Upgrade and Enhancement of HAZUS Fault Database

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The latest HAZUS MH fault database (release MH-MR1) was obtained and reviewed. Examining the fault it was clear that faults within the database are taken from the National Seismic Hazard Map data set. These faults are a subset of the earlier HAZUS data set, which was based principally on dePolo (1998). The current database has about 130 faults in Nevada. The National Seismic Hazard Map is a probabilistic map and a threshold of activity is used so that only the most active (or highest fault slip rate) faults are included; faults of lesser activity do not affect the probabilistic result. As a result of using this activity filter, slower faults that had late Quaternary activity, pose an earthquake threat nevertheless, and are near Nevada communities are not available for use.

The question of what faults should be included in HAZUS is partly philosophical. Probabilistic maps consider only the most active faults. Scenario maps, in contrast, are deterministic by nature. This is not to say that scenario maps and probabilistic concepts can't be coupled, they can (e.g., the likelihood of damage from multiple earthquake sources). But the most common use of a scenario tool such as HAZUS is to evaluate the impact of a deterministic scenario. A particular fault, or a hypothetical fault, or a background earthquake is input and the program run based on those results. With a bulk of HAZUS usage being deterministic, the logic of using an activity filter on faults in HAZUS (via the National Seismic Hazard Map database) is called into question. A deterministic fault database should be available to HAZUS. This is more important in Nevada's urban areas and communities than in large, undeveloped areas. Earthquake scenarios are used to help emergency and planning personnel to visualize the effects of a damaging earthquake, a hard thing for average people to do. Thus nearby earthquake sources are more important to scenarios and exercises than distant earthquakes. For example, some faults missing from the current HAZUS MH data set that are important for earthquake planning scenarios are the Las Vegas Valley fault system (Las Vegas), Pahrump Valley fault system (Pahrump), Steptoe Valley fault system (Ely), Cuprite Hills fault zone (Goldfield), Eastern Carson Valley fault system (Gardnerville), and Incline Village fault (Incline Village).

We suggest two solutions to the missing faults due to the probabilistic filter: 1) overlay the USGS Quaternary fault data set by adding the data set to the HAZUS MH input wizard and viewing possible faults around a community or facility of interest, and using these as a guide for local sources or, 2) create a Nevada deterministic data set that can use used in HAZUS MH. At the time of this writing option 1 is possible and option 2 is being explored with the developers of the HAZUS MH program. The USGS Quaternary fault data set is next in line to be used by HAZUS MH and could resolve the filter problem, but the actual usage of that data set poses its own challenges because faults are so fragmented. Meanwhile, we are preparing an NBMG open-file report with HAZUS input parameters for faults near Nevada communities that can be used to overcome the filter problem; this report will include HAZUS results for each of these faults.