country Lane Brazos River Brazos River and Hood/ Somervell County Line Hwy 144	Hwy 144, Hwy 67 Hwy 377
Zone 1B Hood County	North: East: South: West:	FM 2425 FM 2425 FM 2425 Hwy 144	Hwy 144 Hwy 67 Hwy 377
Zone 1C Hood County	North: East: South: West:	FM 3210 & Power Plant Court and Lake Granbury Brazos River & FM 167 River Country Lane & Brazos River FM 2425 & Brazos River	FM 3210 FM 2425 Hwy 144 Hwy 377 FM 167
Zone 1D Hood County	North: East: South: West:	North boundary of Decordova Bend development; 10-mile limit & Hwy 377 FM 167, 10-mile limit FM 2425; FM 3210, Power Plant Court, Lake Granbury Hwy 144	FM 3210 and FM 2425 Hwy 144 FM 167 Hwy 377
Zone 2G Hood County	North: East: South: West:	Brazos River Johnson County Line Hood County Line Brazos River	FM 2174 FM 199 Hwy 67
Zone 4A Hood County	North: East: South: West:	Coates Road Hwy 144 CPSES boundary & Hood/ Somervell County Line CPSES boundary	Hwy 144 Hwy 67 Hwy 377
Tolar Hood County	City Limits		Hwy 377
Zone 4B Hood County	North: East: South: West:	Cripple Creek Court & Neri Road Hwy 144 Coates Road CPSES boundary & Cripple Creek Ct.	Neri Rd, FM 51, Coats Rd, Hwy 144 Hwy 67 Hwy 377
Zone 4C Hood County	North: East: South: West:	FM 51 & Neri Road Cripple Creek Court, Neri Road, & CPSES boundary Hood/Somervell County Line Hwy 56 & FM 51	FM 56 Hwy 67 FM 51 Hwy 377
Zone 4D Hood County	North: East: South: West:	FM 51 FM 56 Hood/Somervell County Line FM 51 & Edwards Road	FM 51 Bakers Crossing Road, FM 56, Hwy 67

Zone 4E Hood County	North: East: South: West:	Granbury south city limits Hwy 144 Neri Road FM 51	Neri Road FM 51 Hwy 144 Hwy 377
Zone 4F Hood County	North: East: South: West:	10-mile limit FM 51 & Granbury west city limits FM 51 FM 56	FM 51 FM 56 Hwy 377
Zone 4G Hood County	North: East: South: West:	Tolar south city limits, 10-mile limit FM 56 FM 51, Bakers Crossing Road 10-mile limit	Bakers Crossing Road, FM 56 Hwy 377
Zone 4H Hood County	North: East: South: West:	Bakers Crossing Road Edwards Road Hood/Somervell County Line 10-mile limit	Bakers Crossing Road, Edwards Road, FM 51, FM 205
Granbury Hood County	City Limits		Hwy 377

Cleburne Relocation Map | **Stephenville Relocation Map**

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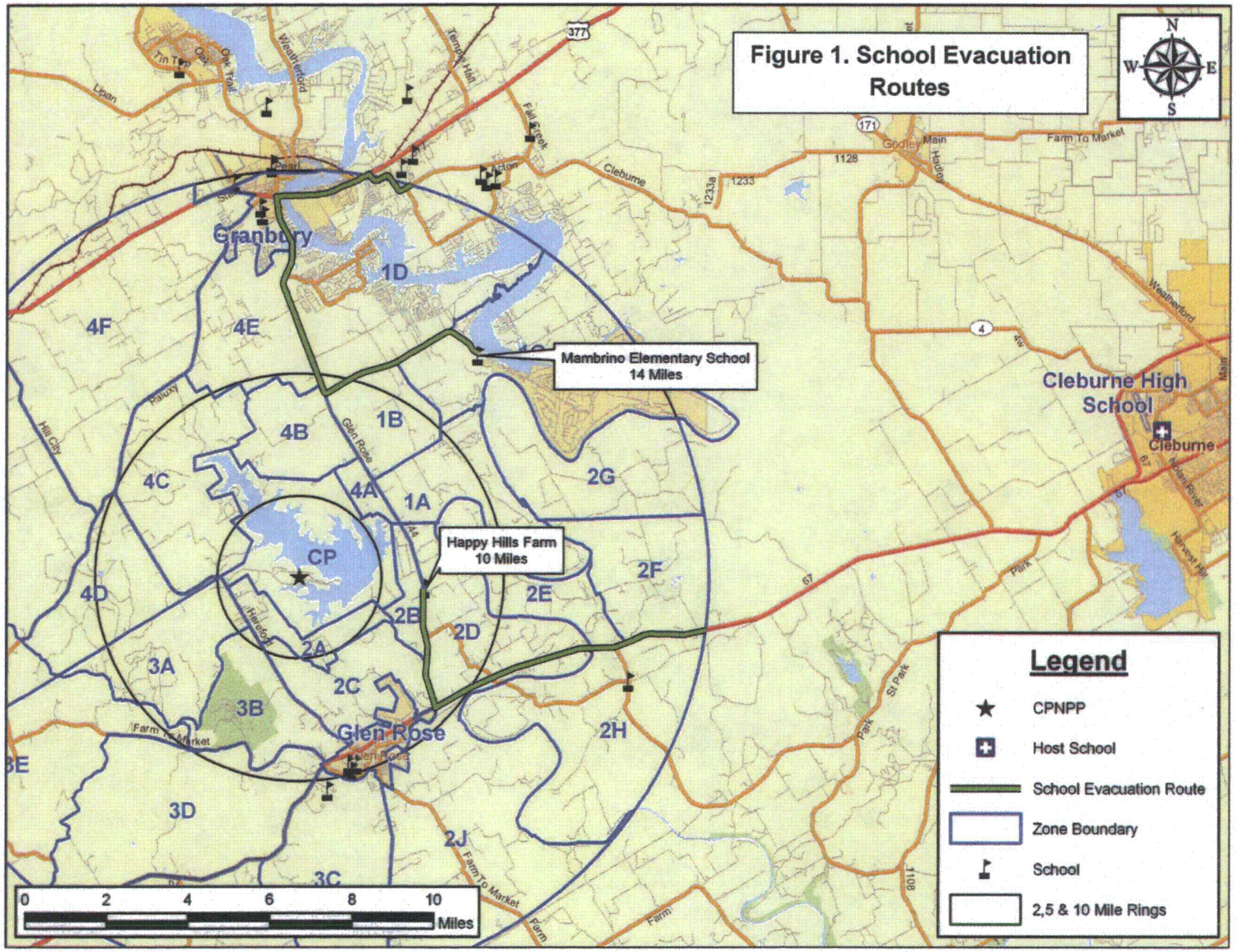
Zone 2A Somervell Co.	North: East: South: West:	CPSES boundary County Rd. 302 County Rd. 318 & 313 FM 56	Hwy 56, Hwy 377, Hwy 67
Zone 2B Somervell Co.	North: East: South: West:	Somervell/Hood County Line Hwy 144 County Rd. 302 County Rd. 302 & CPSES boundary	Hwy 144 Hwy 377 Hwy 67
Zone 2C Somervell Co.	North: East: South: West:	County Rd 318 & 313 County Rd. 302 & Hwy 144 Glen Rose north city limits FM 56	Hwy 67 Hwy 144 FM 56
Zone 2D Somervell Co.	North: East: South: West:	Somervell/Hood County Line Brazos River Brazos River & Hwy 67 Hwy 144	Hwy 144 and Hwy 67
Zone 2E Somervell Co.	North: East: South: West:	Brazos River FM 199 Hwy 67 Brazos River	FM 199 and Hwy 67
Zone 2F Somervell Co.	North: East: South: West:	Somervell/Hood County Line Johnson County Line Hwy 67 FM 199	FM 2174 FM 199 Hwy 67
Zone 2H Somervell Co.	North: East: South: West:	Hwy 67 & Brazos River 10-mile limit Brazos River & 10-mile limit Brazos River	FM 200 FM 199 Hwy 67
Zone 2J Somervell Co.	North: East: South: West:	Glen Rose south city limits and Hwy 67 Brazos River 10-mile limit Hwy 144	Hwy 144 FM 56
Zone 3A Somervell Co.	North: East: South: West:	Somervell/Hood County Line FM 56 County Rd. 1007 County Rd. 1008	Co. Rd. 1007 FM 205 Hwy 67 Hwy 56
Zone 3B Somervell Co.	North: East: South: West:	County Rd. 1007 FM 56 FM 205 County Rd. 1007	FM 205 Co. Rd. 1007 Hwy 67
Zone 3C Somervell Co.	North: East: South: West:	Glen Rose south city limits Hwy 144 10-mile limit Co. Rd. 2008 & Hwy 67	Hwy 67 Hwy 144 Co. Rd. 2008
Zone 3D Somervell Co.	North: East: South: West:	FM 205 Hwy 67 Hwy 67 Co. Rd. 1004 & FM 51	Hwy 67 FM 51 Co. Rd. 1004

Zone 3E Somervell Co.	North: East: South: West:	Somervell/Hood County Line & County Rd. 1008 Co. Rd. 1004 & FM 51 Co. Rd. 1004 & 10-mile limit Somervell/Hood County Line & 10-mile limit	Co. Rd. 1004 FM 205 FM 51 FM 67
Zone 3F Somervell Co.	North: East: South: West:	Hwy 67 County Rd. 2008 10-mile limit Hwy 67 & 10-mile limit	FM 203 Hwy 67 Co. Rd. 2008
GlenRose Somervell Co.	City Limits		Hwy 67 FM 56 FM 205 Hwy 144
Cleburne Relocation Map | **Stephenville Relocation Map**			



Attachment 13.03-22B

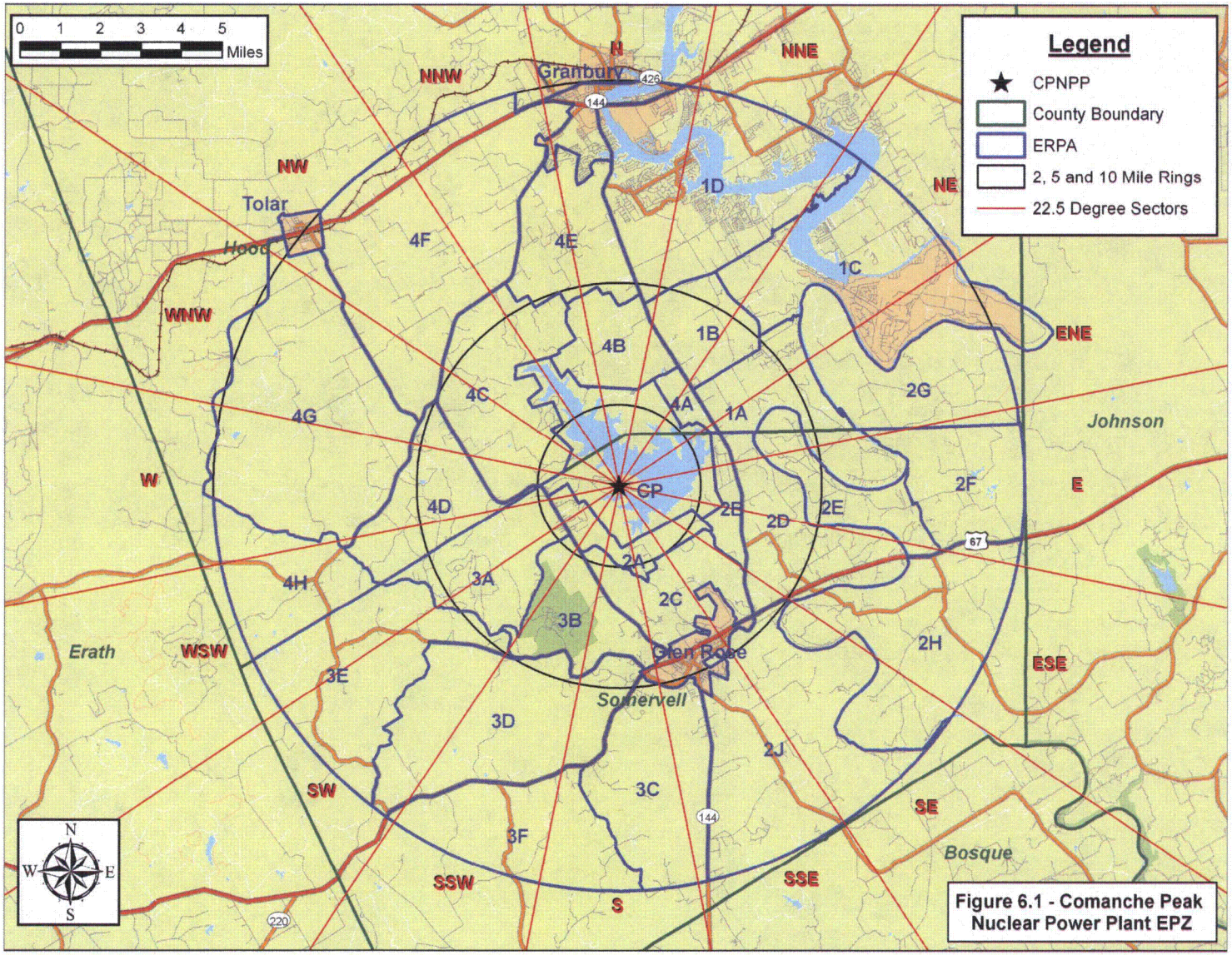


Figure 6.1 - Comanche Peak Nuclear Power Plant EPZ

This Figure Replaces Figure 6-1 in Section 6 RAI No. 3183 13.03-22

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3

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 school buses from either the Stephenville or Cleburne host school, whichever is closer to the assigned route. The travel time back to the EPZ boundary and to the beginning of the bus route is calculated using distances estimated from GIS and a travel speed of 40 mph (35 mph in the rain). The bus then travels its route and picks up transit-dependent evacuees along the route.

School Evacuation

Based on information provided by Hood and Somervell Counties, Granbury ISD has 102 buses, 11 Special Education buses and 12 Vans for the evacuation of school children; additional buses will be provided by Aledo ISD, if needed. Glen Rose ISD has 33 buses on campus with an estimated mobilization time of less than 30 minutes, and Happy Hills Farm has 2 buses and 6 vans. Comparison of the bus resources available with the buses required (See Table 8-2) indicates that sufficient transportation resources are available 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 Host School. 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: 60 min. + 5 + ~~6~~ = ~~1:11~~, rounded to ~~1:15~~, for Brawner Intermediate School, with good weather). The evacuation time to the Host School is determined by adding the time associated with Activity E→F (discussed above), to this EPZ evacuation time.

1.8 1:07 1:10

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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 activities. As indicated in Section 5 (Table 5-1), 94 percent of the evacuees will have completed their mobilization activities when the first buses will begin their routes, 90 minutes after the Advisory to Evacuate.

Those buses servicing the transit-dependent evacuees will travel along their pick-up routes, then proceed out of the EPZ. The proposed bus routes to service the transit dependent people in the Comanche Peak EPZ are described in detail on pages 8-8 and 8-9. Table 8-6 summarizes the bus routes, while Figure 8-2 maps the proposed bus pick-up routes. These routes are used to compute ETE for the transit-dependent population. **It is not necessary for the counties to use these exact routes in the event of an emergency**. It is recommended that the counties identify the transit

minutes, with 30 additional minutes needed for pickups. The last bus will exit the EPZ at 2:50.

Route 4

The bus on this route will pick up evacuees living within the Pecan Plantation, and then travel northbound out of the EPZ. The bus will begin its trip at 90 minutes after the ATE and exit the EPZ at 2:15.

The ETE for good weather for all routes and buses are given in Table 8-7A. Table 8-7B provides the ETE for rain.

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 per bus 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.

It is estimated that mobilization time averages 90 minutes. In the event there is a shortfall of transit vehicles for a single wave evacuation, the buses used to evacuate schools will have to return to evacuate the special facilities. The school ETE to the Reception Centers is ~~1:55~~ 1:40 (hr:min) on average, and 20 to 40 minutes of additional inbound travel time to the special facility from the Reception Center would be required. It follows, therefore, that about ~~one hour~~ forty-five minutes should 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 within Granbury or Glen Rose, with the exception of one small facility in Tolar. It is estimated that buses will have to travel 4 miles, on average, to leave the EPZ. The average speed output by the model at 90 minutes for Region 3, Scenario 6 is 35 mph; thus, travel time out of the EPZ is 7 minutes.

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Those buses assigned to pick up at multiple facilities have these facilities clustered within a mile or two of one another. 5 minutes travel time is allocated between facilities. For example, the calculation of ETE for bus "L" servicing 2 facilities, picking up 18 patients from one facility, and 11 from the other (18+11 minutes loading time), is:

ETE: 90 + 29 + 5 + 7= 131 min. or 2:15 rounded up (~~3:15~~ 3:00 for "second wave").

Table 8-4 indicates that 18 wheelchair bus runs and 5 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

route used to exit the EPZ will depend on the extent of the emergency and the wind direction. For this analysis the evacuating buses are assumed to travel the quickest route out of the EPZ, which is eastbound on US Highway 67. The need for security will largely dictate the number of buses required to transport the [up to] 57 inmates and accompanying corrections officers out of the EPZ. If the jail was filled to capacity, 3 buses would be required; for the current (August 2007) occupancy of 32 inmates, 2 buses would be required.

It is reasonable to estimate the arrival of these buses at ~~2:45~~ 2:30 after the Advisory to Evacuate. This estimate reflects the ~~1:55~~ 1:40 required to evacuate schoolchildren, 15 minutes for de-boarding and a break for the driver, followed by travel time (22 miles from Cleburne) to Somervell County Jail at an assumed average speed of 40 mph. RAI 13.03-22

To maintain security, it is expected that both buses will evacuate in a single group (or convoy) with an escort of law enforcement vehicles. It is estimated that each bus can be boarded and secured in 10 minutes. It is reasonable to assume that 2 buses can be loaded in parallel, consistent with the need to maintain order and security.

For Scenario 6 (winter), Region 3 (entire EPZ), the average speed output by the model at approximately ~~2:45~~ 2:30 after the Advisory to Evacuate is 48 mph. The distance to the EPZ boundary is 8 miles; it will take approximately 10 minutes to travel out of the EPZ.

The ETE for Somervell County Jail is:

Mobilize the buses:	~~2:45~~	2:30
Board the Inmates:	0:10	
Travel out of EPZ:	0:10	
ETE	~~3:05~~	2:50

Table 8-3. Host Schools		
Facility	**Zone**	**Host School**
High Schools		
Brazos River Charter School	2H	Cleburne High School
Tolar High School	4G	Stephenville Junior High School
Glen Rose High School	Glen Rose	Stephenville Junior High School
Middle/ Intermediate Schools		
Glen Rose Intermediate School	Glen Rose	Stephenville Junior High School
Glen Rose Junior High School	Glen Rose	Stephenville Junior High School
Brawner Intermediate School	Granbury	~~Cleburne High School~~ Granbury Middle School
Tolar Junior High School	Tolar	Stephenville Junior High School
Elementary Schools		
Glen Rose Elementary School	Glen Rose	Stephenville Junior High School
Emma Roberson Elementary School	Granbury	~~Cleburne High School~~ Crossland 9th Grade Center
Mambrino Elementary School	Granbury	~~Cleburne High School~~ Acton Middle School
Tolar Elementary School	Tolar	Stephenville Junior High School
Other Schools		
Happy Hills Farm	~~Granbury~~ 2D	Cleburne High School

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Table 8-5A. School Evacuation Time Estimates - Good Weather								
School	**Driver Mobilization Time(min)**	**Loading Time (min)**	**Dist. to EPZ Bndry (mi.)**	**Travel Time to EPZ Bndry (min)**	**ETE (hr:min)**	**Dist. EPZ Bndry to H.S. (mi.)**	**Travel Time EPZ Bndry to H.S. (min)**	**ETE to H.S. (hr:min)**
Hood County Schools								
Brawner Intermediate School	60	5	~~3.0~~ 1.8	~~6~~ 4	~~**1:15**~~ 1:10	~~31~~ 0.5	~~47~~ 1	~~**2:00**~~ 1:10
Emma Roberson Elementary School	60	5	~~3.2~~ 1.4	~~6~~ 3	~~**1:15**~~ 1:10	~~31~~ 0.3	~~47~~ 1	~~**2:00**~~ 1:10
Mambrino Elementary School	60	5	~~14.0~~ 5.1	~~24~~ 9	~~**1:30**~~ 1:15	~~20~~ 6.7	~~30~~ 11	~~**2:00**~~ 1:25
Tolar Elementary School	60	5	1.2	3	**1:10**	24	36	**1:45**
Tolar Junior High School	60	5	1.2	3	**1:10**	24	36	**1:45**
Tolar High School	60	5	0.3	1	**1:10**	24	36	**1:45**
Somervell County Schools								
Brazos River Charter School	60	5	3.1	6	**1:15**	13.4	21	**1:35**
Glen Rose Elementary School	60	5	9.2	16	**1:25**	23	35	**2:00**
Glen Rose High School	60	5	8.8	15	**1:20**	23	35	**1:55**
Glen Rose Intermediate School	60	5	9.0	16	**1:25**	23	35	**2:00**
Glen Rose Junior High School	60	5	8.1	14	**1:20**	23	35	**1:55**
Happy Hills Farm	60	5	10.0	17	**1:25**	13	20	**1:45**
				Average for EPZ:	**1:20**		**Average:**	~~**1:55**~~ 1:40

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Note: The average speed output by the model of 35.8 mph (Scenario 6, Region 3 at 60 minutes after the ATE) is used to compute travel time to the EPZ Boundary. The assumed average speed to the Host School is 40 mph.

Table 8-5B. School Evacuation Time Estimates - Rain								
School	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Bndry (mi.)	Travel Time to EPZ Bndry (min)	ETE (hr:min)	Dist. EPZ Bndry to H.S. (mi.)	Travel Time EPZ Bndry to H.S. (min)	ETE to H.S. (hr:min)
Hood County Schools								
Brawner Intermediate School	65	10	~~3.0~~ 1.8	~~6~~ 4	~~**1:25**~~ 1:20	~~31~~ 0.5	~~54~~ 1	~~**2:15**~~ 1:20
Emma Roberson Elementary School	65	10	~~3.2~~ 1.4	~~7~~ 3	~~**1:25**~~ 1:20	~~31~~ 0.3	~~54~~ 1	~~**2:20**~~ 1:20
Mambrino Elementary School	65	10	~~14.0~~ 5.1	~~28~~ 11	~~**1:45**~~ 1:30	~~20~~ 6.7	~~35~~ 12	~~**2:20**~~ 1:40
Tolar Elementary School	65	10	1.2	3	**1:20**	24	42	**2:00**
Tolar Junior High School	65	10	1.2	3	**1:20**	24	42	**2:00**
Tolar High School	65	10	0.3	1	**1:20**	24	42	**2:00**
Somervell County Schools								
Brazos River Charter School	65	10	3.1	7	**1:25**	13.4	23	**1:45**
Glen Rose Elementary School	65	10	9.2	19	**1:35**	22	38	**2:15**
Glen Rose Elementary School	65	10	9.2	19	**1:35**	23	40	**2:15**
Glen Rose High School	65	10	8.8	18	**1:35**	23	40	**2:15**
Glen Rose Intermediate School	65	10	9.0	18	**1:35**	23	40	**2:15**
Glen Rose Junior High School	65	10	8.1	17	**1:35**	23	40	**2:15**
Happy Hills Farm	65	10	10.0	20	**1:35**	13	23	**2:00**
				Average for EPZ:	**1:30**		**Average:**	~~**2:10**~~ 2:00

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Note: The average speed output by the model of 30.1 mph (Scenario 7, Region 3 at 60 minutes after the ATE) is used to compute travel time to the EPZ Boundary. The assumed average speed to the Host School is 35 mph.

Table 8-7A. Transit Dependent Evacuation Time Estimates - Good Weather

Route Number	Bus Number	Single Wave					Second Wave							
		Mobilization (min.)	Route Length (mi.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)	Mobilization (min.)	Unload (min.)	Driver Rest (min.)	Return Travel time to EPZ (min.)	Travel Time EPZ to Route Start (min.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)
1	1 - 4	90	10	17	30	2:20	~~115~~ 100	5	10	35	0	15	30	~~3:30~~ 3:15
	5 - 7	105	10	17	30	2:35	~~115~~ 100	5	10	35	0	15	30	~~3:30~~ 3:15
2	1 - 4	90	10	17	30	2:20	~~115~~ 100	5	10	38	0	15	30	~~3:35~~ 3:20
	5 - 7	105	10	17	30	2:35	~~115~~ 100	5	10	38	0	15	30	~~3:35~~ 3:20
3	1 - 3	90	18	31	30	2:35	~~115~~ 100	5	10	20	0	27	30	~~3:30~~ 3:15
	4, 5	105	18	31	30	2:50	~~115~~ 100	5	10	20	0	27	30	~~3:30~~ 3:15
4	1	90	8	14	30	2:15	~~115~~ 100	5	10	27	0	12	30	~~3:20~~ 3:05
					Average for EPZ:	**2:30**							**Average for EPZ:**	~~**3:30**~~ 3:15

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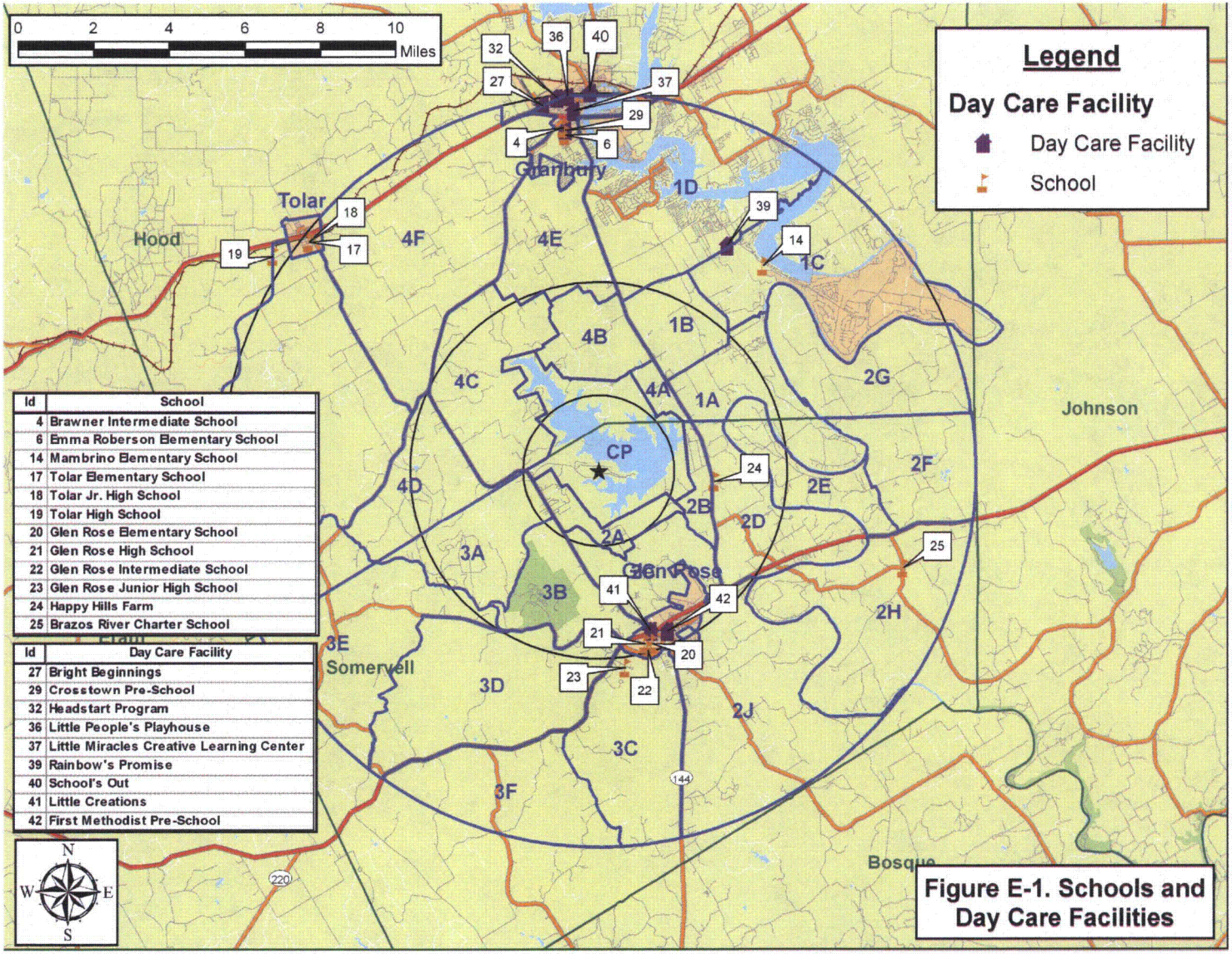
Table 8-7B. Transit Dependent Evacuation Time Estimates - Rain

Route Number	Bus Number	Single Wave: Mobilization (min.)	Route Length (mi.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)	Second Wave: Mobilization (min.)	Unload (min.)	Driver Rest (min.)	Return Travel time to EPZ (min.)	Travel Time EPZ to Route Start (min.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)
1	1 - 4	95	10	23	35	2:35	~~130~~ 120	5	10	39	0	15	35	~~3:55~~ 3:45
	5 - 7	110	10	23	35	2:50	~~130~~ 120	5	10	39	0	15	35	~~3:55~~ 3:45
2	1 - 4	95	10	23	35	2:35	~~130~~ 120	5	10	43	0	15	35	~~4:00~~ 3:50
	5 - 7	110	10	23	35	2:50	~~130~~ 120	5	10	43	0	15	35	~~4:00~~ 3:50
3	1 - 3	95	18	41	35	2:55	~~130~~ 120	5	10	22	0	27	35	~~3:50~~ 3:40
	4 - 5	110	18	41	35	3:10	~~130~~ 120	5	10	22	0	27	35	~~3:50~~ 3:40
4	1	95	8	18	35	2:30	~~130~~ 120	5	10	31	0	12	35	~~3:45~~ 3:35
					Average for EPZ:	2:45							**Average for EPZ:**	~~3:55~~ 3:45

RAI 13.03-22



Id	School
4	Brawner Intermediate School
6	Emma Roberson Elementary School
14	Mambrino Elementary School
17	Tolar Elementary School
18	Tolar Jr. High School
19	Tolar High School
20	Glen Rose Elementary School
21	Glen Rose High School
22	Glen Rose Intermediate School
23	Glen Rose Junior High School
24	Happy Hills Farm
25	Brazos River Charter School

Id	Day Care Facility
27	Bright Beginnings
29	Crosstown Pre-School
32	Headstart Program
36	Little People's Playhouse
37	Little Miracles Creative Learning Center
39	Rainbow's Promise
40	School's Out
41	Little Creations
42	First Methodist Pre-School

Figure E-1. Schools and Day Care Facilities

Figures E-1 through E-7 Replace Figures E-1 through E-3 in Appendix E RAI No. 3183 13.03-22

RAI 13.03-22

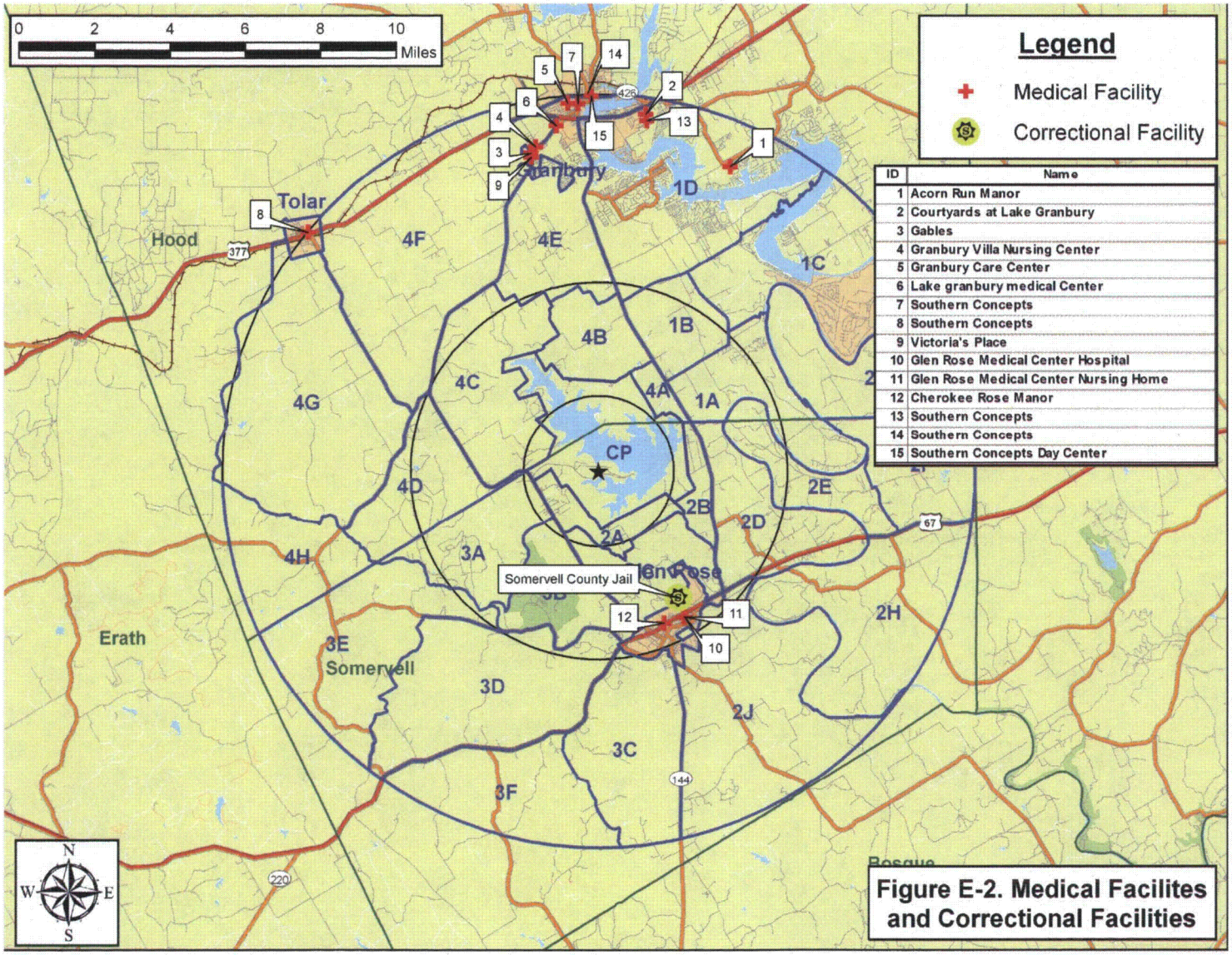


Figure E-2. Medical Facilites and Correctional Facilities

RAI 13.03-22

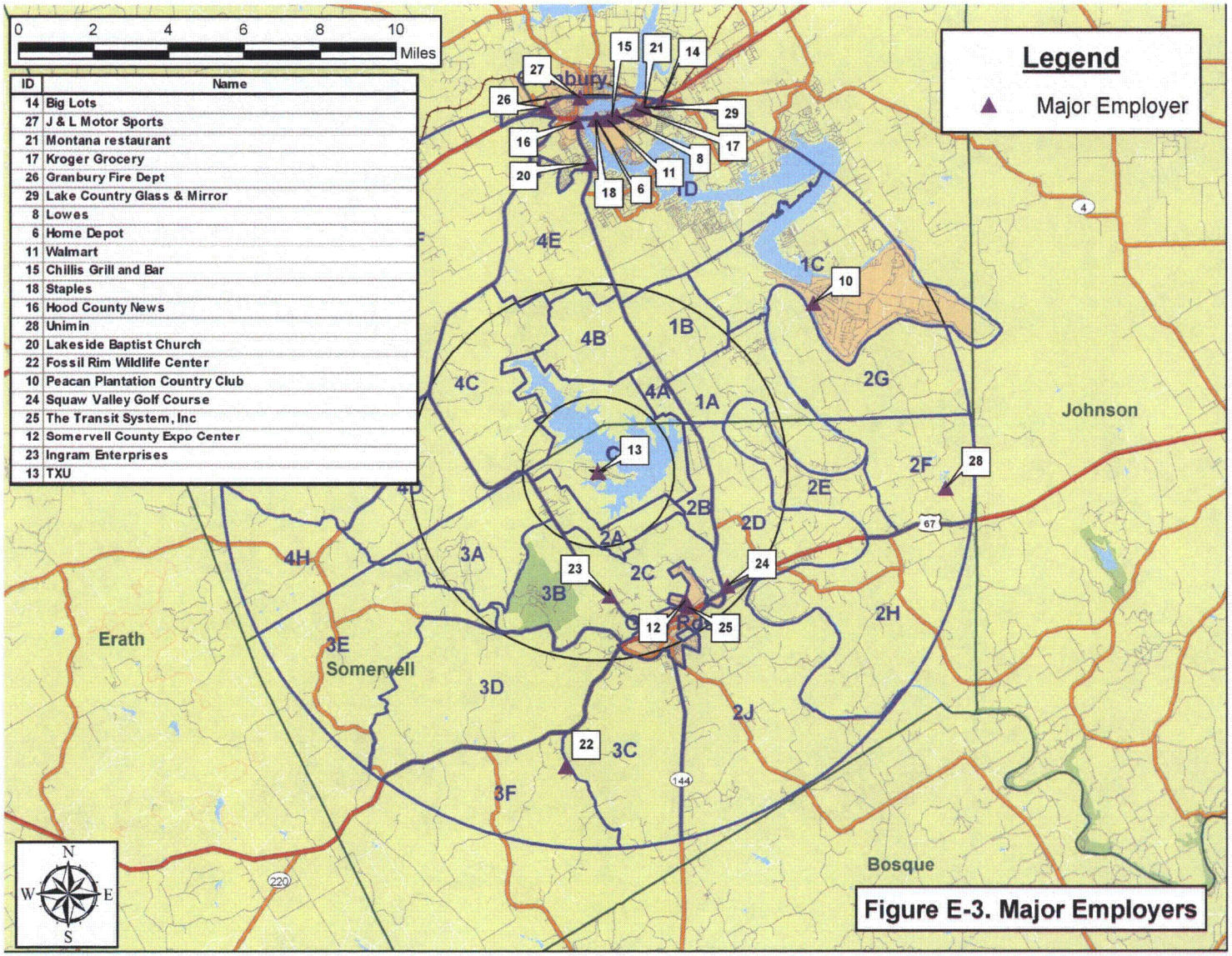


Figure E-3. Major Employers

RAI 13.03-22

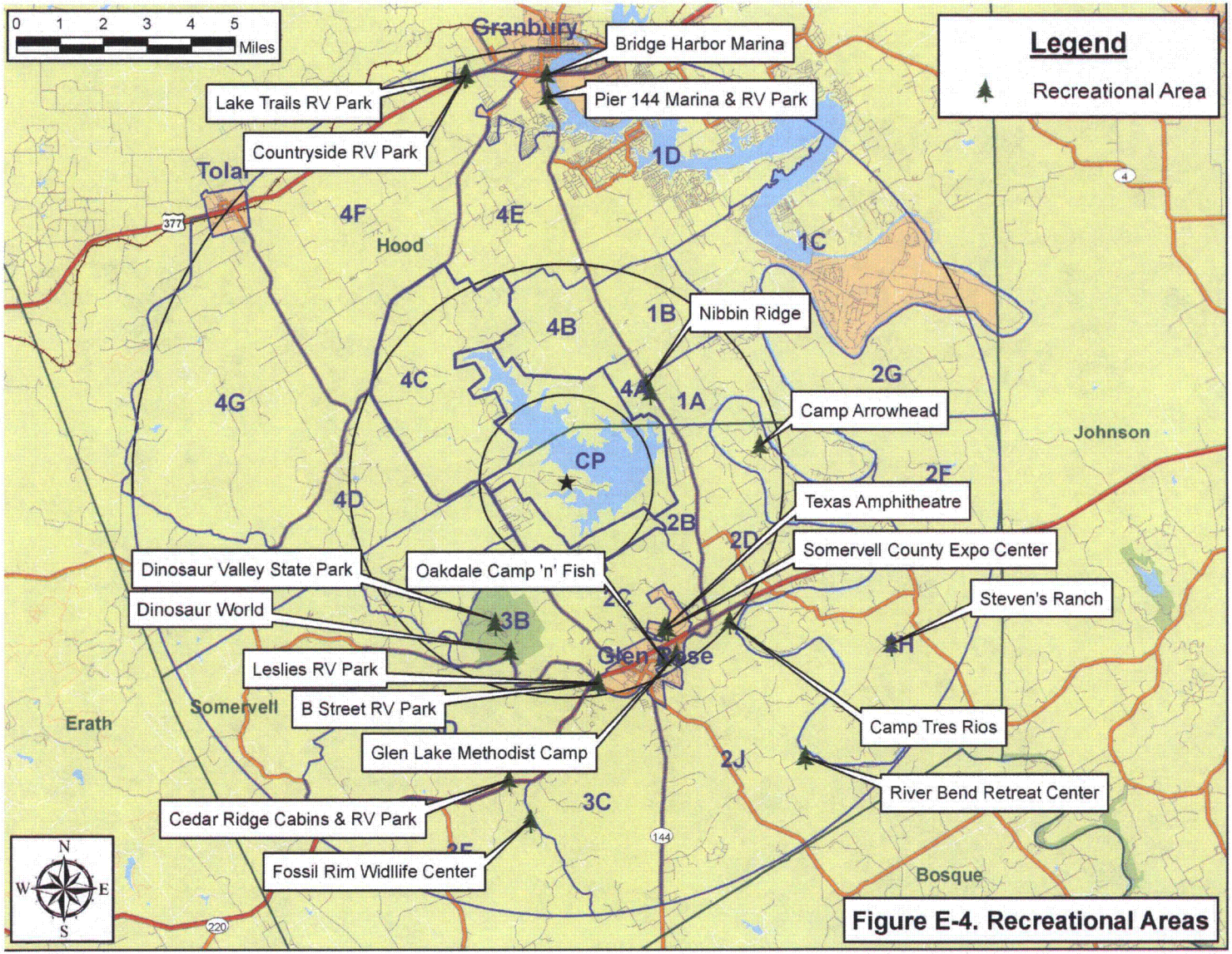


Figure E-4. Recreational Areas

RAI 13.03-22

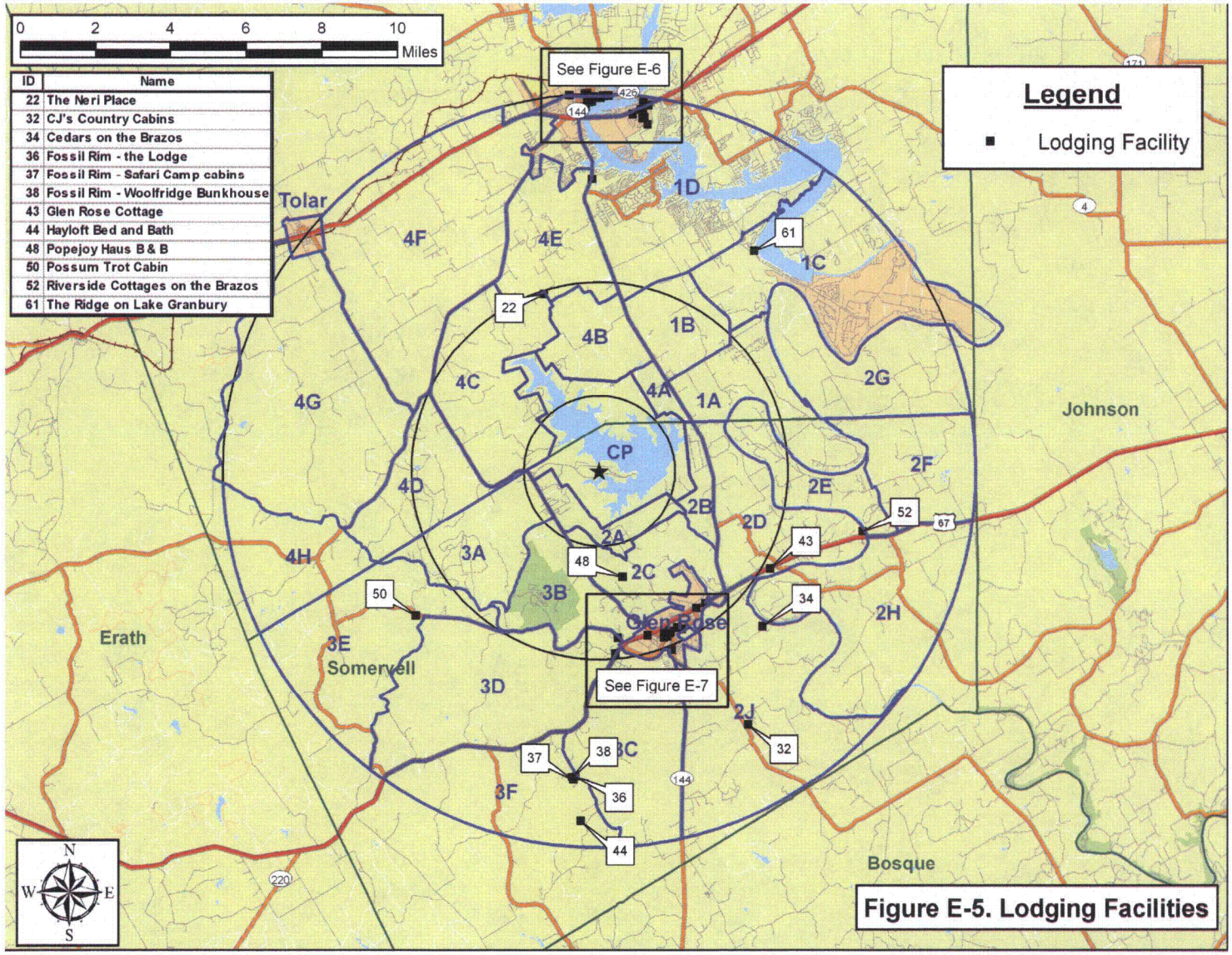


Figure E-5. Lodging Facilities

RAI 13.03-22

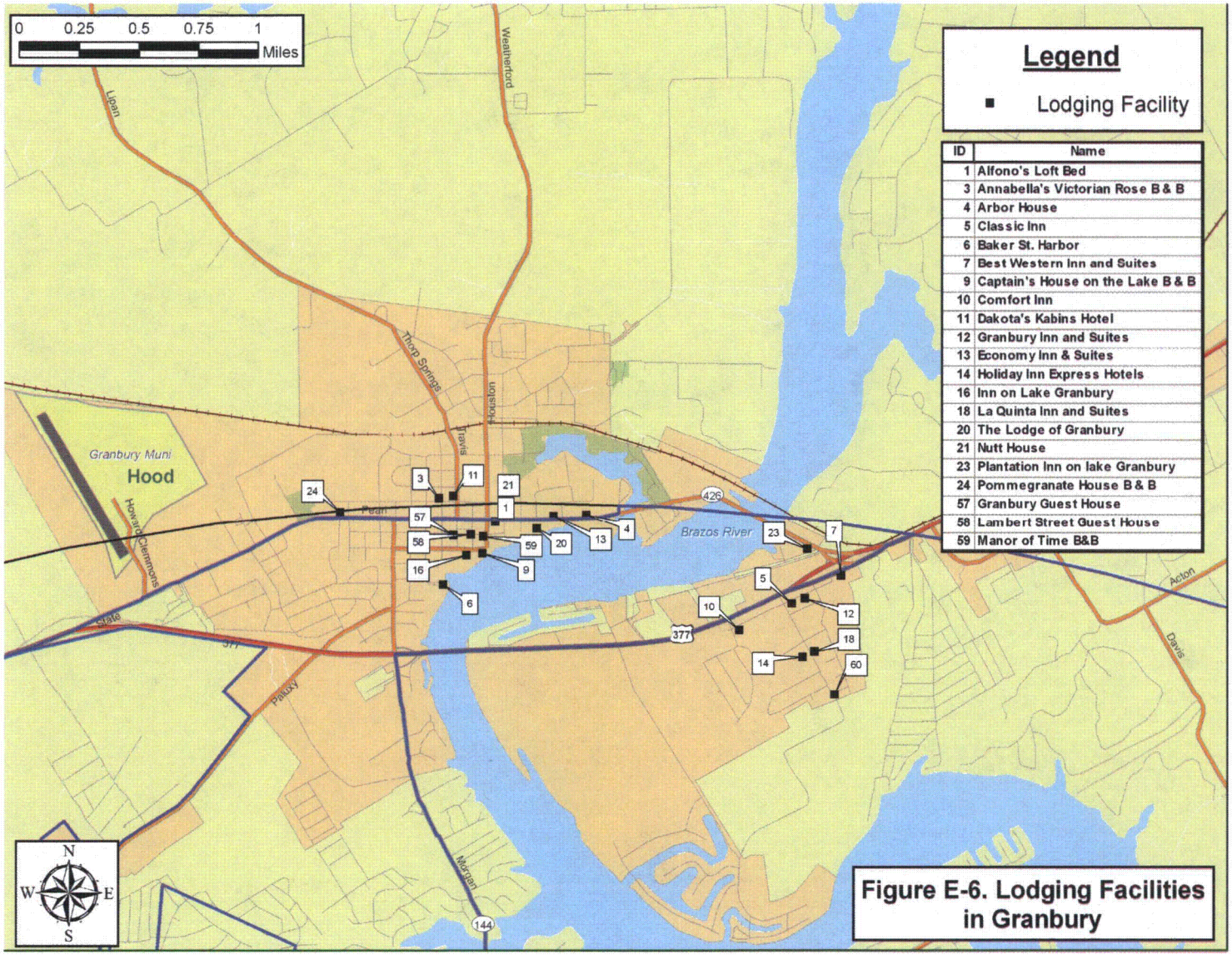


Figure E-6. Lodging Facilities in Granbury

RAI 13.03-22

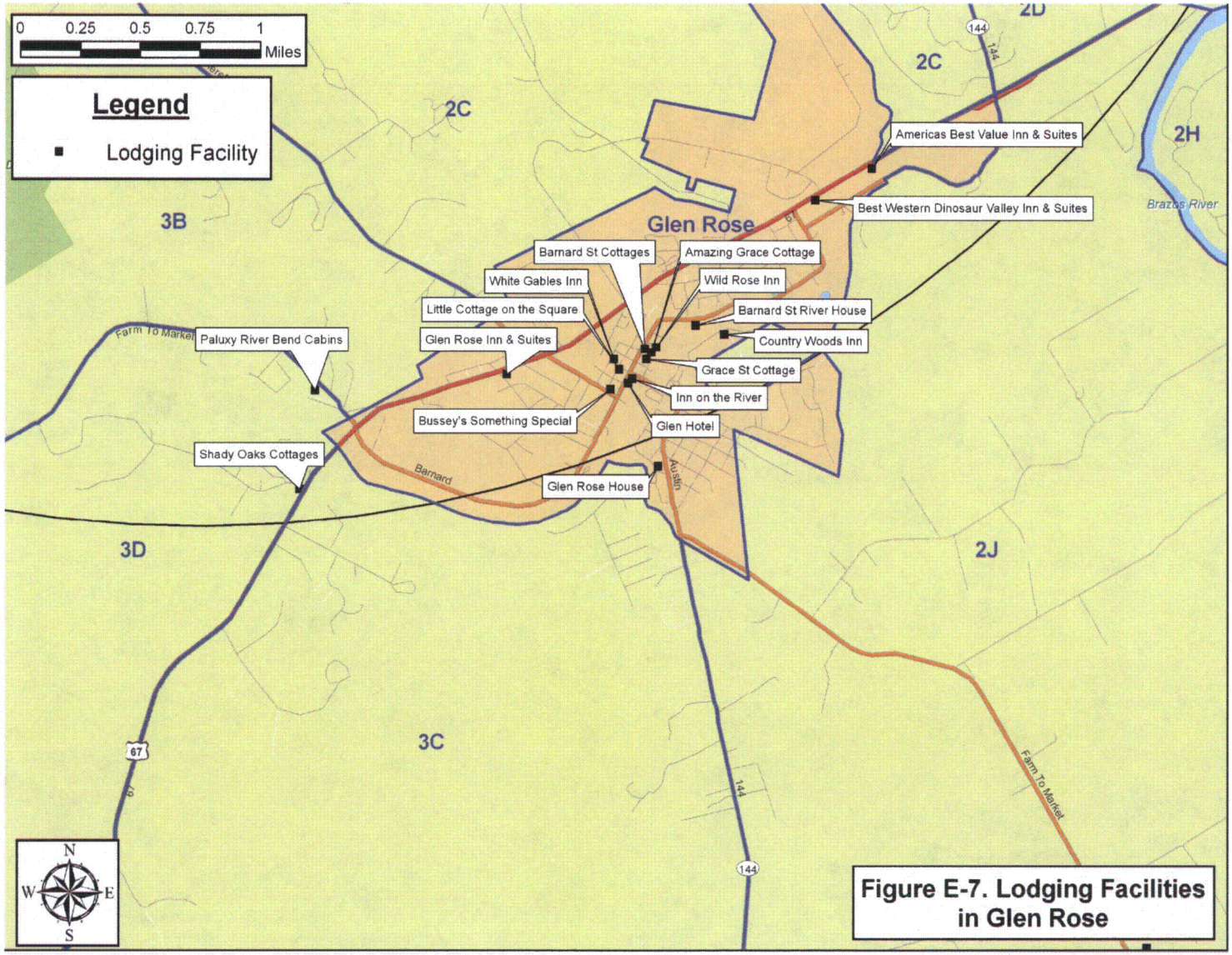


Figure E-7. Lodging Facilities in Glen Rose

RAI 13.03-22

3

RAI 13.03-22

Table 8-5A. School Evacuation Time Estimates - Good Weather

School	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Bndry (mi.)	Travel Time to EPZ Bndry (min)	ETE (hr:min)	Dist. EPZ Bndry to H.S. (mi.)	Travel Time EPZ Bndry to H.S. (min)	ETE to H.S. (hr:min)
Hood County Schools								
Brawner Intermediate School	60	5	~~3.0~~ 1.8	~~6~~ 4	~~**1:15**~~ 1:10	~~34~~ 0.5	~~47~~ 1	~~**2:00**~~ 1:10
Emma Roberson Elementary School	60	5	~~3.2~~ 1.4	~~6~~ 3	~~**1:15**~~ 1:10	~~34~~ 0.3	~~47~~ 1	~~**2:00**~~ 1:10
Mambrino Elementary School	60	5	~~14.0~~ 5.1	~~24~~ 9	~~**1:30**~~ 1:15	~~20~~ 6.7	~~30~~ 11	~~**2:00**~~ 1:25
Tolar Elementary School	60	5	1.2	3	**1:10**	24	36	**1:45**
Tolar Junior High School	60	5	1.2	3	**1:10**	24	36	**1:45**
Tolar High School	60	5	0.3	1	**1:10**	24	36	**1:45**
Somervell County Schools								
Brazos River Charter School	60	5	3.1	6	**1:15**	13.4	21	**1:35**
Glen Rose Elementary School	60	5	9.2	16	**1:25**	23	35	**2:00**
Glen Rose High School	60	5	8.8	15	**1:20**	23	35	**1:55**
Glen Rose Intermediate School	60	5	9.0	16	**1:25**	23	35	**2:00**
Glen Rose Junior High School	60	5	8.1	14	**1:20**	23	35	**1:55**
Happy Hills Farm	60	5	10.0	17	**1:25**	13	20	**1:45**
				Average for EPZ:	**1:20**		**Average:**	~~**1:55**~~ 1:40

Note: The average speed output by the model of 35.8 mph (Scenario 6, Region 3 at 60 minutes after the Advisory to Evacuate) is used to compute travel time to the EPZ Boundary. The assumed average speed to the Host School is 40 mph.

RAI 13.03-22

Table 8-7A. Transit Dependent Evacuation Time Estimates - Good Weather

Route Number	Bus Number	Single Wave					Second Wave							
		Mobilization (min.)	Route Length (mi.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)	Mobilization (min.)	Unload (min.)	Driver Rest (min.)	Return Travel time to EPZ (min.)	Travel Time EPZ to Route Start (min.)	Route Travel Time (min.)	Pickup Time (min.)	ETE (hr:min)
1	1 - 4	90	10	17	30	2:20	~~115~~ 100	5	10	35	0	15	30	~~3:30~~ 3:15
	5 - 7	105	10	17	30	2:35	~~115~~ 100	5	10	35	0	15	30	~~3:30~~ 3:15
2	1 - 4	90	10	17	30	2:20	~~115~~ 100	5	10	38	0	15	30	~~3:35~~ 3:20
	5 - 7	105	10	17	30	2:35	~~115~~ 100	5	10	38	0	15	30	~~3:35~~ 3:20
3	1 - 3	90	18	31	30	2:35	~~115~~ 100	5	10	20	0	27	30	~~3:30~~ 3:15
	4, 5	105	18	31	30	2:50	~~115~~ 100	5	10	20	0	27	30	~~3:30~~ 3:15
4	1	90	8	14	30	2:15	~~115~~ 100	5	10	27	0	12	30	~~3:20~~ 3:15
					Average for EPZ:	**2:30**							**Average for EPZ:**	~~**3:30**~~ 3:05

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-23

ETE-7: Traffic Capacity, Evacuation Roadway Network
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Sections III.A.

A. COLA, Part 5, ETE Report, Section 8.5, "Evacuation Time Estimates for Transit Dependent People," (page 8-7) states that the evacuation routes were only used to compute ETE, and it is not necessary for counties to use these exact routes in the event of an emergency. Explain why the routes proposed should be considered representative of an evacuation and used to formulate the ETE. Revise the ETE report as needed.

B. Figure 1-2, "Comanche Peak Link-Node Analysis Network," shows the nodes used in the analysis, but the nodes are not labeled to correspond to Appendix K, "Evacuation Roadway Network Characteristics." Provide a map in a revision to the ETE report that includes legible node numbers that correspond to Appendix K.

ANSWER:

A. Section IV.B of Appendix 4 of NUREG-0654/FEMA-REP-1 indicates that an estimate of the time required to evacuate that segment of the non-car owning population that is dependent upon public transport needs to be provided. In order to accomplish this, the Evacuation Time Estimate (ETE) study designed routes to service the population centers within the plume exposure pathway Emergency Planning Zone (EPZ) - Granbury, Tolar, Glen Rose and Pecan Plantation – where the non-car owning population is most likely to be concentrated. These routes are described on pages 8-8 and 8-9 of the ETE report and are mapped in Figure 8-2. During the ETE review process with representatives from the Hood and Somervell County Offices of Emergency Management, the counties indicated that they do not have specific routes designated for the evacuation of the transit-dependent population, and requested that a disclaimer be included in the ETE report that the exact routes proposed in the ETE report may not be used in the event of an

evacuation. As indicated in the first paragraph of the "Analysis of Bus Route Operations for Transit Dependent Population" heading on page 8-8, the routes to be used depend on temporal conditions and Hood and Somervell Counties are best qualified to create incident-specific routes.

The suggested routes provided in the ETE report are representative of an evacuation in that they service the population centers within the EPZ. The incident-specific routes implemented by Hood and Somervell Counties are likely to be designed to service the same areas and are not expected to deviate significantly from those routes provided in Figure 8-2, therefore no change to the ETE report is necessary.

B. Due to the scale of Figure 1-2, the node labels and link directional arrows were illegible and were not included with the original report. Figure 1-2 has been divided into several figures and will be included in Appendix K in a future revision of the ETE report. These figures show the directional arrows and annotate the nodes within the link-node analysis network. Appendix K will be renamed "Evacuation Roadway Network", the Table of Contents will be revised to reflect the new title of Appendix K and the table in Appendix K will be numbered Table K-1 and titled, "Evacuation Roadway Network Characteristics." The reference to Figure 1-2 in Section 1.3 will also be revised to reference the newly added figures in Appendix K.

Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and approval.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages iii, 1-6, Appendix K cover page, and pages K-1 through K-18 (total of 21 pages attached).

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None

Impact on DCD

None

LIST OF APPENDICES

Appendix A ..... Glossary of Traffic Engineering Terms
Appendix B ..... Traffic Assignment Model
Appendix C ..... Traffic Simulation Model: PC-DYNEV
Appendix D ..... Detailed Description of Study Procedure
Appendix E ..... Special Facility Data
Appendix F ..... Telephone Survey
Appendix G ..... Traffic Management
Appendix H ..... Evacuation Region Maps
Appendix I ..... Evacuation Sensitivity Studies
Appendix J ..... Evacuation Time Estimates for All Evacuation Regions and Scenarios and Evacuation Time Graphs for Region R03, for all Scenarios
Appendix K ..... Evacuation Roadway Network ~~Characteristics~~
Appendix L ..... Zone Boundaries

RAI 13.03-23

Developing the Evacuation Time Estimates

The overall study procedure is outlined in Appendix D. Demographic data were obtained from several sources, as detailed later in this report. These data were analyzed and converted into vehicle demand data.

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Highway capacity was estimated for each highway segment based on the field surveys and on the principles specified in the 2000 Highway Capacity Manual (HCM[1]). The link-node representation of the physical highway network was developed using Geographic Information System (GIS) mapping software and the observations obtained from the field survey. ~~This network representation of "links" and "nodes" is shown in Figure 1-2.~~

Figure 1-2 presents the link-node analysis network that was constructed to model the evacuation roadway network in the EPZ and Shadow Region. The detailed figures provided in Appendix K depict the analysis network with directional arrows shown and node numbers provided. The observations made during the field survey were used to calibrate the analysis network.

Analytical Tools

The IDYNEV System that was employed for this study is comprised of several integrated computer models. One of these is the PC-DYNEV (DYnamic Network EVacuation) macroscopic simulation model that was developed by KLD under contract with the Federal Emergency Management Agency (FEMA).

IDYNEV consists of three submodels:

- A macroscopic traffic simulation model (for details, see Appendix C).
- An intersection capacity model (for details, see Highway Research Record No. 772, Transportation Research Board, 1980, papers by Lieberman and McShane & Lieberman).
- A dynamic, node-centric routing model that adjusts the "base" routing in the event of an imbalance in the levels of congestion on the outbound links.

Another model of the IDYNEV System is the TRAD (TRaffic Assignment and Distribution) model. This model integrates an equilibrium assignment model with a trip distribution algorithm to compute origin-destination volumes and paths of travel designed to minimize travel time. For details, see Appendix B.

Still another software product developed by KLD, named UNITES (UNIfied Transportation Engineering System) was used to expedite data entry.

The procedure for applying the IDYNEV System within the framework of developing an update to an ETE is outlined in Appendix D. Appendix A is a glossary of terms.

---

[1] Highway Capacity Manual (HCM2000), Transportation Research Board, National Research Council, 2000.

Delete "Characteristics"

APPENDIX K

Evacuation Roadway Network ~~Characteristics~~

RAI 13.03-23

Add text as page K-1 prior to the existing Appendix K content

Appendix K: Evacuation Roadway Network

As discussed in Section 1.3, a computerized link-node analysis network was constructed to model the roadway network within the study area. Figure K-1 provides an overview of the link-node analysis network. The figure has been divided up into 15 more detailed figures (Figures K-2 through K-16) which show each of the links and nodes in the network.

RAI 13.03-23

The analysis network was calibrated using the observations made during the field survey conducted in January 2007. Table K-1 lists the characteristics of each roadway section modeled in the ETE analysis. Each link is identified by its upstream and downstream node numbers. These node numbers can be cross-referenced to Figures K-1 through K-16 to identify the geographic location of each link.

The term, "Full Lanes" in Table K-1 identifies the number of lanes that extend throughout the length of the link. Many links have additional lanes on the immediate approach to an intersection (turn pockets); these have been recorded and entered into the IDYNEV System input stream.

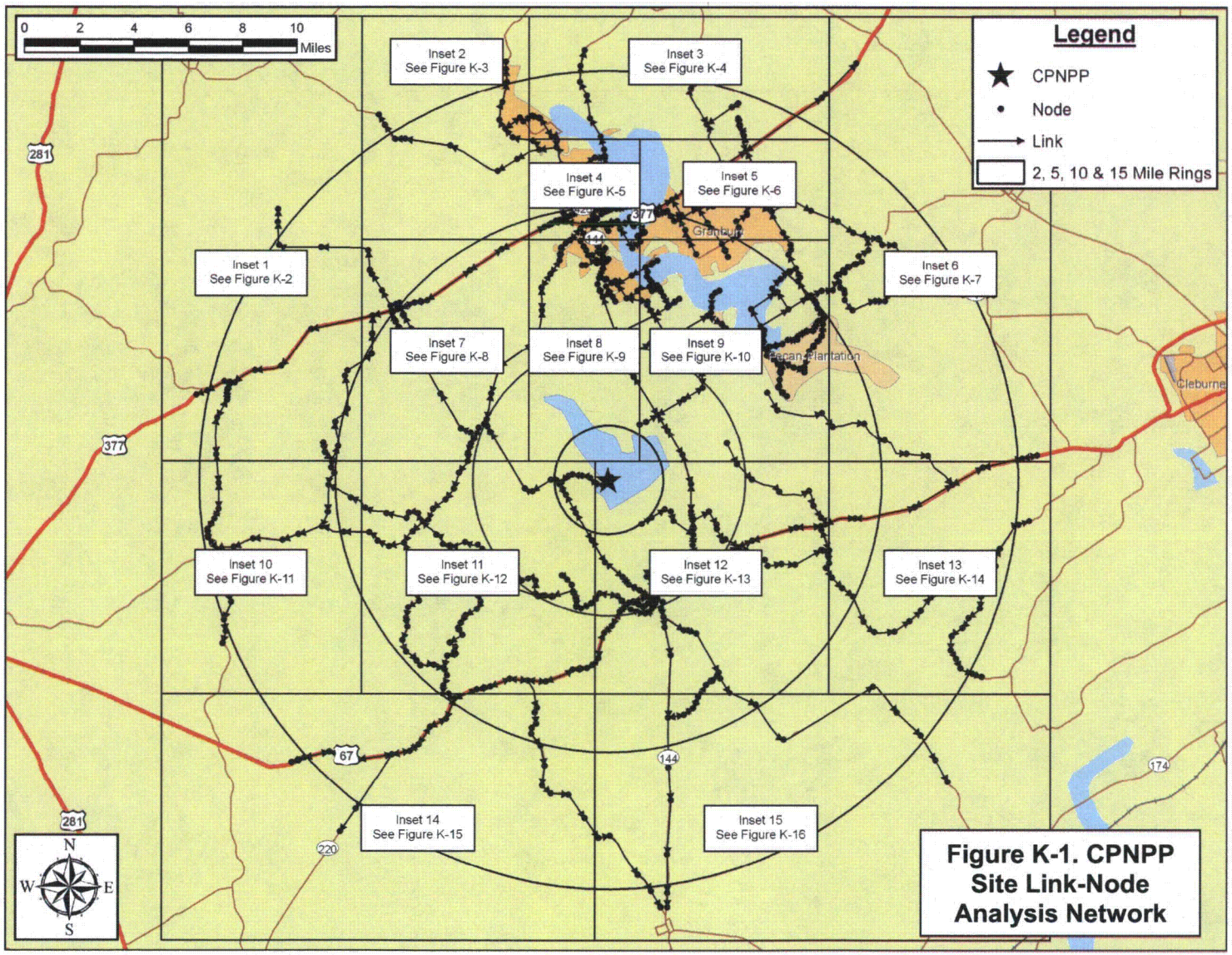

Figure K-1. CPNPP Site Link-Node Analysis Network

Add Figures K-1 through K-16 as pages K-2 through K-17

RAI 13.03-23

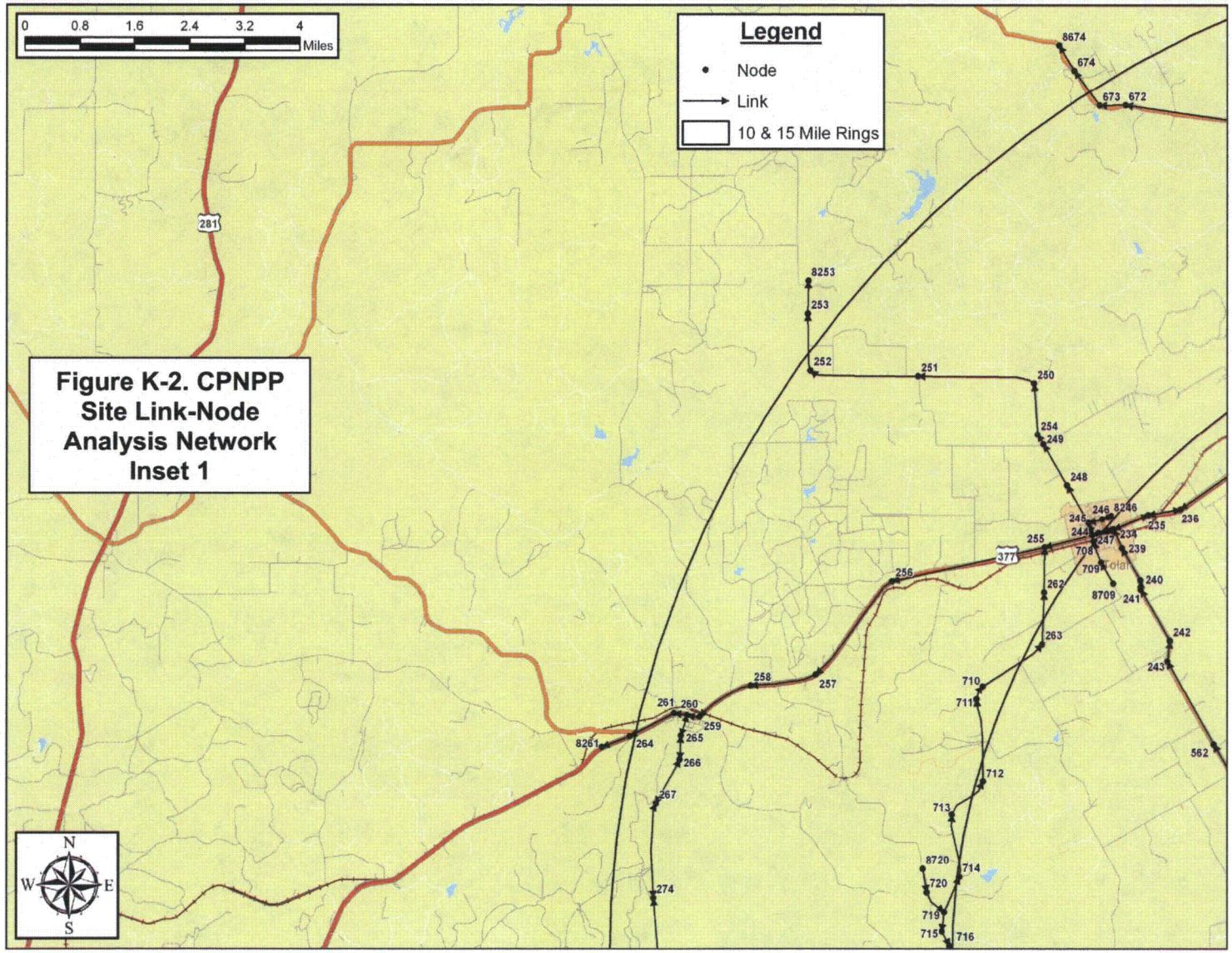

Figure K-2. CPNPP Site Link-Node Analysis Network Inset 1

RAI
13.03-23

3

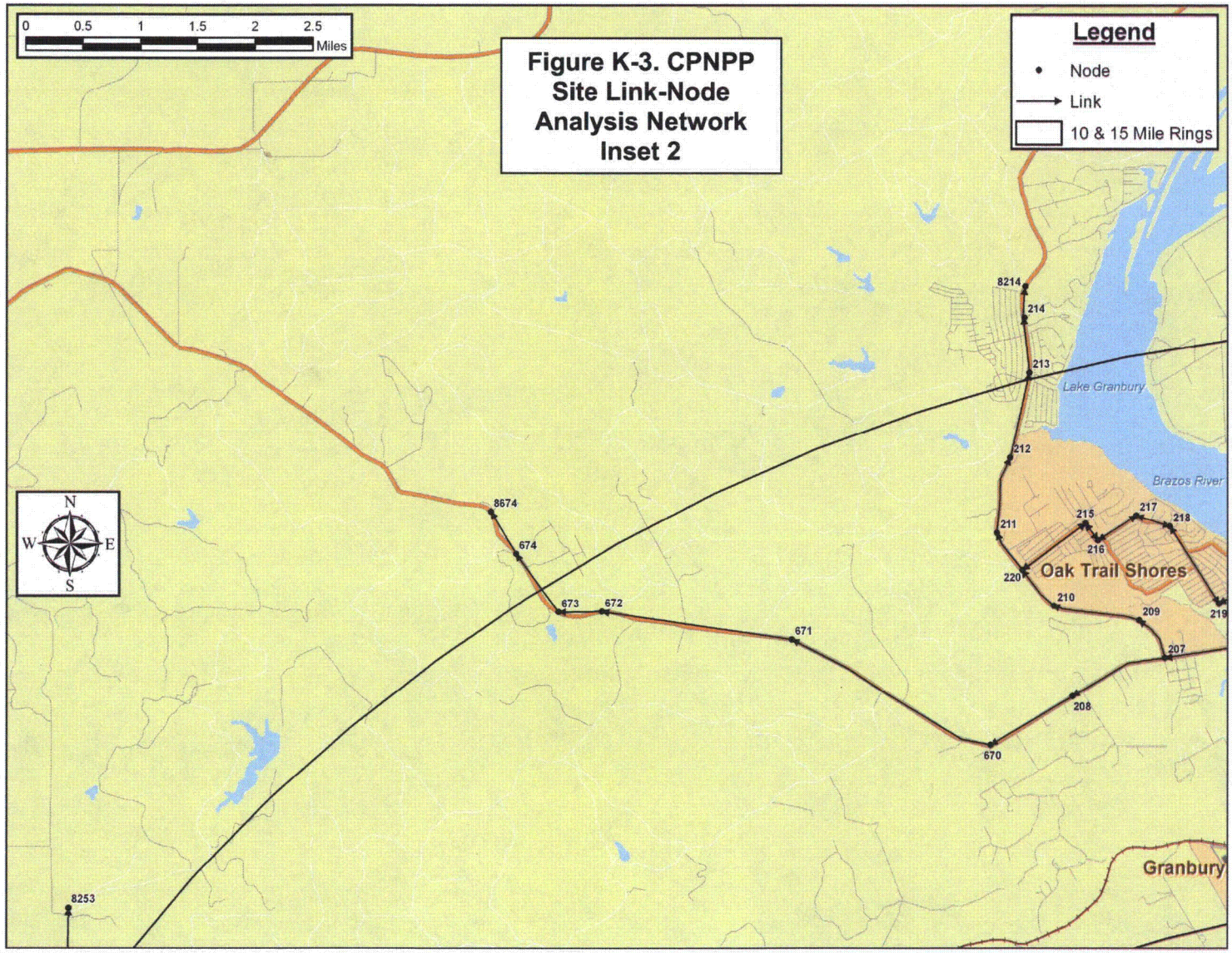
Figure K-3. CPNPP Site Link-Node Analysis Network Inset 2
0 0.5 1 1.5 2 2.5 Miles
Legend
Node
Link
10 & 15 Mile Rings
N
W
E
S
8214
214
213
212
211
220
210
209
207
208
670
671
672
673
674
8674
8253
215
216
217
218
219
Lake Granbury
Brazos River
Oak Trail Shores
Granbury

RAI 13.03-23

3

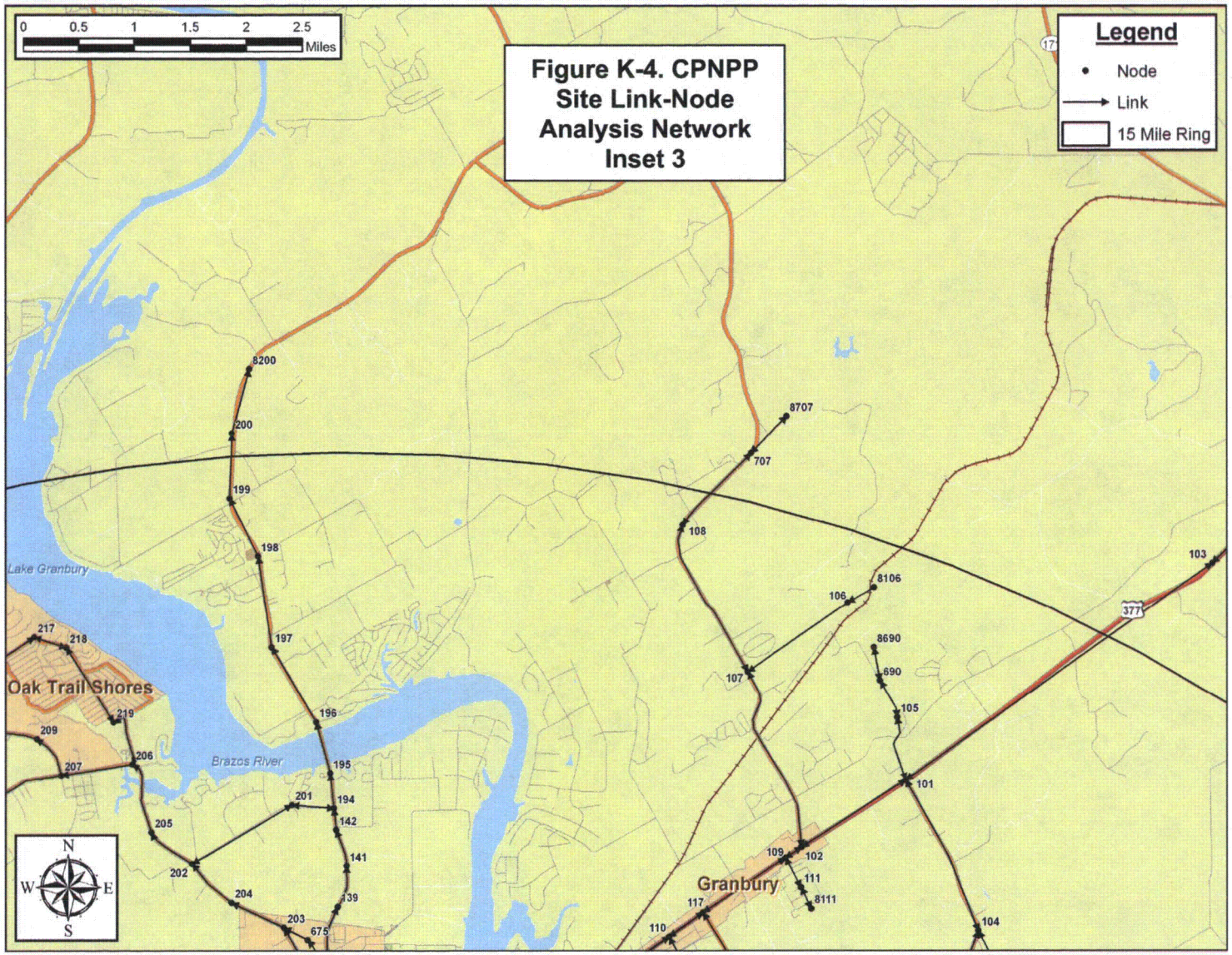
Figure K-4. CPNPP Site Link-Node Analysis Network Inset 3
Legend
Node
Link
15 Mile Ring
0 0.5 1 1.5 2 2.5 Miles
Lake Granbury
Brazos River
Oak Trail Shores
Granbury
N
S
E
W
8200
200
199
198
197
196
195
194
142
141
139
675
203
204
202
205
201
206
207
209
217
218
219
8707
707
108
8106
106
107
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690
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101
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104
109
102
111
8111
117
110
377

RAI 13.03-23

3

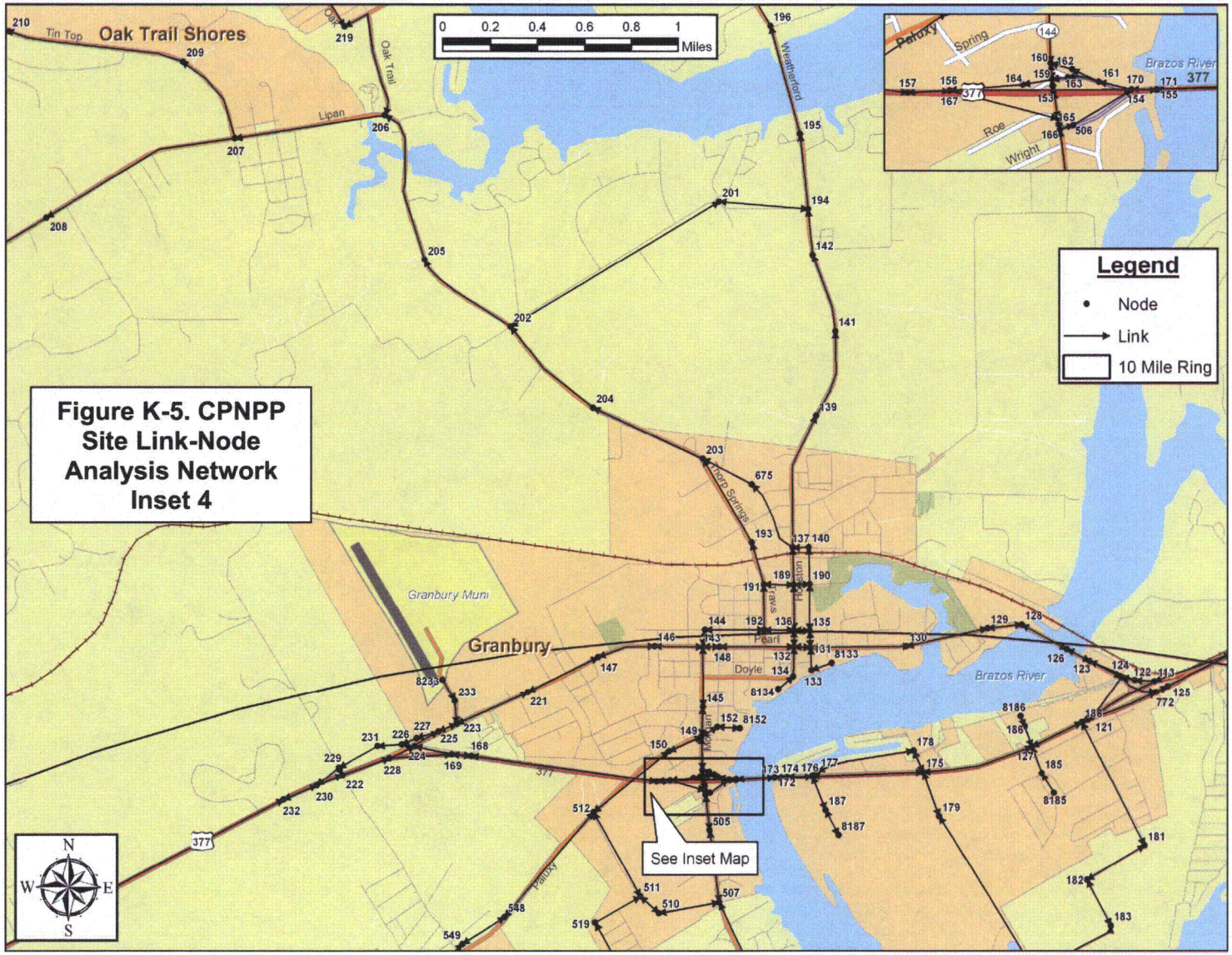


Figure K-5. CPNPP Site Link-Node Analysis Network Inset 4
Legend
Node
Link
10 Mile Ring
0 0.2 0.4 0.6 0.8 1 Miles
Oak Trail Shores
Granbury
Granbury Muni
Brazos River
See Inset Map
N
S
E
W

RAI 13.03-23

3

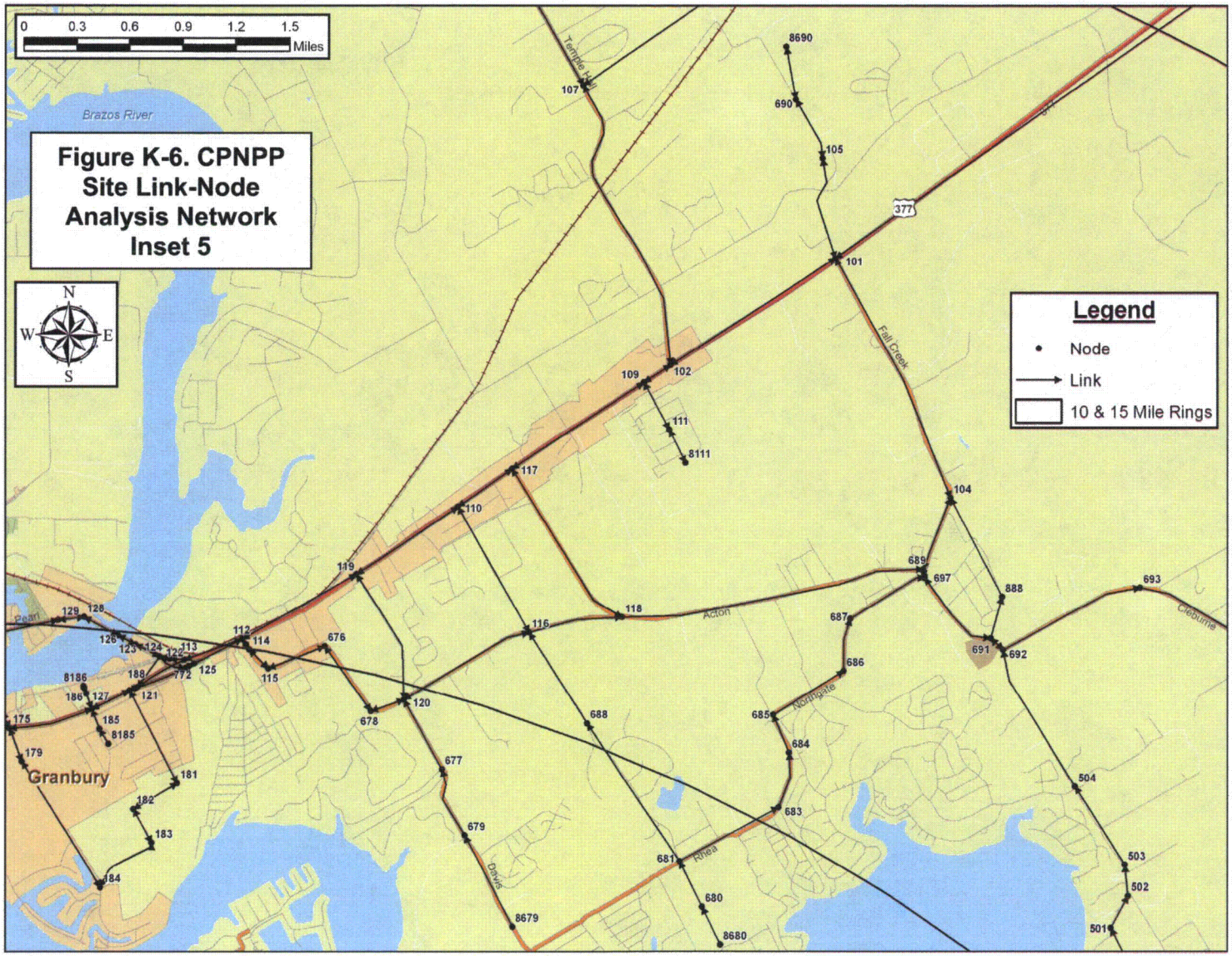
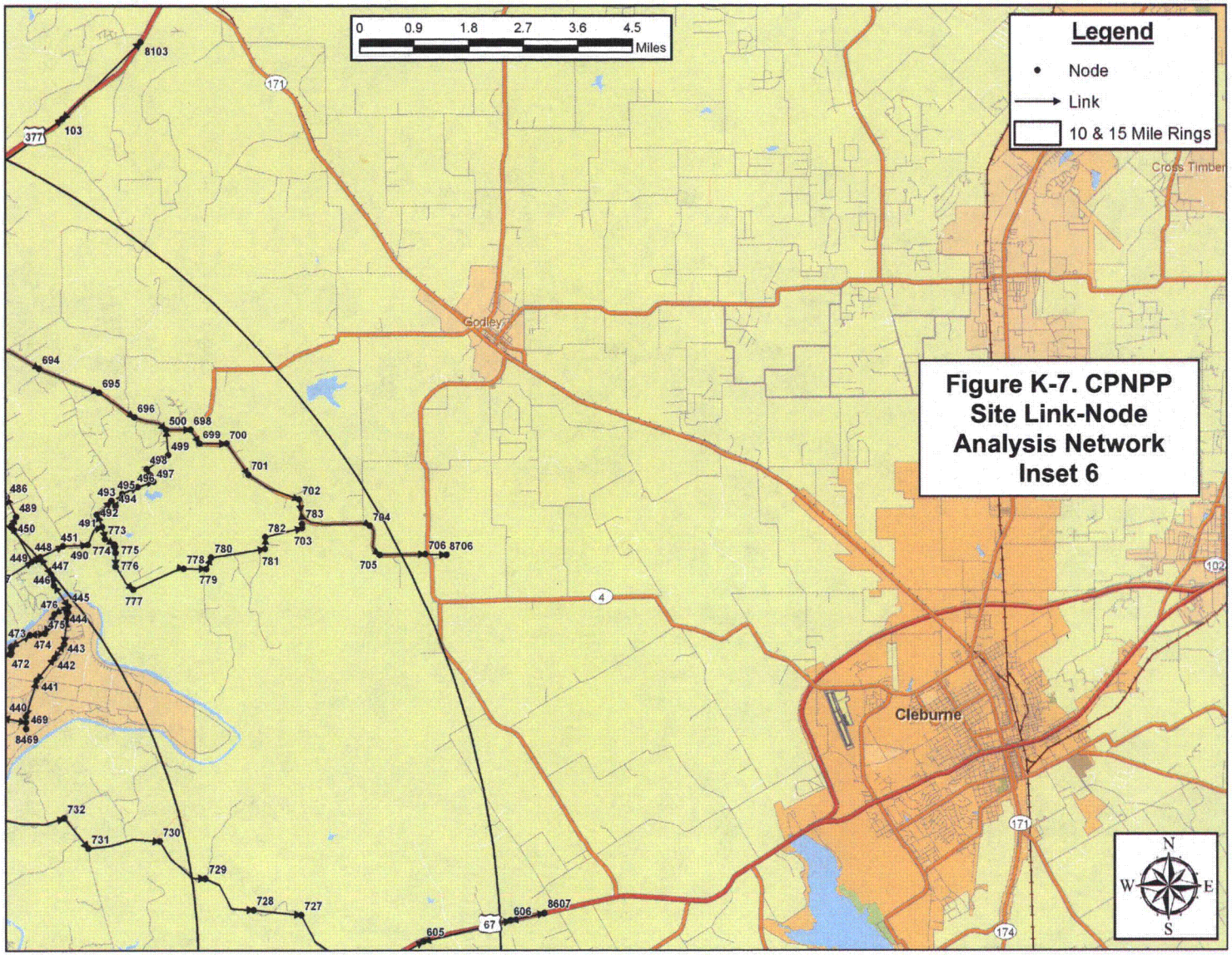


Figure K-6. CPNPP Site Link-Node Analysis Network Inset 5

RAI 13.03-23


0 0.9 1.8 2.7 3.6 4.5
Miles
Legend
Node
Link
10 & 15 Mile Rings
Figure K-7. CPNPP Site Link-Node Analysis Network Inset 6
Godley
Cleburne
Cross Timber
N
W
E
S

RAI 13.03-23

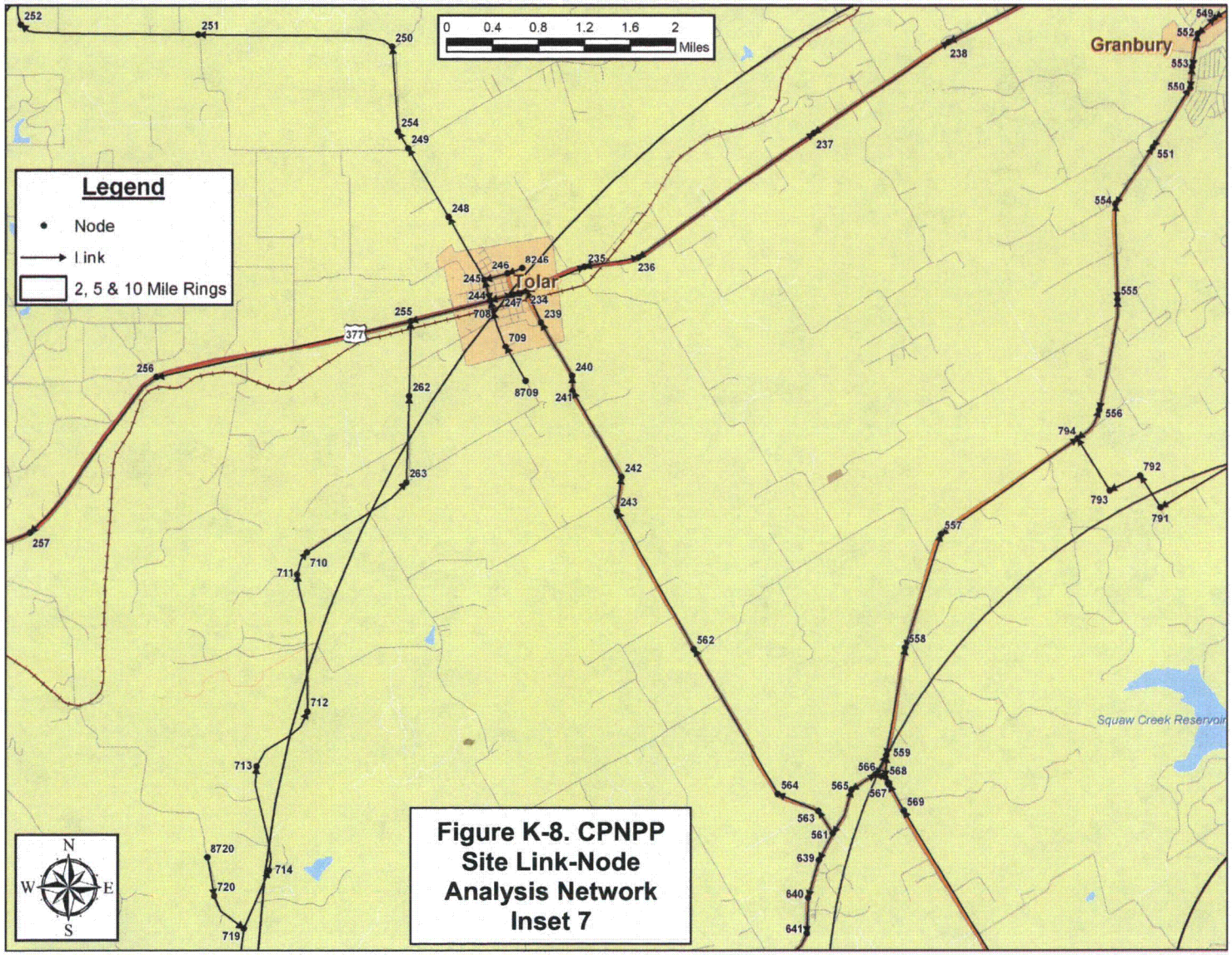


Figure K-8. CPNPP Site Link-Node Analysis Network Inset 7

RAI 13.03-23

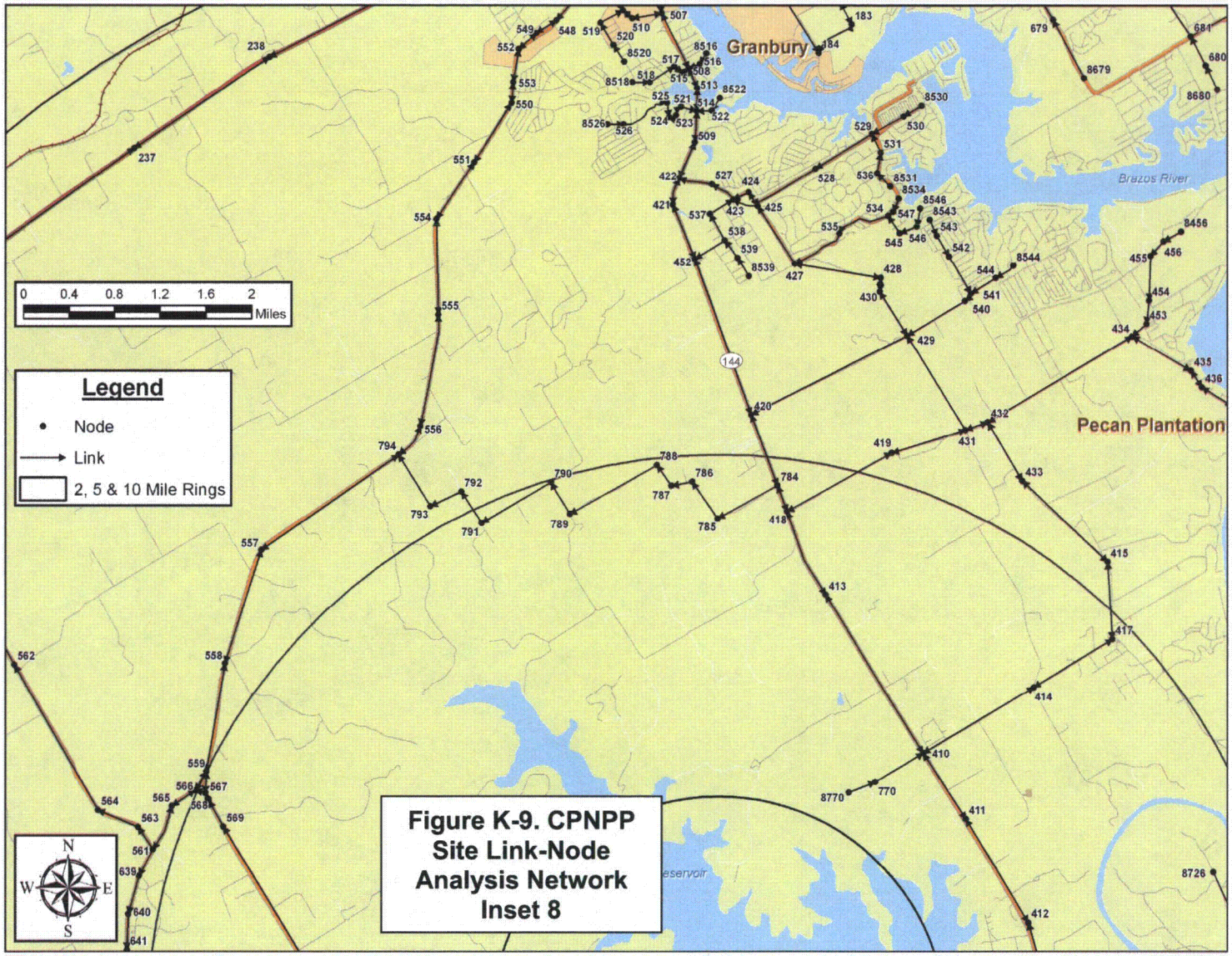


Figure K-9. CPNPP Site Link-Node Analysis Network Inset 8

RAI 13.03-23

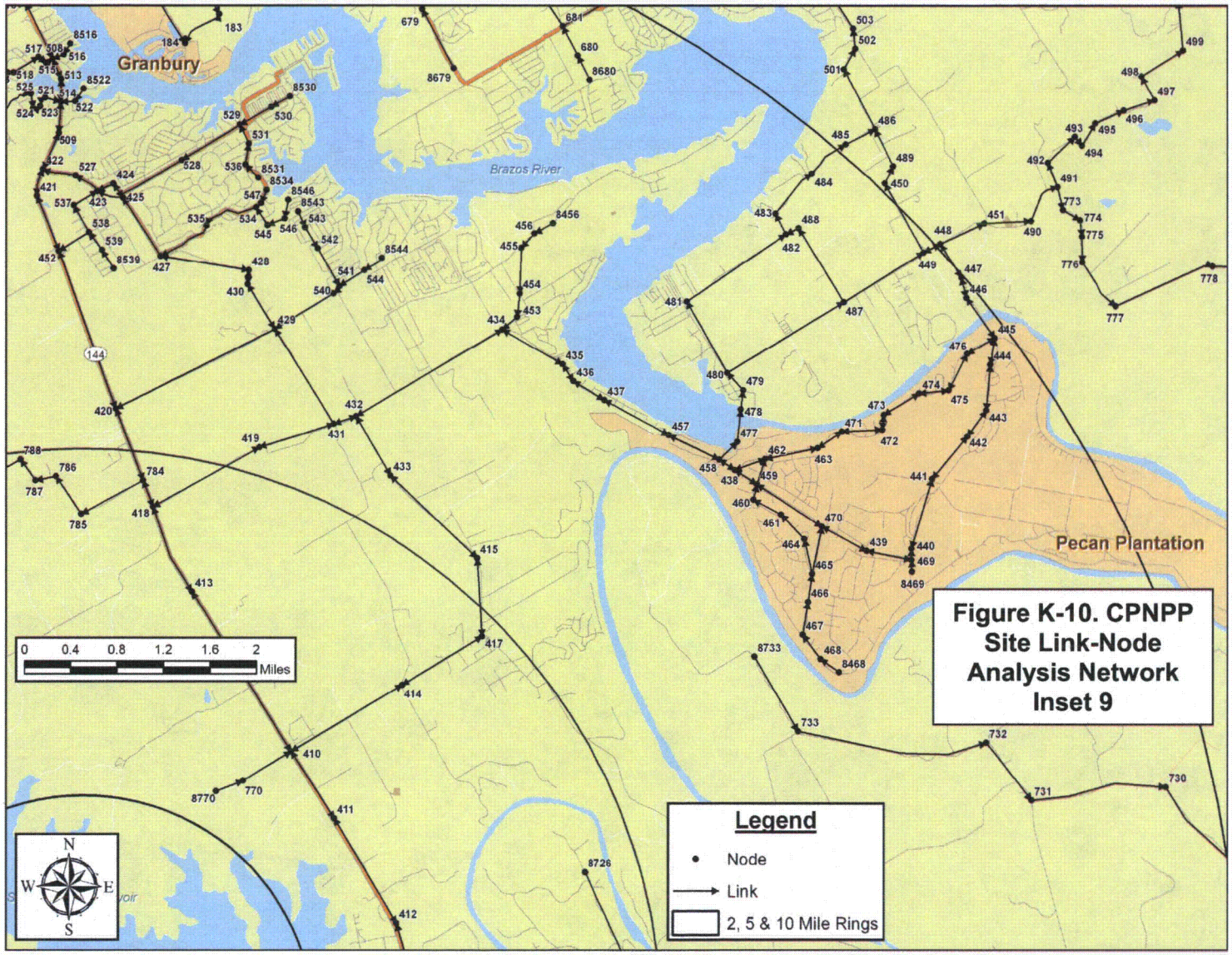


Figure K-10. CPNPP Site Link-Node Analysis Network Inset 9

RAI 13.03-23

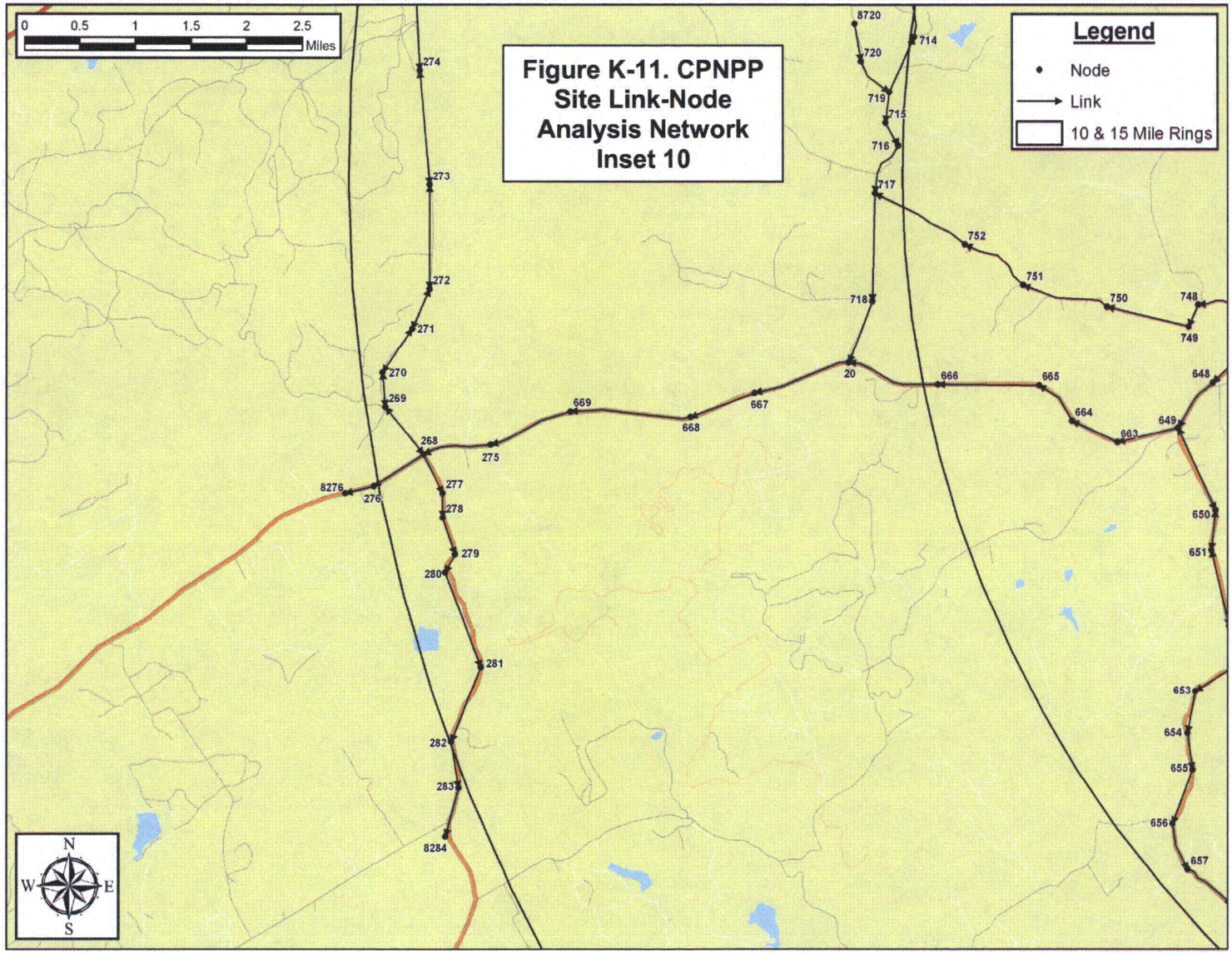


Figure K-11. CPNPP Site Link-Node Analysis Network Inset 10
Legend
Node
Link
10 & 15 Mile Rings
0 0.5 1 1.5 2 2.5 Miles
N
S
E
W
8720
714
720
719
715
716
717
718
752
751
750
748
749
20
666
665
664
663
649
648
650
651
653
654
655
656
657
669
668
667
275
268
269
270
271
272
273
274
8276
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283
8284

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3

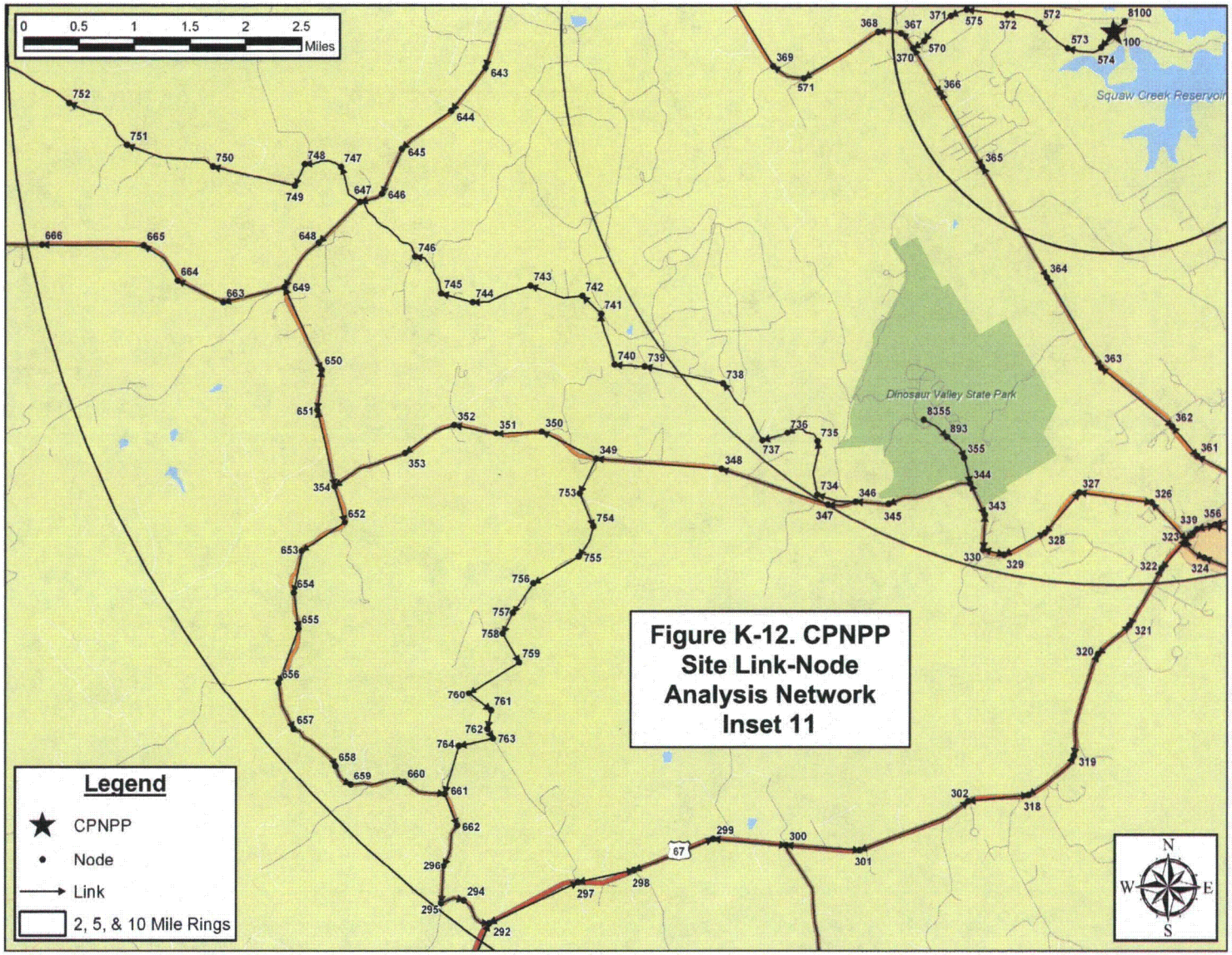


Figure K-12. CPNPP Site Link-Node Analysis Network Inset 11

RAI 13.03-23

3

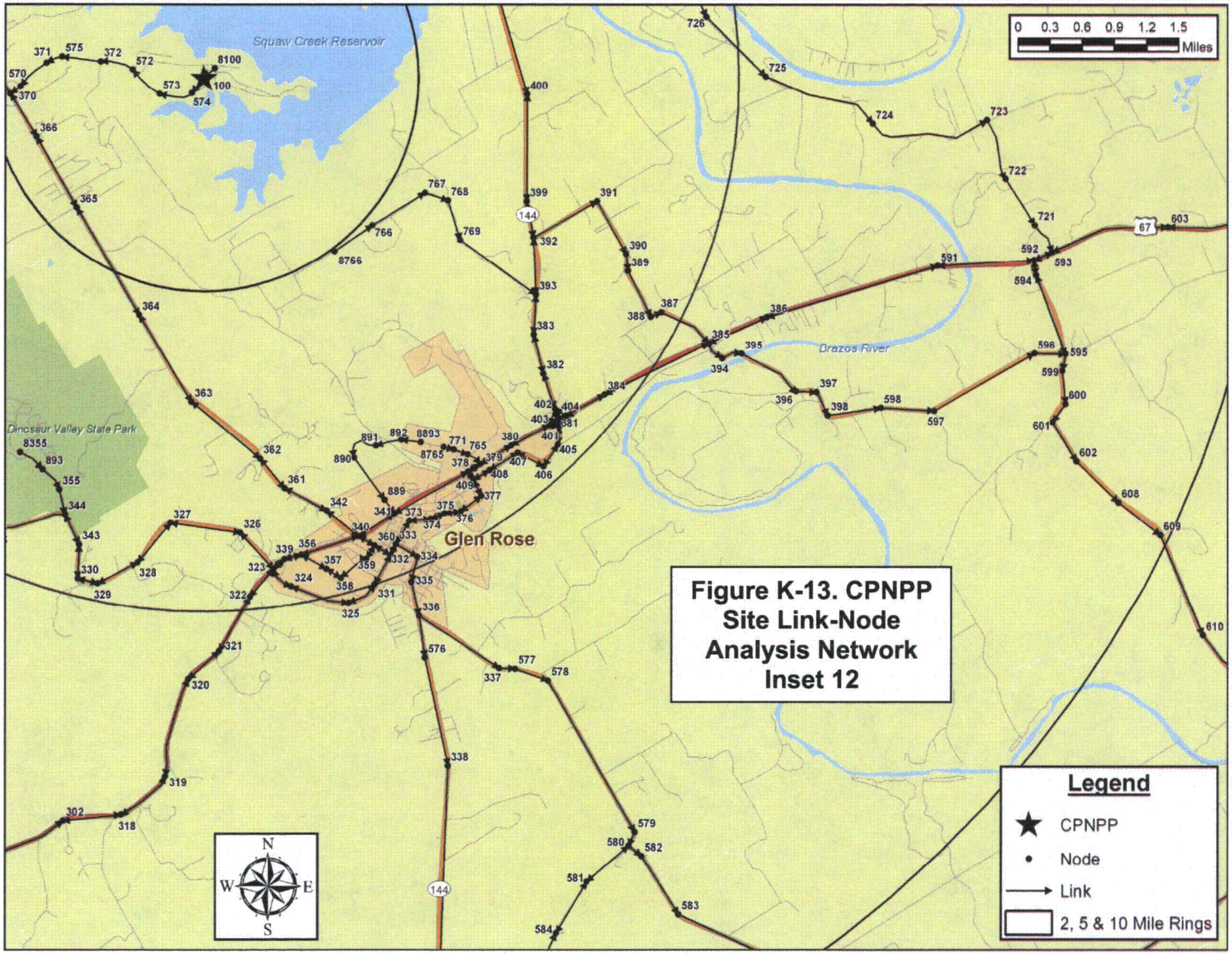


Figure K-13. CPNPP Site Link-Node Analysis Network Inset 12

RAI 13.03-23

3

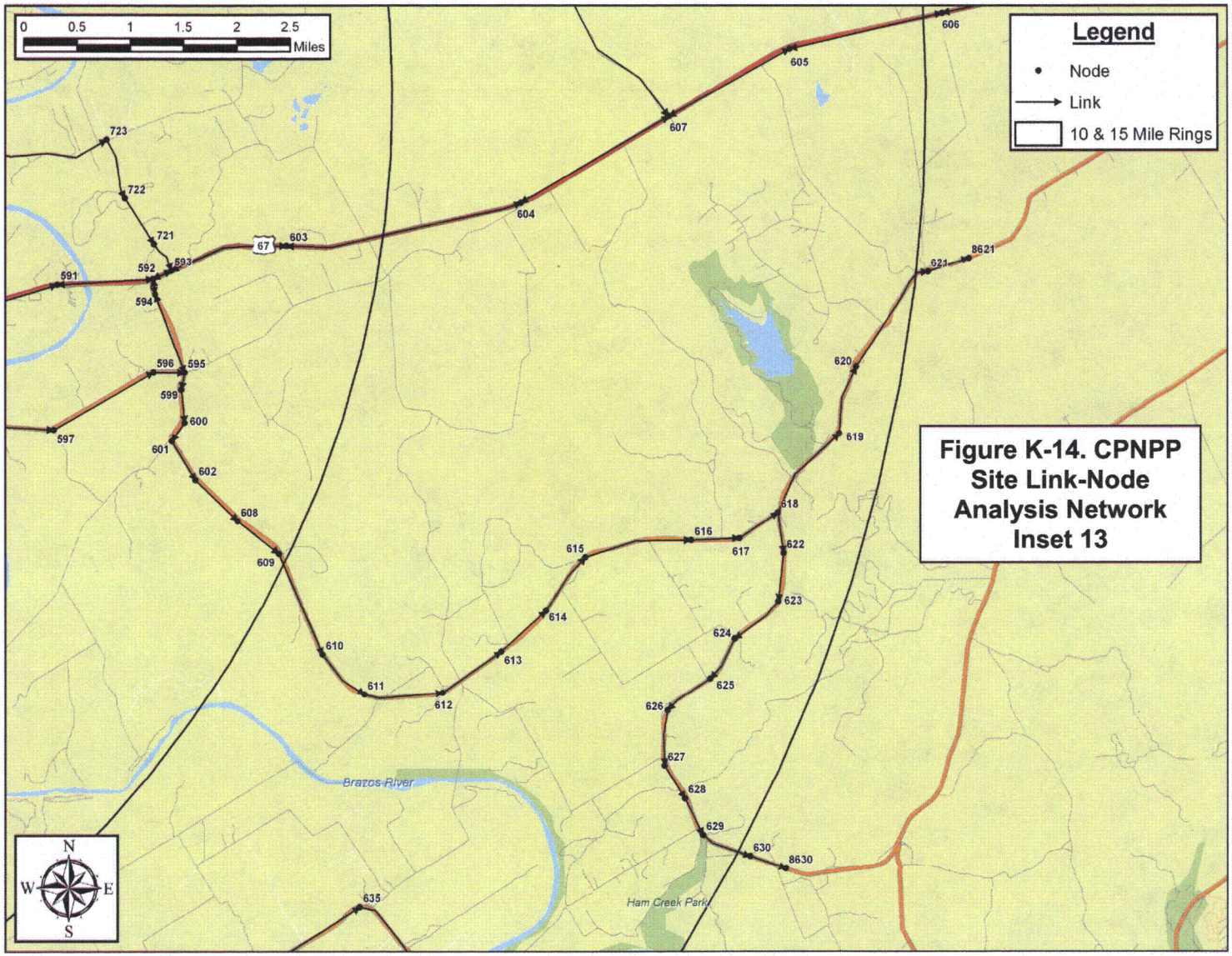


Figure K-14. CPNPP Site Link-Node Analysis Network Inset 13

RAI 13.03-23

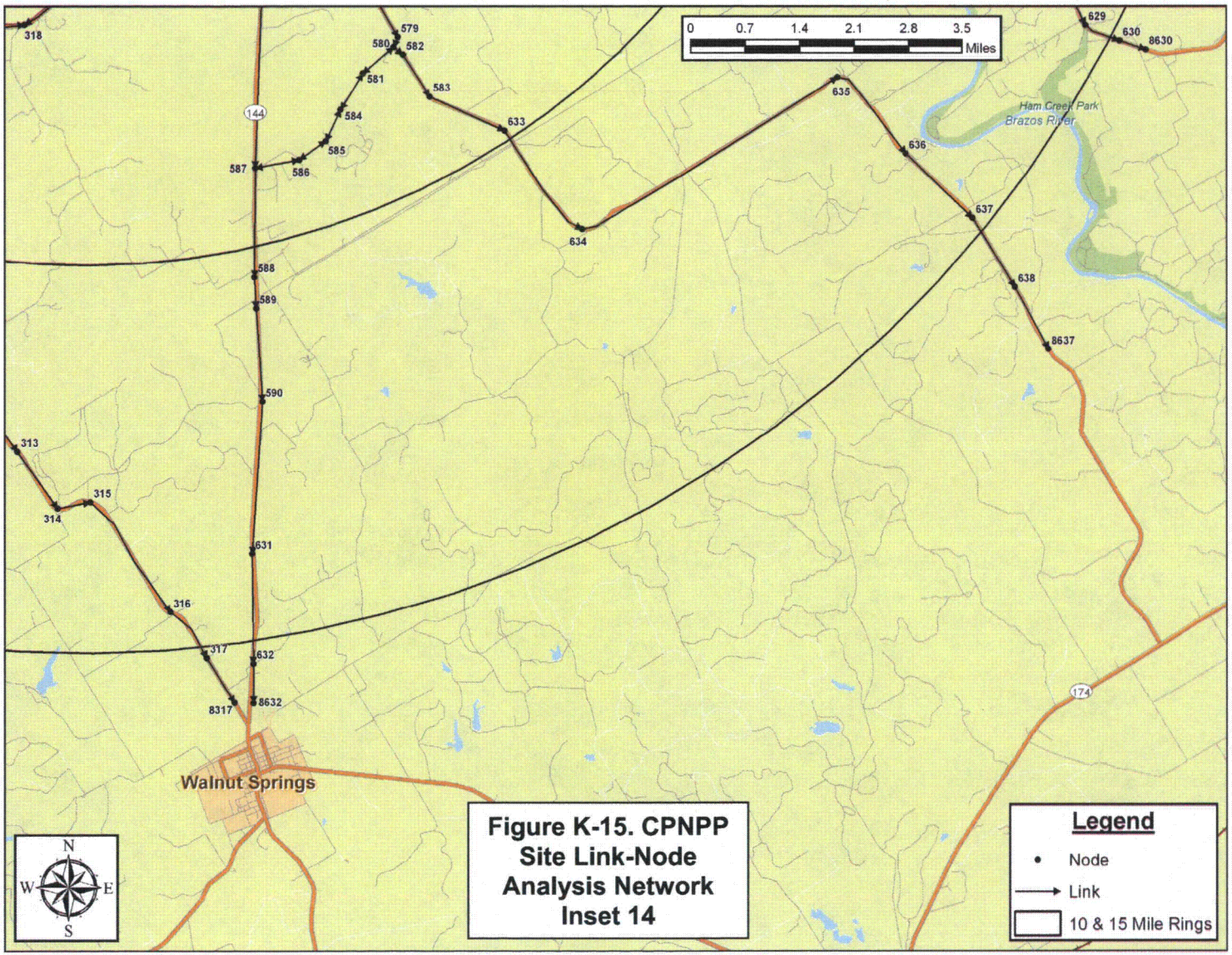


Figure K-15. CPNPP Site Link-Node Analysis Network Inset 14

RAI 13.03-23

3

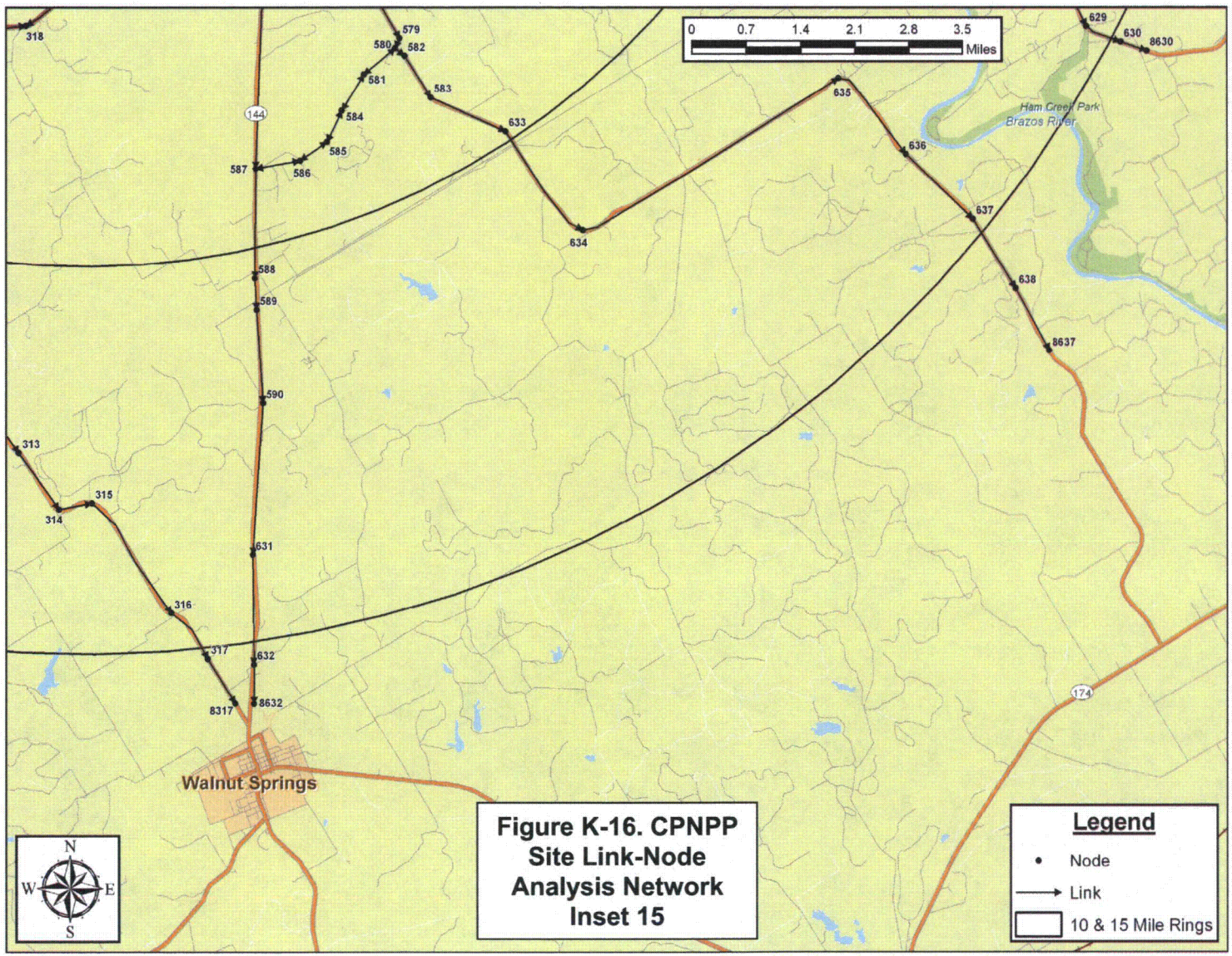


Figure K-16. CPNPP Site Link-Node Analysis Network Inset 15

RAI 13.03-23

Add Title and Table No. and begin table on page K-18

RAI 13.03-23

Table K-1. Evacuation Roadway Network Characteristics					
Upstream Node Number	Downstream Node Number	Length (miles * 100)	Full Lanes	Saturation Flow Rate (Veh/hr/ln)	Free Flow Speed (MPH)
20	667	89	1	1714	60
100	574	18	2	1714	40
101	102	110	2	1895	50
101	103	327	2	1895	65
101	104	150	1	1714	35
101	105	36	1	1714	30
102	107	146	2	1714	45
102	109	34	2	1895	50
102	101	110	2	1895	55
103	101	327	2	1895	55
104	101	150	1	1714	40
104	689	43	1	1714	35
105	101	36	1	1714	30
105	690	36	1	1714	35
106	107	95	2	1714	45
107	102	146	1	1714	50
107	108	145	1	1714	40
108	107	145	1	1714	45
108	707	92	1	1714	45
109	102	34	2	1895	50
109	111	48	1	1714	30
109	117	60	2	1895	50
110	117	49	2	1895	50
110	119	72	2	1895	30
110	116	83	1	1714	35
111	109	48	2	1714	45
112	113	27	2	1895	45
112	114	9	2	1714	30
112	119	75	2	1895	30
113	121	35	2	1714	45
113	122	16	1	1714	40
114	112	9	2	1714	45
114	115	15	2	1714	45
115	676	36	1	1714	45
115	114	15	2	1714	45
116	110	83	1	1714	40
116	118	50	1	1714	40
116	120	80	1	1714	35
117	109	60	2	1895	50
117	110	49	2	1895	30

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-24

ETE-8: Traffic Capacity, Roadway Segment Characteristics
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section III.B

A. COLA, Part 5, ETE Report, Section 4, "Estimation of Highway Capacity – Capacity Estimation Along Sections of Highway," page 4-3, states that capacity of highway sections is a function of, among other things, percent heavy trucks. Section 3.6, "Pass-Through Demand," identifies that there has been an increase in truck traffic through the EPZ. Identify the percent heavy trucks used in the analysis for evacuation of the general public in a revision to the ETE report.

ANSWER:

A. Based on discussions with local authorities, it is anticipated that the presence of trucks in the traffic stream prior to the declaration of a general emergency and the advisory to evacuate could be significant. Specifically, the "through" traffic of "external-external trips" traveling through the plume exposure pathway Emergency Planning Zone (EPZ) along its major highways (US Highway 377 through Granbury and US Highway 67 through Glen Rose) could include significant commercial traffic. Following the activation of Access Control Points (ACPs), 90 minutes following the advisory to evacuate, it is assumed that this through traffic will be diverted to paths outside the EPZ. The evacuating traffic stream would then consist primarily of passenger cars and their equivalents, (i.e., pickup trucks, SUV's, etc.), with few, if any, heavy trucks in the evacuating traffic stream. As a result, the Evacuation Time Estimate (ETE) did not consider the presence of heavy trucks in the analysis.

The primary effect of trucks is to slow traffic flow on upgrades. The terrain within the EPZ is essentially flat to about 3 percent grade, based on observations made during the road survey. According to Exhibit 20-7, the grade adjustment factor, f_G, for directional flow exceeding 600 passenger cars per hour (appropriate for evacuation circumstances) is 1.0 for level terrain and

0.99 for rolling terrain. Exhibit 20-16 yields a passenger car equivalent of 1.0 for trucks on upgrades of up to 3.5%. Thus, for the terrain within the EPZ, trucks perform as passenger cars. Therefore, ETE calculations do not need to consider the presence of heavy vehicles in the traffic stream. Study Assumption #4 in Section 2.3 of the ETE report will be revised to indicate that heavy vehicles do not impact ETE.

Assumption 4 in Section 2.3 of the ETE report will be revised to discuss the effects of heavy trucks on traffic operations.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 page 2-5 and 1 insert page.

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None

Impact on DCD

None

2.3 Study Assumptions

1. The Planning Basis Assumption for the calculation of ETE is a rapidly escalating accident that requires evacuation, and includes the following:
   a. Advisory to Evacuate is announced coincident with the siren notification.
   b. Mobilization of the general population will commence within 10 minutes after the Advisory to Evacuate.
   c. ETE are measured relative to the Advisory to Evacuate.
2. It is assumed that everyone within the group of Zones forming a Region that is issued an Advisory to Evacuate will, in fact, respond in general accord with the planned routes.
3. It is further assumed that:
   a. Schools may be evacuated prior to notification of the general public.
   b. 40 percent of the households in the EPZ have at least 1 commuter; 45 percent of those households will await the return of a commuter before beginning their evacuation trip, based on the telephone survey results.
4. The ETE will also include consideration of "through" (External-External) trips during the time that such traffic is permitted to enter the evacuated Region. "Normal" traffic flow is assumed to be present within the EPZ at the start of the emergency. Insert A RAI 13.03-24
5. Access Control Points (ACP) will be staffed within approximately 90 minutes of the siren notifications, to divert traffic attempting to enter the EPZ. Earlier activation of ACP locations could delay returning commuters. It is assumed that no vehicles will enter the EPZ after this 90 minute mobilization time period.
6. Traffic Control Points (TCP) within the EPZ will be staffed over time, beginning at the Advisory to Evacuate. Their number and location will depend on the Region to be evacuated and the resources available. It is assumed that drivers will act rationally, travel in the directions identified in the plan (as documented in the public information material), and obey all control devices and traffic guides.
7. Buses will be used to transport those without access to private vehicles:
   a. If schools are in session, transport (buses) will evacuate students directly to the assigned Host Schools.
   b. Medical facilities are required to have a detailed evacuation plan and to provide adequate transportation for all residents. Buses needed to evacuate special facilities are provided through private contracting.

Section 2.3, Assumption 4:

INSERT A:

The effect of heavy truck traffic on traffic operations during evacuation was determined to be immaterial; therefore the presence of truck traffic is not expressly considered in calculating ETE. However, the buses used to evacuate transit dependent persons from within the EPZ are represented within the modeling process as being equivalent to two passenger car units in calculating the ETE.

RAI 13.03-24

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-25

ETE-9: Analysis of Evacuation Times, Methodology, Total Evacuation Times
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section IV.B.

A. COLA, Part 5, ETE Report, Section 2.1 "Data Estimates," (7) states that ETE are presented for the 100th percentile which is consistent with the data presented in Section 5, "Estimation of Trip Generation Time." However, Section 7.3, "Evacuation Rates," states that the ETE does not account for stragglers. Discuss whether stragglers are included in the ETE. Revise the ETE report as needed.

B. In Figure 5-1, "Events and Activities Preceding the Evacuation Trip," the timeline for households with commuters includes time to return home, if needed, and then evacuate. The timeline for households without commuters indicates these residents are at home. Members of households without commuters may not be at home when they become aware of the accident and may need to return home.

   1. Explain why the events and activities timeline for households without commuters as represented in Figure 5-1 is different from the timeline for households with commuters.

   2. Discuss any effect this may have on the ETE calculation. Revise the ETE report as needed.

C. The timeline for transients, also in Figure 5-1, indicates that transients do not return home, (e.g., hotel) prior to evacuating.

   1. Discuss why Figure 5-1, indicates transients do not return to their residence (e.g., hotel) prior to evacuation.

   2. Discuss any effect this may have on the time for the transient population to evacuate, if they do return to their hotel prior to leaving. Revise the ETE report as needed.

ANSWER:

A. Guidance provided in NUREG-0654, Appendix 4 states, "evacuation time estimates are ... required for simultaneous evacuation of the entire plume exposure pathway." Additionally, Section 2.2, "Demand Estimation", of NUREG/CR-6863 states, "a small portion of the public refuses to evacuate during some evacuation. For ETE calculations, it should be assumed that the entire population within the assessed area is evacuated." In accordance with this guidance the ETE report includes estimates for 100% of the population within the EPZ.

NUREG/CR-6863 also contains the following discussion in Section 3.7.1, "Recommendations to Improve the ETE":

> During an evacuation event, there is a small portion of the population that requires a significantly longer time to evacuate. This segment of the population skews the evacuation time estimate to the high side (e.g., 90% of the population may evacuate in 4 hours and the remaining 10% require an additional 2 hours). Therefore, steps should be taken to first identify this population (i.e., who are the last people to leave the evacuated zone); second, identify the reasons for the increased evacuation time; and finally, identify if practical measures can be implemented in the planning stages to reduce the amount of time required for this population to evacuate in order to reduce the overall ETE.

Section 7.3 of the ETE report states, "these ETE estimates do not (and should not) be distorted to account for these relatively few stragglers." The mobilization times of those households which indicated long response times in the telephone survey were excluded using an outlier analysis so as to not distort ETE for stragglers. However, 100% of households were considered in the evacuation analysis. In performing the outlier analysis, those households which indicated long response times were essentially grouped with the tail end of the distributions shown in Table 5-1. The data shown in Appendix F are "raw data" before any analysis is made to exclude "outlier" data points. A discussion of the outlier analysis used in this study is included in the following paragraphs.

A key reference on the range of statistical analyses for outliers is Chapter 1 (Irad Ben-Gal, Outlier Detection), in Maimon O. and Rockach L. (Editors.) *Data Mining and Knowledge Discovery Handbook: A Complete Guide for Practitioners and Researchers*, Kluwer Academic Publishers (2005). The literature also cites Grubbs Test which is also referred to as the extreme studentized deviate (ESD) method. See for instance, "Detecting Outliers" (Dr. H Motulsky) at www.GraphPad.com. Grubbs Test handles one outlier at a time. Other techniques in the same family handle multiple outliners at the same time.

Other references on outlier analysis include *Robust Regression and Outlier Detection* (Wiley Series in Probability and Statistics, 2003) by Peter J. Rousseeuw and Annick M. Leroy, and *Outliers in Statistical Data* (Wiley Series in Probability & Statistics, 1994) by Vic Barnett and Toby Lewis.

The technique used in the ETE study is based upon:

(a) in a normal distribution, the probability of exceeding three standard deviations above the mean is 0.00135 or 0.135%,

(b) for N = 400 observations, as one example, one would expect approximately 0.54 observations to exceed that limit,

(c) if one observes several (e.g. 5, rather than 0 or 1) hypothesis testing would reject the hypothesis of such a number. The existence of a gap in the data histogram reinforces the analysis. The same test can be done for higher number of standard deviations (4, rather than 3) but the gap and the relative magnitudes (e.g. 5, rather than 1 or 2) are important considerations.

As shown in Appendix F, the mobilization activity distributions include outliers – generally, these represent anomalous responses to the survey question.

Following the standard statistical practice referenced above, outliers were identified by

(a) computing the estimated mean and standard deviation from the complete set of data,

(b) computing value x_{LIMIT} as the mean plus 3.0 standard deviations, above which one expects 0.135% of the observations,

(c) inspecting the gap between this limit value and the next-lowest observed value,

(d) if that gap is sizable, classify the points above x_{LIMIT} as outliers and eliminate those points from the sample,

(e) repeat the process from "a" to "d" until there are no outliers to consider.

The resulting data sets and distributions are then used to construct distributions for the total mobilization times under different scenarios (e.g. commuter returning, no commuter returning). In general, these are additive, using weighting based upon the probability distributions of each element; Figure 5-3 presents the combined trip generation distributions designated A, C, and D. These distributions are presented on the same time scale. The use of strictly additive activities is a conservative approach, because it makes all activities sequential. In practice, it is reasonable to expect that some of these activities are done in parallel, at least to some extent – for instance, preparation to depart begins by a household member at home while the commuter is still on the road.

Once the mobilization distributions are computed, they are not truncated, but rather used in their tabular/graphical form as direct inputs to later computations that lead to the ETE. As shown in Table 5-1, trips were generated for 100 percent of all population groups by the end of the trip generation time of 4 hours. Thus, none of the stragglers were eliminated from the analysis; rather, their trip generation rates were included within those of the rest of the evacuating population so as to not distort ETE. A discussion of the outlier analysis used in this study will be added to Section 5 of the ETE report.

B. The ETE study assumes that those residents who are not commuters or students and who are away from home at the time of the emergency would be relatively close to home and that travel time home would be small relative to the time required to prepare for evacuation. The time to travel home from a nearby location would be embedded within Distribution No. 1, "Notification Time", which spans 50 minutes and precedes the activity of preparing the home for evacuation.

The ETE study distinguishes between those residents who are at home or close by, and those residents who will await the return of commuters, who are considerably farther away, before evacuating. This need arises from the fact that the time involved for commuters to prepare to leave work (Distribution Number 2, which spans 2 hours) and then travel home (Distribution Number 3, which spans 2 hours and 10 minutes), is significant and influences the trip generation distribution for those households that await the return of a commuter. This is seen by comparing distribution C with distribution D in Table 5-1.

The procedures that have been used fairly represent the range of resident response times to the declaration of a general emergency. The current calculation of ETE is a reliable representation of events as they would occur and no revision to the ETE is required.

C. If the emergency occurs during the daytime, it is reasonable to expect that at least some of those who stay overnight at lodging facilities will leave their personal belongings in their respective rooms. Others, who want to have access to their belongings during the day (or are on their last day), will have their belongings with them. Those of the former group have two choices:

- Evacuate immediately, leaving their belongings in the room for subsequent retrieval; or
- Return to the lodging facility to gather their belongings and then evacuate.

The mobilization distribution for transients extends over a period of 2 hours, as shown in Distribution A in Table 5-1. Those who elect to return to the lodging facilities to pick up their belongings will be able to do so and then begin their evacuation trip within this time frame. Most of the lodging facilities (see page E-12 in the ETE report) in the EPZ are located within approximately 5 miles of the EPZ boundary; thus, travel time to the EPZ boundary will be significantly less than the mobilization time.

To clarify these assumptions, Figure 5-1 will be updated to address the possibility that transients may return to lodging facilities or campsites prior to beginning their evacuation trip. The text of Section 5 will be revised to correspond with the changes to Figure 5-1.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 5-3, 5-4, 5-5, 5-11, and 3 insert pages (total of 7 pages).

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

Fundamental Considerations

The environment leading up to the time that people begin their evacuation trips consists of a sequence of events and activities. Each event (other than the first) occurs at an instant in time and is the outcome of an activity.

Activities are undertaken over a period of time. Activities may be in "series" (i.e. to undertake an activity implies the completion of all preceding events) or may be in parallel (two or more activities may take place over the same period of time). Activities conducted in series are functionally dependent on the completion of prior activities; activities conducted in parallel are functionally independent of one-another. The relevant events associated with the public's preparation for evacuation are:

Event Number	Event Description
1	Notification-accident condition
2	Awareness of accident situation
3	Depart place of work or elsewhere, to return home
4	Arrive (or be at) home
5	Begin evacuation trip to leave the area.

Associated with each sequence of events are one or more activities, as outlined below:

Event Sequence	Activity	Distribution
1 → 2	Public receives notification information	1
2 → 3	Prepare to leave work	2
3 → 4	Travel home*	3
4 → 5	Prepare to leave for evacuation trip	4

*If already at home, this is a null (no-time-consumed) activity.

Insert A

These relationships are shown graphically in Figure 5-1.

~~An employee who lives outside the EPZ will follow sequence (d) of Figure 5-1; a resident of the EPZ who is at work, and will return home before beginning the evacuation trip will follow sequence (a) of Figure 5-1. Note that event 5, "Leave to evacuate the area," is conditional either on event 2 or on event 4. That is, activity 2 → 5 by a resident at home can be undertaken in parallel with activities 2 → 3, 3 → 4 and 4 → 5 by a commuter returning to that home, as shown in Figure 5-1 (a). Specifically, one adult member of a household can prepare to leave home (i.e. secure the home, pack~~

RAI 13.03-25

~~clothing, etc.), while others are traveling home from work. In this instance, the household members would be able to evacuate sooner than if such trip preparation were deferred until all household members had returned home. For this study, we adopt the conservative posture that all activities will occur in sequence.~~

RAI 13.03-25

It is seen from Figure 5-1, that the Trip Generation time (i.e. the total elapsed time from Event 1 to Event 5) depends on the scenario and will vary from one household to the next. Furthermore, Event 5 depends, in a complicated way, on the time distributions of all activities preceding that event. That is, to estimate the time distribution of Event 5, we must obtain estimates of the time distributions of all preceding events.

Estimated Time Distributions of Activities Preceding Event 5

The time distribution of an event is obtained by "summing" the time distributions of all prior contributing activities (This "summing" process is quite different than an algebraic sum since we are operating on distributions, not scalar numbers).

Time Distribution No. 1, Notification Process: Activity 1 $\rightarrow$ 2

It is reasonable to expect that 85 percent of those within the EPZ will be aware of the accident within 30 minutes with the remainder notified within the following 20 minutes. The notification distribution is given below:

Distribution No. 1, Notification Time: Activity 1 $\rightarrow$ 2

Elapsed Time (Minutes)	Percent of Population Notified
0	0
5	7
10	13
15	26
20	46
25	65
30	85
35	90
40	95
45	98
50	100

Insert B will replace this figure

RAI 13.03-25

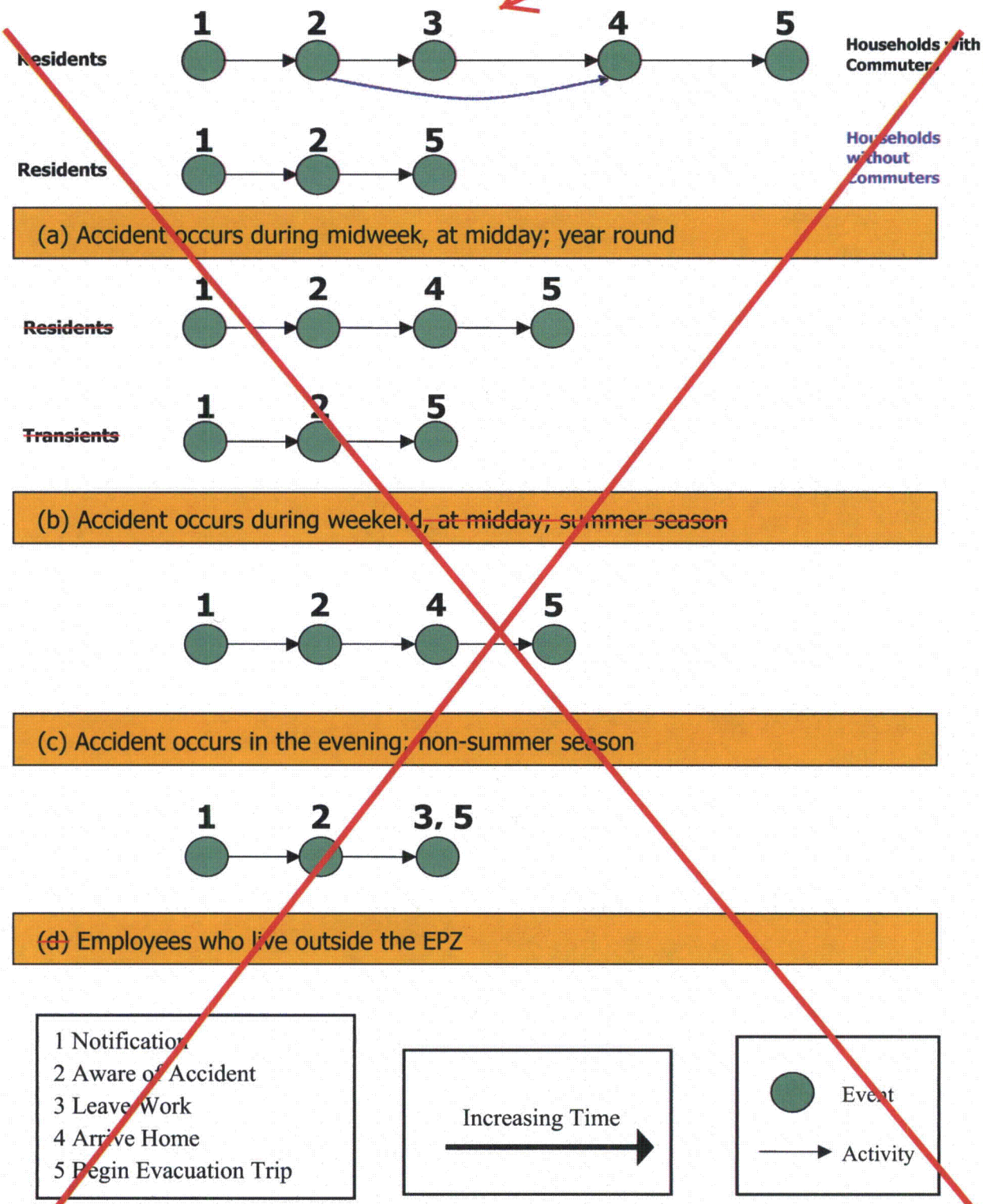
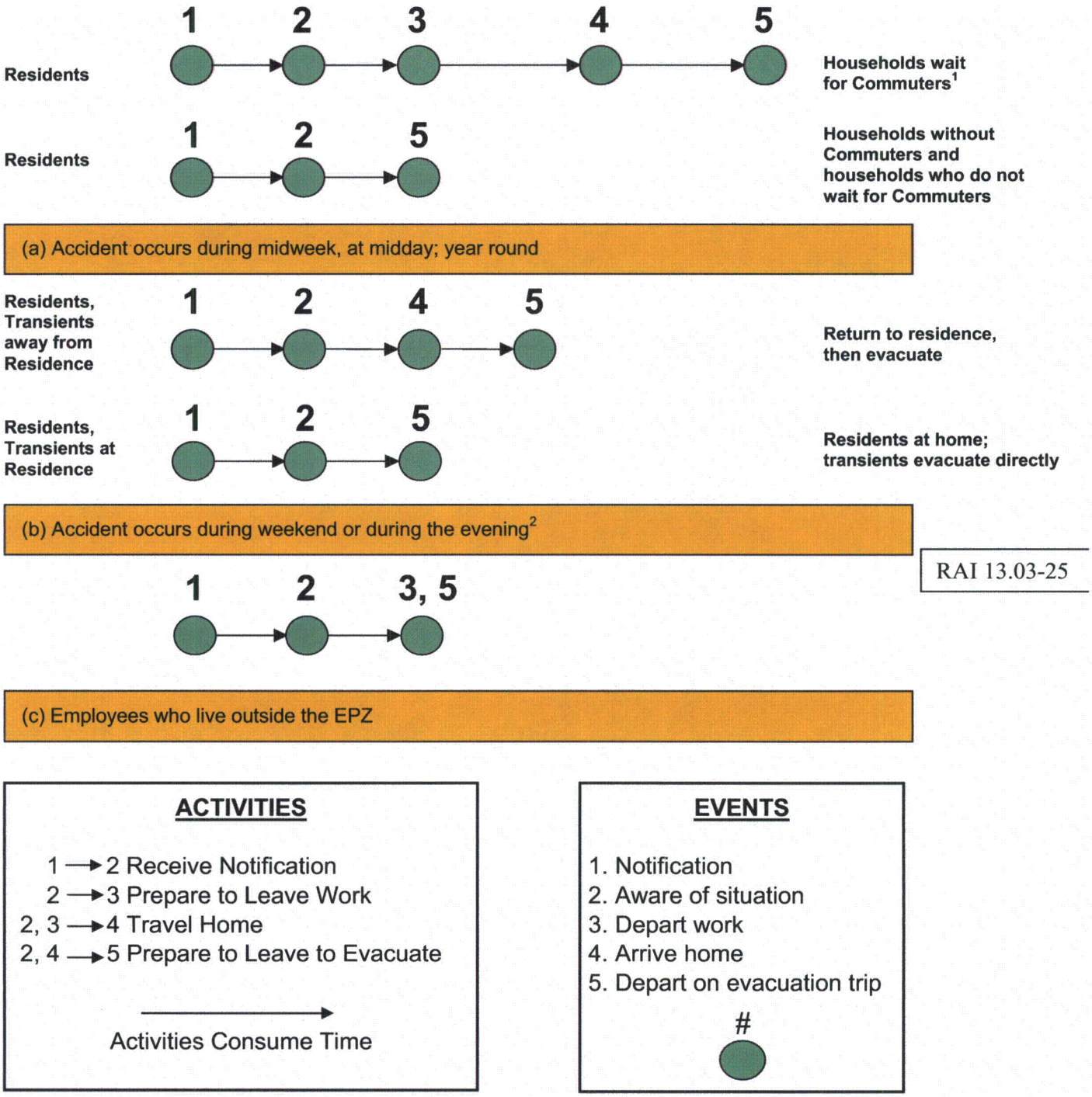


Figure 5-1. Events and Activities Preceding the Evacuation Trip

Insert B



RAI 13.03-25

[1] Applies for evening and weekends also if commuters are at work.
[2] Applies throughout the year for transients.

Figure 5-1. Events and Activities Preceding the Evacuation Trip

Distributions A through D are described below:

Distribution	Description
A	Time distribution of commuters departing place of work (Event 3). Also applies to employees who work within the EPZ who live outside, and to Transients within the EPZ.
B	Time distribution of commuters arriving home.
C	Time distribution of residents with commuters leaving home to begin the evacuation trip.
D	Time distribution of residents without commuters returning home to begin the evacuation trip.

~~Figure 5-3 presents the combined trip generation distributions designated A, C, and D. These distributions are presented on the same time scale. The PC-DYNEV simulation model is designed to accept varying rates of vehicle trip generation for each origin centroid, expressed in the form of histograms. These histograms, which represent Distributions A, C, and D, properly displaced with respect to one another, are tabulated in Table 5-1 (Distribution B, Arrive Home, omitted for clarity).~~

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Insert C

Page 5-3:

INSERT A:

An employee who lives outside the EPZ will follow sequence (c) in Figure 5-1. A household within the EPZ that has one or more commuters at work, and will await their return before beginning the evacuation trip will follow the first sequence of sequence (a) in Figure 5-1. A household within the EPZ that has no commuters at work, or that will not await the return of any commuters, will follow the second sequence of sequence (a) in Figure 5-1, regardless of day of week or time of day. Note that event 5, "Leave to evacuate the area," is conditional either on event 2 or on event 4. For this study, we adopt the conservative posture that all activities will occur in sequence.

RAI 13.03-25

Households with no commuters on weekends or in the evening/night-time, will follow the applicable sequence of sequence (b) in Figure 5-1. Transients will always follow one of the sequences of sequence (b) in Figure 5-1. Some transients away from their residence could elect to evacuate immediately without returning to the residence, as indicated in the second sequence of sequence (b).

Page 5-5:

INSERT B:

See attached Figure 5-1.

Page 5-11:

INSERT C:

As shown in Appendix F, the mobilization activity distributions include outliers – generally, these represent anomalous responses to the survey question. Following standard statistical practice, outliers were identified by (a) computing the estimated mean and standard deviation from the complete set of data, (b) computing value x_{LIMIT} as the mean plus 3.0 standard deviations, above which one expects 0.135% of the observations, (c) inspecting the gap between this limit value and the next-lowest observed value, (d) if that gap is sizable, classify the points above x_{LIMIT} as outliers and eliminate those points from the sample, (e) repeat the process from "a" to "d" until there are no outliers to consider.

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The data sets and distributions are then used to construct distributions for the total mobilization times under different scenarios (e.g. commuter returning, no commuter returning, no snow or snow in each). In general, these are additive, using weighting based upon the probability distributions of each element; Figure 5-3 presents the combined trip generation distributions designated A, C and D. These distributions are presented on the same time scale. (The use of strictly additive activities is a conservative approach, because it makes all activities sequential – preparation for departure follows the return of the commuter; snow clearance follows the preparation for departure, and so forth. In practice, it is reasonable that some of these activities are done in parallel, at least to some extent – for instance, preparation to depart begins by a household member at home while the commuter is still on the road.)

Once the mobilization distributions are computed, they are not truncated, but rather used in their tabular form as direct inputs to later computations that lead to the ETE. The PC-

DYNEV simulation model is designed to accept varying rates of vehicle trip generation for each origin centroid, expressed in the form of histograms. These histograms, which represent Distributions A, C, and D, properly displaced with respect to one another, are tabulated in Table 5-1 (Distribution B, Arrive Home, omitted for clarity).The final time period (9) is 600 minutes long. This time period is added to allow the analysis network to clear, in the event congestion persists beyond the trip generation period. Note that there are no trips generated during this final time period.

RAI 13.03-25

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-26

ETE-10: Analysis of Evacuation Times, Methodology, Transit Dependent
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section IV.B.

A. COLA, Part 5, ETE Report, Section 8-1, "Transit Dependent People - Demand Estimate," identifies the need for 20 bus runs to support evacuation of the transit dependent population, but information is needed on the total number of specialized vehicles that may be required. Discuss the affect on the ETE if specialized transportation is required to support evacuation of the transit dependent people. Revise the ETE report as needed.

B. Figure 8-2, "Proposed Transit Dependent Bus Routes," identifies bus routes 1 and 3 on roadways where access control points prevent vehicle traffic in at least one direction. Access control points 2 and 4, which are detailed in COLA, Part 5, ETE Report, Appendix G, "Traffic Management," include physical barricades that would slow inbound buses using bus routes 1 and 3. Discuss any delays expected along bus routes 1 and 3 as a result of access control points. Revise the ETE report as needed.

C. COLA, Part 5, ETE Report, Section 10, "Evacuation Routes," states that routing of evacuees from the EPZ boundary to the reception centers should minimize travel. However, evacuees exiting the EPZ on Farm to Market (FM) roadways FM4, FM56, FM203, and State Road 144, as indicated in Figure 10-2, "Evacuation Routes for Hood County," and Figure 10-3, "Evacuation Routes for Somervell County," are not traveling toward reception centers. Discuss how evacuees exiting the EPZ on FM4, FM56, FM203, and State Road 144 get to the reception centers based on the direction of travel identified. Revise the ETE report as needed.

ANSWER:

A. This information is provided in response to Question 13.03-19, Part C, above.

B. Physical barricades, such as those that would be in place along bus routes 1 and 3, are necessary to divert inbound traffic from entering the plume exposure pathway Emergency Planning Zone (EPZ) following activation of the Access Control Points (ACP). In addition to diverting most vehicles from entering the EPZ, the traffic guides at ACPs should selectively facilitate the movement of entering vehicles that are necessary to service the public evacuating from within the EPZ, including buses which are dispatched to provide service for transit dependent evacuees, such as those on routes 1 and 3. Police and emergency response personnel, and late arriving returning commuters who need to provide transport for family members would also need to enter the EPZ through ACPs. It is expected that traffic and access control points, if established, would be established in a manner that does not interfere with the movement of inbound buses.

The need to establish the validity of an entering privately owned vehicle could be time consuming and potentially delay other vehicles that are needed for emergency response. The personnel manning ACPs should be trained to expedite the entry of those vehicles such as buses and other emergency vehicles while ensuring that private vehicles have a legitimate need to enter the EPZ. Any delay experienced by these relatively few private vehicles after the ACP is activated would be minimal and will not influence the movements of those vehicles evacuating from the EPZ.

Text will be added to Section 9 and Appendix G of the ETE report to indicate that transit vehicles and other responders entering the EPZ to evacuate transit-dependent persons will not be delayed at ACPs.

C. According to Section 2.10, "Radial Dispersion", of NUREG/CR-6863,

> Evacuation planning should be based on moving the population away from the hazard in the most expedient manner possible. This generally equates to a radial dispersion away from the NPP.

Many evacuees may elect to evacuate to a lodging facility or the home of a friend or family member outside of the EPZ. Therefore, not all evacuees will go to reception centers. Page III-92 of the FEMA Radiological Emergency Planning (REP) manual indicates that reception centers should have the capacity to monitor 20% of the EPZ population within 12 hours

Question 33 in NUREG/CR-6953, Vol.2, asked EPZ residents how likely they were to go to a reception center after evacuating. Approximately 40% of those surveyed indicated that it was unlikely they would go to a reception center.

FM-4, FM-56, FM-203 and State Road 144 are all major evacuation routes which travel away from CPNPP and out of the EPZ. Although these routes do not travel toward the designated reception centers, they do move evacuees toward neighboring cities where they may be going to stay with a friend or family member or at a lodging facility.

Those evacuees who wish to relocate to the reception centers will choose their evacuation routes accordingly. The discussion of routing from the EPZ boundary to the reception centers in Section 10 of the ETE report will be deleted.

Text will be added to Section 9 (page 9-2) and Appendix G (page G-1) of the ETE report to indicate that transit vehicles and other responders entering the EPZ to evacuate transit-dependent persons will not be delayed at ACPs.

The discussion of routing from the EPZ boundary to the reception centers in Section 10 will be deleted.

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 9-2, 10-1, and G-1.

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

10. EVACUATION ROUTES

Evacuation routes are comprised of two distinct components:

- Routing from a 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 Comanche Peak Nuclear Power 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:~~

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- ~~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 two counties within the EPZ are presented in Figures 10-2 and 10-3.

APPENDIX G: TRAFFIC MANAGEMENT

This appendix presents the traffic control and access control tactics implemented in developing evacuation time estimates for the Comanche Peak Nuclear Power Plant. Suggested Traffic Control Points (TCP) and Access Control Points (ACP) are listed, recognizing that existing plans are in place and have been tested. **This Appendix provides information that may be considered in updating the existing plans, but does not supersede them.** TCP and ACP should be manned according to priority, manpower and available equipment resources – not all TCP and ACP need to be activated.

Pages G-2 through G-43 detail the TCP, which are typically within the EPZ or just outside the EPZ. TCP are established to facilitate the flow of evacuating traffic from the Region being evacuated. Figure G-1 presents an overview map of the TCP, while Figures G-2 through G-4 depict the TCP in the more populated areas of the EPZ. Table G-1 summarizes the TCP and the manpower and equipment needed to implement traffic control. The table is sorted by county and by priority.

Pages G-44 through G-61 detail the ACP, which are typically on the periphery of the EPZ; these points are established to divert vehicles from entering the EPZ. Doing so provides all of the available roadway capacity within the EPZ to the evacuees. Table G-2 summarizes the ACP and the manpower and equipment needed to establish access control, while Figure G-5 provides a detailed map of the location of each ACP.

Manpower and equipment shortages are likely to arise; as such, prioritization of TCP and ACP was established to make the most efficient use of manpower and equipment in the event of an emergency. The use of ITS technologies, as outlined in Section 9, can also aid in overcoming resource constraints.

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All transit trips and other responders entering the EPZ to support the evacuation are assumed to be unhindered by personnel manning ACPs.

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 law 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.

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 plant. 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.

Insert C

RAI 13.03-18

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-27

ETE-11: Analysis of Evacuation Times, Methodology, Special Facilities
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section IV.B.

A. Table 8-4, "Special Facility Transit Demand," lists special facility capacities, but uses the facility current census for the determination of resources needed to support an evacuation. Discuss whether additional resources would be required to support peak populations of special facilities. Revise the ETE report as needed.

B. The time for 30 ambulances to mobilize is identified as 30 minutes in Section 8-5, "Evacuation Time Estimates for Transit-Dependent People," (page 8-10) but information is needed to support the basis of this estimate. Clarify whether there are 30 ambulances available to support the evacuation in a single run and discuss the logistics of mobilizing this number of ambulances to support the 30 minute response time. Revise the ETE report as needed.

ANSWER:

A. Please refer to the response to Question 13.03-21, Part A, above.

B. There are 26 ambulances that can be mobilized within 30 minutes, 1 ambulance that can be mobilized within 45 minutes, and 8 ambulances that can be mobilized within 60 minutes. These times include mobilization and travel time to the EPZ. Table 1 summarizes the ambulance resources and their respective mobilization times. The weighted average for mobilization time (using max times for those resources giving ranges) is 29.9 minutes.

Thus, the ETE assumption that 30 ambulances would be available in 30 minutes is valid. Section 8.5 of the ETE report will be revised to indicate that the mobilization time for ambulances

is 30 minutes, on average. Table 8.9 will be added to Section 8 in a future revision of the ETE report.

Table 1. Ambulance Resources			
Name	**Ambulances**	**Estimated Mobilization Time (min)**	
Granbury Hood County EMS	4	10	
Pecan Plantation EMS	3	15	
Erath County EMS	3	30	
Stephenville Fire Dept.	2	30	
LifeCare EMS, Parker County	5	20	
CareFlite, Johnson County	4	20	
Benbrook Fire Dept.	1	30	
MedStar, Tarrant County	8	45-60	
Crowley Fire Dept.	1	30-45	
Northern Bosque County	1	30	
Somervell County	3	15	
TOTAL:	**35**	**Weighted Average**	**29.9**

Impact on R-COLA

See attached Evacuation Time Estimate Draft Revision 3 pages 8-10, 8-23, and Table 8-9.

Note: Proposed revisions to the ETE Report require review by State and local governments prior to implementation. The revised ETE will be submitted to State and local governments for final review and certification. Accordingly, the revised ETE report will be submitted to the NRC following State and local certification.

Impact on S-COLA

None.

Impact on DCD

None.

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 for 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 30 ambulance runs are needed to evacuate all of the bed ridden patients in the EPZ, assuming 2 people per ambulance.

Based on the ambulance resource information provided in Table 8-9, ~~I~~it is estimated that 30 minutes, on average, will be needed to mobilize the needed 30 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 4 miles, on average, to leave the EPZ. The average speed output by the model at 1 hour for Scenario 6 (Region 3 evacuation) is 35.8 mph; thus, travel time out of the EPZ is 7 minutes. The ETE for ambulances is: 30 + 30 + 7 = 1:10 (rounded up to the nearest 5 minutes).

RAI 13.03-27

Table 8-8A. Camp Evacuation Time Estimates - Good Weather								
Facility	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Bndry (mi.)	Travel Time to EPZ Bndry (min)	ETE (hr:min)	Dist. EPZ Bndry to R.C. (mi.)	Travel Time EPZ Bndry to RC (min)	ETE to R.C. (hr:min)
Somervell County								
Camp Arrowhead	90	5	7	14	**1:50**	13	20	**2:10**
Camp Tres Rios	90	5	7	14	**1:50**	14	21	**2:10**
Glen Lake Methodist Camp	90	5	8.5	16	**1:55**	14	21	**2:15**
Riverbend Retreat Center	90	5	3.5	7	**1:45**	23	35	**2:20**
Steven's Ranch	90	5	2.5	5	**1:40**	18	27	**2:10**
				Average for EPZ:	**1:50**		**Average:**	**2:15**

Table 8-8B. Camp Evacuation Time Estimates - Rain								
Facility	Driver Mobilization Time(min)	Loading Time (min)	Dist. to EPZ Bndry (mi.)	Travel Time to EPZ Bndry (min)	ETE (hr:min)	Dist. EPZ Bndry to R.C. (mi.)	Travel Time EPZ Bndry to RC (min)	ETE to R.C. (hr:min)
Somervell County								
Camp Arrowhead	100	10	7	17	**2:10**	13	23	**2:30**
Camp Tres Rios	100	10	7	17	**2:10**	14	24	**2:35**
Glen Lake Methodist Camp	100	10	8.5	21	**2:15**	14	24	**2:35**
Riverbend Retreat Center	100	10	3.5	9	**2:00**	23	40	**2:40**
Steven's Ranch	100	10	2.5	7	**2:00**	18	31	**2:30**
				Average for EPZ:	**2:10**		**Average:**	**2:35**

Insert A

RAI 13.03-27

Insert A

RAI 13.03-27

Table 8-9. Ambulance Resources			
Name	**Ambulances**	**Estimated Mobilization Time (min)**	
Granbury Hood County EMS	4	10	
Pecan Plantation EMS	3	15	
Erath County EMS	3	30	
Stephenville Fire Dept.	2	30	
LifeCare EMS, Parker County	5	20	
CareFlite, Johnson County	4	20	
Benbrook Fire Dept.	1	30	
MedStar, Tarrant County	8	45-60*	
Crowley Fire Dept.	1	30-45*	
Northern Bosque County	1	30	
Somervell County	3	15	
TOTAL:	**35**	**Weighted Average**	**29.9**

*Weighted average computed using the upper bound of this range.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-28

ETE-12: Other Requirements, Confirmation of Evacuation
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section V.

A. COLA, Part 5, ETE Report, Section 12, "Confirmation Time," provides a time estimate for confirmation of the evacuation; however, the process provided is a suggested alternative. Discuss whether the counties have agreed with the ETE plans for confirmation of evacuation using a telephone survey approach. Revise the ETE report as needed.

B. Discuss whether the time required to obtain telephone numbers of residents has been included in the time estimate. Revise the ETE report as needed.

ANSWER:

A. Appendix 4 of NUREG-0654, FEMA-REP-1, Rev. 1, includes the following guidance:

> The time required for confirmation of evacuation shall be estimated. Candidate methods include visual confirmation by aircraft or ground vehicles and telephone confirmation.

Section 12 of the ETE Report provides a recommended methodology for evacuation confirmation to be performed by Hood and Somervell Counties. As indicated in the response to RAI 13.03-29(B) of this letter, the ETE Report was reviewed by the State and counties, and their comments were incorporated into the report. There were neither any comments related to the use of the telephone survey for confirmation time nor any decision regarding the actual confirmation methodology to be used.

The suggested approach can be complemented by dispatching ground based vehicles with public address systems, but this is a state/local planning issue and outside the scope of the ETE. The purpose of including the proposed approach in the ETE was to provide an estimate of the time required to conduct the confirmation, using a method that does not rely on first responder assets.

The signed certification letters from each county and from the State of Texas included in the COLA verify that the offsite agencies concur with the ETE document, including the proposed confirmation of evacuation as provided in Section 12 of the ETE Report.

B. The time required to obtain telephone numbers has not been included in the time estimate provided in Section 12 of the ETE Report. However, as indicated in the third paragraph on Page 12-1, the confirmation process should not begin until 3 hours after the Advisory to Evacuate, to ensure that most households have had enough time to mobilize and to start their evacuation trip. This timeframe will enable telephone operators to arrive at their workplace, access a call list and prepare to make the necessary phone calls. By this time, virtually all evacuees will have departed and the local telephone system will be largely free of traffic.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 3183 (CP RAI #88)

SRP SECTION: 13.03 - Emergency Planning

QUESTIONS for Licensing and Inspection Branch (NSIR/DPR/LIB) (EP)

DATE OF RAI ISSUE: 9/26/2009

QUESTION NO.: 13.03-29

ETE-13: Other Requirements, Draft Review
Acceptance Criteria: NUREG-0800, Standard Review Plan (SRP), Section 13.3, "Emergency Planning," Requirements A and H; Acceptance Criterion 11
Regulatory Basis: Appendix 4 to NUREG-0654 Section V.

A. COLA, Part 5, ETE Report, Section 9, "Traffic Management Strategy," discusses the priorities of the traffic management plan. COLA, Part 5, ETE Report, Appendix G, "Traffic Management," states that manpower and equipment shortages are likely to arise. Clarify whether State and local law enforcement have reviewed the traffic control plan. Revise the ETE report as needed.

B. Discuss whether State and local organizations provided any comments or concerns regarding the ETE, including resources and priorities of placement of traffic control. Revise the ETE report as needed.

ANSWER:

A. As indicated in item 4 of Section 1.1 of the ETE report, the traffic control plan was reviewed by State and local police personnel. This point is reiterated in item 3 on page 9-2 of the ETE report. Revision 1 of the ETE report, including the traffic management plan documented in Section 9 and Appendix G, was provided to representatives from the State of Texas and Hood and Somervell Counties for review and comment. The traffic management plan documented in Section 9 and Appendix G of Revision 1 of the report was also provided to State and local police for their review and comment. On February 13, 2008, a summary of the ETE study was presented to the offsite response agencies, including representatives from local police agencies. Verbal and hand-written comments were provided on the traffic management plan. These comments were incorporated into Revision 2 of the ETE report. No revisions to the ETE report are necessary.

B. As discussed in the response to Part A, a meeting was held on February 13, 2008 with representatives from State and county emergency planning agencies and local law enforcement

personnel. Revision 1 of the ETE report was provided to these agencies in advance of the meeting. A summary of the ETE study was presented by the ETE contractor. After the presentation, comments were provided to the ETE contractor by the attendees. These comments, including comments on the traffic management plan (see the response to Part A), were incorporated into Revision 2 of the ETE report. No revisions to the ETE report are necessary.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.