

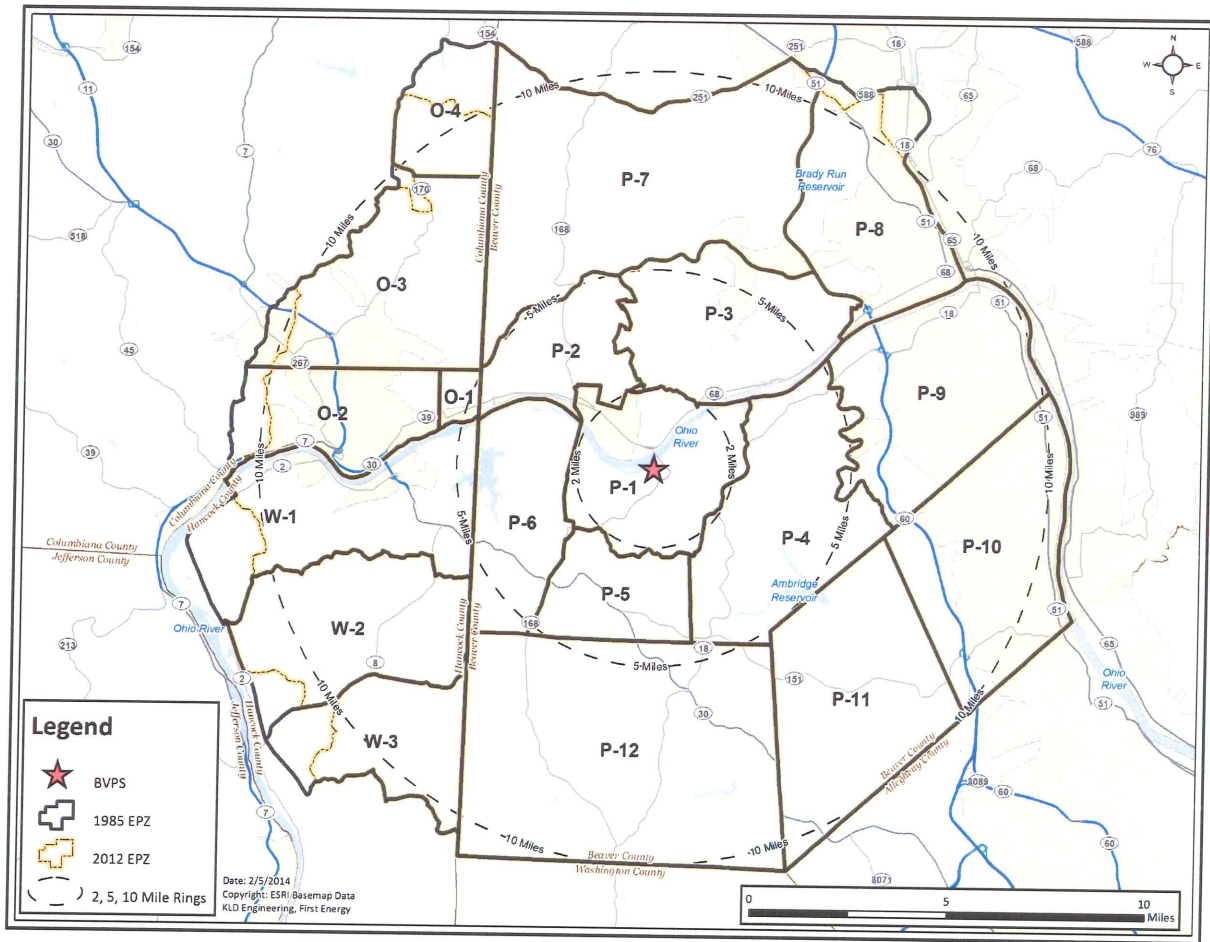
### **Attachment 3**

Beaver Valley Power Station Evaluation to Revise the  
Emergency Planning Zone, prepared by KLD Engineering, P.C.,  
KLD TR-641  
(20 pages follow)

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## Beaver Valley Power Station

### Evaluation to Revise the Emergency Planning Zone



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## 1 INTRODUCTION

Item number 2 in Part I, Section D of NUREG-0654 FEMA-REP-1, Rev. 1 defines the Emergency Planning Zones (EPZs) for nuclear power plants “as the areas for which planning is needed to assure that prompt and effective actions can be taken to protect the public in the event of an accident.” Additionally:

The Task Force [Nuclear Regulatory Commission and Environmental Protection Agency] selected a radius of about 10 miles for the plume exposure pathway... Although the radius for the EPZ implies a circular area, the actual shape would depend on the characteristics of a particular site.

The basis for the selection of a 10-mile radius is also explained in item number 2 in Part I, Section D of NUREG-0654 FEMA-REP-1:

The size (about 10 miles radius) of the plume exposure EPZ was based primarily on the following considerations:

- a. Projected doses from the traditional design basis accidents would not exceed Protective Action Guide levels outside the zone;
- b. Projected doses from most core melt sequences would not exceed Protective Action Guide levels outside of the zone;
- c. For the worst core melt sequences, immediate life threatening doses would generally not occur outside the zone;
- d. Detailed planning within 10 miles would provide substantial base expansion of response efforts in the event that this proved necessary.

The Beaver Valley Power Station (BVPS) is located in Shippingport in Beaver County, Pennsylvania and is operated by FirstEnergy. The Emergency Planning Zone (EPZ) for the BVPS was established during licensing in the 1985 Safety Evaluation Report (SER). Figure 1 shows the EPZ boundary that was documented in the 1985 SER. As shown in Figure 1, the EPZ extends well beyond the 10-mile radius to the southwest, northwest and northeast. At the request of the County Emergency Management agencies in Beaver, Columbiana, and Hancock Counties, FirstEnergy is proposing a new EPZ boundary shown in Figure 2. This proposed EPZ boundary was used in the *Development of Evacuation Times Estimate for the Beaver Valley Power Station* study, dated December 2012 (KLD TR-495). FirstEnergy is working with the Federal Emergency Management Agency (FEMA) and the Offsite Response Organizations (OROs) in the EPZ to formally change the BVPS EPZ boundary to that used in the 2012 ETE study.

Part IV, Section K of the June 2013 FEMA Radiological Emergency Planning (REP) Manual outlines the process for making EPZ Boundary Changes:

If an ORO wants to change the boundary of an existing EPZ, the proposal must be submitted to the FEMA Regional Administrator or his/her designee, usually the RAC [Regional Assistance Committee] Chair. The proposal shall include, but not be limited to:

- Action by appropriate ORO officials desiring the change to the boundary (i.e., resolution by elected official, etc.);
- Description of the change to the boundary;
- Discussion of the population affected by the change;
- Effect that the change has on evacuation routes or evacuation time estimates; and
- Maps showing the existing EPZ boundary and proposed new boundary.

FEMA and the RAC will review the request on its merits. After the regional review, the request and RAC recommendation will be forwarded to FEMA Headquarters for final action. If the EPZ boundary change is approved, the approval is contingent on the ORO submitting for review the appropriate changes to their plans/procedures, maps of the EPZ, public information material, and impact that the addition or subtraction of population from the EPZ has on the evacuation time estimates. The required information would include changes to the geographical boundary descriptions and the ANS [Alert and Notification System], including additional sirens or other means for public notification. Any modifications to an ANS must be consistent with FEMA-REP-10.

## **2 PROCESS**

This section describes how each item of the REP Manual process for making EPZ boundary changes was considered.

### **2.1 Action by Appropriate ORO Officials Desiring the Change to the Boundary**

FirstEnergy will deliver this report to the ORO officials for each of the three counties and three states within the EPZ. FirstEnergy and the ORO officials will work with FEMA to resolve any issues that may develop in the process of formally changing the EPZ boundary.

### **2.2 Description of the Changes to the Boundary/Maps Showing the Existing EPZ Boundary and Proposed New Boundary**

Table 1 describes the existing BVPS EPZ boundary, itemized by state, as defined in the 1985 SER. As discussed earlier, Figure 1 displays the existing EPZ boundary as documented in the 1985 SER. Table 2 describes the proposed BVPS EPZ boundary, itemized by state, as defined in the 2012 BVPS ETE Study (KLD TR-495). The aforementioned Figure 2 displays the proposed EPZ boundary.



Table 3 and Figure 3 describe and display the differences between the existing and proposed EPZ boundaries. Deletions to the 1985 EPZ description are shown in strike-out text format; insertions to the 2012 EPZ description are shown in underlined text format in Table 3. The portions of the existing 1985 EPZ that have been removed for the proposed 2012 EPZ are shown with red hatching in Figure 3.

Note that the 2012 EPZ divides the 10-mile EPZ into several Sub-Areas, designated as P-#, W-# and O-# depending on the state where the Sub-Area is located. As per the federal guidance document NUREG/CR-7002 – “Criteria for Development of Evacuation Time Estimate Studies” – these Sub-Areas are “local areas within the EPZ for which emergency response information is provided.” Also, “these areas are typically defined by geographic or political boundaries to support emergency response planning...” These Sub-Areas support the concept of a keyhole evacuation discussed in Section 1.4 of NUREG/CR-7002.

**Table 1. Existing EPZ Boundary Description (1985)**

**Pennsylvania**

Begin at the junction of the Ohio/Pennsylvania State Line and Pennsylvania Route 251. Follow Route 251 east to its junction with Pennsylvania Route 51. Proceed southeast on Route 51 to where it meets Pennsylvania Route 588. Proceed east on Pennsylvania Route 588 to where the Chippewa Township, Patterson Township, and White Township boundaries meet. Continue east on Pennsylvania Route 588 to its junction with 25<sup>th</sup> Street in Beaver Falls Township. Proceed east on 25<sup>th</sup> Street until Beaver River. Proceed South down Beaver River following the Beaver Falls Township and Daugherty Township boundary. Continue following Beaver River until the junction of Bridgewater Township, Monaca Township, and Rochester Township. Proceed east to follow the Ohio River to its junction with Ambridge Township, Crescent Township, Leetsdale Township, and South Heights Township. Proceed southwest on the Beaver County and Allegheny County boundary to where the Allegheny County, Beaver County, and Washington County boundaries meet. Proceed west on the Beaver County and Washington County boundary to its junction with the Pennsylvania/West Virginia State Line. Proceed north on the Pennsylvania/West Virginia State line until the intersection with Shreeves Road (Co Hwy 7/8).

**West Virginia**

Begin at the intersection of the Pennsylvania/West Virginia State Line and County Road 7/8. Follow Co Road 7/8 west to its junction with Co Road 7/6. Proceed north on Co Road 6/7 to its junction with Co Road 9/2. Follow Co Road 9/2 west to its junction with Co Road 9. Proceed north on Co Road 9 to its junction with Co Road 7. Follow Co Road 7 west to where it meets a clearing for power lines. Follow the power line corridor north to where it coincides with Gobble Hill Road. Follow Gobble Hill Road north to its junction with Co Road 66/2. Proceed west, then north on Co Road 66/2. Where Co Road 66/2 bends westward, continue north until Welton Road, paralleling West Virginia Route 2. Proceed west on Welton Road to its junction with West Virginia Route 2. Proceed north on West Virginia Route 2 to its junction with Congo Road. Follow Congo Road to the Ohio River, ending at the West Virginia State Line/Ohio State Line boundary.

**Ohio**

Begin at where Congo Road would intersect the West Virginia/Ohio State Line if it were to continue north. Proceed east on the Ohio River following the Ohio/West Virginia State line to where it would intersect Co Hwy 716 if Co Hwy 716 continued south. Proceed north on Co Hwy 716 to its junction with Co Hwy 1004. Follow Co Hwy 1004 north to its junction with Co Hwy 1039. Proceed north on Co Hwy 1004 to its junction with Co Hwy 428. Follow Co Hwy 428 north to its junction with Little Beaver Creek. Follow Little Beaver Creek north for approximately 1.5 miles. Proceed north, following a residential driveway to the junction with Co Hwy 1032 and Ohio Route 170. Follow Ohio Route 170 north to its junction with Co Hwy 1026. Follow Co Hwy 1026 east to its junction with Ohio Route 154. End at the Ohio/Pennsylvania State Line.

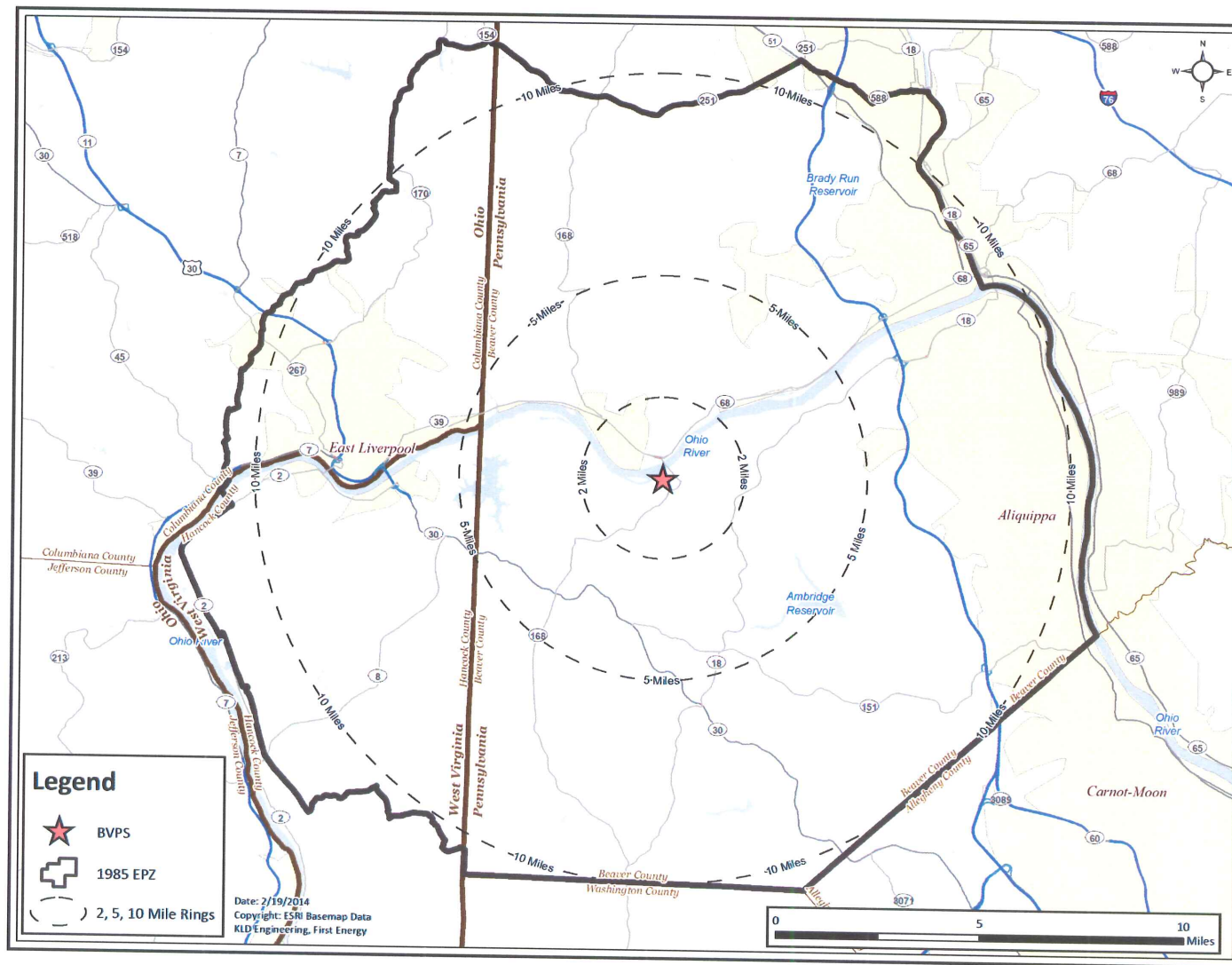


Figure 1. Existing EPZ (1985)



**Table 2. Proposed EPZ Boundary (2012)**

### **Pennsylvania**

The EPZ is defined as the area that begins at the junction of the Ohio/Pennsylvania State Line and Pennsylvania Route 251. Follow Route 251 east to its junction with Pennsylvania Route 51. Proceed southeast on Route 51 to where it meets the northwest corporate boundary of Patterson Township. Proceed east/northeast on the Patterson Township line to the point where the White Township, Beaver Falls City, and Patterson Township corporate boundaries meet.

Proceed south on the Patterson Township/Beaver Falls City corporate boundary to its junction with the Patterson Heights Borough corporate boundary. Continue southeast on the Patterson Heights/Beaver Falls City corporate boundary to the Beaver River.

Proceed south on the Beaver River to the junction of the Ohio River. Proceed east, then south on the Ohio River to its intersection with the Beaver County and Allegheny County boundary.

Proceed southwest on the Beaver County and Allegheny County boundary to where the Allegheny County, Beaver County, and Washington County corporate boundaries meet. Proceed west on the Beaver County and Washington County boundary to its junction with the Pennsylvania/West Virginia State Line.

Proceed north on the Pennsylvania/West Virginia State line to its junction with the Ohio/West Virginia State line. Proceed north on the Ohio/Pennsylvania State line to its junction with Pennsylvania Route 251.

### **West Virginia**

The EPZ is defined as the area that begins at the intersection of the Pennsylvania/West Virginia State Line and Shreeves Road (County Road 7/8). Follow Shreeves Road (Co Road 7/8) west to its junction with Cameron Hollow (Co Road 7/6). Proceed north on Cameron Hollow (Co Road 7/6) to its junction with Chapman Road (Co Road 9/2). Follow Chapman Road (Co Road 9/2) west to its junction with Wylie Ridge Road (Co Road 9). Proceed north on Wylie Ridge Road (Co Road 9) to its junction with Hardens Run (Co Road 7). Follow Hardens Run (Co Road 7) west to where it meets Mayhew Rd (Co Road 7/1). Proceed north on Mayhew Rd until its junction with Frankfort Road (Co Road 24). Follow Frankfort Road (Co Road 24) north until its intersection with Archer Street. Follow Archer Street until its junction with West Virginia State Route 8 (Veterans Boulevard). Follow West Virginia State Route 8 (Veterans Boulevard) west until its junction with Washington School Road (Co Road 3).

Proceed north on Washington School Road (Co Road 3) until its junction with Ferndale Road (County Road 3/5). Proceed west, on Ferndale Road (County Road 3/5) to a point parallel to but ¼ mile east of State Route 2 (Ohio River Blvd) (excludes residences along State Route 2). Continue north parallel but ¼ mile east of State Route 2 to White Oak Run Road (Co Road 6). Follow White Oak Run Road (Co Road 6) until its junction with Arroyo Road (Co Road 3/6). Continue north on Arroyo Road (Co Road 3/6) until the junction with West Virginia State Route 2 (Ohio River Blvd) and Congo Road. Follow Congo Road to the Ohio River, ending at the West Virginia State Line/Ohio State Line boundary.



## Ohio

The EPZ is defined as the area that begins in the middle of the Ohio River where Congo Road (in West Virginia) would intersect the West Virginia/Ohio State Line if it were to continue north. Proceed east on the Ohio River following the Ohio/West Virginia State line to where it would intersect Campground Road (Co Hwy 427) if Campground Road (Co Hwy 427) continued south. Proceed north on Campground Road (Co Hwy 427) to its junction with Annesley Road (Co Hwy 963). Follow Annesley Road (Co Hwy 963) north until it turns into Co Hwy 966. Proceed north on Annesley Road (Co Hwy 966) to its junction with East Liverpool Road (Co Hwy 425). Follow East Liverpool Road (Co Hwy 425) northwest to its junction with Cannon Mills Road (Co Hwy 1004). Follow Cannon Mills Road (Co Hwy 1004) to its junction with Sprucevale Road (Co Hwy 428). Follow Sprucevale Road (Co Hwy 428) north to its junction with Little Beaver Creek. Follow Little Beaver Creek north to its junction with Ohio Route 170. Follow Ohio Route 170 north to its junction with Pancake-Clarkson Road (Co Hwy 1031). Follow Pancake-Clarkson Road (Co Hwy 1031) east to the Ohio State Line/Pennsylvania State Line.

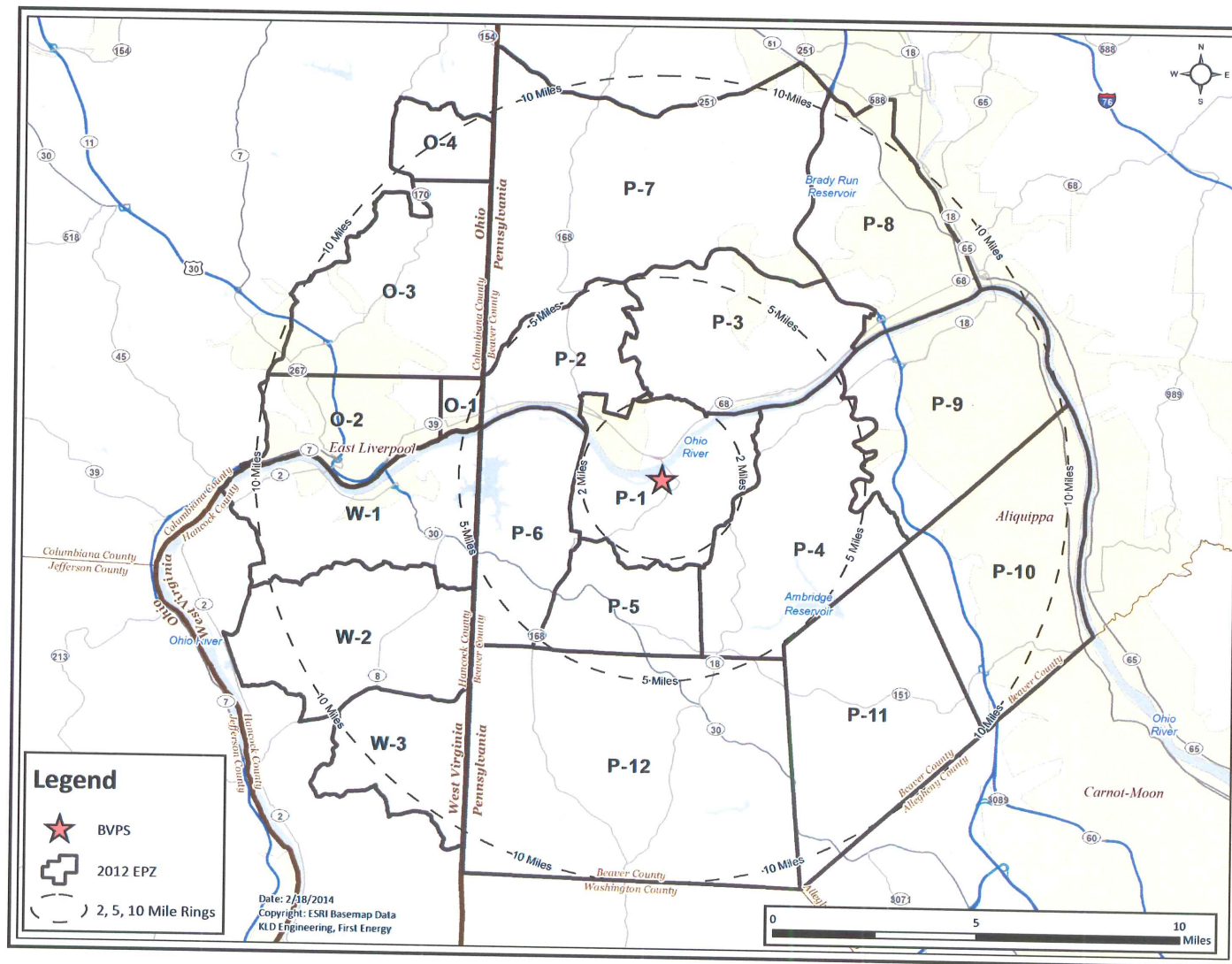


Figure 2. Proposed EPZ Boundary (2012)

Table 3. Changes to EPZ Boundary

### Pennsylvania

The EPZ is defined as the area that begins at the junction of the Ohio/Pennsylvania State Line and Pennsylvania Route 251. Follow Route 251 east to its junction with Pennsylvania Route 51. Proceed southeast on Route 51 to where it meets the northwest corporate boundary of Patterson Township. Pennsylvania Route 588. Proceed east/northeast on the Patterson Township line to the point where the White Township, Beaver Falls City, and Patterson Township corporate boundaries meet. on Pennsylvania Route 588 to where the Chippewa Township, Patterson Township, and White Township boundaries meet.

Proceed south on the Patterson Township/Beaver Falls City corporate boundary to its junction with the Patterson Heights Borough corporate boundary. Continue southeast on the Patterson Heights/Beaver Falls City corporate boundary to the ~~Continue east on Pennsylvania Route 588 to its junction with 25<sup>th</sup> Street in Beaver Falls Township. Proceed east on 25<sup>th</sup> Street until Beaver River.~~

Proceed south down on the Beaver River to the junction of the Ohio River. following the Beaver Falls Township and Daugherty Township boundary. Continue following Beaver River until the junction of Bridgewater Township, Monaca Township, and Rochester Township. Proceed east, then south on the ~~to follow the Ohio River to its intersection with the Beaver County and Allegheny County boundary. junction with Ambridge Township, Crescent Township, Leetsdale Township, and South Heights Township.~~

Proceed southwest on the Beaver County and Allegheny County boundary to where the Allegheny County, Beaver County, and Washington County corporate boundaries meet. Proceed west on the Beaver County and Washington County boundary to its junction with the Pennsylvania/West Virginia State Line.

Proceed north on the Pennsylvania/West Virginia State line ~~until the intersection with Shreeves Road (Co Hwy 7/8) to its junction with the Ohio/West Virginia State line. Proceed north on the Ohio/Pennsylvania State line to its junction with Pennsylvania Route 251.~~

### West Virginia

The EPZ is defined as the area that begins at the intersection of the Pennsylvania/West Virginia State Line and Shreeves Road (County Road 7/8). Follow Shreeves Road (Co Road 7/8) west to its junction with Cameron Hollow (Co Road 7/6). Proceed north on Cameron Hollow (Co Road 6/7) to its junction with Chapman Road (Co Road 9/2). Follow Chapman Road (Co Road 9/2) west to its junction with Wylie Ridge Road (Co Road 9). Proceed north on Wylie Ridge Road (Co Road 9) to its junction with Hardens Run (Co Road 7). Follow Hardens Run (Co Road 7) west to where it meets a clearing for power lines. Follow the power line corridor north to where it coincides with Gible Hill Road. Follow Gible Hill Road north to its junction with Co Road 66/2. Proceed west, then north on Co Road 66/2. Where Co Road 66/2 bends westward, continue north until Welton Road, paralleling West Virginia Route 2. Proceed west on Welton Road to its junction with West Virginia Route 2. Proceed north on West Virginia Route 2 to its junction with Congo Road. Mahyew Rd (Co Road 7/1). Proceed north on Mayhew Rd until its junction with Frankfort Road (Co Road 24). Follow Frankfort Road (Co Road 24) north until its intersection with Archer Street. Follow Archer Street until its junction with West Virginia State Route 8 (Veterans Boulevard). Follow West Virginia State Route 8 (Veterans Boulevard) west until its junction with Washington School Road



(Co Road 3).

Proceed north on Washington School Road (Co Road 3) until its junction with Ferndale Road (County Road 3/5). Proceed west, on Ferndale Road (County Road 3/5) to a point parallel to but ¼ mile east of State Route 2 (Ohio River Blvd) (excludes residences along State Route 2). Continue north parallel but ¼ mile east of State Route 2 to White Oak Run Road (Co Road 6). Follow White Oak Run Road (Co Road 6) until its junction with Arroyo Road (Co Road 3/6). Continue north on Arroyo Road (Co Road 3/6) until the junction with West Virginia State Route 2 (Ohio River Blvd) and Congo Road. Follow Congo Road to the Ohio River, ending at the West Virginia State Line/Ohio State Line boundary.

## **Ohio**

The EPZ is defined as the area that begins in the middle of the Ohio River at where Congo Road (in West Virginia) would intersect the West Virginia/Ohio State Line if it were to continue north. Proceed east on the Ohio River following the Ohio/West Virginia State line to where it would intersect Campground Road (Co Hwy 716427) if Campground Road (Co Hwy 716 427) continued south. Proceed north on Campground Road (Co Hwy 716427) to its junction with Annesley Road (Co Hwy 1004963). Follow Annesley Road (Co Hwy 1004963) north until it turns into to its junction with Co Hwy 9661039. Proceed north on Annesley Road (Co Hwy 966)1004 to its junction with East Liverpool Road (Co Hwy 425)428. Follow East Liverpool Road (Co Hwy 425)428 northwest to its junction with Cannon Mills Road (Co Hwy 1004)Little Beaver Creek. Follow Cannon Mills Road (Co Hwy 1004) to its junction with Sprucevale Road (Co Hwy 428). Follow Sprucevale Road (Co Hwy 428) north to its junction with Little Beaver Creek. Follow Little Beaver Creek north to its junction with Ohio Route 170. for approximately 1.5 miles. Proceed north, following a residential driveway to the junction with Co Hwy 1032 and Ohio Route 170. Follow Ohio Route 170 north to its junction with Pancake-Clarkson Road (Co Hwy 10311026). Follow Co Hwy 1026 east to its junction with Ohio Route 154. End at the Ohio/Pennsylvania State Line.



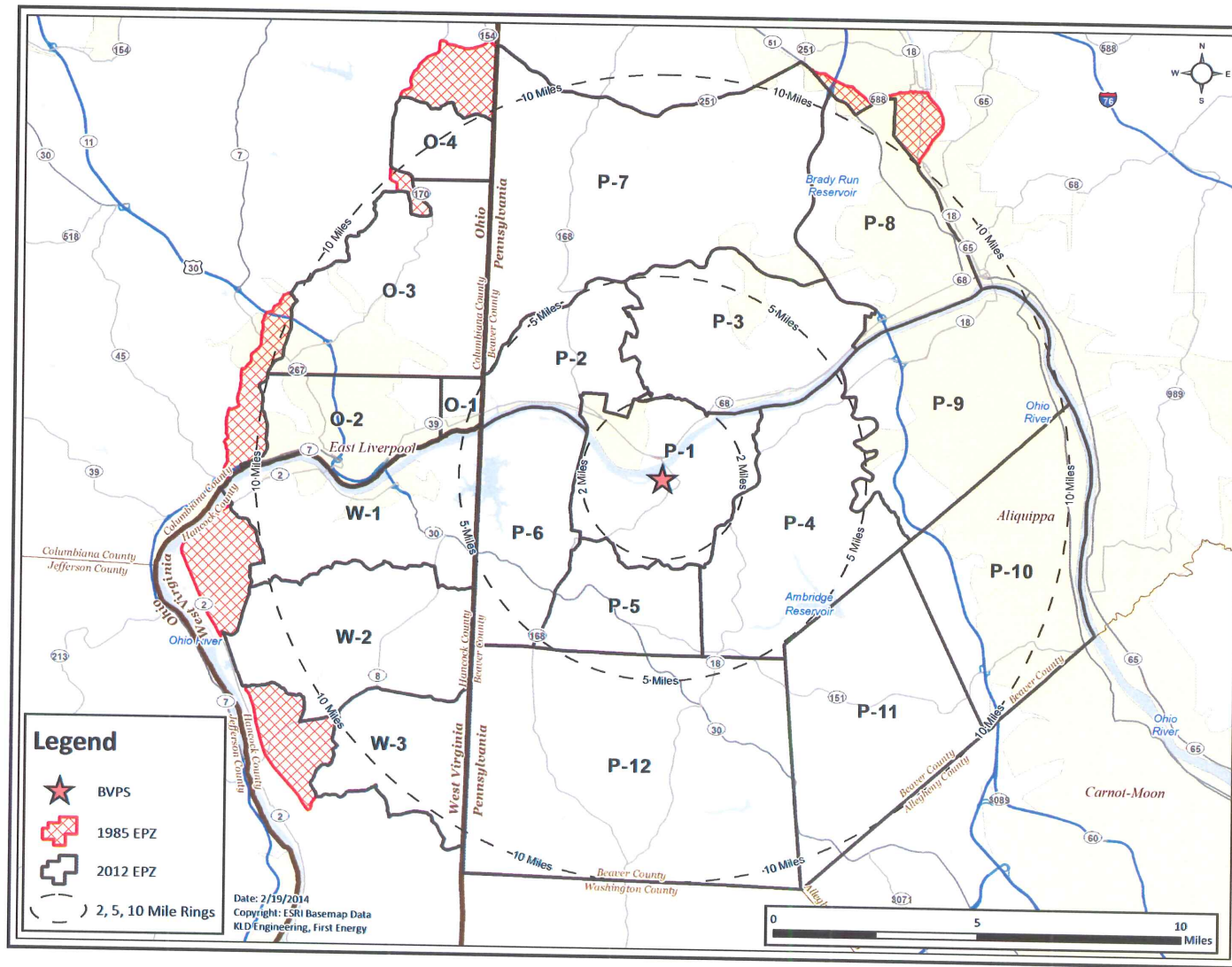


Figure 3. Changes to EPZ Boundary

## 2.3 Discussion of the Population Affected by the Change

### 2.3.1 Permanent Resident Population

Table 4 provides the permanent resident population within the EPZ, by sub-area, for the 1985 EPZ boundary and the 2012 EPZ boundary. Population estimates are based upon U.S. Census 2010 data. The proposed changes to the EPZ boundary result in a reduction in the permanent resident population of 8,833 people, or 7%.

As shown in Table 4, Sub-Area O-4 results in the largest percent change by Sub-Area of EPZ residents. Since so few people live in Sub-Area O-4, the changes in the EPZ boundary, shown in Figure 3, result in a permanent resident population reduction of 48%. Sub-Area P-8, however, results in a reduction of 6,309 permanent residents. Although a smaller percentage change by Sub-Area (29%) than O-4, the change in population in this Sub-Area accounts for 5% of the 7% overall change in EPZ population. The significant reduction of permanent residents in Sub-Area P-8 is the result of the elimination of the city of Beaver Falls from the proposed EPZ. The population center of Beaver Falls is located approximately 11 miles northeast of BVPS, beyond the recommended 10-mile plume exposure pathway.

Table 4. Permanent Resident Population

Sub-Area	1985 EPZ Population	2012 EPZ Population	Difference	% Change in Sub-Area Population
P-1	3,680	3,680	0	0%
P-2	1,542	1,542	0	0%
P-3	4,607	4,607	0	0%
P-4	3,042	3,042	0	0%
P-5	1,365	1,365	0	0%
P-6	1,124	1,124	0	0%
P-7	6,305	6,182	123	-2%
P-8	21,670	15,361	6,309	-29%
P-9	17,718	17,718	0	0%
P-10	22,494	22,494	0	0%
P-11	2,509	2,509	0	0%
P-12	3,799	3,799	0	0%
O-1	798	798	0	0%
O-2	14,473	14,174	299	-2%
O-3	6,237	5,428	809	-13%
O-4	301	156	145	-48%
W-1	6,364	6,173	191	-3%
W-2	2,335	2,109	226	-10%
W-3	1,897	1,166	731	-39%
<b>TOTAL</b>	<b>122,260</b>	<b>113,427</b>	<b>8,833</b>	<b>-7%</b>

### 2.3.2 Employee Population

Employees who work within the EPZ fall into two categories:

- Those who live and work in the EPZ
- Those who live outside of the EPZ and commute to jobs within the EPZ.

Those of the first category are already counted as part of the permanent resident population. To avoid double counting, we focus only on those employees commuting from outside the EPZ who will evacuate along with the permanent resident population.

Section 2.1.2 of NUREG/CR-7002 indicates that major employers (50 or more employees working a single shift) should be considered. Major employers typically attract employees from beyond the local area to fulfill the workforce needed. Smaller employers typically rely on local residents, whom have already been counted as permanent resident.

Based on aerial imagery, the largest employer in the 1985 EPZ that is not included in the 2012 EPZ is McDaniel Advanced Ceramic Technologies. The parking lots for this facility have a capacity of about 30 vehicles, which does not constitute a major employer. Thus, there are no major employers in the areas of difference between the 1985 EPZ and the 2012 EPZ.

### 2.3.3 Transient Population

Transient population groups are defined as those people (who are not permanent residents, nor commuting employees) who enter the EPZ for a specific purpose (shopping, recreation). Transients may spend less than one day or stay overnight at camping facilities, hotels and motels. The BVPS EPZ has a number of areas and facilities that attract transients, including:

- Lodging Facilities
- Marinas
- Parks/Recreational Areas
- Campgrounds
- Golf Courses
- Performing Arts/Conference Centers
- Hunting

There is one transient facility within the 1985 EPZ that would be eliminated when changing to the 2012 EPZ. The Highland County Club (golf course) is located in Sub-Area O-3 along Florence Street in Glenmoor. Based on aerial imagery, the parking lot at the golf course is estimated to accommodate 50 vehicles, or 120 transients based on the average household size of 2.40 people per household (see Appendix F of KLD TR-495). Assuming at peak times the facility attracts all 120 transients, and due to its close proximity to the EPZ boundary, all of these visitors are non-EPZ residents, the proposed EPZ results in a reduction in transient population of 120 people and 50 vehicles.

### 2.3.4 Special Facility Population

Several schools are located in Sub-Areas O-3 and P-8 that are within the existing EPZ but outside of the proposed EPZ. Table 5 lists the schools, as well as enrollments, within the areas



that are not within the proposed EPZ. As shown, there are 1,804 schoolchildren within the 1985 EPZ that are not included in the 2012 EPZ.

Table 5. Schools Eliminated from Proposed EPZ

Sub-Area	Facility	Enrollment
<b>COLUMBIANA COUNTY, OH</b>		
<b>O-3</b>	American Spirit Academy	185
	East Liverpool Christian School	138
<b>BEAVER COUNTY, PA</b>		
<b>P-8</b>	Big Beaver Elementary School	347
	Beaver Falls Middle School	334
	Beaver Falls Senior High School	689
	Divine Mercy Academy	111
<b>Total:</b>		<b>1,804</b>

There are no in-patient medical facilities or correctional facilities within the areas of difference between the existing EPZ and the proposed EPZ.

## 2.4 Effect of EPZ Boundary Change on Evacuation Time Estimates

### 2.4.1 General Population ETE

As discussed in the 2012 ETE Report (KLD TR-495), the Dynamic Evacuation (DYNEV) model was used to compute ETE. The input streams for the 2012 ETE analysis were updated based on the population changes noted above and simulations were rerun to compute ETE.

Table 6 presents the 90<sup>th</sup> and 100<sup>th</sup> percentile ETE (hr:min) for the general population (permanent residents, transients and employees evacuating in their personal vehicles) for the existing EPZ and proposed EPZ, as well as the decrease in ETE, for a summer, midweek, midday, good weather scenario (Scenario 1). Table 7 presents the 90<sup>th</sup> and 100<sup>th</sup> percentile ETE for the existing EPZ and proposed EPZ, as well as the decrease in ETE, for a winter, midweek, midday, good weather scenario (Scenario 6).



**Table 6. Time to Clear the Indicated area of the Affected Population for Scenario 1**

Scenario 1			
Region	Existing EPZ ETE	Proposed EPZ ETE	Decrease
90 <sup>th</sup> Percentile			
2-mile	2:00	2:00	0:00
5-mile	2:25	2:25	0:00
Entire EPZ	3:05	3:05	0:00
100 <sup>th</sup> Percentile			
2-mile	4:30	4:30	0:00
5-mile	4:35	4:35	0:00
Entire EPZ	5:00	4:40	0:20

**Table 7. Time to Clear the Indicated area of the Affected Population for Scenario 6**

Scenario 6			
Region	Existing EPZ ETE	Proposed EPZ ETE	Decrease
90 <sup>th</sup> Percentile			
2-mile	2:00	2:00	0:00
5-mile	2:20	2:20	0:00
Entire EPZ	3:05	3:05	0:00
100 <sup>th</sup> Percentile			
2-mile	4:30	4:30	0:00
5-mile	4:35	4:35	0:00
Entire EPZ	5:00	4:40	0:20

The decrease in population for the proposed EPZ did not impact the 90<sup>th</sup> percentile ETE for any of the regions or scenarios considered. As per Section 4.0 of NUREG/CR-7002, protective action recommendations and decisions should be based on the 90<sup>th</sup> percentile ETE. Thus, the proposed change in the EPZ boundary would not impact protective action recommendations and decisions.

The decrease in population for the proposed EPZ does reduce the 100<sup>th</sup> percentile ETE for an evacuation of the full EPZ by 20 minutes for both scenarios considered – not a significant change. The ETE for an evacuation of the 2-mile or 5-mile region remains the same.

Figure 4 and Figure 5 have been extracted from Section 7 of KLD TR-495. These figures illustrate the patterns of traffic congestion that arise for an evacuation of the entire EPZ during the summer, midweek, midday period under good weather conditions (scenario 1).

Traffic congestion, as the term is used here, is defined as Level of Service (LOS) F. LOS F is defined as follows (HCM 2010, page 5-5):

The HCM uses LOS F to define operations that have either broken down (i.e., demand exceeds capacity) or have exceeded a specified service measure value, or combination of service measure values, that most users would consider unsatisfactory. However, particularly for planning applications where different alternatives may be compared, analysts may be interested in knowing just how bad the LOS F condition is. Several measures are available to describe individually, or in combination, the severity of a LOS F condition:

- *Demand-to-capacity ratios* describe the extent to which capacity is exceeded during the analysis period (e.g., by 1%, 15%, etc.);
- *Duration of LOS F* describes how long the condition persists (e.g., 15 min, 1 h, 3 h); and
- *Spatial extent measures* describe the areas affected by LOS F conditions. These include measures such as the back of queue, and the identification of the specific intersection approaches or system elements experiencing LOS F conditions.

All highway "links" which experience LOS F are delineated in these figures by a thick red line; all others are lightly indicated.

The last road to clear in the proposed EPZ is Route 51 in Crescent Township, Pennsylvania (just south of the Sub-Area P-10 boundary) at 4 hours and 30 minutes after the advisory to evacuate, as shown in Figure 4. It can be seen however, that congestion still exists along Route 2 and Route 8 in West Virginia (west of the Sub-Area W-2 boundary). As shown in Figure 1, Route 8 westbound near the intersection with Route 2 is within the existing EPZ. As a result, the congestion on Route 8 dictates the 100<sup>th</sup> percentile ETE for the existing EPZ as opposed to Route 51 near Sub-Area P-10 for the proposed EPZ. The congestion on Route 8 west of Sub-Area W-2 prolongs the ETE for the existing EPZ, explaining the 20 minute increase in ETE at the 100<sup>th</sup> percentile for an evacuation of the entire EPZ.

Figure 5 displays the congestion patterns at 5 hours after the advisory to evacuate. The congestion on Route 8 has cleared. Route 2 is the last road to clear within the study area; this road is just outside of the existing EPZ boundary.

#### 2.4.2 Special Facility ETE

As discussed in Section 8 of KLD TR-495, ETE for special facilities are equal to the sum of the times to complete the following activities:

- Mobilization of bus drivers – alert bus drivers, bus drivers travel to bus depot, bus drivers briefed at depot and assigned to a facility, bus drivers travel to facility
- Loading time – load a bus to capacity with evacuees from the special facility
- Travel time to the EPZ boundary

It is assumed that the mobilization time – 90 minutes – and the loading time – 15 minutes – used for the schools considered in the 2012 ETE study are also valid for the schools listed in Table 5. The travel time to the EPZ boundary is computed based on the length in miles of the



most likely route from the special facility to the EPZ boundary and the average speed along that route as estimated by the DYNEV model (see pages 8-6 and 8-7 of KLD TR-495 for additional explanation).

Table 8 provides the ETE for the schools in the areas of difference between the proposed EPZ and the existing EPZ for an evacuation of the entire EPZ when school is in session in good weather. The ETE for schools in the Table 8-7 of KLD TR-495 range from 1:50 to 3:50 for good weather. The ETE shown in Table 8 are on the low end of this range because each of the facilities is less than a mile from the existing EPZ boundary.

**Table 8. Evacuation Time Estimates for Schools – Good Weather**

School	Driver Mobilization Time	Loading Time (min)	Dist. To EPZ Bdry (mi.)	Average Speed (mph)	Travel Time to EPZ Bdry (min.)	ETE (hr:min)
<b>COLUMBIANA COUNTY, OH</b>						
American Spirit Academy	90	15	0.5	11.6	3	<b>1:50</b>
East Liverpool Christian School	90	15	0.5	11.6	3	<b>1:50</b>
<b>BEAVER COUNTY, PA</b>						
Big Beaver Elementary School	90	15	0.6	30.8	2	<b>1:50</b>
Beaver Falls Middle School	90	15	0.6	30.8	2	<b>1:50</b>
Beaver Falls Senior High School	90	15	0.6	30.8	2	<b>1:50</b>
Divine Mercy Academy	90	15	0.8	30.5	2	<b>1:50</b>

### 3 CONCLUSIONS

As described in NUREG-0654 FEMA-REP-1, Rev. 1, defining an EPZ boundary of about 10 miles radially from the BVPS will ensure that prompt and effective actions can be taken to protect the public in the event of an accident. As such, FirstEnergy is proposing to formally change the existing EPZ boundary in response to the request from the three surrounding risk county Emergency Management Agencies.

The proposed EPZ results in a permanent resident population reduction of 8,833 people, a transient population reduction of 120 people, and the exclusion of 1,804 schoolchildren at six schools that are within the existing EPZ.

The reduction in population with the proposed EPZ has no impact on the 90<sup>th</sup> percentile ETE for the general population, which are to be used in making protective action recommendations and decisions. In addition, the ETE for the schools in the areas of difference between the proposed and existing EPZ boundaries are comparable to school ETE in the 2012 ETE study. As such, the proposed change to the EPZ boundary does not have a significant impact on ETE for the general population or for special facilities.

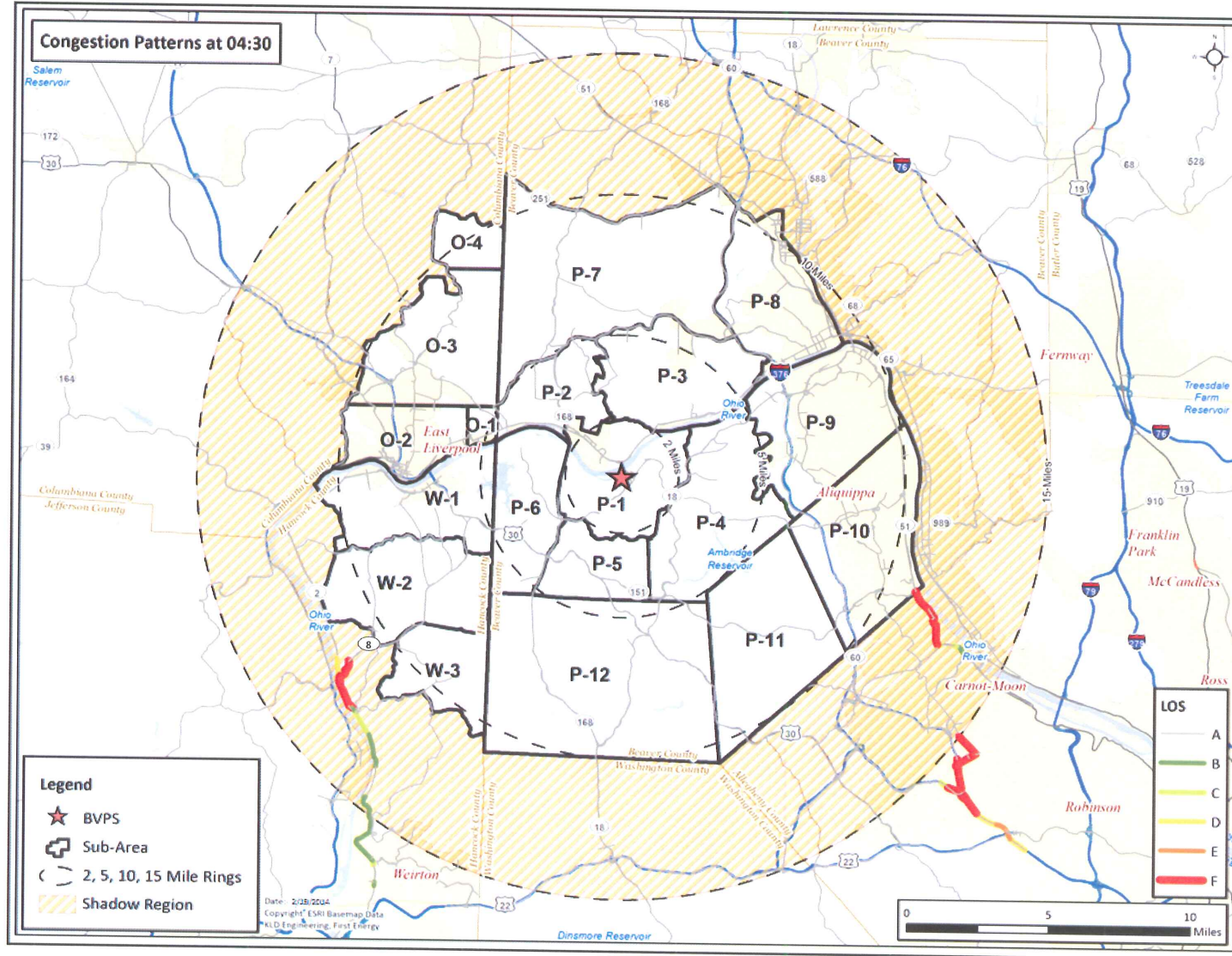


Figure 4. Congestion Patterns at 4 Hours, 30 Minutes after the Advisory to Evacuate



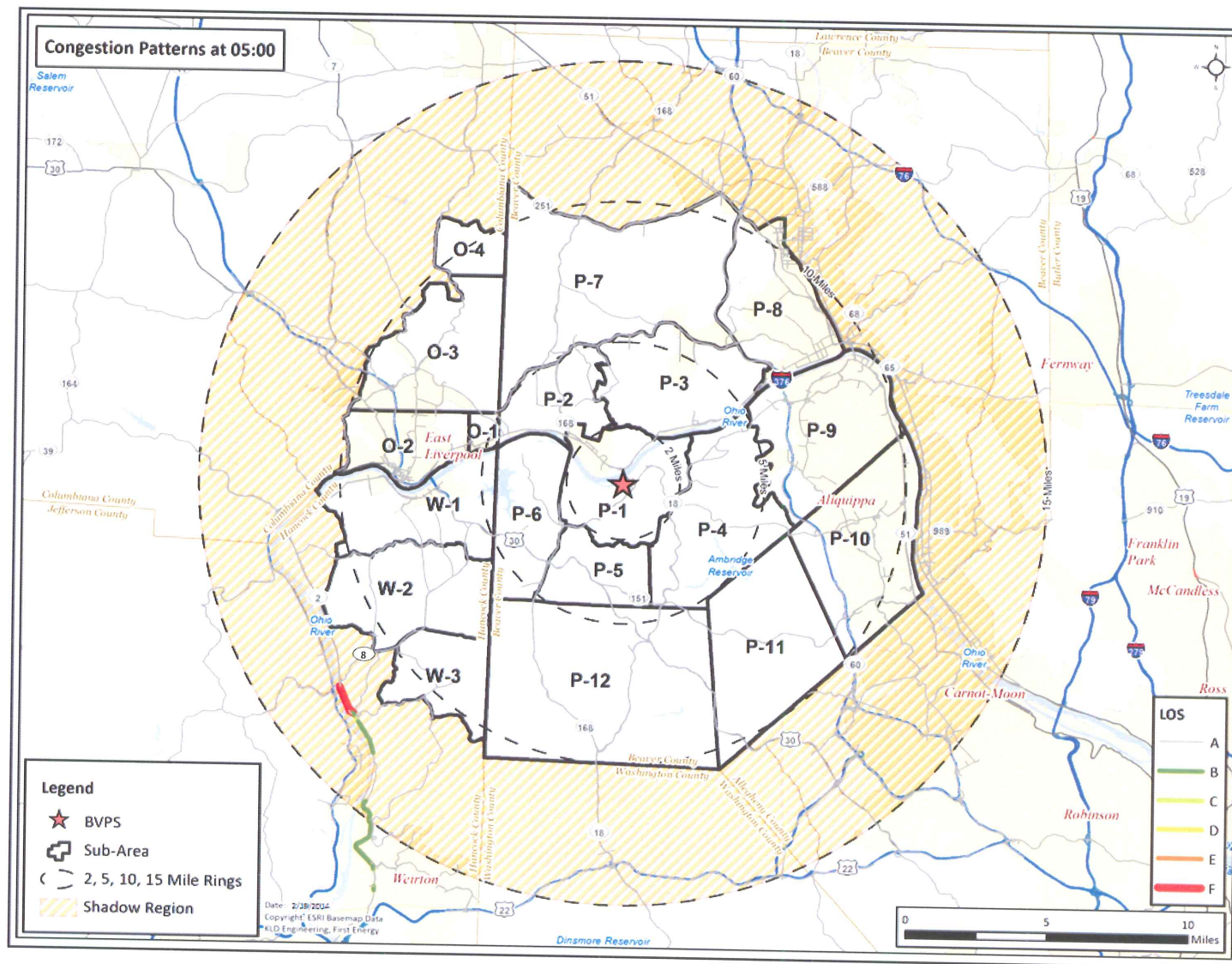


Figure 5. Congestion Patterns at 5 Hours after the Advisory to Evacuate