ftn Associates Ltd.
water resources / environmental consultants

ENTERGY INDEPENDENCE PLANT
EAST AND WEST RECYCLE PONDS

DEMONSTRATION OF COMPLIANCE WITH EPA CCR RULE SITING CRITERIA §257.63, SEISMIC IMPACT ZONE

PREPARED IN COMPLIANCE WITH THE EPA FINAL RULE FOR THE DISPOSAL OF COAL COMBUSTION RESIDUALS TITLE 40 CODE OF FEDERAL REGULATIONS PART 257

OCTOBER 17, 2018

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EAST AND WEST RECYCLE PONDS

DEMONSTRATION OF COMPLIANCE WITH EPA CCR RULE SITING CRITERIA §257.63, SEISMIC IMPACT ZONE

Prepared for

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FTN No. R07920-1861-001

October 17, 2018

PROFESSIONAL ENGINEER'S CERTIFICATION

With this certification, I certify that I, as a Professional Engineer in the State of Arkansas, am a qualified professional engineer as defined in §257.53 of Title 40 Code of Federal Regulations (40 CFR) Part 257, that this report has been prepared under my direction in accordance with generally accepted good engineering practices, that the findings are accurate to the best of my knowledge, and that the CCR unit that is subject to this certification meets the location restriction requirements under §257.63 of 40 CFR Part 257.

Dana L. Derrington, Arkansas PE #16372

10/17/2018
Date

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1.0 INTRODUCTION

Entergy Arkansas, Inc. (Entergy), operates the Independence plant located approximately 2 miles southeast of Newark, Arkansas. The plant utilizes two recycle ponds, hereafter referred to as the East and West Recycle Ponds, for, among other things, the management of bottom ash transport water. Pursuant to §257.63 of Title 40 Code of Federal Regulations (40 CFR) Part 257, existing coal combustion residual (CCR) surface impoundments must be not be located in seismic impact zones unless the owner or operator demonstrates that all structural components including liners, leachate collection and removal systems, and surface water control systems are designed to resist the maximum horizontal acceleration (MHA) in lithified earth material for the site. A seismic impact zone is defined by §257.53 as an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years. This report presents the findings of an evaluation of the East and West Recycle Ponds in support of the location restriction requirements of §257.63.

2.0 SITE DESCRIPTION

The East and West Recycle Ponds are shown on Figure 1 (all figures are located in Appendix A). The East Recycle Pond has an approximate surface area of 6.2 acres and the West Recycle Pond has an approximate surface area of 6.8 acres[1]. Based on surveys completed during June 2018, the East Recycle Pond has a maximum depth of 20 ft below ground surface (ft bgs) and the West Recycle Pond has a maximum depth of 18 ft bgs (FTN Associates, Ltd. [FTN] 2018a). The typical water level elevation in the recycle ponds is approximately 235 ft North American Vertical Datum of 1988 (NAVD88) based on field observations during June 2018. At the time of this evaluation, the West Recycle Pond was being drained for maintenance. Drained water from the West Recycle Pond was being pumped into and stored in

[1] Pond surface areas were estimated based on the water level (East Recycle Pond) and water level line (West Recycle Pond) during field activities in June 2018.

the East Recycle Pond. Topography surrounding the East and West Recycle Ponds is generally flat-lying, with ground surface elevations ranging from approximately 234 to 239 ft NAVD88, as shown on Figures 1 and 2.

3.0 SEISMIC IMPACT ZONE EVALUATION

The plant and its recycle ponds are located approximately 40 miles west of the New Madrid seismic zone, which stretches from southern Illinois and southeast Missouri to northeast Arkansas, southwestern Kentucky, and northwestern Tennessee as shown on Figure 3 (retrieved from USGS, no date). In accordance with US Environmental Protection Agency (EPA) guidance (EPA 1995), the MHA for this site was determined using the 2014 US Geological Survey (USGS) National Seismic Hazard Map presenting the estimated peak ground surface acceleration (PGA) in bedrock. As shown on Figure 4, the PGA value for this site with a 2% probability of exceedance in 50 years is approximately 0.35 g. As such, the East and West Recycle Ponds are located in a seismic impact zone as defined by §257.53.

In accordance with §257.63(a), Entergy must demonstrate that all structural components including liners, leachate collection and removal systems, and surface water control systems are designed to resist the MHA because the ponds are located in a seismic impact zone as defined by §257.53. Neither pond was constructed with leachate collection and removal system. According to an evaluation performed by Environmental Resources Management (2018), the East and West Recycle Ponds are classified as “incised” and are not constructed with a dike that impounds water. As such, there are no outward-facing structural slopes associated with the ponds that have potential for failure under seismic loading conditions. An evaluation performed by FTN (2018b) considered the stability of the interior side slopes and liquefaction potential of foundation soils due to seismic loading. Findings from the evaluation concluded that the East and West Recycle Ponds are resistant to the MHA for this site.

4.0 CONCLUSIONS

Based on a review of the available documentation in this report, both the East and West Recycle Ponds at the Entergy Independence plant meet the location restriction requirements of §257.63.

5.0 REFERENCES

EPA [Environmental Protection Agency]. 1995. See Richardson, Kavazanjian Jr., and Matasovic 1995.

Environmental Resources Management. 2018. *Summary of Site Visit and Review of CCR Structural Integrity Criteria Requirements for Independence Steam Electric Station (ISES) Recycle Ponds*. Mount Pleasant, SC: Environmental Resources Management.

FTN [FTN Associates, Ltd.]. 2018a. *Entergy Independence Plant, East and West Recycle Ponds, Demonstration of Compliance with EPA CCR Rule Siting Criteria, §257.60, Placement Above the Uppermost Aquifer*. Little Rock, AR: FTN Associates, Ltd.

———. 2018b. *Entergy Independence Plant, East and West Recycle Ponds, Slope Stability and Soil Liquefaction Analyses*. Little Rock, AR: FTN Associates, Ltd.

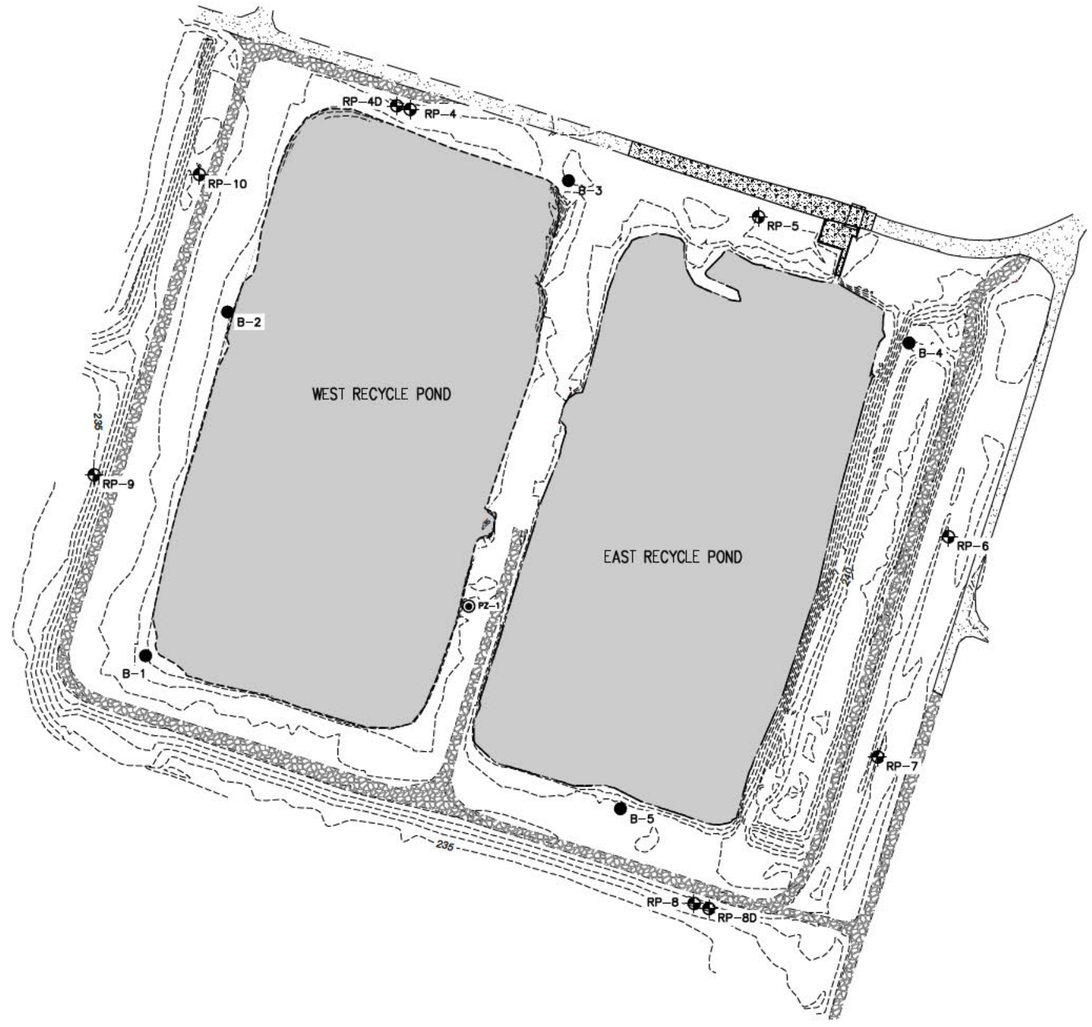
Richardson, G.N., E. Kavazanjian Jr., and N. Matasovic. 1995. *RCRA Subtitle D (258): Seismic Design Guidance for Municipal Solid Waste Landfill Facilities* [EPA/600/R-95/051]. Cincinnati: US Environmental Protection Agency, Office of Research and Development, Risk Reduction Engineering Laboratory.

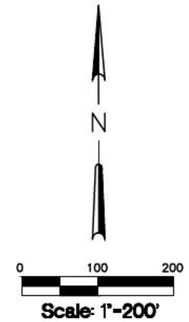
USGS [US Geological Survey]. 1962 (rev 1981). "USGS 1:24000-Scale Quadrangle for Newark, AR 1962." US Geological Survey. Available online at https://www.sciencebase.gov/catalog/item/5a8a29e6e4b00f54eb3c797b.

———. (no date). "Earthquake Fault Map" [web page]. https://earthquake.usgs.gov/hazards/qfaults/map/#qfaults (retrieved August 8, 2018).

APPENDIX A

Figures





LEGEND

- 240 — 5-FT INDEX CONTOUR (HARMON SURVEYING, INC.)
- 1-FT INTERMEDIATE CONTOUR (HARMON SURVEYING, INC.)
- PAVED ROAD
- GRAVEL ROAD
- CONCRETE PAD
- B-5 SOIL BORING
- PZ-1 PIEZOMETER
- RP-6 MONITORING WELL
- EDGE OF WATER, JUNE 2018
- TYPICAL EDGE OF WATER

NOTES:

1. TOPOGRAPHIC INFORMATION OUTSIDE OF POND AREA IS FROM SURVEY PERFORMED BY HARMON SURVEYING, INC., JUNE 2018.
2. WEST POND BOTTOM TOPOGRAPHIC DATA IS FROM SURVEY PERFORMED BY B&F ENGINEERING, INC., JULY AND AUGUST 2018.
3. DRAWING IS BASED ON ARKANSAS STATE PLANE SYSTEM, NAD83, U.S. FEET.
4. WEST RECYCLE POND WAS BEING DRAINED FOR MAINTENANCE DURING JUNE 2018.

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Figure 1. Site map, Entergy Independence recycle ponds.

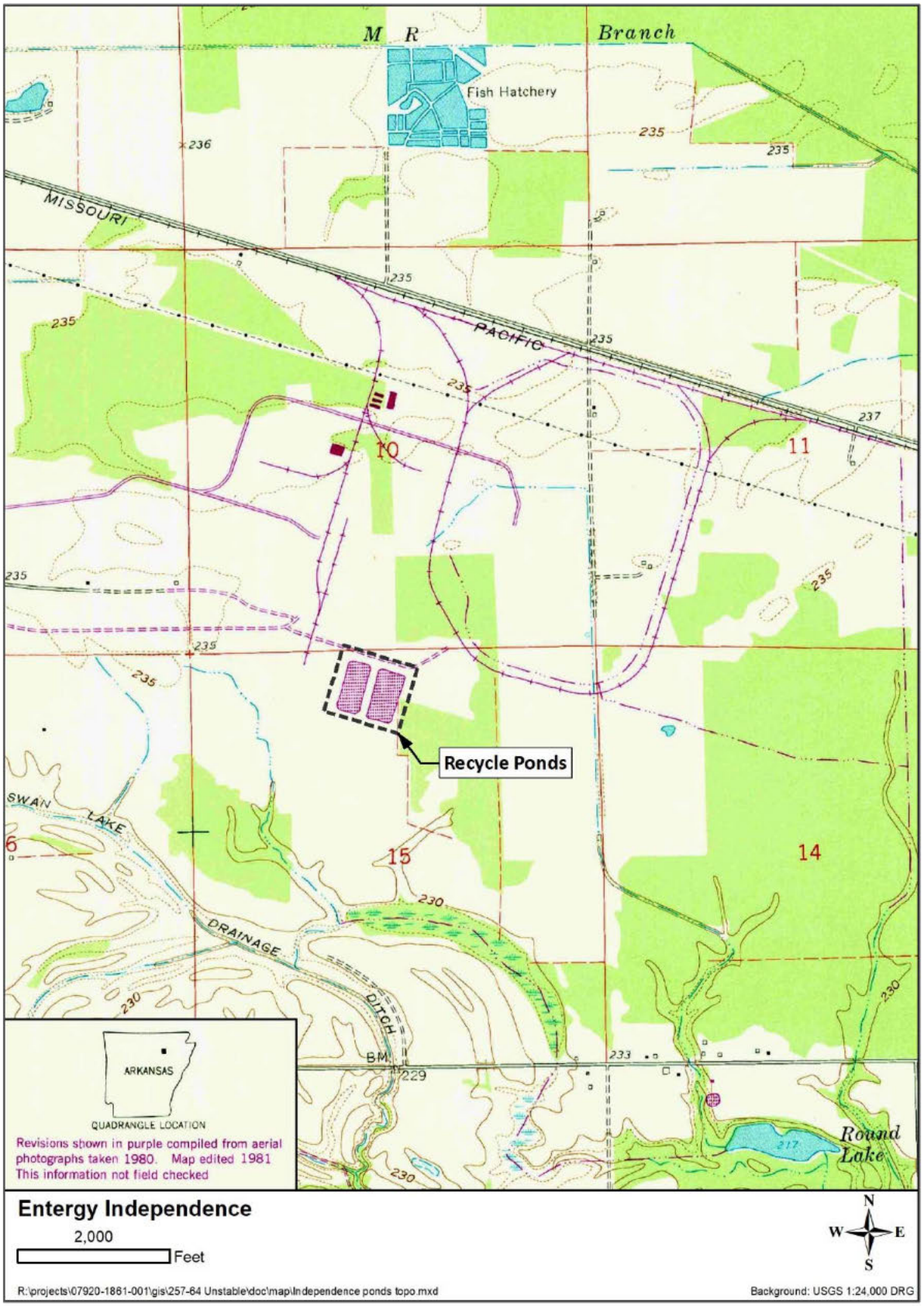

Figure 2. Topographic map of recycle ponds and surrounding area based on USGS topographic quadrangle Newark, AR (1981).

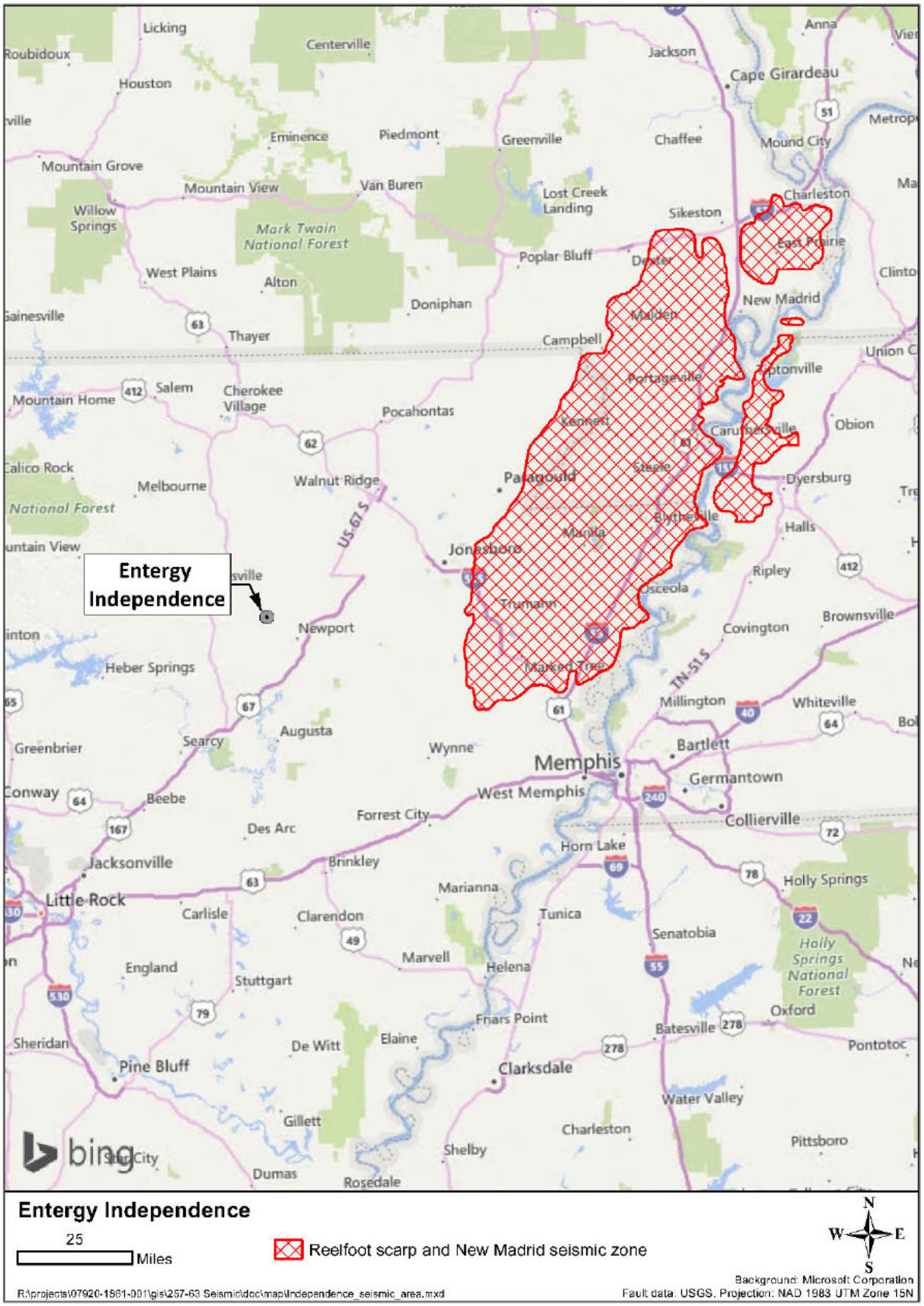

Figure 3. New Madrid seismic zone showing area of Quaternary faulting.

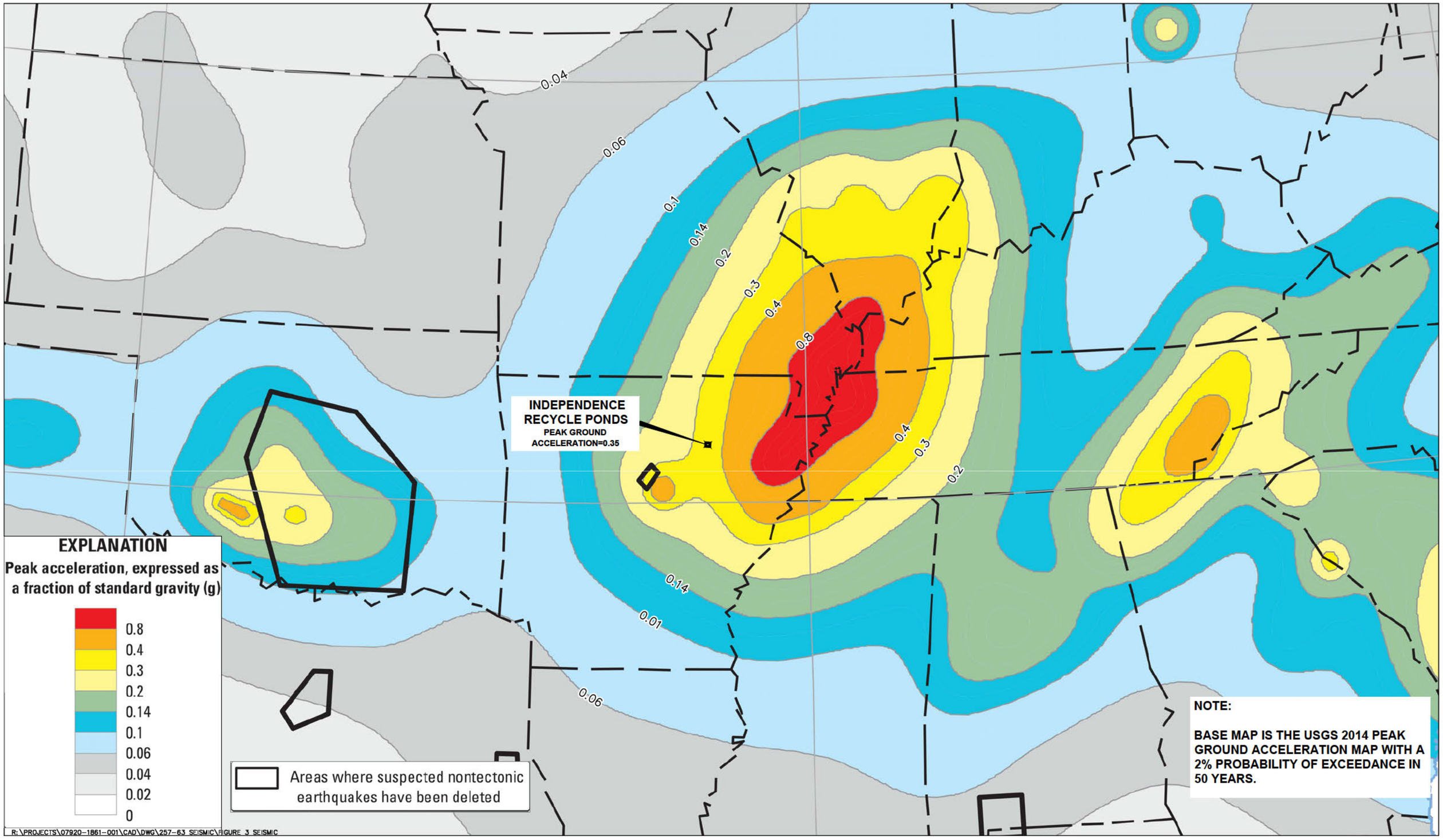

Figure 4. USGS seismic hazard map showing PGA with 2% probability of exceedance in 50 years.