

**NRC STAFF RESPONSE TO PUBLIC COMMENTS ON
NUREG/CR-7002, REVISION 1, “CRITERIA FOR DEVELOPMENT OF
EVACUATION TIME ESTIMATE STUDIES”
85 FR 52930 (August 27, 2020)**

On August 27, 2020, the U.S. Nuclear Regulatory Commission (NRC) issued for public comment in Volume 85 of the *Federal Register* (FR), page 52930 (85 FR 52930), draft NUREG/CR-7002, “Criteria for Development of Evacuation Time Estimate Studies,” Revision 1 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20233A700). The FR notice provided a 45-day public comment period, which expired on October 13, 2020. Comments on the subject NUREG are available electronically in the NRC’s electronic Reading Room at <https://www.nrc.gov/reading-rm/adams.html>. From this page, the public can enter ADAMS, which provides text and image files of the NRC’s public documents.

During the comment period, the NRC staff received 10 comment submissions on NUREG/CR-7002, Revision 1, from the following individuals or organizations:

Comment No.	ADAMS Accession No.	Commenter Affiliation	Commenter Name
1	ML20290A311	No Known Affiliation	Anonymous
2	ML20290A314	KLD, Engineering P.C.	Kevin Weinisch
3	ML20290A316	KLD, Engineering P.C.	Kevin Weinisch
4	ML20290A322	KLD, Engineering P.C.	Kevin Weinisch
5	ML20290A324	KLD, Engineering P.C.	Kevin Weinisch
6	ML20290A326	KLD, Engineering P.C.	Kevin Weinisch
7	ML20290A327	KLD, Engineering P.C.	Kevin Weinisch
8	ML20290A329	KLD, Engineering P.C.	Kevin Weinisch
9	ML20290A331	KLD, Engineering P.C.	Kevin Weinisch
10	ML20290A333	KLD, Engineering P.C.	Kevin Weinisch

Below, the staff details the public comments and the NRC’s responses to them. For each comment, the NRC has repeated the comment as written by the commenter and then provided the NRC’s disposition of it, including a description of any revisions made in response to the comment. The technical basis for many comment resolutions resides in the NRC’s study of evacuation time estimates published in NUREG/CR-7269, “Enhancing Guidance for Evacuation Time Estimate Studies,” (ADAMS Accession No. ML20070M158), referred to here as “the ETE Study (NUREG/CR-7269)”.

Comment No. 1

In terms of terrorism it looks like rightwing militias are the biggest threat. But don't count on President Tiny Hands to find any, as he's too busy searching behind the sofa cushions for signs of Antifa.

Also: Bill Barr is a corrupt lying weasel. Pompeo too.

Thanks for listening, NRC, and have a wonderful day.

NRC Response

This comment is outside the scope of NUREG/CR-7002, Revision 1. The NRC did not revise NUREG/CR-7002 in response to this comment.

Comment No. 2

Staged Evacuation—Section 1.4.1—Pages 1-9, 1-10

Lines 11 through 14 read “If the site-specific PAR logic addresses staged evacuation, then the licensee should include in the ETE study a discussion on the approach used in the development of staged evacuation scenarios. Licensees should include a staged evacuation analysis for initial PAR strategy development as described in Section 5.6.” This is the proverbial “putting the cart before the horse.” The ETE study is supposed to inform the PAR. If the ETE study deems staged evacuation to be beneficial to those people living in the 2-mile region, then the licensee and OROs should include staged evacuation in their PAR logic if they feel it can realistically be implemented. By saying staged evacuation analysis should be done if it is in the existing PAR logic, you are relying on PAR logic that was developed after the last full ETE study. What if the population in the 2-5 mile area has drastically changed in the last decade (this is happening in Florida and the Carolinas) and staged evacuation is now beneficial based on population distribution when it was not beneficial a decade earlier? The original version of NUREG/CR-7002 (dated November 2011) required a staged evacuation analysis for all sites. Nearly all sites showed no benefit from staged evacuation (after a rigorous quantitative analysis) after the 2010 Census. We recommend the following approach for determining whether staged evacuation analysis should be further considered for a site in the new guidance document. Run an ETE simulation for an evacuation of the full EPZ for the scenario (non-special event) that has the highest number of evacuating vehicles. If the simulation indicates traffic congestion (Level of Service F) and queuing that extends from outside the 2-mile region into the 2-mile region, it clearly shows that evacuation beyond the 2-mile region is delaying the egress of people within the 2-mile region. If that occurs, then a quantitative analysis of staged evacuation (comparing ETE with and without staged evacuation) should be done. This is the fundamental idea of staged evacuation...get the people in the 2-mile region out as quickly as possible. It should only be considered for sites where it is a valid concern. As an example, Oyster Creek Generating Station is one of the few sites that exhibited an ETE benefit of staged evacuation after the 2010 Census. Attached is Figure 7-5 from the Oyster Creek ETE report which shows traffic congestion on US Highway 9 northbound that extends from the EPZ boundary into the 2-mile radius just north of the plant at 4 hours after the advisory to evacuate. Clearly, in this example, evacuation of the 2-mile radius is hindered by evacuation of those beyond 2 miles and further analysis of staged evacuation is needed.

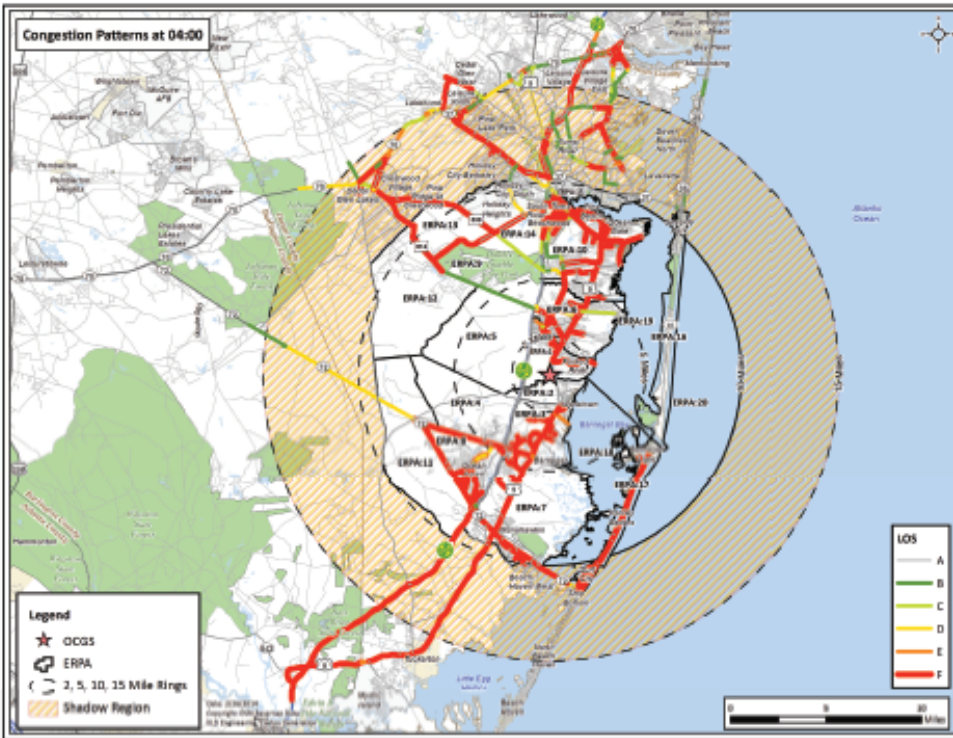


Figure 7-5. Congestion Patterns at 4 Hours after the Advisory to Evacuate

NRC Response

The NRC agrees with the comment. The evacuation time estimate (ETE) should inform the protective action recommendation (PAR) strategy. And the draft guidance could be interpreted not to consider staged evacuation which is not the intent. The guidance in NUREG/CR-7002 needs to support that in NUREG-0654, Supplement 3, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants: Guidance for Protective Action Strategies," (ADAMS Accession No. ML113010596) for the development of PAR strategies. Staged and keyhole evacuation ETEs should be evaluated as per the original issue of NUREG/CR-7002. The staff removed the conflicting statement on lines 11 through 14 in Section 1.4.1. The staff also revised Section 1.4 to reflect the original guidance and development of keyhole and staged evacuation ETEs, but also to reflect variable sized emergency planning zones. Changes were made to Section 4.7 to conform with the revised bulleted list of Section 1.4. Finally, the staff added headers for Section 1.4.1 on keyhole evacuations and Section 1.4.2 on staged evacuations to clearly distinguish those parts of the guidance.

Comment No. 3

Shadow Evacuation—Section 2.5.2—Pages 2-5 through 2-7

Lines 40 through 42 read "... in some cases, the shadow region may need to be extended to include the influence of major population centers as shown in this figure." Please provide more specific guidance. What defines a "major population center"? Population exceeding 20,000 people, 50,000 people, etc.? Also, Figure 2-2 shows the major population center intersecting the

EPZ Shadow Region. Should the Shadow Region be extended to include the major population center only when it intersects the recommended Shadow Region ("at least half the radial distance of the evacuation area"), or should it also be considered if the major population center is near the recommended Shadow Region? Also, how much of the major population center needs to be considered? If the population center intersects the recommended Shadow Region and extends an additional 5-miles beyond the Shadow Region, does the whole population center need to be considered? We understand that it is an engineering judgment call as to whether a nearby population center should be considered and how much of it should be considered. We would just like a bit more guidance on this subject to ensure the guidance is interpreted commonly by all who may use it.

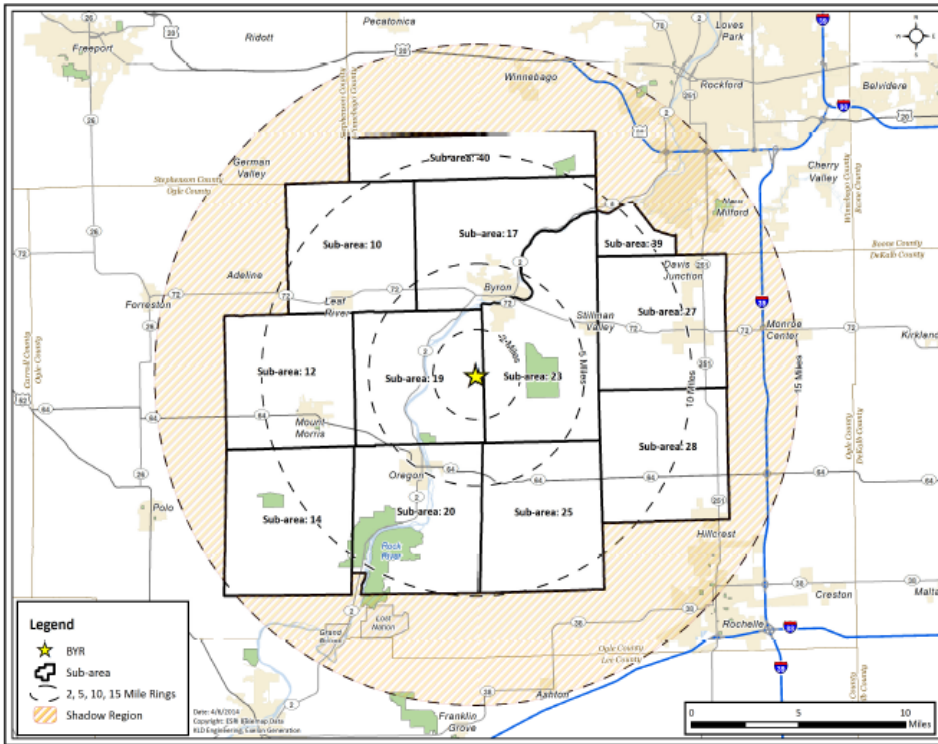
NRC Response

The NRC agrees with the comment. The guidance is based on 1-mile buffers throughout. Capacity reductions and populations centers, if included, should extend the model, locally, about 1 additional mile along major evacuation routes of interest. Task 2 and Task 4 of the ETE Study (NUREG/CR-7269) indicate there is a very high threshold for when population centers outside the emergency planning zone (EPZ) would impact the ETE. This threshold is reached for population centers with populations approximately 4 times greater than the number of EPZ evacuees, based on the ETE study. The staff revised Section 2.5.2 to define the 50,000 evacuees more clearly as based on the permanent resident and transient populations within the EPZ. The staff also added a discussion on the insensitivity of the shadow analysis for EPZs with less than 50,000 evacuees. Finally, the staff revised the guidance to reference Section 4.5 to state when the model boundaries may need to be extended an additional mile due to capacity reductions or the presence of population centers.

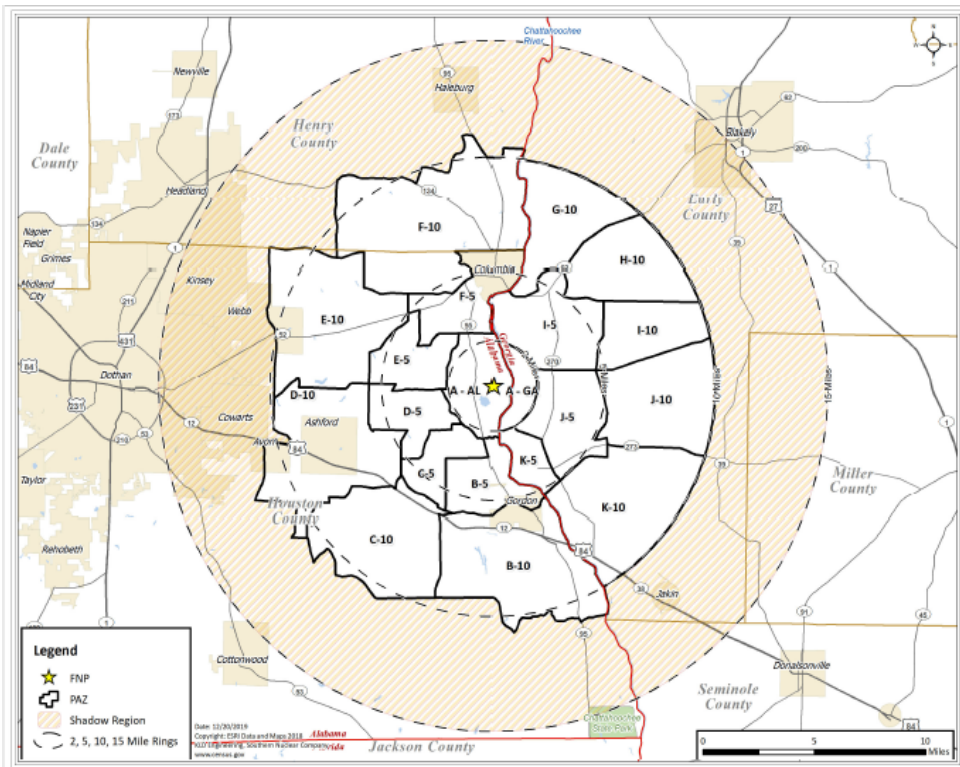
Comment No. 4

Shadow Evacuation—Section 2.5.2—Pages 2-5 through 2-7

Lines 40 through 42 on page 2-5 "... in some cases, the shadow region may need to be extended to include the influence of major population centers as shown in this figure" and lines 5 through 7 on page 2-7 "ETE studies do not need to model a shadow evacuation if the number of evacuees is less than 50,000 and 20 percent of the shadow population is less than half of the evacuating population" could conflict with one another for some sites. We offer two examples: (1) Byron Generating Station – the EPZ population as per the 2010 Census was 29,116 people (less than 50,000). The population in the Shadow Region (from EPZ boundary to 15 miles) was 34,644, 20% of which is 6,929 people, which is less than half of the evacuating population in the EPZ. Based on the page 2-7 criteria, a Shadow Region does not have to be considered for this site. However, as shown in the attached figure, the City of Rockford, IL intersects the 15-mile radius. The population of Rockford was approximately 152,000 people per the 2010 Census. A city that densely populated could impact ETE for the Byron Generating Station and should likely be considered as part of a shadow evacuation for the site. (2) Plant Farley - the EPZ population as per the 2010 Census was 10,707 people (less than 50,000). The population in the Shadow Region (from EPZ boundary to 15 miles) was 20,402, 20% of which is 4,080 people, which is less than half of the evacuating population in the EPZ. Based on the page 2-7 criteria, a Shadow Region does not have to be considered for this site. However, as shown in the attached figure, the City of Dothan, AL intersects the 15-mile radius. The population of Dothan was approximately 65,500 people per the 2010 census. A city that densely populated could impact ETE for Plant Farley and should likely be considered as part of a shadow evacuation for the site.



Byron Shadow Region



Farley Shadow Region

NRC Response

The NRC partially agrees with the comment. Tasks 1, 2, and 4 of the ETE Study (NUREG/CR-7269) and a review of 2010 ETEs would not suggest that Rockford and Dothan would impact the ETE. However, Task 2 of the ETE study highlighted issues of route choice and Task 4 has examined the impact of background traffic. Both analyses would indicate there is a very high threshold for when population centers outside the EPZ would impact the ETE. This threshold is reached for population centers with populations approximately 4 times greater than the number of EPZ evacuees (for EPZs with more than 50,000 evacuees), based on the ETE study. This compares well with the information provided in this comment that suggests that cities with populations 5 to 6 times greater than the EPZ resident population may influence the ETE. However, the results of the ETE study indicate that for EPZs with less than 50,000 evacuees, the ETE is relatively insensitive to regions outside the study area. The staff revised Section 2.5.2 to define the referenced 50,000 evacuees more clearly as based on the permanent resident and transient populations within the EPZ and added a discussion on the insensitivity of the shadow analysis for EPZs with less than 50,000 evacuees. The staff also added guidance in Section 2.5.2 referencing Section 4.5 to address establishing boundary conditions for larger population sites (EPZs with more than 50,000 evacuees). Finally, the staff added clarification in Section 4.5 that boundary conditions are more important along major evacuation routes and for large population sites.

Comment No. 5

COVID-19 Impacts on Trip Generation—Section 4.3—Pages 4-3 and 4-4, Special Facilities—Section 4.3.3—Pages 4-5 and 4-6, and Schools—Section 4.3.4—Pages 4-6 and 4-7

Lines 37 through 39 on page 4-3 states “Surveys of residents within the EPZ are commonly used to provide some of the data used to develop the time distributions.” We agree that surveys are an excellent method for gathering demographics and mobilization times that are specific to the EPZ. However, responses to these surveys are likely to be significantly impacted by the ongoing COVID-19 pandemic. Many people have lost their jobs as a result of the pandemic. Many of those who are still employed are working remotely, which reduces their time to prepare to leave work and to commute home from work if an emergency occurs at a nuclear power plant during working hours. Unfortunately, nobody knows at this time if/when the COVID-19 pandemic will end and what the lasting impacts will be. Should the ETE study be developed using trip generation times that are specific to the pandemic timeframe, or should they be developed based on the normal commute of a person, which may or may not occur in the near future.

Also, COVID-19 has a very pronounced impact on medical facilities and on schools. Clearly, medical facilities may be at much higher occupancy rates (perhaps even higher than their stated capacity) due to COVID-19 illnesses. Evacuating patients that have COVID-19 may not be practical. If evacuated, the necessary transportation resources may be overstated due to the high occupancy of the facility and the condition of the patients.

Many schools in the U.S. are operating under unusual circumstances. Some schools have children attending on an every other day schedule to limit the number of students at the school at a given time and promote social distancing. School buses are also operating at half or even quarter capacity to promote social distancing. Many schools are using two waves of pickup service to get the students to the school and limit the number of students on the buses. The number of school students to be evacuated, the transportation resources needed to evacuate the students, and the number of waves of bus service to transport students are all impacted by

COVID-19. Should the ETE study be developed based on the current school operations, or on normal school operations which we do not know if/when those conditions will ever occur again?

NRC Response

The NRC partially agrees with the comment. ETE times are based on a variety of scenarios. Trip generation times include normal activities for these scenarios, which mostly vary due to time of day and weather. The draft revised guidance stated that trip generation times based on survey data are subject to uncertainty. The draft revised guidance provides an example of ways this uncertainty can be minimized. The staff added more guidance to Section 4.3 stating that temporary conditions within the EPZ (e.g., frequent natural hazards, public health emergencies) may lead to skewed survey results and that trip generation times should be based on assumed normal activities and operations. The methods used to minimize uncertainty in the development of trip generation times should be described in the ETE study. The decision to evacuate patients falls under U.S. Environmental Protection Agency guidance and is not part of the ETE analysis. Estimates related to schools should also be based on normal operations. A sensitivity analysis could always be performed, if desired. The NRC did not revise Sections 4.3.3 and 4.3.4 in response to this comment.

Comment No. 6

Stochastic Model Runs—Section 4.4—Pages 4-7 and 4-8

Running a traffic simulation/evacuation model is a very time-consuming and costly endeavor. Section 1.3 of the guidance document outlines a minimum of 10 scenarios that should be considered. Section 1.4 of the guidance document outlines the various groupings of ERPA [emergency response planning area] that should be considered in the ETE: considering a 2-mile, 5-mile and 10-mile radial evacuation, keyholes with a 2-mile radius and downwind to 5 miles for all 16 wind directions, and staged keyholes with a 2-mile radius and downwind to 5 miles for all 16 wind directions could result in up to 35 ERPA combinations. Some sites also consider keyholes of a 2-mile radius and downwind to the EPZ boundary. Considering these keyholes both staged and unstaged could add an additional 32 ERPA combinations. The number of evacuation cases to be considered (combination of scenario and ERPA combination) could range from 350 cases to 670 cases. Line 26 on page 4-7 discusses the possibility of needing 10 runs to “generate a large enough sample size to produce reasonable results without requiring excessive computational resources or time”. Doing this increases the number of simulations to range from 3,500 to 6,700. The time and resources needed to run and analyze this many cases represents an undue financial burden on licensees. The simulation of 350 to 670 cases in the ETE study, and the application of the guidance in NUREG-0654/FEMA-REP-1, Rev. 1, Supplement 3, and in NEI [Nuclear Energy Institute] 12-10 has the effect of averaging ETE results for hundreds of cases and using the averages to inform protect action recommendations and decisions. We strongly recommend that this section of the draft guidance be removed or be revised to only perform the stochastic analysis on a single case (i.e., evacuation of the full EPZ for the scenario – non special event – with the highest number of evacuating vehicles) to quantify the impact of random number seeds on ETE results.

NRC Response

The NRC agrees with the comment. Based on Task 4 of the ETE Study (NUREG/CR-7269), it is reasonable to assume that the random seed variation is much less than the variation of ETEs among scenarios. When a single random seed is used for each scenario, the scenarios provide

the needed ETE variation to produce an average result that accounts for random effects. The staff revised Section 4.4 to provide for a bounding calculation on the random seed variability so that a single random seed can be used.

Comment No. 7

Traffic Simulation Model Output—Section 4.6—Page 4-9

The bullet on Line 14 is a repeat of the bullet on Line 11.

NRC Response

The NRC agrees with the comment. The staff removed the repeated bullet on line 11 of Section 4.6.

Comment No. 8

Appendix B—Page B-8

Section 4.3 Model Boundaries” should be “Section 4.5 Model Boundaries”. Also, cross-check that the titles for section numbers in Appendix B match the titles in the main body of the document.

NRC Response

The NRC agrees with the comment. The staff revised Appendix B to correct the heading for Section 4.5.

Comment No. 9

Page 4-3—Line 19 footnotes “(TRB, 2000)”. Page 6-1—Line 34 also footnotes “\”(TRB, 2000).” There is no “(TRB, 2000)” reference listed in Section 7 “References”. Perhaps the footnotes should be “(TRB, 2010)” which is shown on Lines 37 and 38 (page 7-2) of Section 7.

NRC Response

The NRC agrees with the comment. The staff removed the reference on page 4.3, line 19 and page 6.1 line 34, since it was not necessary. The staff verified no other reference to (TRB, 2000) was in the document and verified correct references to (TRB, 2010).

Comment No. 10

Intersection Control—Section 3.3—Pages 3-4 and 3-5

Manned traffic-controlled intersections are discussed in Lines 15 through 36. The counties and states within the EPZ of each plant in the U.S. typically have a Traffic Management Plan (TMP) that consists of Traffic Control Point (TCPs) where a police officer will control traffic during an evacuation. Most of the plans were developed when the plant was first licensed, and they have been refined and typically expanded over the years. Many of these plans have many more TCPs identified than they have police officers on duty at any given time. Many Offsite Response Organizations (ORO) operate under the assumption that all the TCPs identified in their TMP

must be manned during an evacuation as this question has come up from federal regulators during drills and exercises. We very much agree with the text that is written in this section of the draft guidance document, specifically the text in Lines 25 through 27, reading “Modeling of manual traffic control (MTC) at intersections should be limited to key locations where it is believed that MTC would be necessary and can be readily implemented. Extensive use of manned traffic control at intersections should not be assumed.” This has been an issue for many years. Developing a TMP that is responsible and in line with available resources and manpower would be prudent emergency planning. The ETE analysis can help to identify the few TCPs that are most critical and require MTC. Should the OROs be encouraged to revise their TMP after the completion of the ETE study to emphasize only those few TCPs?

The text on page xii in the Executive Summary of this guidance document states “It is important to use the information found in approved emergency plans when developing an ETE study to ensure that the results represent the expected response from authorities.” If an ORO’s emergency plan includes a TMP with an excessive number of TCPs, this text in the guidance document could be interpreted as meaning the ETE would have to model the excessive number of TCPs to be compliant with what is in the existing emergency plans. If the ETE analysis deems the existing TMP in an ORO’s emergency plan to be excessive, does the ORO have to revise and approve their emergency plan prior to completing the ETE study such that the ETE study is in agreement with the approved emergency plans? If yes, this could present a problem in completing the ETE study within the 365-day timeframe after the release of decennial Census data.

Also, some OROs identify TCPs specific to the reentry phase of emergency planning or TCPs that are sometimes referred to as “Lockdown TCPs” or “Security TCPs” where they are trying to limit anyone crossing into the EPZ (or a specific ERPA) when it is empty to avoid looting and other crimes. These TCPs are typically manned later when National Guard or other resources/personnel may become available. It is okay to leave these TCPs in a TMP, but they should be clearly explained in the emergency plan as TCPs that would not need to be manned during an evacuation.

NRC Response

The NRC agrees with the comment. The guidance in Section 3.3 should be clear that traffic control points operate the same under manual traffic control and automated traffic control, but the ETE study needs to model approved plans. The staff moved the guidance on additional considerations for the use of manual traffic control to the more appropriate location under Section 5.2 on enhancements to ETES. The staff also removed the phrase “or traffic control” from the first bullet in Section 5.2 as this was too general and some traffic control methods, such as manual traffic control, may not necessarily increase throughput. The staff removed the unnecessary guidance to have licensees document in the ETE report that they shared the results of any Section 5.2 analysis with offsite response organizations. Finally, the staff clarified in Section 3.3 that there is no need to model access control points (ACPs) for reentry or security and added reference to Section 2.5.3 on background traffic, which accounts for the assumed establishment of ACPs.