

HAZUS User Group Success Story

Using HAZUS for Exercise Scenarios

Dan O'Brien, Program Manager,
New York State Emergency Management Office

Exercises are a major component of emergency preparedness. They provide the testing, evaluation and groundwork for improving target emergency management capabilities as outlined by FEMA's Homeland Security Exercise and Evaluation Program (HSEEP). Short of a major disaster, exercises assemble and focus the emergency management community more than any other activity or event. As such, tools that can contribute to the success and value of these exercises take on a particular significance.



HAZUS Supports Disaster Exercises

The New York State Emergency Management Office and its partner Exercise Planning Teams, responsible for the design and oversight of exercises, have found that HAZUS, FEMA's loss estimation tool for earthquakes, hurricanes and floods, is very useful supporting their efforts to create exercise scenarios that are well tailored to specific regions, are realistic and more accurate than would be possible to develop without significant additional investment. The "enhanced" scenarios made possible by HAZUS can be a great benefit to exercises. For exercise players, they can foster a realism that increases the intensity of play and help stimulate critical thinking and discussion amongst players through commonly shared and familiar real world references. For the exercise participants at large they can provide new insights on risk and contribute to the overall awareness of the hazard used for the scenario.



Empire Express State Emergency Operations Center

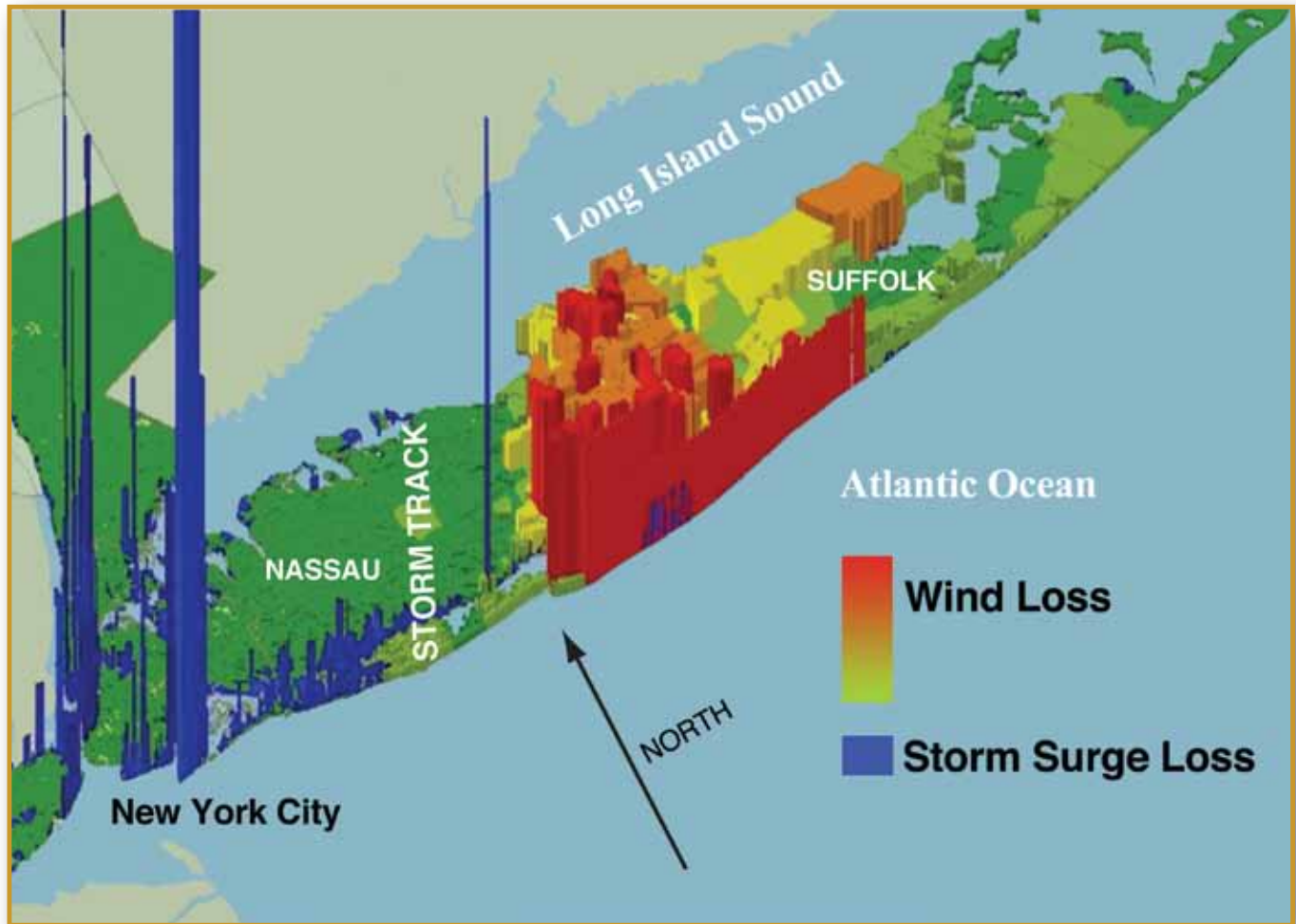
Exercise planners responsible for developing the Master Scenario Event List - MSEL (the chronological timeline of expected actions and events to be injected into exercise play) are able to use the range of loss calculations that HAZUS provides, i.e. building damage, essential facility functionality, casualties, debris, sheltering, fire, economic loss, utility outages and restoration rates, to establish a broad foundational picture of a situation from which site specific incidents, not necessarily modeled by HAZUS, can be scripted. This helps the weaving of a cohesive storyline. For instance, HAZUS will predict a certain number of ignitions from an earthquake, fire station functionality, debris distribution by census tract and number of pipeline leaks and breaks. This information helps craft the MSEL establishing specific locations of fires as well of complications encountered by certain fire departments such as fire station garage doors that don't open, low water pressure or roads that are impassible.



Vigilant Guard Erie County Emergency Operations Center

Notable examples of applying HAZUS for exercises that have taken place in New York State are the state and coastal counties June 2008 Empire Express Exercise, which simulated



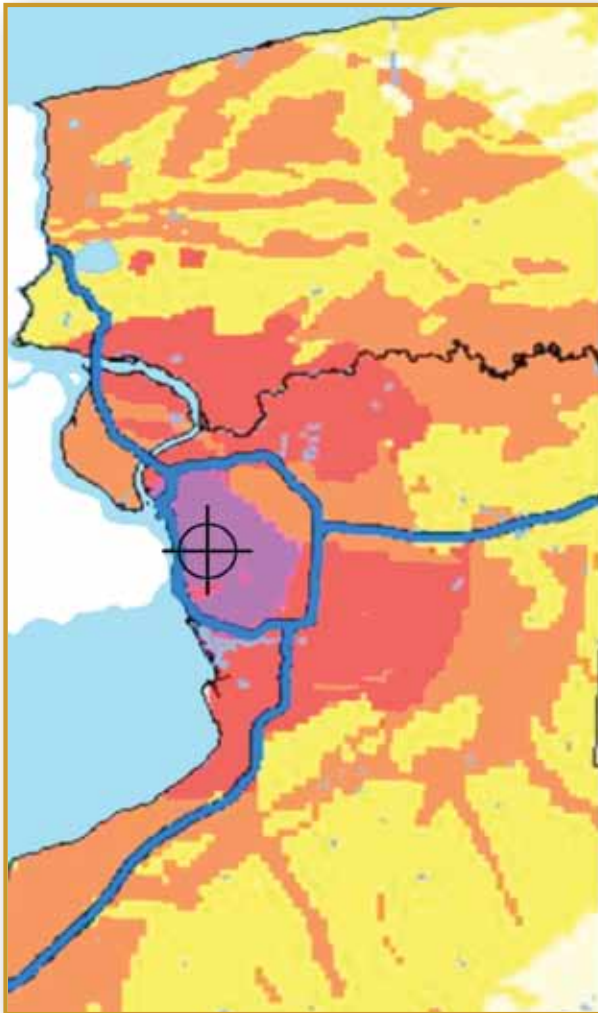


3-D Depiction of HAZUS Estimated Direct Economic Losses to Buildings Due to Wind vs. Storm Surge From Empire Express Exercise - Scenario "Hurricane Eli"

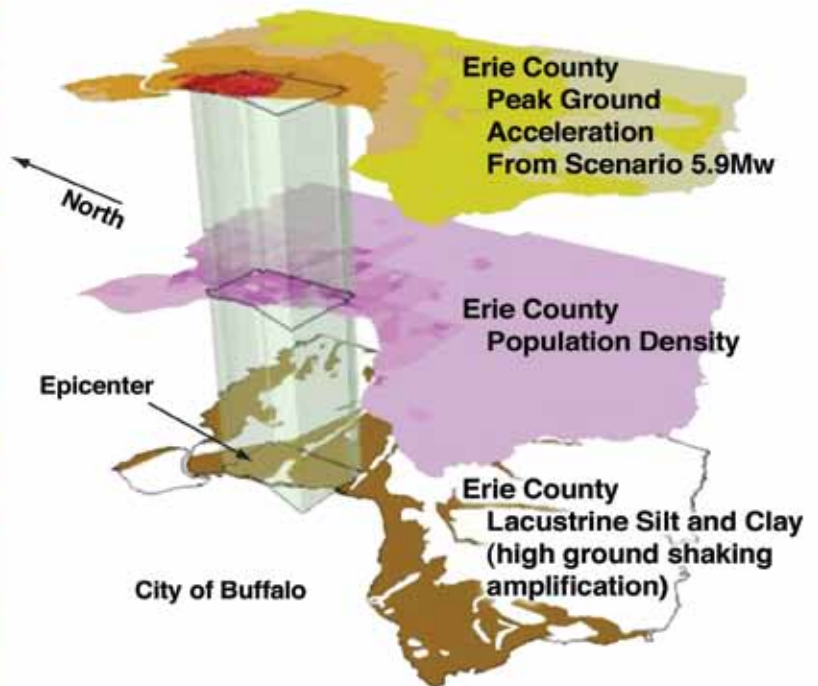
a high range category 2 hurricane crossing Long Island, and the November 2009 Vigilant Guard Exercise, which used a 5.9M earthquake in the City of Buffalo as the backdrop to the largest military/civilian exercise in the State's history. This exercise involved over 1,700 National Guard troops from five states in addition to several hundred civilian players from Erie and Niagara Counties, search and rescue units from several cities across the state and New York State agencies.

Empire Express Hurricane Exercise

The HAZUS modeling of scenario "Hurricane Eli" used for the Empire Express Exercise included use of the flood module for estimating storm surge losses and the hurricane module for wind losses. For storm surge losses, "user defined" inundation grids were developed based on storm surge height values for Eli that were provided by NOAA from an "operational" SLOSH model run. The wind damages were based on an input of a storm file prepared by Sea Island Software, the developers of HURREVAC and from ARA, the prime contractor for the HAZUS wind module. The results of the effort revealed that a storm such as Hurricane Eli may result in an overall 3:1 ratio of storm surge related losses to wind losses and those jurisdictions receiving the greatest storm surge damages may receive only limited damages from wind. These data served as the backdrop to test hospital evacuation plans and sheltering amongst other capabilities.



The damages from the scenario 5.9Mw earthquake are considerable due to an epicenter within an urban area, significant number of older unreinforced masonry buildings and soil conditions that amplify earthquake ground shaking.

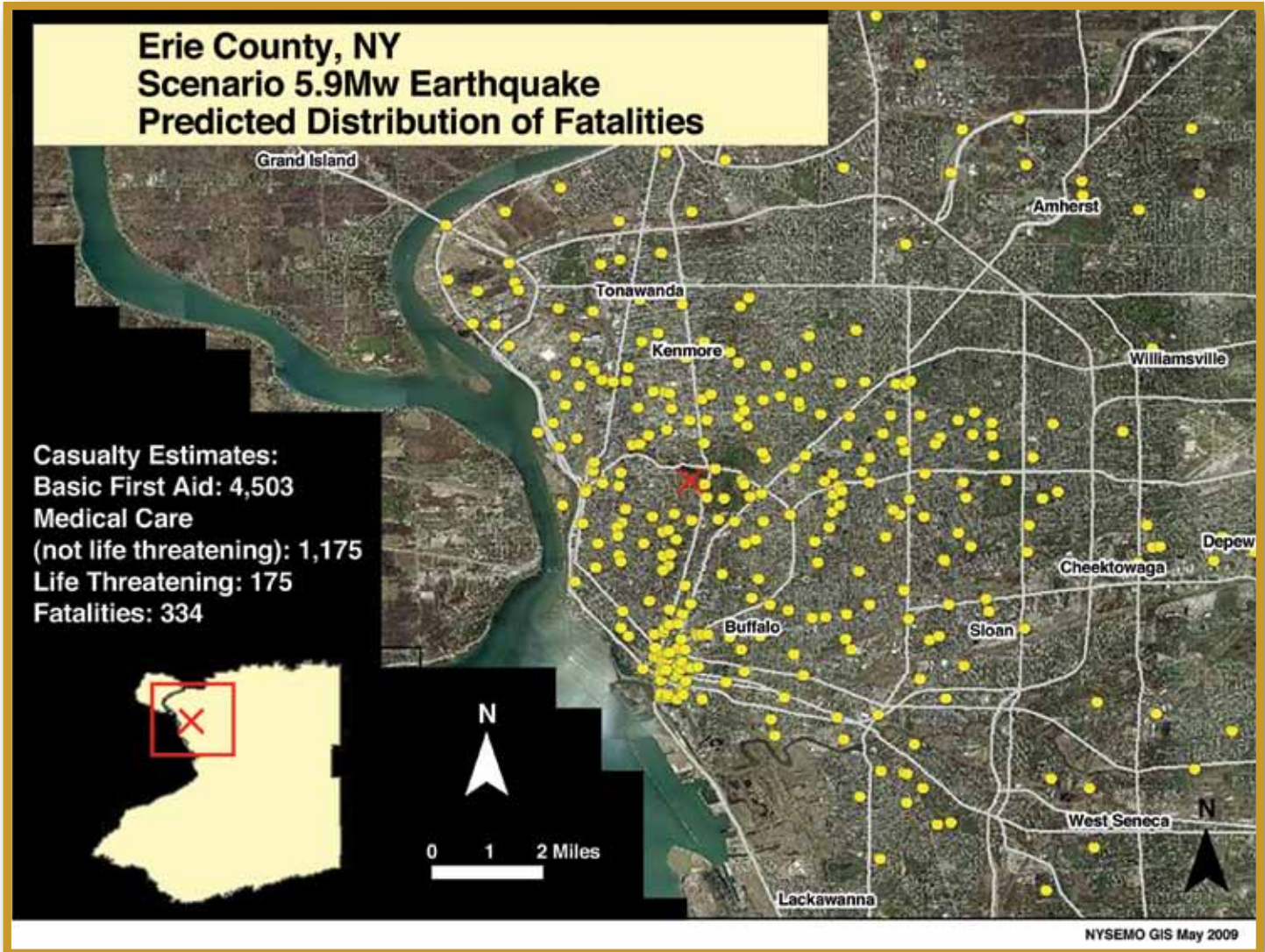


*Vigilant Guard Exercise: November 1-5, 2009.
Scenario 5.9M Earthquake: City of Buffalo, NY*

Vigilant Guard Earthquake Exercise

With the Vigilant Guard Exercise, the New York State Geological Survey's surficial geologic soil map, which is cross referenced with NEHRP soil site classifications, was used in replacement of the HAZUS default. A modified essential facility database was also incorporated through FEMA's Comprehensive Data Management software (CDMS). The modeling revealed that this moderate sized earthquake would result in significant losses given the urban location of the epicenter, the concentration of older unreinforced masonry structures, and glacial silt and clay deposits that amplify ground shaking that underlie much of the City of Buffalo and surrounding region.

In the early stages of the exercise planning leading up to the Initial Planning Conference, it was not clear what level of damage and casualties would be commensurate with the capabilities that the exercise was designed to test. The ability of HAZUS to run several comparison scenarios – a 5.0M, 5.5M, 5.7M and finally settling on a 5.9M – provided exercise planners with a better feel of how various magnitudes affect damage levels and help focus on the question of how big does this earthquake have to be. The desire was to find the lowest magnitude that would result in losses that would trigger actions and test the capabilities the exercise was intended to address. This would maximize the plausibility of the scenario by not selecting an event with unnecessarily low probability of occurrence.



While HAZUS has shown to be an effective tool in supporting exercises, challenges still remain. GIS professionals as well as good data may be available to support exercise plans, but not all jurisdictions have a trained cadre of HAZUS users. In certain locations where exercises are being planned you may have experienced HAZUS users or an active HAZUS Users Group qualified to assist with scenario development, but these same individuals may be expected to be exercise players, serving as GIS staff as they would be in any EOC activation. This creates a conflict. As players, they should not be privy to the scenario, at least in any detail. This is akin to having a copy of the exam before test day.

An approach used in the Empire Express and Vigilant Guard exercises to address these conflicts was to establish certain GIS staff and HAZUS users as “trusted agents”. As trusted agents they are members of the Exercise Planning Team, supporting the scenario development, yet also serving in a limited capacity as players when the exercise takes place.

The scope of hazards addressed by HAZUS also limits its use with certain exercises, such as with the June 2009 New York State/FRMAC Empire '09 Exercise, which used an improvised radiological device (dirty bomb) detonated in the City of Albany for its scenario. Despite these and other challenges, many of which are well known to HAZUS users, HAZUS is now recognized as a standard tool for exercise planning.