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**NAVAL
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SCHOOL**

MONTEREY, CALIFORNIA

THESIS

**SERIOUS GAMES IN FEMA REGIONAL RESPONSE
COORDINATION CENTER TRAINING AND
EXERCISES**

by

Randy S. Brawley

September 2015

Thesis Advisor:
Second Reader:

Rodrigo Nieto-Gomez
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**SERIOUS GAMES IN FEMA REGIONAL RESPONSE COORDINATION
CENTER TRAINING AND EXERCISES**

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Submitted in partial fulfillment of the
requirements for the degree of

**MASTER OF ARTS IN SECURITY STUDIES
(HOMELAND SECURITY AND DEFENSE)**

from the

**NAVAL POSTGRADUATE SCHOOL
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ABSTRACT

This thesis describes how the Department of Homeland Security and the Federal Emergency Management Agency could use a serious game to improve performance, feedback, and engagement in Regional Response Coordination Center training and exercises. Despite the publicly acknowledged deficiencies of FEMA's response to Hurricane Katrina in 2005, more than half the positions FEMA identified for Hurricane Sandy in 2012 were filled by unqualified personnel. While training and exercises are but elements of the problem, they are essential to the solution. In particular, one weakness of traditional training and exercises is they do not sufficiently stress decision makers. An ever-increasing body of research exists demonstrating how serious games provide positive skill transfer and evoke similar reactions as real-world disasters. This paper presents a game design document and prototype for a Regional Response Coordination Center serious game called *72-Hours*. The game is intended to stress individual players and teams as they attempt to stabilize a disaster within the 72-hour goal set by the Federal Emergency Management Agency Administrator.

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LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---------|---|
| CNCS | Corporation for National and Community Service |
| COA | Course of Action |
| COP | Common Operating Picture |
| DCE | Defense Coordinating Element |
| DHS | Department of Homeland Security |
| DMAT | Disaster Medical Assistance Team |
| DMORT | Disaster Mortuary Operational Response Team |
| DOD | Department of Defense |
| DOE | Department of Energy |
| DOT | Department of Transportation |
| EOC | Emergency Operations Center |
| EPA | Environmental Protection Agency |
| ESF | Emergency Support Function |
| ESF #1 | Transportation (Department of Transportation) |
| ESF #2 | Communications (DHS/National Communications System) |
| ESF #3 | Public Works and Engineering (DOD/U.S. Army Corps of Engineers) |
| ESF #4 | Firefighting (USDA/U.S. Forest Service/FEMA/U.S. Fire Administration) |
| ESF #5 | Information and Planning (DHS/FEMA) |
| ESF #6 | Mass Care, Emergency Assistance, Temporary Housing, and Human Services (DHS/FEMA) |
| ESF #7 | Logistics (Government Services Agency/DHS/FEMA) |
| ESF #8 | Public Health and Medical Services (Department of Health and Human Services) |
| ESF #9 | Search and Rescue (DHS/FEMA) |
| ESF #10 | Oil and Hazardous Materials Response (Environmental Protection Agency) |
| ESF #11 | Agriculture and Natural Resources (U.S. Department of Agriculture) |
| ESF #12 | Energy (Department of Energy) |

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| ESF #13 | Public Safety and Security (Department of Justice/Bureau of Alcohol, Tobacco, Firearms, and Explosives) |
| ESF #14 | Superseded by the National Disaster Recovery Framework |
| ESF #15 | External Affairs (DHS) |
| FCO | Federal Coordinating Officer |
| FEMA | Federal Emergency Management Agency |
| FMS | Federal Medical Stations |
| FQS | FEMA Qualification System |
| GAO | Government Accountability Office |
| GIS | Geospatial Information System |
| GSA | Government Services Agency |
| HHS | Health and Human Services |
| HSEEP | Homeland Security Exercise and Evaluation Program |
| IAEM | International Association of Emergency Management |
| IAP | Incident Action Plan |
| IMAT | Incident Management Assistance Team |
| ISB | Incident Support Base |
| ISCRAM | International Information Systems for Crisis Response and Management |
| IT | Information Technology |
| LLIS | Lessons Learned Information Sharing |
| MRE | Meals Ready to Eat |
| MMO | Massively Multiplayer Online |
| MSEL | Master Scenario Event List |
| NCS | National Communications System |
| NDMS | National Disaster Medical System |
| NICS | Next-Generation Incident Command System |
| NPS | National Preparedness System |
| NEP | National Exercise Program |
| OIG | Office of Inspector General |
| PKEMRA | Post-Katrina Emergency Management Reform Act |
| PRT | Planning and Response Team |

| | |
|--------|---|
| RA | Regional Administrator |
| RISM | <i>Regional Incident Support Manual</i> |
| RRF | Resource Request Form |
| RRCC | Regional Response Coordination Center |
| RRCS | Regional Response Coordination Staff |
| RSP | Regional Support Plan |
| RSS | Resource Support Section |
| SAR | Search and Rescue |
| SAS | Situational Assessment Section |
| SITREP | Situation Report |
| UCS | Unified Command Staff |
| USACE | U.S. Army Corps of Engineers |
| USAR | Urban Search and Rescue |
| USCG | U.S. Coast Guard |
| USDA | U.S. Department of Agriculture |
| VTC | Video Teleconference |

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EXECUTIVE SUMMARY

By all accounts, the Federal Emergency Management Agency (FEMA) was not prepared for the overwhelming nature and catastrophic effects of Hurricane Katrina. Despite the lessons learned in Katrina, when Hurricane Sandy struck, only 47% of FEMA's identified required positions were filled by qualified personnel, 25% were filled by trainees, and 28% were vacant.¹ Clearly, FEMA had room to improve with respect to preparing its personnel for catastrophic disasters. Among other challenges, FEMA has not been able to provide the robust training and exercise program required to prepare the agency as a whole as well as the individual personnel. One solution to address the training and exercise need is to use serious video games to qualify personnel and teams. This thesis describes how FEMA could use a serious game to improve performance, feedback, and engagement in Regional Response Coordination Center (RRCC) training and exercises. Specifically, this thesis includes a game design document as well as a board game prototype for a computer game called *72-Hours* to improve performance, feedback, and engagement of FEMA Regional Response Coordination Staff (RRCS).

Hurricanes Katrina and Sandy uncovered deficiencies in the preparedness of emergency managers to effectively respond to catastrophic events. That is, emergency managers quickly become overwhelmed by catastrophic disasters because current training and exercises do not adequately stimulate decision making under the stress of an actual event. The severity of catastrophic disasters is such that emergency managers must react quickly to save lives. However, the events that FEMA faces on a regular basis are termed, "Recovery Disasters." These are non-catastrophic disasters that pass through an area quickly and are handled largely by local and state responders. The damage is done and FEMA basically helps the community clean up and rebuild. Lives are typically not at stake for FEMA so the pace is slower. While a state may receive a Presidential Disaster Declaration for one of these events, it may take months to evaluate the damage and process the declaration. The result of the difference between the "typical" disaster and the

¹ Federal Emergency Management Agency, *Hurricane Sandy FEMA After-Action Report*, (Washington, DC: Federal Emergency Management Agency, July 1, 2013), 32.

catastrophic ones is that FEMA Regional Response Coordination Staff can be woefully unprepared for the big ones.

FEMA currently lacks the exercise personnel and systems to provide a realistic, high fidelity environment, or detailed reconstruction for feedback. Full-scale exercises are the current, top tier of training for FEMA RRCCs. Interestingly, these exercises may not be the most effective method for training personnel in overwhelming situations. In their presentation to the 9th International Information Systems for Crisis Response and Management (ISCRAM) Conference, Lachlan MacKinnon and Liz Bacon stated, “Current crisis management training, at the strategic level, is predominantly focused on two approaches, table-top exercises and large-scale physical simulations. Unfortunately, neither of these approaches provides the necessary realism to accurately prepare trainees for the stress, volume and speed of decision-making required in an actual crisis situation.”² The challenge for FEMA is that it may not be capable of creating such a realistic training environment. In 2009, the GAO reported that the Post Katrina Emergency Management Reform Act requires exercises that stress the National Preparedness System (NPS) through stressful and realistic exercises. However, FEMA replied to the GAO that exercising to the point of failure is unlikely due to resource constraints.³ A creative approach to improving exercises is warranted.

A game-based training and exercise environment offers a solution to the problems inherent in the current system. Since disaster plans are typically based on scenarios, serious games may be ideal for designing training and exercises based on those plans. Trainees can be kept fully engaged while training for their FEMA Qualification System (FQS) roles. Games provide both immediate and end-of-game feedback. Since results are automatically captured, the accuracy of the lessons learned process is more accurate than with human observers. Games may be reset, replayed, and extended to review and

² Lachlan MacKinnon and Liz Bacon, School of Computing & Mathematical Sciences, University of Greenwich, U.K., “Developing Realistic Crisis Management Training,” (paper presented at the 9th International Information Systems for Crisis Response and Management (ISCRAM) Conference, Vancouver, Canada, April 22-25, 2012), l.mackinnon@gre.ac.uk, e.bacon@gre.ac.uk.

³ Government Accountability Office, “National Preparedness: FEMA Has Made Progress, but Needs to Complete and Integrate Planning, Exercise, and Assessment Efforts” (report to Congressional Requesters, Washington, DC: 2009), 49.

address corrective actions. Players could also simply log in at their workstations to participate in either individual or team training. Furthermore, a virtual, game-based environment will likely be very cost effective in the long run since travel of participants and controllers can be minimized. An ever-increasing body of research exists demonstrating how serious games provide positive skill transfer and evoke similar reactions as real world disasters. This paper presents a game design document and prototype for a Regional Response Coordination Center serious game called *72-Hours*. The game is intended to stress individual players and teams as they attempt to stabilize a disaster within the 72-hour goal set by the Federal Emergency Management Agency Administrator.

Fortunately, the United States does not face catastrophic disasters very often. But one result of this condition is FEMA personnel had great difficulty rising to the challenges of Hurricanes Katrina and Sandy. In part, training and exercises were lacking. Surprisingly, the participants of FEMA training and exercises may not even be blameworthy for their lack of engagement if the exercises do not give them sufficient stimulation to act on. However, this is not a FEMA-centric problem. In 2013, Gallup reported that only 30% of U.S. employees are engaged; 52% are not engaged; and 18% are actively disengaged.⁴ Clearly, there is great room for improvement for engaging employees. One solution to increase FEMA RRCS performance, feedback, and engagement is to use a serious game for training and exercises. This thesis presents both the game design document and analogue prototype for the multiplayer, serious game called *72-Hours*. The game is designed to support both FQS position certification and to train RRCS to react to catastrophic disasters. The next time a Katrina or Sandy strikes, FEMA personnel can be truly ready.

⁴ Gallup, "State of the Global Workplace Report 2013: Employee Engagement Insights for Business Leaders Worldwide," (Gallup Inc., 2013), 83.

LIST OF REFERENCES

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I. INTRODUCTION

Hurricanes Katrina and Sandy uncovered deficiencies in the preparedness of emergency managers to effectively respond to catastrophic events. That is, emergency managers quickly become overwhelmed by catastrophic disasters because current training and exercises do not adequately stimulate decision making under the stress of an actual event.

Catastrophic disasters are overwhelming in terms of size, scope, and pace of operations. Fortunately, the United States does not face them very often. Truly catastrophic disasters are of a scale that the full resources of the nation must be brought to bear. In addition, the severity of catastrophic disasters is such that emergency managers must react quickly to save lives. However, the events that the Federal Emergency Management Agency (FEMA) faces on a regular basis are termed, “Recovery Disasters.” These are of the nature of a flash flood, fire, or severe storm that passes through an area quickly and is handled largely by local and state responders. The damage is done and FEMA is helping the community clean up and rebuild. Lives are no longer at stake so the pace is slower. While a state may receive a Presidential Disaster Declaration for one of these events, it may take months to evaluate the damage and process the declaration. The result of the difference between the “typical” disaster and the catastrophic ones is that FEMA Regional Response Coordination Staff (RRCS) can be woefully unprepared for the big ones.

A. BACKGROUND

Despite the publicly acknowledged deficiencies of FEMA’s response to Hurricane Katrina in 2005, more than half of the positions FEMA identified for Hurricane Sandy in 2012 were filled by unqualified personnel. While training and exercises are but elements of the problem, they are essential to the solution. In particular, one weakness of traditional training and exercises is they did not sufficiently stress decision makers with the complexity and pace of a catastrophic disaster.

The Department of Homeland Security (DHS) Office of Inspector General (OIG) and the Government Accountability Office (GAO) have documented deficiencies in FEMA's training and lessons learned programs. Furthermore, FEMA has testified before Congress that it does not have the resources to run exercises to the breaking point.

FEMA regions typically use existing state & territorial catastrophic plans as the scenarios for their state/territorial-level exercises. However, FEMA currently lacks the exercise personnel and systems to provide a realistic, high fidelity environment, or detailed reconstruction for feedback. The result is that regional and state/territorial emergency managers do not experience critical, complex decision making under stress until faced with an actual disaster.

FEMA needs to produce better results for the millions of dollars it dedicates annually to training and exercises. The ideal environment would be similar to the U.S. Air Force's Virtual Flag, which is a tactical to operational-level exercise that virtually links aircrew with the Air and Space Operations Center. The Air and Space Operations Center is analogous to FEMA's Regional Response Coordination Center. In Virtual Flag participants experience a very realistic training in a web-based, distributed environment without leaving their home stations.

Similar to Virtual Flag, serious games offer the potential to provide engaging training and exercises in a team-building environment that continuously challenges participants to continuously reach higher level of performance. An ever-increasing body of research exists demonstrating how serious games provide positive skill transfer and evoke similar reactions as real world disasters. This thesis presents a game design document and prototype for a Regional Response Coordination Center serious game called *72-Hours*. The game is intended to stress individual players and teams as they attempt to stabilize and disaster within 72 hours.

B. SERIOUS GAMES AND FEMA TRAINING AND EXERCISES

The objective of this thesis is to develop a game design document and prototype that DHS and FEMA could use to develop an online, serious game to improve performance, feedback, and engagement of FEMA Regional Response Coordination Staff

(RRCS). While an actual catastrophic disaster would likely consume and overwhelm the RRCS, it is difficult in exercises to keep hundreds of people engaged to a similar level due to the immense amount of personnel resources to develop, deliver, monitor, and provide feedback regarding scenario events. Unfortunately, the result of underdeveloped training and exercises can be many players watching the clock and waiting for the end of the exercises without remaining engaged. The participants may not even be blameworthy for their lack of engagement if the exercise does not give them sufficient stimulation to act on. Interestingly, this is not a FEMA-centric problem. In 2013, Gallup reported that only 30% of U.S. employees are engaged; 52% are not engaged; and 18% are actively disengaged.⁵ Clearly, there is great room for improvement for engaging employees.

1. Engagement, Feedback, and Performance

One of the key methods to increase engagement is simply to capture and provide feedback to personnel. This is formally accomplished through FEMA's Continuous Improvement Program, which captures lessons learned from both training activities and real world disasters. Unfortunately, DHS and FEMA are performing poorly in actually learning from their exercises. In 2012, the DHS Office of Inspector General (OIG) determined that less than 40% of identified corrective actions were actually corrected following exercises between 2007 and 2009.⁶ The OIG concluded that FEMA is missing opportunities for improvement and its "disaster management operations may be adversely affected."⁷

Ultimately, the intent of any training and exercise effort by FEMA should be to improve the performance of its operations. Two indications of improvement needed in emergency management are the significant legislative changes that resulted from Hurricanes Katrina and Sandy; the Post-Katrina Emergency Reform Act of 2006

⁵ Gallup, "State of the Global Workplace Report 2013: Employee Engagement Insights for Business Leaders Worldwide," (Gallup Inc., 2013), 83.

⁶ Department of Homeland Security, Office of Inspector General, "FEMA's Management of Corrective Actions and Lessons Learned From National Level Exercises," (OIG-12-118 report, Washington, D.C.: Department of Homeland Security, September 2012), 4, accessed January 4, 2014, <https://www.hsdl.org/?view&did=722598>.

⁷ Department of Homeland Security, "FEMA's Management," 8.

(PKEMRA) and the Sandy Recovery Improvement Act of 2013 (SRIA) respectively. With respect to training, education and exercises, the Hurricane Katrina After Action Report stated, “Training is not nearly as costly as the mistakes made in a crisis. Equally important, this corps must be populated by leaders who are prepared to exhibit innovation and take the initiative during extremely trying circumstances.”⁸ Despite the lessons learned in Katrina, when Hurricane Sandy struck, only 47% of FEMA’s identified required positions were filled by qualified personnel, 25% were filled by trainees, and 28% were vacant.⁹ Clearly, FEMA was not able to correct its training deficiencies between Katrina in 2005 and Sandy in 2012. Again, as the DHS/OIG reported in 2012, DHS was aware of its deficiency in acting on lessons observed, but was unable to correct its poor performance in acting on those lessons.

2. Full-Scale Exercises and the Serious Game Solution

Full-scale exercises are the current, top tier of training for FEMA Regional Response Coordination Centers. Interestingly, these exercises may not be the most effective method for training personnel in overwhelming situations. In their presentation to the 9th International Information Systems for Crisis Response and Management (ISCRAM) Conference, Lachlan MacKinnon and Liz Bacon stated that “Current crisis management training, at the strategic level, is predominantly focused on two approaches, table-top exercises and large-scale physical simulations. Unfortunately, neither of these approaches provides the necessary realism to accurately prepare trainees for the stress, volume and speed of decision-making required in an actual crisis situation.”¹⁰ The challenge for FEMA is that it may not be capable of creating such a realistic training environment. An analogous program is the U.S. Air Force’s operational-level command and control

⁸ White House, “Homeland Security Training, Education, and Exercising,” in *The Federal Response to Hurricane Katrina: Lessons Learned*, (Washington, DC: White House, February, 2006), 72.

⁹ Federal Emergency Management Agency, *Hurricane Sandy FEMA After-Action Report*, (Washington, DC: Federal Emergency Management Agency, July 1, 2013), 32.

¹⁰ Lachlan MacKinnon and Liz Bacon, School of Computing & Mathematical Sciences, University of Greenwich, U.K., “Developing Realistic Crisis Management Training,” (paper presented at the 9th International Information Systems for Crisis Response and Management (ISCRAM) Conference, Vancouver, Canada, April 22-25, 2012), 1, l.mackinnon@gre.ac.uk, e.bacon@gre.ac.uk.

training program run by the 505th Command and Control Wing.¹¹ Specifically, four squadrons in the 505th Training Group run exercises equivalent to FEMA's RRCC/state-level exercises. However, based on FEMA's Congressional testimony, it may not be possible for FEMA to emulate that concept. In 2009, the GAO reported that the Post Katrina Emergency Management Reform Act requires exercises that stress the National Preparedness System (NPS) through stressful and realistic exercises. However, FEMA replied to the GAO that exercising to the point of failure is unlikely due to resource constraints.¹² A creative approach to improving exercises is warranted.

A game-based training and exercise environment offers a solution to the problems inherent in the current system. Since disaster plans are typically based on scenarios, serious games may be ideal for designing training and exercises based on those plans. Trainees can be kept fully engaged while training for their FEMA Qualification System (FQS) roles. Games provide both immediate and end-of-game feedback. Since results are automatically captured, the accuracy of the lessons learned process will be more accurate. Games may be reset, replayed, and extended to review and address corrective actions. Players could also simply log in at their workstations to participate in either individual or team training. Furthermore, a virtual, game-based environment will likely be very cost effective in the long run since travel of participants and controllers can be minimized. Based on the estimates in the next section, developing a serious game for Regional Response Coordination Center training and exercises is fiscally feasible.

3. Game Development Cost Formula

In order for a serious game to be a feasible solution, it must offer a positive value proposition. The Department of Defense (DOD) realizes a positive value for the millions of dollars per year it expends on simulations. For example, DOD uses simulators to keep pilot skills from atrophying. The Navy found that an F/A-18 Top Gun-trained pilot's

¹¹ "505th Command and Control Wing," accessed July 6, 2015, <http://www.505ccw.acc.af.mil>.

¹² Government Accountability Office, "National Preparedness: FEMA Has Made Progress, but Needs to Complete and Integrate Planning, Exercise, and Assessment Efforts" (report to Congressional Requesters, Washington, DC: 2009), 49.

skills revert to pre-training levels after 45 days without continuation training.¹³ Given the cost per flight hour of F-18's, simulators are natural bridges between flights. Given that FEMA Regional Response Coordination Staff may only engage in one to three full-scale exercises per year, it is easy to imagine how rusty their skills would be when catastrophes such as Katrina and Sandy actually strike. Clark Aldrich Designs LLC, estimate serious game development costs to range from \$10,000 to \$300,000.¹⁴ Similarly, SUCCUBUS Interactive estimated a cost of approximately \$23,000-\$230,000 (2014 dollars).¹⁵ Using SUCCUBUS Interactive methodology, the cost for a nominal 4-hour game would be approximately \$97,218. The calculations are presented in the following formula, and explained in Table 1.

$$\begin{aligned} \text{Cost "Per Hour"}^{16} &= \text{Price} = J*(T+Q+L) \\ P &= J*(T+Q+L) = (\$6,944+\$9,259)*(0+2+4) = \underline{\underline{\$97,218}} \end{aligned}$$

¹³ Dr. Joe Braddock, and Dr. Ralph Chatham, "Report of the Defense Science Board Task Force on Training Superiority & Training Surprise," (Washington, D.C.: Defense Science Board, Office of the Defense Undersecretary of Defense (AT&L), January, 2001), 5.

¹⁴ Clark Aldrich Designs LLC, accessed January 23, 2014, <http://www.clarkaldrichdesigns.com/2008/11/cost-of-computer-game-vs-cost-of.html>.

¹⁵ SUCCUBUS Interactive, "How Much is a Good Serious Game Costing," (presentation at Serious Game Expo, November 22, 2011), 10, accessed January 23, 2014, <http://www.slideshare.net/Succubuscomm/how-much-is-a-good-serious-game-costing>; <https://www.statbureau.org/en/eurozone/inflation-calculators?dateBack=2011-12-1&dateTo=2014-12-1>; <https://www.google.com/search?client=safari&rls=en&q=exchange+rate&ie=UTF-8&oe=UTF-8>.

¹⁶ SUCCUBUS Interactive, "How Much is a Good Serious Game Costing," 17-20.

Table 1. Game Development Cost Parameters

| Variable | Variable Description | Value | Value Description |
|----------|---------------------------------|-----------------------|--------------------------------|
| J | Type of Game | \$6,944 ¹⁷ | Reflection/Strategy/Management |
| J | Type of Game | \$9,259 ¹⁸ | Scenario |
| T | Existing Technology | 0 | Flash 2D |
| Q | Quality | 2 | Best Quality |
| L | Length “one-use gaming hour” | 4 | Gaming Hours |

SUCCUBUS Interactive Methodology for Calculating the Cost for a nominal 4-hour Video Game. After SUCCUBUS Interactive, “How Much is a Good Serious Game Costing,” 17–20.

Furthermore, Clark Aldrich Designs LLC estimates that serious game development time can be as short as six months.¹⁹ A starting estimate to develop a serious game for FEMA could be as low as \$100,000 and six months. This estimate must be refined to ensure it captures the cost of a Massively Multiplayer Online (MMO) game. Even if a significant pad is included, this cost and time is certainly feasible. FEMA spent \$218M between 2005 and 2010 on its exercise program and upwards of \$16 million on national level exercises.²⁰ Although the exercise expenditure between 2005 and 2010 was significant, FEMA’s National Level Exercise Program was cut by \$800,000 in Fiscal Year (FY) 2013 over FY 2012.²¹ While it is unknown whether the downward trend in

¹⁷ SUCCUBUS Interactive, “How Much,” (cost in 2011 Euros converted to 2014 Dollars), 17.

¹⁸ Ibid.

¹⁹ Clark Aldrich Designs LLC.

²⁰ Spencer S. Hsu, “National Disaster Exercises, Called Too Costly and Too Scripted, May Be Scaled Back,” (The Washington Post, April 2, 2010), accessed January 23, 2014, <http://www.washingtonpost.com/wp-dyn/content/article/2010/04/01/AR2010040103746.html>.

²¹ Department of Homeland Security, “Department of Homeland Security Federal Emergency Management Agency Salaries and Expenses,” (Congressional justification, Washington, D.C: Department of Homeland Security 2013), http://www.fema.gov/pdf/about/budget/11a_fema_salaries_expenses_dhs_fy13_cj.pdf.

exercise budget will continue, it is likely FEMA will need to find a cost-effective alternative to relying on full scale exercises.

A matrix of the game design document elements and milestones is shown in Table 2.

Table 2. Game Design Document—Milestone Matrix

| Milestone | Overview | Requirements Specifications | Technical Architecture | Game Design | Programming | Asset Acquisition & Development | Training & Debugging | Deployment | Maintainance & Troubleshooting | Project Management | Legal |
|-------------------------|----------|-----------------------------|------------------------|-------------|-------------|---------------------------------|----------------------|------------|--------------------------------|--------------------|-------|
| Requirements | X | X | | | | | | | | X | X |
| Technical Architecture | X | | X | | | | | | | X | X |
| Solution Design | X | | | X | | | | | | X | X |
| Code / Implement | X | | | | X | X | | | | X | X |
| Test / Debug | X | | | | | | X | | | X | X |
| Deploy | X | | | | | | | X | | X | X |
| Maintain / Troubleshoot | X | | | | | | | | X | X | X |

From Bryan Bergeran, *Developing Serious Games* (Hingham, MA: Charles River Media, 2006), 338.

C. SUMMARY

In summary, DHS and FEMA did not have a sufficiently robust training and exercise program to correct performance problems following Hurricane Katrina. As a result, less than half of the positions in Hurricane Sandy were filled by qualified personnel. Not only is its existing exercise program failing to provide the stressful environment required, but FEMA also failed to follow-up on corrective actions. In contrast, the DOD has used modeling and simulations for years to augment live training and real-world experiences. However, FEMA reported to the GAO it does not have the resources to conduct the stressful exercises mandated by the Post-Katrina Emergency Management Reform Act. While replacing some full-scale exercises with serious games presents a risk of development costs and the unknown impact of the new technology, games do provide a solution to keep people engaged, provide high-fidelity feedback, and ultimately improve FEMA staff performance. Ideally, FEMA will have far more than half of the emergency managers qualified the next time a catastrophic disaster strikes.

II. LITERATURE REVIEW

The intent of this thesis is to determine the applicability of serious games to FEMA RRCC training and exercises. Therefore, the sources for the literature review will include a wide spectrum, from federal directives, to actual gaming use, to the studies on games and simulation human performance.

The background for the problem statement is Congressional reports, after action reviews, and lessons learned from past training and exercises. While FEMA's Lessons Learned Information Sharing (LLIS) site has been offline since before October 2014, its official after action reports should ultimately be available. In addition, DHS Inspector General reports to Congress are available.

Since the intent is to design a game that could immediately enhance training and exercises, the *National Preparedness System* is a foundational document. Similarly, a successful program must include elements of the FEMA Qualification System, which defines performance standards for the Regional Response Coordination Staff. Due to the increasing application of simulation and gaming in the DOD as well as emergency management programs in other countries, there are a number of reports regarding the efficacy of gaming in training programs. Finally, due to the maturity of the computer gaming industry, there are a large number of sources regarding the actual design of games themselves.

Many books, reports, and conference presentations on serious games are available because gaming has matured and proliferated in recent years. Two main sources for the game design are Lewis Pulsipher's *Game Design: How to Create Video and Tabletop Games, Start to Finish*²² and Bryan Bergeron's *Developing Serious Games*.²³

In addition, Chad M. Gorman's Center for Homeland Defense and Security thesis, *Getting Serious About Games-Using Video Game-Based Learning to Enhance Nuclear*

²² Lewis Pulsipher, *Game Design: How to Create Video and Tabletop Games, Start to Finish*, (Jefferson, NC: McFarland & Company, 2012), accessed December 22, 2014, ProQuest ebrary. <http://site.ebrary.com/lib/nps/Doc?id=10589670>.

²³ Bryan Bergeron, *Developing Serious Games*.

Terrorism Preparedness, provided a baseline for research on using serious games for disaster preparedness. His work was followed up by a serious game prototype in 2013 by Lincoln Laboratories and Oak Ridge National Laboratory to deliver guidance for reacting to an improvised nuclear device detonation.

One of the most important groups in the game development is those who will play the prototype. Pulsipher writes that most games are not good at first and must be play tested.²⁴ Therefore, criteria must be established for observing players in order to improve and refine the game. Full testing of the game using multiple rounds and multiple subject groups of the game is beyond the scope of this thesis. However, DHS, Science and Technology have conducted gaming design through the Massachusetts Institute of Technology and Lincoln National Laboratories. Therefore, subject matter experts and their work are available as resources.

A. DHS/FEMA REGIONAL-LEVEL TRAINING AND EXERCISES

FEMA's National Exercise Program (NEP)²⁵ validates core capabilities as defined in the *National Preparedness Goal* to save lives, protect property and the environment.²⁶ In addition to exercises, the 31 core capabilities provide a common thread for a number of FEMA requirements such as the National Preparedness Report, National Planning Frameworks,²⁷ and Threat and Hazard Identification and Risk Assessments.²⁸ These core capabilities are the foundation for learning objectives in FEMA training and exercises. DHS and FEMA have done a poor job historically capitalizing on the lessons learned from past events and exercises. One challenge for FEMA in capturing lessons from training, exercises and actual disasters is the breadth of participants. For example,

²⁴ Pulsipher, *Game Design*, 16.

²⁵ Federal Emergency Management Agency, "National Exercise Program," accessed January 4, 2014, <https://www.fema.gov/national-exercise-program-nep-capstone-exercise-2014>.

²⁶ Federal Emergency Management Agency, *National Preparedness Goal*, accessed January 4, 2014, <https://www.fema.gov/media-library/assets/documents/25959?fromSearch=fromsearch&id=5689>.

²⁷ Federal Emergency Management Agency, "National Planning Frameworks," accessed January 4, 2014, <https://www.fema.gov/national-planning-frameworks>.

²⁸ Federal Emergency Management Agency, "Threat and Hazard Identification and Risk Assessment," accessed January 4, 2014, <https://www.fema.gov/threat-and-hazard-identification-and-risk-assessment>.

FEMA has ten geographic regions whose main subordinate exercise partners are states and territories. Each FEMA region maintains its own training, exercise, and Lessons Learned / Continuous Improvement Programs. While FEMA had a Lessons Learned Information Sharing site, there was not a coordinated feedback loop that evaluated whether FEMA Regions were actually applying lessons to new training, exercises, or even real world events. Similarly, Hurricane Katrina largely affected FEMA, Regions IV and VI, while Hurricane Sandy affected FEMA Regions I and II. Each region and their associated states are unique and relatively independent. Without a robust lessons learned program, the disparate regions may not learn from each other. In 2009, the Government Accountability Office (GAO), reported that the Post-Katrina Emergency Management Reform Act of 2006 (PKEMRA) requires exercises that stress the National Preparedness System through stressful and realistic exercises. However, FEMA replied to the GAO that exercising to the point of failure is unlikely due to resource constraints.²⁹ The GAO also reported that FEMA was not adequately tracking corrective actions as required by PKEMRA and the agency only discussed after action reviews at annual conferences.³⁰ Later in 2012, the Department of Homeland Security's (DHS) Office of Inspector General (OIG) determined that less than 40% of identified corrective actions were corrected for exercises between 2007 and 2009.³¹ The OIG concluded that FEMA is missing opportunities for improvement and its "disaster management operations may be adversely affected."³² Exasperating the problem of learning from exercises, the Lessons Learned Information Sharing (LLIS) Program website has been down since at least October 2014 and has no predicted time to be operational.³³ LLIS is FEMA's web-based repository for post-exercise and disaster evaluation reports. It should provide official reports regarding the effectiveness of FEMA training and exercises. However, the LLIS

²⁹ Government Accountability Office, "National Preparedness: FEMA Has Made Progress, but Needs to Complete and Integrate Planning, Exercise, and Assessment Efforts" (Report to Congressional Requesters: 2009), 49.

³⁰ Government Accountability Office, "National Preparedness," 40.

³¹ Department of Homeland Security, Office of Inspector General, "FEMA's Management," 4.

³² *Ibid.*, 8.

³³ David Allen, FEMA National Preparedness Assessment Division, e-mail message to author, December 19, 2014.

program office itself is unable to search the database at the time of this writing.³⁴ The inaccessibility of FEMA's lessons learned has hampered research for this paper. But it also demonstrates the need for a more effective method of feedback to trainees. In a thesis on lessons learned, Jeffrey Kaliner concluded that, "The complexity of modern day exercises and emergencies demands that responders be able not just to apply learning from past events but also to reflect, act, and learn in real time."³⁵

Providing for good learning in crisis management is not just a problem for DHS and FEMA. In their presentation to the 9th International Information Systems for Crisis Response and Management (ISCRAM) Conference, Lachlan MacKinnon and Liz Bacon, stated, "Current crisis management training, at the strategic level, is predominantly focused on two approaches, table-top exercises and large-scale physical simulations. Unfortunately, neither of these approaches provides the necessary realism to accurately prepare trainees for the stress, volume and speed of decision-making required in an actual crisis situation."³⁶

B. LEARNING IN SERIOUS GAMES

Game-based environments have become baseline elements of a number of organizations. For example, *America's Army* was designed essentially as a recruiting tool. The game was so successful that it has been developed further. One outgrowth of the gaming environment is that soldiers in combat zones play first-person shooter games such as *Halo* and *Call of Duty* in their time off.³⁷ The U.S. Army has also incorporated gaming in its tactical-level training with *Follow Me*. This game is designed with an intelligent tutoring system that provides three levels of feedback; real-time, after action review

³⁴ David Allen, personal communication.

³⁵ Jeffrey Kaliner, "When Will We Ever Learn? The After Action Review, Lessons Learned, and the Next Steps in Training and Educating the Homeland Security Enterprise in the 21st Century," (Thesis, Naval Postgraduate School, June 2013), v, accessed January 4, 2014, <https://www.hsdl.org/?view&did=741706>.

³⁶ Lachlan MacKinnon & Liz Bacon, "Developing Realistic," 1, l.mackinnon@gre.ac.uk, e.bacon@gre.ac.uk.

³⁷ Dr. Mario Herger, "Enterprise Gamification," (Presentation at GamifyCon 13, Published November 26, 2013), 10:40, <http://youtu.be/v2PIsksNLPk>.

playback, and after action review summary and analysis.³⁸ These capabilities address some of the deficiencies the DHS OIG reported in not following through with corrective actions. DHS Science and Technology (S&T) has also developed a tactical-level game prototype to prepare citizens for a nuclear fallout situation. They reported, “Fundamentally, serious games consist of an objective, game play rules, and feedback mechanisms to the player...In essence, serious game...are systems in which players engage in artificial conflict, defined by rules that results in a quantifiable outcome.”³⁹ As with *Follow Me*, their game provides immediate and post-game feedback. The DHS developers noted, “Often, serious games make use of models and simulations to depict actual scenario dynamics and phenomenology and can provide the player with higher fidelity feedback.”⁴⁰ Furthermore, the DHS S&T team addressed lessons learned and corrective actions by including hints for improving future performance.⁴¹

DHS and FEMA should also increase player engagement. Gallup reported that only 30% of U.S. employees are engaged; 52% are not engaged; and 18% are actively disengaged.⁴² Brian Burke wrote that gamification is a growing method to improve employee engagement.⁴³ Jeanne Meister describes how Deloitte sees gamification as a method to take “engagement and learning to the next level” in delivering lessons from such Universities as Harvard and Stanford.⁴⁴ Meister also describes how DOD’s Defense

³⁸ Randy Jensen, Bart Presnell, Stottler Henke Associates and Glen M. Cobb, U.S. Army Research Institute. “Automated Intelligent Training with a Tactical Decision Making Serious Game. (Research Product 2014-04, United States Army Research Institute for the Behavioral and Social Sciences, January, 2014). Accessed October 23, 2014. <https://www.hsdl.org/?view&did=756291>.

³⁹ Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831-6283 managed by UT-Battelle, LLC for the U.S. Department of Energy under contract DE-AC05-00OR22, and Lincoln Laboratory Massachusetts Institute of Technology, Lexington, Massachusetts 02420-9108, “Use of Series Games in FEMA Messaging of: Get Inside, Stay Inside, Stay Tuned,” (project Report, DOE Proposal No. 1457-V529-12, September 30, 2013), 6.

⁴⁰ Oak Ridge, “Use of Serious Games,” 6.

⁴¹ Ibid, 41.

⁴² Gallup, “State of the Global Workplace,” 83.

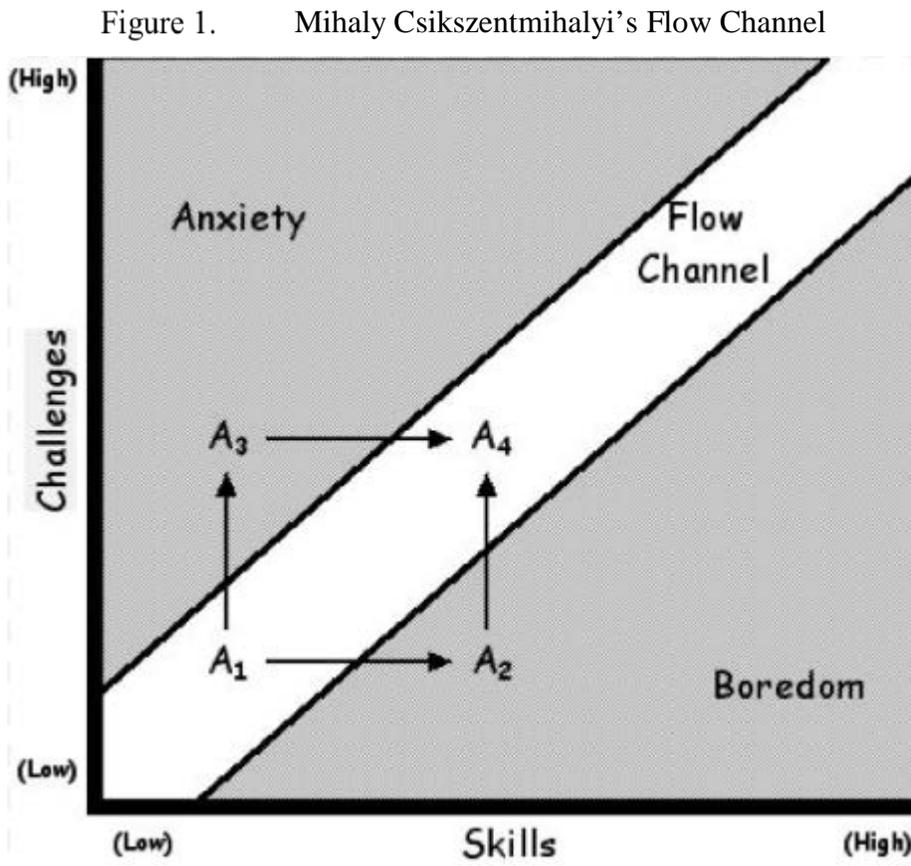
⁴³ Brian Burke, *Gamify: How Gamification Motivates People to do Extraordinary Things*, (Gartner, Inc, Brookline, MA: 2014).

⁴⁴ Jeanne Meister, (*Forbes*: May 21, 12, 6:11 PM), 2, accessed January 21, 2014, <http://www.forbes.com/sites/jeannemeister/2012/05/21/gamification-three-ways-to-use-gaming-for-recruiting-training-and-health-amp-wellness/>.

Acquisition University uses serious games to train employees how to work programs that are so large that employees are not likely to see them often.⁴⁵

1. Flow Channel

The ideal training and exercise program would put FEMA employees in what Mihaly Csikszentmihalyi calls the flow channel.⁴⁶ In order for people to maintain focus, they need to stay in the flow channel depicted in Figure 1.



From Mihaly Csikszentmihalyi, *Flow: The Psychology of Optimal Experience*, (New York: Harper and Row, 1990) 74.

⁴⁵ Ibid.

⁴⁶ Jesse Schell, *The Art of Game Design*, (Burlington, MA: Morgan Kaufmann Publishers, 2008), 119.

Training and exercise participants essentially begin at A₁. As described earlier in this paper, the DHS OIG determined DHS could not provide the requisite exercise intensity dictated by the Post-Katrina Emergency Management Reform Act.⁴⁷ Arguably, the resulting low-intensity FEMA exercises have placed participants at A₂ in Figure 1. That is, as they acquire skills, they become bored because the exercises do not provide sufficient challenge. On the other hand, if a training program, game-based or not, suddenly stressed people to failure, they would find themselves at A₃. At this point, people are frustrated and tend to simply give up. This happened to FEMA employees in Hurricane Sandy. In the Hurricane Sandy After Action Report, FEMA Administrator Fugate proclaimed, “We still do not go big enough, fast enough, or smart enough...We still train and exercise for what we can manage...We must plan, train and exercise even bigger to fracture the traditional mindset.”⁴⁸ However, if training and exercises now immediately pushed people to failure, FEMA would end up at point A₃. The sweet spot for a serious game for FEMA training and exercises would balance challenge with skill development and strive to move people up the flow channel to point A₄.

There are several considerations that a proposed serious game will need to address to move people up the flow channel⁴⁹:

- 1. There are clear goals at every step.** A serious game for FEMA should include both outer objectives regarding FEMA’s training requirements and inner objectives that the players establish based on the scenario and their skill level.
- 2. People receive immediate feedback.** Games are ideal for feedback because they provide immediate coaching and end of game feedback. This is in contrast to current after action reports that can take months to publish. The time lag severely decreases or eliminates participant enrichment.
- 3. Participants’ skill levels and challenges are in balance.** The very essence of game design is to provide a skill-challenge balance that motivates players to achieve ever-higher levels.

⁴⁷ Government Accountability Office, “National Preparedness,” 49.

⁴⁸ Federal Emergency Management Agency, *Hurricane Sandy*, i.

⁴⁹ Mihaly Csikszentmihalyi, “Creativity: Flow and The Psychology of Discovery and Invention,” 6, accessed February 6, 2015, <http://www.bioenterprise.ca/docs/creativity-by-mihaly-csikszentmihalyi.pdf>.

4. **People’s action and awareness are merged.** A common characteristic of games is they have displays for both individual and all players so they are aware of the impact of their actions.
5. **Distractions are excluded from consciousness.** The gaming environment must be immersive enough to garner participants’ full focus.
6. **People do not worry about failure.** This is an important aspect of a training and exercise program. In order for employees to accept the efforts, they must be stressed to the point of failure as dictated by the Post Katrina Emergency Management Reform Act without the stigma of failure. Games provide an excellent environment for players to try novel solutions.
7. **Self-consciousness disappears.** This is related to losing a fear of failure. When in the flow channel, people are “all in.”
8. **The sense of time becomes distorted.** This element is a good metric for a game-based solution. When people are in the flow, they lose track of time. The ideal is to move FEMA employees from being clock-watchers, waiting for ENDEX and have to be pulled out of the game at the termination time.
9. **The activity becomes autotelic.** In other words, an ideal game would have a purpose in its own right. People would not play the game because of some extrinsic reward. They would enjoy playing it for its own sake.

In summary, any training and exercise solution FEMA engages in would ideally keep people in the flow channel. In that state, they would maintain focus on the task(s) at hand without becoming either bored or frustrated. The nine elements of flow are not the only or all-inclusive considerations for a serious game. However, they provide an excellent benchmark when evaluating the results as people actually play the game.

2. **Serious Games in Crisis Management**

MacKinnon and Bacon discussed the benefits of Project Pandora, which is a serious game solution to train leaders in strategic-level disaster response. Specifically, Project Pandora is a gaming environment aimed at training emergency managers to make strategic plans, develop response and collaboration skills, and even learn to address the media. The game is designed to be a bridge between tabletop and full-scale exercises. This is precisely where a game for FEMA Regional Response Coordination Centers would reside in the training and exercise program. They conclude that serious games can

be used to enhance disaster response decision-making training in a stressful environment.⁵⁰

In “Training for Crisis response with Serious Games Based on Early Warning Systems,” Simone De Kleermaeker, Annette Zijerveld, and Bart Thonus, reported how serious games could be designed to be effective training tools for crisis response efforts in flooding in the Netherlands.⁵¹ Like *Follow Me*, their game trains first responders at the tactical level.

In “First Responder Weapons of Mass Destruction Training Using Massively Multiplayer On-Line Gaming” Thomas Richardson reported on the fiscal feasibility and cost effectiveness of developing and using serious games in disaster response.⁵² He reported that training times have been reduced by 80%⁵³ and organizations have reduced training cost to 2% of their previous costs.⁵⁴

In summary, other countries are already using gaming to train emergency managers and responders. In addition, they have proven to be effective from both a performance and cost basis.

3. Serious Game Transfer

The efficacy of a videogame-based training environment is ultimately determined by whether there is actual transfer from the gaming environment to the high-stress of real world disasters. In their paper “Training for Crisis Response with Serious Games Based on Early Warning Systems,” Heide Lukoshch, Theo van Ruijven, and Alexander Verbraeck concluded that serious games could evoke some of the same sensory responses

⁵⁰ MacKinnon and Bacon, “Developing Realistic,” 5.

⁵¹ Simone De Kleermaeker et al., “Training for Crisis response with Serious Games Based on Early Warning Systems,” (paper presented at the 8th International ISCRAM Conference – Lisbon, Portugal, May, 2011), 1.

⁵² Thomas J. Richardson, “First Responder Weapons of Mass Destruction Training Using Massively Multiplayer On-Line Gaming,” (Thesis, Naval Postgraduate School, June, 2004), accessed on October 24, 2014. <https://www.hSDL.org/?view&did=448641>.

⁵³ Thomas J. Richardson, “First Responder,” 62.

⁵⁴ *Ibid.*, 63.

as the real world.⁵⁵ Furthermore, they reported, “Transfer research emphasizes that transfer is effective when the trained skills have similar logical or deep structures in virtual and in real world (Lehman, Lempert & Nisbett, 1988).”⁵⁶ In other words, if designed correctly, serious games can provide effective crisis response training that transfers to real world disasters. In, “Serious Games as a Means for Scientific Knowledge Transfer-A Case from Engineering Management,”⁵⁷ Tobias Mettler and Roberto Pinto presented their concept for how to design serious games to provide, “the content for training at different levels, from scholars to professionals.”⁵⁸ Beyond the potential for serious games to enable people to acquire knowledge, skills, and competencies, Mettler and Pinto provided a knowledge transfer framework (Figure 2) that can be used for game design to set outcomes such as knowledge acquisition, content understanding, cognitive skills, behavior and attitude change, physiological outcomes, and social/soft skills outcomes.⁵⁹

⁵⁵ Heide Lukoshch, Theo van Ruijven, and Alexander Verbraeck, Dleft University of Technology, “The other city – Designing a serious game for crisis training in close protection,” (paper presented at the 9th International ISCRAM Conference – Vancouver, Canada, April 2012), 2.

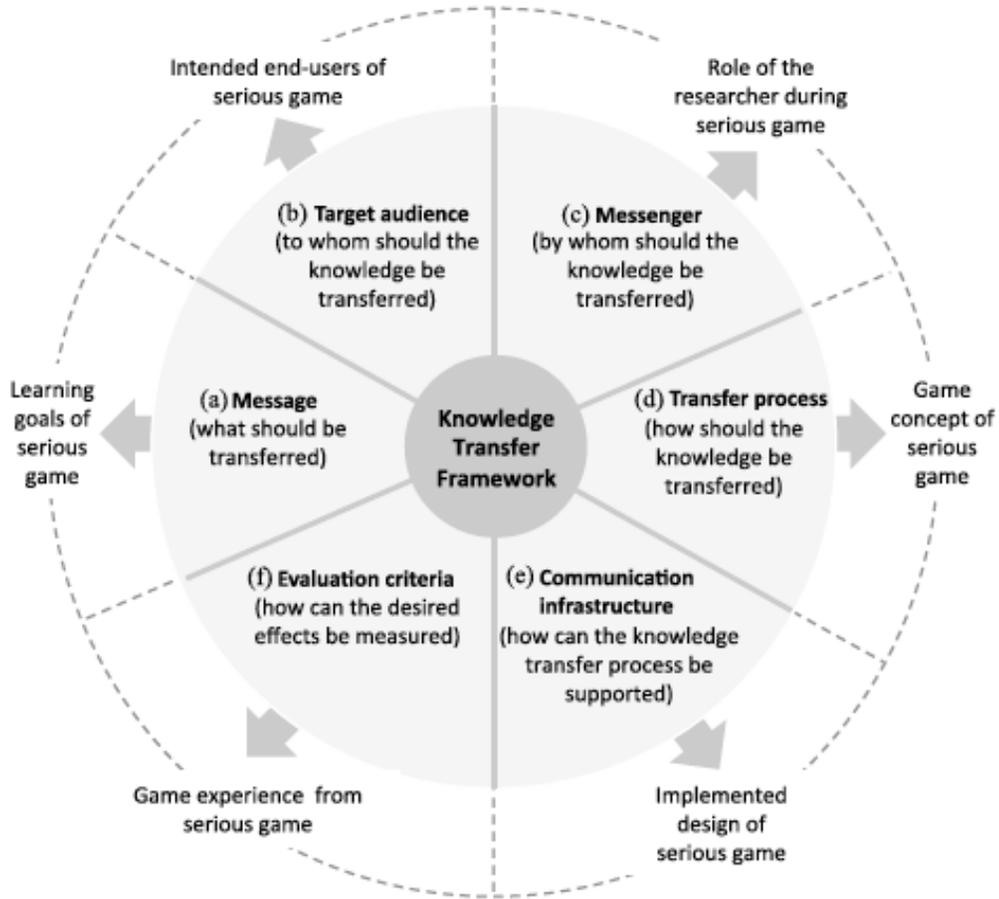
⁵⁶ Heide Lukoshch et al., “The other city,” 1.

⁵⁷ Tobias Mettler and Roberto Pinto, “Serious games as a means for scientific knowledge transfer - A case from engineering management education,” *IEEE Transactions on Engineering Management*, 62(2), 256, accessed June 28, 2015, <http://search.proquest.com/docview/1676135315?accountid=12702>.

⁵⁸ Mettler and Pinto, “Serious Games,” 257.

⁵⁹ Mettler and Pinto, “Serious Games,” 258.

Figure 2. Reference Knowledge Transfer Framework



From Tobias Mettler and Roberto Pinto, “Serious games as a means for scientific knowledge transfer - A case from engineering management education,” *IEEE Transactions on Engineering Management*, 62(2): 257. Accessed June 28, 2015. <http://search.proquest.com/docview/1676135315?accountid=12702>.

In, “Assessing the Validity of Using Serious Game Technology to Analyze Physician Decision Making,”⁶⁰ Mohan, et al. reported on the results of a study that evaluated whether a serious game emulates real world results of emergency room physicians. The study concluded that, “We found that physicians made decisions consistent with actual practice, that we could manipulate cognitive load, and that load

⁶⁰ Deepika Mohan et al., “Assessing the validity of using serious game technology to analyze physician decision making,” *PLoS One*, 9(8), accessed June 29, 2015, doi:<http://dx.doi.org/10.1371/journal.pone.0105445>.

increased the use of heuristics, as predicted by cognitive theory.”⁶¹ The results are salient for FEMA because emergency managers must also make decisions in a fast paced, high stress environment in which lives may be at stake.

Several conclusions can be drawn from the current application of serious games in crisis management training with respect to this thesis:

1. Programs such as Project Pandora are already being used to improve crisis management training.
2. Serious games have provided positive transfer for emergency room physician training.
3. Serious game development is economically feasible.

C. SUMMARY

There is a very real requirement to provide realistic emergency management training in a stressful environment and provide trainees effective feedback regarding the training. Current tabletop and full-scale exercises simply do not have the fidelity to do so. Even when exercises occur, DHS and FEMA are not following up on the lessons learned. FEMA lessons learned for exercises and actual disasters have been unavailable for review for more than eight months at the time of this writing. Even when the after action reports were available, FEMA had a poor record of following up on the actions. Furthermore, the after action reviews did not provide a methodology for exercise participants to learn in real time. A serious game that uses *National Preparedness Goal* core capabilities to provide real time play and feedback to participants has the potential to address the adverse effects of disaster operations identified by the DHS OIG. One of the great advantages of serious games is they provide instant and end of game feedback for both individuals and teams.

Using serious games has taken hold and is expanding in both the private and public sectors. Three major advantages provided by serious games are feedback, increased engagement, and a realistic feel. The excellent feedback mechanism afforded

⁶¹ Ibid.

by games has the potential to partially address the FEMA weakness identified by DHS OIG and the GAO in corrective action follow through. Secondly, games are effective in increasing engagement for employees. And third, serious games provide an opportunity to train employees on stressful, large-scale scenarios that they do not see on a regular basis. Translating these advantages to emergency management holds promise for improving disaster operations training and exercises.

Serious games are taking hold in disaster response as well. The literature review found that the leaders in disaster response serious gaming are in Europe. While there is some work using serious games for preparing for nuclear fallout, DHS and FEMA have yet to incorporate serious gaming in “strategic-level” emergency management. Strategic-level in this sense equates to FEMA National/Regional Response Coordination Centers. It appears that incorporating serious games into National/Regional Response Coordination Centers is underdeveloped and an area wide open for further research and development.

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III. RESEARCH DESIGN

The main objective in the research was to develop a game design document and prototype of a serious online game called *72-Hours* for FEMA's regional-level exercises. The research followed three main efforts. First, existing research on the use of serious games for training was reviewed to establish a baseline of knowledge regarding the applicability of serious games to training. Second, a game design document was created that could be used as a standalone resource for further game development. Third, a prototype board game was developed in support of the game design document. Although developing and testing a prototype game is part of the game design document, it is presented in this thesis as a standalone product that developers could use as a game in its own right. Due to the nature of having the game design document and the prototype design as standalone elements, the reader will find some redundancy between these sections. The 72-hour theme is based on the *FEMA Strategic Plan: Fiscal Years 2011–2014*, "(1) Developing a framework for catastrophic planning that focuses on stabilizing an event within 72 hours."⁶² Tabletop prototypes are a common and even essential technique for video game designers.⁶³ Since the actual coding involved in computer games represents a significant cost, game developers use board game prototypes to test and refine the game play. The research involved basic game theory and design of computer and board games. The prototype is a combination of board game and a computer game. The board game aspect involves players playing in turns, drawing input cards, and using physical turn markers. Due to the need to have both large and small scale map displays, it was actually easier to use the mapping function of the Next-Generation Incident Command System (NICS). This collaborative, online disaster management application has been used in many fire responses. The end result is a game design document and prototype that could be translated into a multiplayer online game and could fit into the Homeland Security Exercise and Evaluation Program (HSEEP).

⁶² Federal Emergency Management Agency, *FEMA Strategic Plan: Fiscal Years 2011-2014*, FEMA P-806, (Washington, D.C.: Federal Emergency Management Agency, February, 2011), i.

⁶³ Lewis Pulsipher, "*Game Design*," 16.

A. STATUS OF GAMES IN THE HOMELAND SECURITY EXERCISE AND EVALUATION PROGRAM

The Homeland Security Exercise and Evaluation Program describes two major categories of exercises; discussion-based and operations-based. Games are described in HSEEP as discussion-based exercises. However, games are not the standard for conducting exercises. FEMA regions, in conjunction with states and territories, use functional exercises and full-scale exercises to evaluate plans and procedures. This thesis will seek to break this mold and posit that serious games can be a basis for operations-based exercises. In order to do so, the proposed game must emulate the functions currently performed by human exercise observers and evaluators.

Functional exercises focus on “plans, policies, procedures, and staff members involved in management, direction, command, and control functions.”⁶⁴ Functional exercises run real-time and a simulation cell controls the scenario with inputs that follow a Master Scenario Event List (MSEL). However, the functional exercises simulate much of the movement of personnel and resources. Given that the movement of personnel and resources is simulated in functional exercises, serious games, with their mature game engines, artificial intelligence and high fidelity, have the potential to greatly enhance these training and exercise events. Furthermore, games may be run at various speeds as required based on player exercise levels as well as exercise objectives.

Full-scale exercises are complex and expensive because compared to a functional exercise, many more participants and resources are mobilized for the effort. Full-scale exercises also typically include multiple agencies at the federal, state, and local levels of government. Due to their cost, complexity and level of effort, full-scale exercises could perhaps benefit the most from a serious game platform. Games can bring together a great number of personnel from disparate agencies and locations in a realistic and interactive environment. Since every action in a game is recorded, feedback and analysis are more robust and accurate than that provided by a limited number of observers and evaluators.

⁶⁴ Department of Homeland Security, *Homeland Security Exercise and Evaluation Program (HSEEP)*, (Washington, D.C.: Department of Homeland Security, April, 2013), 2-6.

B. EVALUATION CRITERIA FOR IMPLEMENTING SERIOUS GAMES IN FEMA TRAINING

(1) Effectiveness

The effectiveness is simply the ability to evaluate exercise participants' performance with respect to the FEMA Qualification System and core capabilities. The ideal is a program that provides individuals and teams both immediate feedback when appropriate, as well as an overall performance assessment. The game should also provide different levels of challenges for teamwork as a whole to improve performance. For example, a catastrophic flood may result in 10,000 survivors needing to be rescued within 72 hours. The game could provide feedback regarding attainment of the goal. Each time the game is played, participants can be challenged to rescue more people, or in different locations, or under different levels of damage than in the last event. In short, games provide an ideal platform for performance effectiveness feedback. In order to improve the effectiveness of the cognitive transfer, the prototype game is based to the maximum extent possible on actual disaster planning factors. For example, FEMA estimates each survivor needs three liters of drinking water and two Meals Ready to Eat (MRE) per day. Even unpredictable factors such as the cost to rent material handling equipment (MHE) have been calculated based on currently advertised rates. Beyond improving teamwork and leadership under pressure, players will internalize actual FEMA planning factors by playing the game.

(2) Cost

The cost of implementing a gaming solution could be as low as \$100,000 and take approximately six months. This is a fraction of the \$800,000 that FEMA's National Level Exercise Program was cut in Fiscal Year (FY) 2013 over FY 2012.⁶⁵ While it is unknown whether the downward trend in exercise budget will continue, any policy decision will obviously have to maximize the resources. A serious game should provide

⁶⁵ Department of Homeland Security, "Federal Emergency Management Agency Salaries and Expenses."

not only greater effectiveness, but also greater fiscal efficiency. This criterion is largely one of judging if a MMO game for FEMA exercises is economically feasible.

(3) Realism

The game requires a high degree of realism in order to provide the stressful environment required to prepare people for large-scale disasters. However, the real world does not have to be replicated precisely as long as the requisite cues are available. Since it is a command and control environment, the players do not need to maneuver through disaster neighborhoods like in a first person shooter game. Similarly, the telephone doesn't necessarily need to ring. If players wear headsets, they may receive calls through the computer system rather than actual telephone. The game environment does need to present authentic cues for operations in terms of communication, coordination, and information gathering difficulties. The game must also accurately model the time element in attempting to quickly support disaster survivors and responders. If it would take 48 hours and \$100,000 to move a search and rescue across country, then it should take that amount of game time and reflect costs, transportation challenges, etc. The intent is to stimulate the players through information overload. If those cues can be provided through a reasonable simulation, then a great deal of cost and complexity can be eliminated. D.H. Andrews, Colonel Lynn A Carroll, and Herbert H. Bell referred to this as the 60% solution in, "The Future of Selective Fidelity in Training Devices."⁶⁶ Andrews, Carroll, and Bell found that in such simulations as for tank crews, about 60% fidelity was sufficient to achieve the training objectives for multi-crew coordination.⁶⁷ The bottom line is even if 100% fidelity is possible, it would likely be cost prohibitive and unnecessary. FEMA would need to balance cost and fidelity to arrive at a suitable solution.

⁶⁶ D.H. Andrews, Colonel Lynn A. Carroll, and Herbert H. Bell, Armstrong Laboratories, "The Future of Selective Fidelity in Training Devices," (Final Technical Report, Air Force Material Command, Brooks AFB, TX: 1996), 2, accessed February 7, 2015. <http://oai.dtic.mil/oai/oai?verb=getRecord&metadataPrefix=html&identifier=ADA316902>.

⁶⁷ Ibid.

(4) Is the Solution a “Good Game”?

Ultimately, the proposed game must be good. FEMA employees should want to play the game for it to be effective. Lewis Pulsipher provides some criteria for what constitutes a good game.⁶⁸ The overriding concern is gameplay. Other criteria relevant to FEMA are:

1. The game is “**player centric**.”⁶⁹ The game design must focus on the players and not the designer. This will be a challenge since the design will seek to impart training defined by guidance while keeping players in mind. Due to the limited scope of this thesis, this factor would have to occur later during player testing.
2. The game has “**interesting challenges**.”⁷⁰ Since regional-level disaster response occurs in a command and coordination center, there are no exciting physical challenges as in a first-person shooter game. The challenge will be more cerebral. The concept will be to stimulate excitement by placing players in a time-constrained environment, just like the real world. Players will, in fact, either help or leave stranded tens of thousands of disasters survivors in *72 Hours*.
3. The players should have a “**choice**”⁷¹ and ability to affect the outcome of the game. Fortunately, this is the very essence of training decision makers. The game will ideally be a “sandbox” that will allow decision makers to try different strategies with each game playing experience. In *72-Hours*, players will quickly see the results of their decisions on the population in need.
4. The game will have to foster “**interaction with others**.”⁷² Since this is the essence of disaster response, the game will need to have a realistic collaborative environment. Each role will have different capabilities and authorities that align with actual *Regional Incident Support Manual* roles and responsibilities. This will foster a collaborative environment.
5. The game should have a high “**activity**”⁷³ level so players are not spending a great deal of time waiting for their turn. In order to accomplish this, the game will be a sandbox that will allow simultaneous play while

⁶⁸ Ibid.

⁶⁹ Ibid.

⁷⁰ Ibid.

⁷¹ Ibid.

⁷² Ibid.

⁷³ Ibid.

following 10-minute turns based on an actual RRCC operational tempo. Players will actually simultaneously engage in their respective roles and then come together at the end of each turn. There is minimal to no condition of players sitting around watching others.

6. The game should have great “**replayability**.”⁷⁴ This occurs when the game presents new challenges and outcomes each time it is played. A game that feels the same every time you play it will not be successful. *72-Hours* is intended to be a game that will be extremely difficult to win. This is similar to the immense challenge of actually stabilizing a disaster within 72 hours. In the game, players can use different strategies and actions to obtain a different outcome with each round of play.
7. The game should have “**memorability**.”⁷⁵ Memorability occurs when the play is significant enough that players talk about it after the fact. Per the literature review, a serious game actually has the ability to stimulate similar emotions as real world events.
8. The game should have good “**play balance**.”⁷⁶ A good game is fair and rewards players as they increase their skills. A fair game is one in which players can win in a predictable manner. For example, many children’s games, like *Candy Land*, are based on pure chance and luck of the draw. Games like chess are both fair and rewards players who improve their skills. Due to the extreme time constraints levied on players in *72-Hours*, they will undoubtedly improve their score as they increase their positional knowledge and skill.
9. The game should have “**multiple ways to win**.”⁷⁷ Games like tic-tac-toe have a winning strategy. The player who goes first can take the center square and always win or draw. A good game, on the other hand, provides for multiple strategies to win. As stated earlier, *72-Hours* would have a sandbox feel and allow players to try different strategies. While there may be definite wrong ways to respond to a disaster, there really are no clear right ways. Each is unique and players can respond accordingly.
10. The game should have a good “**control scheme/user interface**.”⁷⁸ How easy is the game to play? The proposed game will rely on players knowing their actual real-world roles. However, it should provide an easy interface. Furthermore, the game should be easy for game masters (exercise control specialists) to tailor and provide exercise injects. Every disaster is a new,

⁷⁴ Ibid.

⁷⁵ Ibid.

⁷⁶ Ibid.

⁷⁷ Ibid.

⁷⁸ Ibid.

unique experience. Therefore, a training environment repeatedly focusing on the same narrow skills would not be sufficient. Fortunately, C.S. Green and D. Bavelier found that, “the true effect of action video game playing may be to enhance the ability to learn new tasks.”⁷⁹ In other words, action video games actually teach people to learn. Game-based training can provide benefits well beyond simply learning how to win the specific game.

(5) Adoptability

The game must be designed for use by typical players based on their information technology. For example, a game based on consoles or specific devices would be difficult to adopt across the spectrum. However, a PC based game that uses standard Internet interface software will enable good adoptability.

Table 3 is a matrix of matrix of the five evaluation criteria that should be considered for *72-Hours*. In order to be successful, the game should score favorably across the five criteria.

Table 3. Evaluation Matrix

| Effectiveness | Cost | Realism | Good Game | Adoptability |
|---------------------------------|---------------------------------------|--|--|--|
| Ability to evaluate performance | Feasible within budgetary constraints | Sufficiently stimulate players similar to an actual disaster | A “good game” as defined by sub-criteria | Acceptable training platform for leaders and players |

C. SCOPE AND LIMITS

This thesis will focus on designing a serious game based on the *National Preparedness Goal* core capabilities, the FEMA Qualification System (FQS), and the *Regional Incident Support Manual* (RISM), to guide player action in scenarios that are based on emergency operations plans. Gamification (related to, but different from serious

⁷⁹ C.S. Green and D. Bavelier, “Learning, Attention Control, and Action Video Games,” (Current Biology 22, R197-R206: March 20, 2012), 197, accessed February 7, 2015, http://ac.els-cdn.com/S0960982212001303/1-s2.0-S0960982212001303-main.pdf?_tid=01881646-aed5-11e4-ada1-00000aacb35e&acdnat=1423319240_5ef0d73f63c9ef9596ab8253a1bf8e5f.

games) is growing in use for a number of applications. For example, the Department of Defense uses gamification to “bring real-world situations to life in a controlled environment.”⁸⁰ Due to the extensive online gaming industry as well as cases that will be cited in the paper, it is assumed that the intrinsic value and feasibility of gaming has been well established. Therefore, rather than build the case for using serious games in general, the thesis will demonstrate the application of serious games to FEMA regional-level training and exercises.

This thesis is also limited to a demonstration by the author of a serious game prototype. Follow-on research would be needed to specifically evaluate players using the prototype. The ultimate computer game development would also need to follow in a more extensive effort.

D. 72-HOURS DEVELOPMENT PROCESS

The researcher is not a computer game player. Therefore, there were no preconceived notions about the final design and nature of *72-Hours*. A literature review of game design was complete before beginning development of *72-Hours*. Based on the literature review, it was determined that the game would be a collaborative, serious, role-playing, real-time strategy game. Furthermore, for the thesis to be a valid concept for DHS and FEMA to use, it would have to provide positive transfer to actual Regional Response Coordination Staff positions. Part of the realism includes using real-world data and planning guides. Finally, the nature of the play itself should capture the essence and feel of a Regional Response Coordination Center. This section outlines the researcher’s methodology for realizing each of these factors.

Player Roles: The essence of Regional Response Coordination Staff performance is collaboration. While key members of the RRCS have the authority to actually commit resources and make operational decisions, they not only rely on their subordinate section’s staff, but other leaders as well to accomplish the mission. This condition lends itself to a direct translation to good gaming design of using asymmetric roles to force players to work together. While the interdependencies are simplified in the game, the

⁸⁰ Jeanne Meister, *Forbes*.

roles match actual *Regional Incident Support Manual* roles and responsibilities. For example, in the prototype, the RISM information sharing methodology is emphasized by having the Situational Awareness Section Chief being responsible for drawing and distributing all situational input cards.

Serious Game Elements: Serious games have a purpose other than entertainment. Since the very intent is to use *72-Hours* as a training platform, it needs to emulate a real world disaster response. *Battlestar Galactica* and *Pandemic* are excellent, cooperative, role playing, strategy games. Since they are so difficult to win, the players must work well together and learn from past games to be successful. This is, of course, similar to the necessary condition of FEMA RRCC training and exercises. While having Regional Response Coordination Staff simply play these games may help them to become better strategists and team players, they will not learn their respective *Regional Incident Support Manual* positions. Therefore, the game design is based on RISM positions as well as individual FEMA Qualification System standards. The player roles and responsibilities (Appendix B) are as defined in the *Regional Incident Support Manual*. There are no fictitious characters or super capabilities.

Realism: The game should use accurate planning factors to enhance realism. The challenge with the *72-Hours* prototype is to develop a “board” game with a realistic enough feel for players to have a positive transfer to Regional Response Coordination Center Operations. Actual or realistic planning factors are used in the player handbook materials. FEMA essentially conducts its disaster response efforts by creating resource requests and issuing mission assignments. Mission assignments are nothing more than contracts between FEMA and other organizations to provide disaster response support. The resource sourcing cards (Appendix D) are based on the FEMA Region IX prescribed mission assignment library. Due to the extreme time constraints in *72-Hours*, the statements of work on each card are simplified. The numerical factors on each card are either based on actual FEMA guides or are representative of real world conditions. For example, FEMA’s “Incident Support Handbook”⁸¹ is the source for many planning

⁸¹ Federal Emergency Management Agency, “Incident Management Handbook,” F-5.

factors such as the truck payloads, number of personnel required for a Point of Distribution, and the amount of commodities such as ice, water, meals, blankets, and tarps each disaster survivor will need. FEMA's "Commonly Used Sheltering Items & Services Listing Catalogue"⁸² is the source for information about requirements such as infant-toddler kits, durable medical equipment and, consumable medical supplies. The Department of Health and Human Services was the source for the capacity of Federal Medical Stations, Disaster Management Assistance Teams, and Disaster Mortuary Operational Response Teams. The airlift capacities of C-17⁸³ and C-130⁸⁴ aircraft are from official U.S. Air Force web pages. FEMA's, "Schedule of Equipment Rates"⁸⁵ was the source for costs such as the material handling equipment. In short, the planning factors are actual numbers to the maximum extent possible.

Simplifications: The three, major simplifications are for resource movement costs, the amount of durable medical equipment and the amount of consumable medical supplies. Although FEMA responds to many disasters each year, the final statements of work are not let until each disaster occurs. This means that even with DOD, FEMA negotiates a final cost for its movement needs. However, what is consistent is DOD airlift is the most expensive airlift option, commercial airlift is less expensive, and surface movement is the least expensive of the three options. In order to simulate this relationship, the resource sourcing cards simply reflect that differential with realistic costs. In addition, FEMA's "Commonly Used Sheltering Items & Services Listing Catalogue"⁸⁶ uses a planning factor of 10% of a shelter population requiring infant toddler kits. However, it has no similar factor for durable medical equipment or

82 Federal Emergency Management Agency, "Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue," (Washington, D.C.: Federal Emergency Management Agency, August, 2011), 2-10.

83 U.S. Air Force, "C-17 Globemaster III," accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104523/c-17-globemaster-iii.aspx>.

84 U.S. Air Force, "C-130 Hercules," accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104517/c-130-hercules.aspx>.

85 Federal Emergency Management Agency, "Schedule of Equipment Rates," accessed July 7, 2015, <https://www.fema.gov/schedule-equipment-rates>.

86 Federal Emergency Management Agency, "Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue," (Washington, D.C.: Federal Emergency Management Agency, August, 2011), 2-10.

consumable medical supplies. The *72-Hours* prototype uses a planning factor of 5% of the shelter population for both of these categories. In addition to the situational input cards and the resource request sourcing cards, the planning factors are used in the player handbook. The researcher combined the various guides and sources into an Excel workbook and the player handbook into a consolidated resource that players and even Regional Response Coordination Staff can use to expedite their response efforts. The Excel workbook, as well as the other supplemental materials, may be accessed through the Dudley Knox Library at <http://hdl.handle.net/10945/46412>.

High-Tempo Environment: Finally, in actual RRCC operations, personnel are synchronized by an operational tempo and operate simultaneously to accomplish their individual tasks. This dynamic lent itself to making *72-Hours* a simultaneous play, turn-based game. Not only does this type of game provide realism, but simultaneous play is also an excellent game design technique to increase player engagement. *72-Hours* is specifically designed to be a simultaneous, turn based game. Just as in actual disaster response operations, the players work on their respective responsibilities and then come together at the end of each turn to accomplish tasks similar to those outlined in the *Regional Incident Support Manual* operational tempo. For example, the Planning Support Section typically works with a small team on the Regional Support Plan and then briefs that plan according to the operational tempo. This same concept would be captured in *72-Hours*. Since developing a computer game by writing code would be a high-cost and high-risk venture, the first step is to establish a proof of concept with a board game prototype.

In summary, *72-Hours* was designed by deconstructing the operations and nature of Regional Response Coordination Center disaster response operations as defined in the *Regional Incident Support Manual*. RRCC operations were then overlaid onto computer game design fundamentals. Then, as with the industry standard, the board game prototype was developed to mimic Regional Response Coordination Center and an eventual *72-Hours* computer game to the maximum extent possible. The prototype is essentially a board game played on a web-based platform. Due to the fidelity of the prototype, even if

FEMA does not develop the full *72-Hours* computer game, the agency could use the prototype as a training aid.

Limitations: While *72-Hours* is designed to improve FEMA's RRCC training and exercises, the prototype and final version of the game have limitations. The most significant limitation is *72-Hours* is intended to help leaders and staff make decisions under pressure. The assumption is the leadership and the staff are fundamentally sound and have accomplished basic FEMA training. This is especially true for the board game prototype. Computer games, on the other hand, can be designed to coach individual players and provide performance feedback based on the FEMA Qualification System. As with existing computer games, *72-Hours* can be designed with a training mode in which players could play alone to learn the system. However, due to the design of the prototype as a board game, the assumption is that the players are already qualified. The position descriptions are very brief. In addition, the quick pace of the game requires a high proficiency level. If players wished to use the prototype for training novices, they would need instructors. They could also slow the game clock or stop it all together to allow instruction and discussion.

A second, major limitation is *72-Hours* requires a large number of players. Again, the nature and pace of the game requires the players to work as a team. Given the state of MMO games, this is not a technological leap for the final game. The large number of required players is more of a limitation for the prototype. A team of teams will be beneficial to a point. An ideal number is likely to be between five and ten. However, it is difficult to imagine a full, 40-person Regional Response Coordination Staff playing the prototype.

IV. GAME DESIGN DOCUMENT DEVELOPMENT

A. GAME DESIGN FACTORS

This section describes overall game design considerations. Section IV contains the game design document itself, and section V contains the game prototype. There will be some redundancy because the game design document and the prototype are intended to be standalone products to enable follow-on work for each. The FEMA Regional Response Coordination Staff organizational structure is in Appendix A, and the Position descriptions are in Appendix B.

(1) Sources

The two main sources for the game design are Lewis Pulsipher's *Game Design: How to Create Video and Tabletop Games, Start to Finish*⁸⁷ and Bryan Bergeron's *Developing Serious Games*.⁸⁸

(2) Develop both Outer and Inner Objectives

Outer objectives relate to the intent of the game itself. For example, individual, outer objectives will focus on players meeting training events and standards as defined in the FEMA Qualification System. Team outer objectives will focus on performance according to the *Regional Incident Support Manual* with respect to *National Preparedness Goal* core capabilities.

Inner objectives relate to the scenario itself and what players want to achieve. For example, players may want to provide evacuation for 50,000 and mass care and sheltering for 250,000. On a subsequent play session, they may want to change the objectives to provide evacuation for 200,000 and mass care and sheltering for 100,000. The ability to set inner objectives provides players with choice, replayability, and multiple ways to win.

⁸⁷ Lewis Pulsipher, "Game Design."

⁸⁸ Bryan Bergeron, *Developing Serious Games*.

(3) Develop a Tabletop Game Prototype

The full prototype description is in section V.

1. The game will be of the serious, collaborative genre.
2. The game will be four hours in length and simulate 72 hours.
3. A timer will be used to maintain the pace and provide stress.
4. Cards will be used to provide input to players and stimulate action.
5. Players will pass action requests to each other to model the real-world processes.
6. Players will both work simultaneously on individual tasks and in 10-minute turns as the leaders interact with subordinates.
7. The game ends with players either stabilizing the disaster in 72 hours or failing to do so.
 - (a) A high-level disaster such as a catastrophic earthquake will be virtually impossible for players to stabilize without preparedness and mitigation efforts.
 - (b) Replayability will be enhanced by allowing players to attempt different mitigation, preparedness, and response strategies.

(4) Game Concept

72-Hours is a collaborative, serious game based on a catastrophic disaster scenario. The worst case would be a no-notice disaster such as a major earthquake on the San Andreas Fault. The prototype is based on a catastrophic flood of Sacramento, CA. Players will assume FEMA Qualification System position roles as they would two to four hours after the incident. Players will strive to achieve one of three key initiatives from the *FEMA Strategic Plan: Fiscal Years 2011–2014*, “(1) Developing a framework for catastrophic planning that focuses on stabilizing an event within 72 hours”⁸⁹ In a scenario such as the catastrophic flood in Sacramento, 250,000 people may need shelter, tens of thousands will need medical treatment, thousands will require urban search and rescue, and several million will lack critical lifelines such as power, water, wastewater,

⁸⁹ Federal Emergency Management Agency, *FEMA Strategic Plan: Fiscal Years 2011-2014*, FEMA P-806, (Washington, D.C.: Federal Emergency Management Agency, February, 2011), i.

communications, fuel, and transportation. The initial player briefing will provide the known situation and assumptions based on emergency operations plans.

Unlike current exercises in which resources suddenly appear, the game will simulate time, funding, personnel, and materiel resources. On repeat attempts, players could make pre-disaster preparedness and mitigation actions based on realistic budgets to improve their performance.

The prototype will be designed to run four hours, simulating 72. Every 10-minute turn will represent three-hours of real time. The disaster response operational tempo will be designed for meetings, briefing, etc., every ten minutes.

Information cards will provide input just as with a computer game or simulation. Every minute, the Situational Awareness Section (SAS) Leader will turn over a card to reveal information from social media source, traditional media source, state and local requests, etc. The unit will have to quickly populate a common operating picture and/or pass the cards on to the relevant players who act on the information. The SAS, in conjunction with a geospatial information specialist, will use the information to keep the map updated. In the prototype, the Next-Generation ICS is used as the platform to develop the Common Operating Picture. As with the real world, the pace and nature of the game will change as time passes. Initially, very little, actionable information will be available so players will have to work off of disaster plan assumption cards they can hold. Information will start slowly with social and traditional media. After two to three turns, more information will come in as the state starts making requests. Information flow will accelerate even more as local requests filter up and FEMA headquarters provides information. Leaders will be distracted by requests for information and reports due to headquarters.

The Resource Support Section (RSS) will need to take requests and order resources. In the prototype game, card “bins” will be marked with the ten-minute turn intervals. Resources that are ordered will be placed in the appropriate bin based on the time required for transit. Players will not be able to use the resources until the turn period reaches the wait time.

The Planning Section will need to develop a plan for the next twelve-hour operational period (every 40 minutes). Planners can draw and place markers on the prototype game board. Additionally, The Next-Generation Incident Command System (NICS), allows players to set up and use their own map in a collaborative workspace to do planning while the main game play continues.

The Regional Response Coordination Staff Support Section tracks the budget and fund expenditure. If the response hits the limit of appropriated funds, no further resources could be moved until a delay representing Presidential and Congressional decision-making. The staff tracks expenditures for end of game analysis. Furthermore, External Affairs personnel would deliver press releases according to the operational tempo. The administrative personnel could be the timekeepers who turn over the input cards every minute and move the turn marker every ten minutes.

The Regional Administrator, through the Regional Response Coordination Staff Chief provides the guidance and priorities. This will represent the inner objectives. The Regional Administrator could vary the guidance to maximize the outcome.

Collaboration will be fostered by the game requirements. Players will have asymmetric roles so they will not all have the same capabilities and authorities. While anyone may make a resource request, it will have to be validated by the Resource Support Section Leader before it can be ordered. The funds will have to be deducted before the resource can be requested. Finally, when the Resource Support Section completes its action, the request can be placed in the time bin. Players will physically pass the request card around during the tabletop. Pre-scripted mission assignments have been developed and are part of the game. The cards are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>. A pre-scripted mission assignment might be for the DOD to provide helicopter support for search and rescue for \$500,000 per day. Not only do the pre-scripted mission assignments expedite game play, they are used in the real world to shorten resource request times. The game also has blank Resource Request Forms (RRF) that are simplified versions of the real world documents. Clips or other markers can be used to track where the request is in the ordering process. Leaders will be distracted because they will have to hold meetings, research questions, develop reports,

etc., just like in real life. Each section will need multiple players to keep working when the leaders are pulled away.

At the end of four hours, the players will be able to see what action requests were acted upon, which resources were ordered, and what resources were delivered/staged in 72 hours. The expended funds will be seen and players will be able to see if their actions matched the Regional Administrator's guidance and objectives. Players could develop mitigation and preparedness strategies before the next game. Even though the same inject cards may be used from game to game, shuffling them will provide a different look as the status of highway, bridges, and population centers will appear in different orders. Through it all, the timing and pace will provide a stressful and realistic pace. Three videos of the introduction, prototype setup, and prototype game play are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>.

(5) Test the Game

Due to the scope of this thesis, there will not be a demonstration of the game itself beyond the videos available from the Dudley Knox Library. Actual human testing would occur in follow-on work. Once the game is complete, further studies would evaluate actual Regional Response Coordination Staff performance. Performance could be evaluated on multiple levels and across multiple categories. Games are ideal for providing instant feedback to players and teams regarding their performance. Players and teams would strive to achieve both outer performance objectives defined by FEMA and inner objectives they determine at the beginning of the game.

Multiple Levels: For example, FEMA could establish agency-wide team performance standards based on core capabilities. The criteria would match the three FEMA incident levels. A Level III (Minor) disaster is,

Minimal levels of damage, which could result in a Presidential declaration of emergency or a major disaster. Some federal involvement may be

requested by state and local jurisdictions, and the request will be met by existing federal regional resources.⁹⁰

A Level II (Moderate) disaster is the next level of complexity and is,

Moderate levels of damage, which will likely result in a major Presidential disaster declaration, with moderate federal assistance. Federal regional resources will be fully engaged, with potential involvement of federal regional offices from outside the affected area. Select national resources may also be utilized.⁹¹

A Level I (Massive) disaster is the highest level of response and is,

This level of event will result in a Presidential disaster declaration, with major federal involvement and full engagement of federal regional and national resources.⁹²

Multiple Categories: The two main categories will be individual and team performance. Individual performance can be evaluated based on the FEMA Qualification System. Players could actually receive a report at the end of gaming session identifying their FQS accomplishments. In addition, the team would receive a report showing its performance based on core capability goals. Both individuals and teams could see their performance during the game via points accumulated for those accomplishments.

(6) Complete the GDD Based on Research and the Prototype

The game design is complete after the prototype has been thoroughly tested. A typical test cycle begins with the designer and the immediate team. The test cycle then continues with experts at both game design and subject matter experts. Once the playability of the game itself has been established, prototype testing continues with less experienced FEMA Regional Response Coordination Staff. Due to the limited scope of this thesis, final prototype testing would occur in further research. Should the prototype

⁹⁰ Federal Emergency Management Agency, "Incident Management Handbook: FEMA B-761 / Interim, Expires: 01 January 2010," (Washington, DC: Federal Emergency Management Agency, March 2009), 13-4, accessed June 20, 2015, http://www.aphis.usda.gov/emergency_response/downloads/hazard/Incident%20Management%20Handbook6-09.pdf.

⁹¹ Ibid

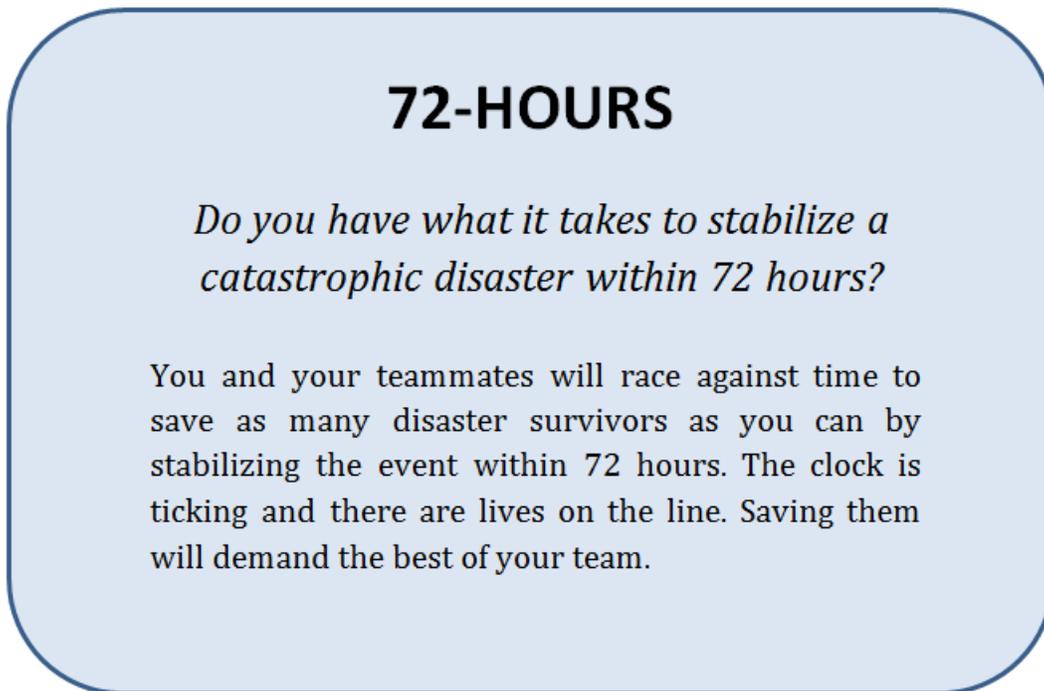
⁹² Ibid.

prove viable, the game development could continue. The following game design document is based on the University of North Carolina's, "Game Design Document Template."⁹³

1. Title Page Design

Figure 3 depicts the text the player will see on the game's title page.

Figure 3. Title Page Mockup



2. Game Overview

a. Game Concept

72-Hours is a collaborative, serious game based on a catastrophic disaster scenario. In addition, *72-Hours* is a role assumption/story dominated, free play game. The worst case would be a no-notice catastrophic disaster such as an earthquake. Players will assume roles based on FEMA Qualification System position descriptions in a Regional

⁹³ University of North Carolina, "Game Design Document Template," accessed January 26, 2014, wwwx.cs.unc.edu/Courses/.../585GameDesignDocumentTemplate.docx.

Response Coordination Center as they would two to four hours after the catastrophe has occurred. Players will strive to achieve the goal of one of three initiatives in the *FEMA Strategic Plan: Fiscal Years 2011–2014*, “(1) Developing a new framework for catastrophic planning that focuses on stabilizing an event within 72 hours”⁹⁴ The prototype scenario is a catastrophic flood in Sacramento, CA. The flood could leave 250,000 people needing shelter, tens of thousands needing medical treatment, thousands requiring urban search and rescue, and several million without critical lifelines such as power, water, wastewater, communications, fuel, and transportation. The initial player briefing will provide the known situation and assumptions based on emergency operations plans. The game will be similar to the games *Battlestar Galactica* and *Pandemic*. In *Battlestar Galactica*, players collaborate in a race against time before they run out of food, fuel, population or morale.⁹⁵ In *Pandemic*, players race around the globe before too many outbreaks occur or they simply run out of time.⁹⁶ Similarly, in *72-Hours*, the players will race against time to rescue, provide shelter, food, water, and other essential items to as many of the survivors as possible.

The game will simulate time, funding, personnel, and materiel resources. On repeat attempts, players could make pre-disaster preparedness and mitigation actions based on realistic budgets to improve their performance.

The game time is designed to be a nominal four hours, which would provide players in the training environment enough time in one day to pre-brief, setup, play the game, and review the results. In a final, MMO game, players could essentially play real time for as long as they wished as the game transitioned through phases of mitigation, disaster response, and then disaster recovery. The prototype will be designed to run four hours, simulating 72 hours. Every 10-minute turn will represent three-hours of real time.

⁹⁴ Federal Emergency Management Agency, *FEMA Strategic Plan: Fiscal Years 2011-2014*, 1.

⁹⁵ Fantasy Flight Games, *Battlestar Galactica; The Board Game*, (Fantasy Flight Games, 2013), accessed February 18, 2015, http://www.fantasyflightgames.com/edge_minisite_sec.asp?eidm=18&esem=1.

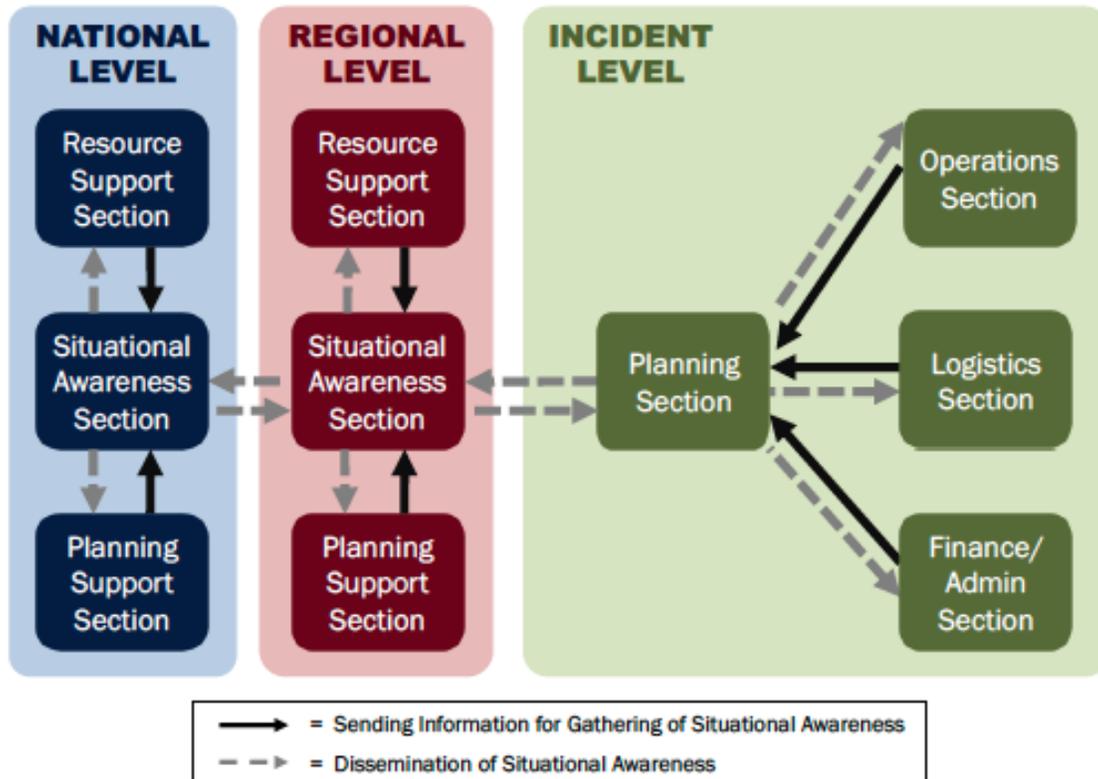
⁹⁶ Z-Man Games, *Pandemic*, (Z-Man Games, 2013), accessed June 30, 2015, <http://zmangames.com/product-details.php?id=1246>.

The disaster response operational tempo will be designed for meetings, briefing, etc., every ten minutes (representing three hours).

News, social media, and official information feeds will provide input just as with a computer game or simulation. The game will need to provide sufficient information input to both inform and distract the players. As with the real world, the pace and nature of the game will change as time passes. Initially, very little, actionable information will be available so players will have to work off of disaster plan assumption cards they can hold. Information will start slowly with social and traditional media. As time passes, more information will come in as the state starts making requests. Information flow will accelerate even more as local requests filter up and FEMA headquarters provides information. Leaders will be distracted by requests for information and reports due to headquarters. As the situation develops, personnel become overloaded with information and are often distracted by irrelevant cues and untimely tasks. Although people may play the game multiple times, they should receive different inputs and in a different order each time. The prototype uses 360 situational information cards. This number is 50% more than the 240 cards required for a four-hour game with one drawn every minute. The excess cards, along with shuffling them before each gaming session, provide players a different look every time they play the game.

Situational information cards will provide input just as with a computer game or simulation. The Situational Awareness Section leader will turn over a card every minute to reveal information from social media, traditional media, state and local requests, etc. The unit will have to quickly populate a common operating picture and/or pass the information card to the appropriate player(s) for action. Figure 4 is the Situational Assessment information flow in the *Regional Incident Support Manual*. *72-Hours* mirrors the doctrinal information flow by having the Situational Awareness Section Chief be the controller of the Situational Input Cards.

Figure 4. Situational Awareness Information Flow



From Federal Emergency Management Agency, *Regional Incident Support Manual*, (Washington, DC: Federal Emergency Management Agency, January, 2013) 11.

The Situational Awareness Section, in conjunction with a geospatial information specialist will use the information to populate a map and keep it updated. Other players will be reliant on this section because they will not be able to act to save survivors until they first know the situation. In the prototype, players use the web-based application, Next-Generation Incident Command System (NICS). This application is currently used by firefighters to manage their response to fires. A training incident within NICS has been established with several pre-populated data layers. Using NICS is not only easier and more effective than a traditional board game; it also allows players to use a real-world crisis management tool.

The Resource Support Section will need to take requests and order resources. Again, players must react from input derived from the Situational Awareness Section. The Resource Support Section will be constrained and have to supply food, water,

shelter, and even rescuers to the highest priority areas as dictated by the inner objectives and the plan. Players will not be able to use the resources until the transit time is complete. The game should track the requests for resources, the status of the ordered resources in transit, and the final delivery. The game should use basic planning factors such as three liters of water and two meals per day to determine the survivors' needs. The non-player characters should react like the "Sims" in *SimCity* or the "Peeps" in *Rollercoaster Tycoon*. They should complain of being tired, hungry, and thirsty, etc. In the prototype game, card "bins" will be marked with the ten-minute turn intervals. Resources that are ordered will be placed in the appropriate bin based on the time required for transit. Furthermore, the prototype has basic spreadsheets and tracking cards both in print and electronically for players to use to track resources requests. The electronic versions are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>.

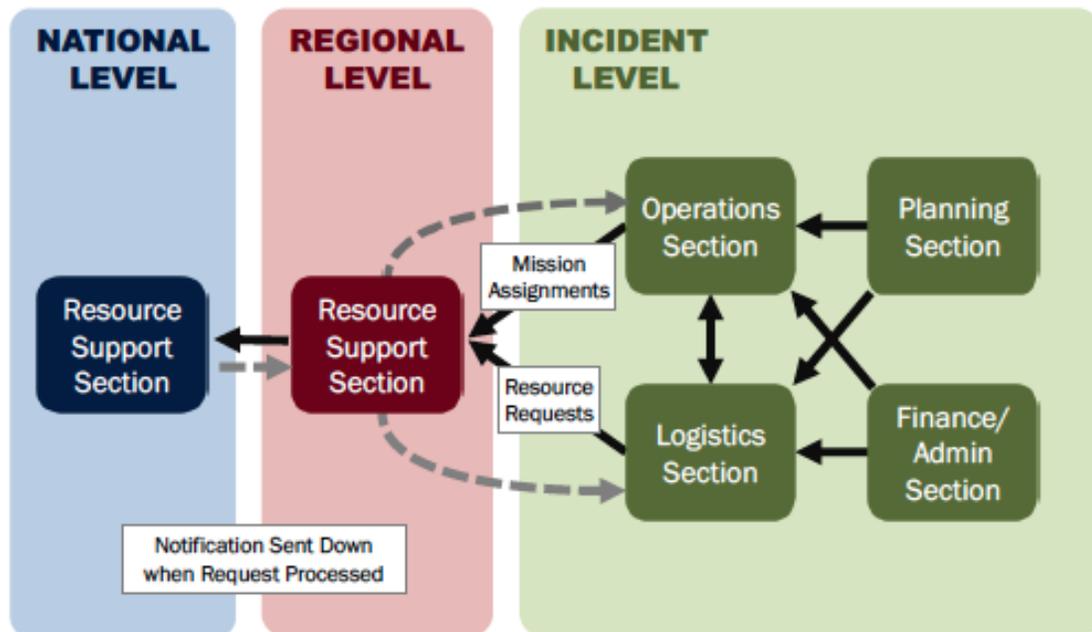
The planning section will need to develop a plan for the next twelve-hour operational period (every 40 minutes). In the computer game, the planners could develop their concept in a geospatial information system display that could then be shared with all at the time of execution. In NICS, used in the prototype, planners can copy the active map into a separate, collaborative workspace. Players can work together on the planning map while other players continue on the main, operational map.

The Regional Response Coordination Center Staff Support Section tracks the budget and funds. If the response hits the limit of appropriated funds, no further resources could be moved until a delay representing Presidential and Congressional decision-making. The staff would track expenditures for end of game analysis. Furthermore, External Affairs personnel would deliver press releases according to the operational tempo. The administrative personnel could be the timekeepers who turn over the input cards every minute and move the turn marker every ten minutes.

The Regional Administrator, through the Regional Response Coordination Staff Chief would provide the guidance and priorities. This will represent the inner objectives. The Regional Administrator could vary the guidance to maximize the outcome.

Collaboration will be fostered by the game requirements. Players will have asymmetric roles so they will not all have the same capabilities and authorities. The entire team is assessed regarding how they execute the Planning Section concept. Everyone waits for the Situational Awareness Section to provide the needed information. While anyone may make a resource request, it will have to be validated by the Resource Support Section Leader before it can be ordered (Figure 5).

Figure 5. Resource Request Information Flow



From the Federal Emergency Management Agency, *Regional Incident Support Manual*, 11.

The funds will have to be deducted before the resource can be requested. Finally, when the Resource Support Section completes its action, the request can be put in motion for delivery. In the prototype, the resource request is placed in the time bin corresponding to the delivery time drawn from the Resource Request Sourcing deck. Players will physically pass the resource request card around during the prototype.

During actual disaster response, FEMA tasks other organizations through mission assignments. *72-Hours* will also move personnel, equipment, set up points of distribution, and other actions based on mission assignments. FEMA uses pre-scripted mission

assignments to expedite the resource ordering process. FEMA personnel predict what resources might be needed during a disaster, and create pre-scripted mission assignments with a statement of work and estimated costs. For example, a pre-scripted mission assignment might be for the DOD to provide helicopter support for search and rescue for \$500,000 per day. Similarly, the game should have pre-scripted mission assignments to keep play moving rapidly. Pre-scripted mission assignments have been developed and are part of the prototype game. The game also has blank Resource Request Forms (RRF) that are simplified versions of the real world documents. These are used in lieu of prescribed mission assignments. Clips or other markers can be used to track where the request is in the ordering process. Leaders will be distracted because they will have to hold meetings, research questions, develop reports, etc., just like in real life. Each section will need multiple players to keep working when the leaders are pulled away.

Play progresses with both simultaneous actions and ten-minute (simulating three hours) turns that simulate major events in the operational tempo such as briefings. At the end of 24 turns over four hours, the players will be able to see what action requests were acted upon, which resources were sourced, and what resources were delivered/staged in 72 hours. The expended funds will be seen and players will be able to see if their actions matched the Regional Administrator's guidance and objectives. Players could develop mitigation and preparedness strategies before the next game. Even though the same situational input cards may be used from game to game, shuffling them will provide a different look as the status of highway, bridges, and populations centers will appear in different orders. Through it all, the timing and pace will provide a stressful and realistic pace.

b. Genre

72-Hours is a collaborative, serious, role-playing, real-time strategy game. While the game will have elements of both real-time strategy and resource management, the focus will be on real-time strategy development. The intent is to address the problem of FEMA's emergency managers having to face their first major disaster having never trained to make decisions under similarly stressful situations. Rather than being fictitious,

the roles are based on real-world FEMA *Regional Incident Support Manual* positions. In a final version, it would be an MMO game that would incorporate hundreds of players across a vast geographic area and through several levels of government. According to Lewis Pulsipher, one easy path is to develop a game as a derivation of another, successful game.⁹⁷ While he also states that there is danger in making the game feel too much like another,⁹⁸ FEMA would do well in in terms of both lowering cost and barriers to adoption by developing a derivation of a current, successful game rather than develop its own game from the ground up. Early versions and/or lower levels would be turn-based strategy games such as *Zork*, *Kings Quest*, *Grim Fandango*, *Myst*.⁹⁹ Final versions and/or higher levels would be real-time strategy games such as *WarCraft II*, *StarCraft*, *Total Annihilation*, *Command & Conquer* series.¹⁰⁰ However, the closest game to *72-Hours* is a multiplayer version of a simulation-based game such as *SimCity* and *Rollercoaster Tycoon*. In fact, *72-Hours* could be a derivation of *SimCity*, to include the game engine. *72-Hours* would have the added pressure of a time element to save as many lives as possible. Players would start with a city that has been hit by a major disaster and need to react to the situation quickly. A great advantage of deriving the game from *SimCity* is also that a FEMA exercise specialist could be a game master and easily develop the scenario to fit the specific training scenario and objective. *SimCity* already has non-player characters from different city-management functions. In *72-Hours*, those characters would be actual players or represent other state, federal, or local agencies or even the general public-just as in an actual disaster.

c. Target Audience

The target audience is emergency management professionals who work in FEMA Regional Response Coordination Centers. A final, MMO version of the game would also include state and local emergency managers and even first responders (fire, police, and emergency medical services). A final version could even include citizen volunteers who

⁹⁷ Lewis Pulsipher, “*Game Design*,” 14.

⁹⁸ *Ibid.*, 14.

⁹⁹ *Ibid.*, 200.

¹⁰⁰ *Ibid.*, 199.

would organize a community disaster response. A major consideration of the genre and target audience is the demographics of FEMA and typical game players. For example, the target audience of real time strategy games is typically young males because these games are fast moving and involve acquiring assets and forces and conquering others. The key difference for *72-Hours* is it will be a collaborative rather than competitive game. Fortunately, a turn-based strategy game actually appeals to a broader audience.¹⁰¹ As described in genre above, a turn-based strategy game for early and/or lower levels of the game may be more successful in having a broader appeal to average FEMA employees. As their proficiency increases, moving toward a real-time strategy genre would achieve the overall objective of developing emergency managers' ability to think and act under stressful, high-pressure situations. In a survey of the International Association of Emergency Management (IAEM) November 2003 conference attendees, Carol Cwiak, Cathy Cline and Tammy Karlgaard found that the mean age of full-time emergency managers was 46 years.¹⁰² In addition, the DHS survey reported that nearly 73% of employees are more than 40 years of age.¹⁰³ These data support the concept that early/lower-level versions of *72-Hours* should be turn-based rather than real-time strategy games.

d. Game Flow Summary

At the macro level, the flow of the game will take players from a catastrophic event through a 72-hour point or beyond as they attempt to save as many lives as possible. As with an actual disaster, players will be presented with a situation and limited information. They will need to make decisions with imperfect knowledge while attempting to acquire more information. Greater information will provide improved insight regarding the game environment. However, the information flow itself will

¹⁰¹ Lewis Pulsipher, "*Game Design*," 199.

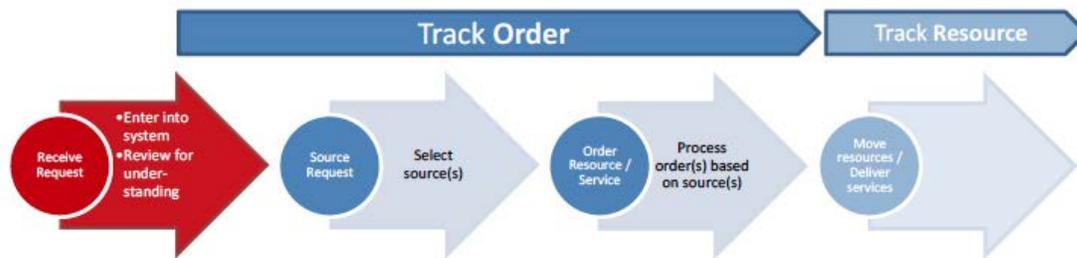
¹⁰² Carol Cwiak, Cathy Cline and Tammy Karlgaard, "Emergency Management Demographics: What Can We Learn from a Comparative Analysis of IAEM Respondents and Emergency Managers?" 4, accessed February 15, 2015, <http://training.fema.gov/hiedu/surveys.aspx>.

¹⁰³ Department of Homeland Security, "2014 Federal Employee Viewpoint Survey Results," accessed February 15, 2015, http://www.dhs.gov/sites/default/files/publications/2014_FEVS_Summary_Results_DHS.pdf.

increase so that managing it is a problem in itself. In addition, the incoming information will also increase the number of problems the team must solve. The problems will continue to increase until the players get ahead of them and achieve their objectives or game time expires and they fail to achieve their objectives.

In contrast to first-person shooter type of game, *72-Hours* must simulate support agencies that provide resources to first responders. As a serious game, *72-Hours* will follow FEMA's *Regional Incident Support Manual* processes (Figure 6) as part of the game flow. FEMA's main role is to support state and local disaster response efforts rather than to be the first responder.

Figure 6. Resource Management and Tracking Process



From Federal Emergency management Agency, *Regional Incident Support Manual*, 109.

While the agency can take some unilateral action, its Regional Response Coordination Centers react to requests from other organizations such as state and territorial government emergency managers. As such, the general flow of the game should have players reacting to outside requests and situational information. As with real life, the game players will have asymmetric capabilities and responsibilities so they must rely on each other to achieve the game objectives. In addition, various, asynchronous, sub processes will also underlie the overall coordination flow.

With respect to Mihaly Csikszentmihalyi's concept of flow, the difficulty should be established in forcing players to work together ever more quickly on complex problems. Matching of difficulty with skill level can be achieved first by having multiple levels. A base level can be a small-scale disaster such as a localized flood, fire, a tornado

or even small earthquake. As teams of players acquire greater skills, they can move to higher levels simulated by more complex disasters. These levels should follow FEMA's definitions of increasing complexity of Level III at the low end and Level I at the high end. Even within levels, players can be presented with scenario injects in a different manner each game so players face different challenges. For example, in a Sacramento, CA flooding scenario, which highways are impassible can change each time the game is played in order to present different problems. Closing the north-south running I-5 is a completely different experience than closing east-west running I-80.

Player movement through the game: Again, unlike a first-person shooter game, players of *72-Hours* do not run through the scenario. However, they will need to bring up information to solve problems. Players "move" through the game just as they would in real life. That is, they will call up different people, information sources, media feeds, etc., in order to build their situational awareness. Players should interface through VOIP networks, text and video chat, and other typical medium.

The player interface should be realistic but not simply copy FEMA's actual systems. FEMA simply does not have the systems to bring all of the information together in an easy to use and intuitive display that games do. For example, *SimCity* has a nice dashboard that quickly lets players see the scenario, select tools, chat with city council members and receive information feeds (see Figure 7). In contrast, a sample of a Web EOC Page that FEMA Regional Response Coordination Staff currently use is in Figure 8. It is a generic workspace in which personnel select boards to be displayed from the left side of the page.

Figure 7. SimCity Player Interface



Screenshot of the researcher's game, *SimCity*.

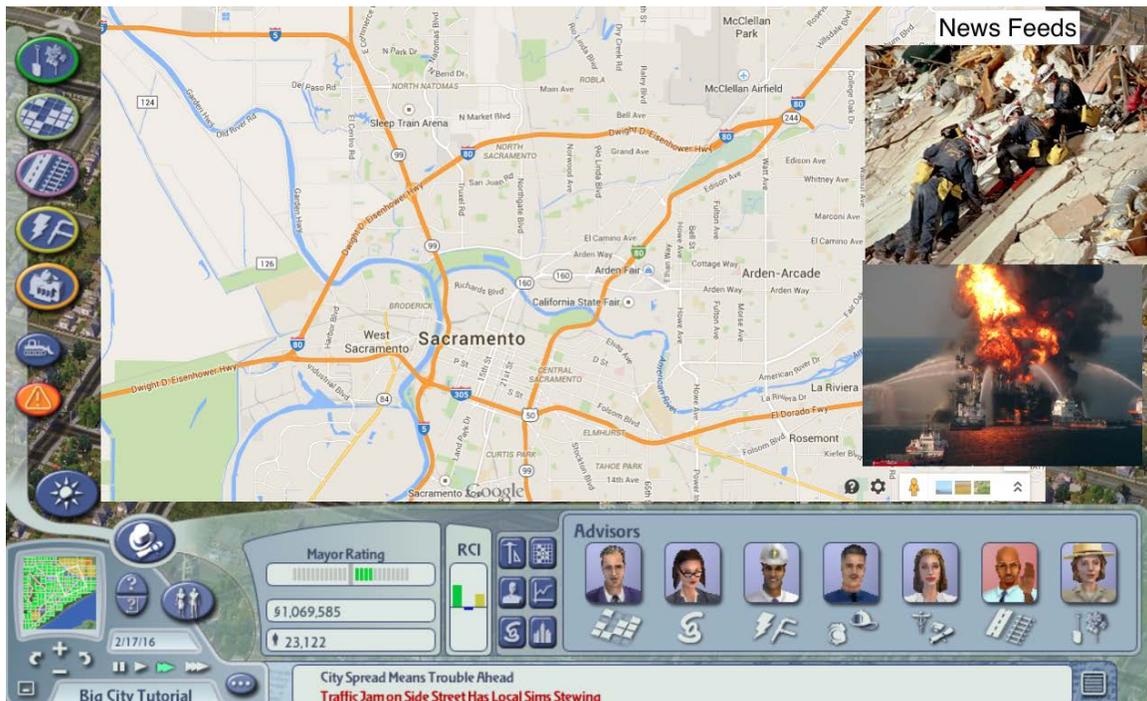
Figure 8. Sample Web EOC Page

A screenshot of a Web EOC (Emergency Operations Center) page from FEMA RRCC Significant Events. The page is titled 'FEMA RRCC Significant Events' and 'Incident: FEMA_RIX August Stand Down Training Part 1'. It features a search bar, a 'Priority' dropdown set to 'View All', and a 'Region' dropdown set to 'View All'. A note states: 'Note: Records older than 7 days can be viewed in the "Archived" view'. Below the search area is a 'Resource Tracking' section with a table showing tracking records. The table has columns for 'Processing', 'En Route', 'On Site', 'Staged', 'Employed', 'Canceled', 'DeMobed', and 'Completed', all with a value of 0. There are also buttons for 'Create PDF', 'Export', and 'View Resource Request'. The page is part of a 'WebEOC 7.7' interface by 'intermedix'.

From Federal Emergency Management Agency, Region IX stand down training Web EOC display.

The typical Web EOC page is unwieldy, not intuitive, and makes a poor gaming, and even a poor operational, platform. Although it would not accurately depict Web EOC, a player interface more akin to *SimCity* would be far superior (Figure 9). A game-based interface is clearly superior as it allows players to act quickly and intuitively. In addition, it enables both the players and the team to evaluate their progress toward the objective(s).

Figure 9. Sample Interface



After a screen shot from the researcher's game, *SimCity*; from a screen of "Next-Generation Incident Command System (NICS)," sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>. From Wikipedia, "Deepwater Horizon oil spill," Embedded video, "Deepwater_Horizon_fire_seen_by_US_Coast_Guard_Helicopter," accessed September 12, 2015, https://en.wikipedia.org/wiki/Deepwater_Horizon_oil_spill. From David J. Phillip, Associated Press: April 20, 1996, accessed September 12, 2015, www.whcuradio.com/news/030030-20-years-later-oklahoma-city-bombing-murrah-building.

e. Look and Feel

The look of the game is a more “realistic” Sim City. While the cartoon representation in *SimCity* would be sufficient, a more realistic map from Google Maps or ArcGIS¹⁰⁴ would enhance game play. In addition, non-player characters should have a more realistic look. There might be real actor news feeds or simply, realistic graphics. In actual emergency operations centers, most of the information is garnered on collaborative sites, so there does not need to be a heavy reliance on very realistic characters. A combination of a realistic map and *SimCity* type dashboard might look like Figure 9.

B. GAMEPLAY AND MECHANICS

1. Gameplay

Game progression begins with simple tasks that players can accomplish in a training mode and builds with more players required as larger, more complex scenarios are encountered. Early generations of the game can be kept small in scope. Based on the success of the game, it could become a MMO game with hundreds of players that are both in the government response and citizens reacting to the simulated world they live in. Within the game play for each session, players would be presented with the basic disaster event and little information. They would need to seek out information to save as many people as possible within 72 hours. More information will help build the picture, but also complicate the situation. As with real life, information then flows in ever faster from multiple sources such state and local government, traditional media, social media, other federal government agencies, and non-governmental organizations, etc. As the disaster progresses, Regional Response Coordination Staff often find themselves overloaded with information. Some of the information is good and relevant and some is a distraction. Leaders must make strategic decisions very quickly and under pressure. Emergency managers have failed in the past because they were not accustomed to this environment prior to catastrophic disasters such as Hurricanes Katrina and Sandy. The game should create this environment with both relevant and distracting information flowing in.

¹⁰⁴ <http://www.arcgis.com>

The mission/challenge structure revolves around *National Preparedness Goal* core capabilities. The overarching mission is simple. Players must save as many disaster survivors as possible in 72 hours. The challenge structure is for players to move the essential personnel and resources in place to stabilize the disaster within 72 hours per the FEMA Administrator's intent. The general cycle will involve players gathering and processing information as quickly as possible to gain situational awareness. They will then react by moving the personnel and resources to the locations that will save the most lives. But they will be challenged by the obstacles caused by the devastation such as damaged bridges and roadways, lack of electricity, communications, fuel, water, and wastewater. All of these needs must be met. In a catastrophic disaster, it is simply not possible to serve everyone in a timely manner. The challenge for players in subsequent sessions is to modify their strategy to save more survivors. While players may not address all of the *National Preparedness Goal's* Response mission area core capabilities, they should frame their mission around those goals. The *National Preparedness Goal* is the foundation document that defines the 31 core capabilities that Federal, state, territorial, tribal, and local jurisdictions use to essentially define their level of preparedness. The core capabilities are used in such analyses as the annual State Preparedness Report and annual Threat and Hazard Identification and Risk Assessment. They are also used for purposes such as defining training and exercise goals and even for developing grant investment justifications. In short, Federal, State, territorial, tribal, local jurisdictional use core capabilities to assess past and current capabilities as well as to establish future performance objectives. Since *72-Hours* is focused in the Response mission area, the game would restrict its use of core capabilities to this set. The stated *National Preparedness Goal* core capabilities for the Response mission area are as follows:

- “Critical Transportation: Provide transportation (including infrastructure access and accessible transportation services) for response priority objectives, including the evacuation of people and animals, and the

delivery of vital response personnel, equipment, and services into the affected areas.”¹⁰⁵

- “Environmental Response / Health and Safety: Ensure the availability of guidance and resources to address all hazards including hazardous materials, acts of terrorism, and natural disasters in support of the responder operations and the affected communities.”¹⁰⁶
- “Fatality Management Services: Provide fatality management services, including body recovery and victim identification, working with state and local authorities to provide temporary mortuary solutions, sharing information with mass care services for the purpose of reunifying family members and caregivers with missing persons/remains, and providing counseling to the bereaved.”¹⁰⁷
- “Infrastructure Systems: Stabilize critical infrastructure functions, minimize health and safety threats, and efficiently restore and revitalize systems and services to support a viable, resilient community.”¹⁰⁸
- “Mass Care Services: Provide life-sustaining services to the affected population with a focus on hydration, feeding, and sheltering to those who have the most need, as well as support for reunifying families.”¹⁰⁹
- “Mass Search and Rescue Operations: Deliver traditional and atypical search and rescue capabilities, including personnel, services, animals, and assets to survivors in need, with the goal of saving the greatest number of endangered lives in the shortest time possible.”¹¹⁰
- “On-scene Security and Protection: Ensure a safe and secure environment through law enforcement and related security and protection operations for people and communities located within affected areas and also for all traditional and atypical response personnel engaged in lifesaving and life-sustaining operations.”¹¹¹
- “Operational Communications: Ensure the capacity for timely communications in support of security, situational awareness, and

¹⁰⁵ Department of Homeland Security, *National Preparedness Goal: First Edition*, (Washington, D.C.: Department of Homeland Security, September, 2011), 12.

¹⁰⁶ *National Preparedness Goal*, 13.

¹⁰⁷ *National Preparedness Goal*, 13.

¹⁰⁸ *Ibid.*

¹⁰⁹ *Ibid.*

¹¹⁰ *Ibid.*, 14.

¹¹¹ *Ibid.*

operations by any and all means available, among and between affected communities in the impact area and all response forces.”¹¹²

- “Operational Coordination: Establish and maintain a unified and coordinated operational structure and process that appropriately integrates all critical stakeholders and supports the execution of core capabilities.”¹¹³
- “Planning: Conduct a systematic process engaging the whole community as appropriate in the development of executable strategic, operational, and/or community-based approaches to meet defined objectives.”¹¹⁴
- “Public and Private Services and Resources: Provide essential public and private services and resources to the affected population and surrounding communities, to include emergency power to critical facilities, fuel support for emergency responders, and access to community staples (e.g., grocery stores, pharmacies, and banks) and fire and other first response services.”¹¹⁵
- “Public Health and Medical Services: Provide lifesaving medical treatment via emergency medical services and related operations and avoid additional disease and injury by providing targeted public health and medical support and products to all people in need within the affected area.”¹¹⁶
- “Public Information and Warning: Deliver coordinated, prompt, reliable, and actionable information to the whole community through the use of clear, consistent, accessible, and culturally and linguistically appropriate methods to effectively relay information regarding any threat or hazard, as well as the actions being taken and the assistance being made available, as appropriate.”¹¹⁷
- “Public Health and Medical Services: Provide lifesaving medical treatment via emergency medical services and related operations and avoid additional disease and injury by providing targeted public health and medical support and products to all people in need within the affected area.”¹¹⁸

¹¹² Ibid.

¹¹³ Ibid., 12.

¹¹⁴ *National Preparedness Goal*, 12.

¹¹⁵ Ibid., 14.

¹¹⁶ Ibid., 15.

¹¹⁷ Ibid., 12.

¹¹⁸ Ibid., 15.

- “Situational Assessment: Provide all decision makers with decision-relevant information regarding the nature and extent of the hazard, any cascading effects, and the status of the response.”¹¹⁹

2. Objectives

There are outer and inner objectives. Outer objectives relate to the intent of the game itself. The game should provide the “necessary realism to accurately prepare trainees for the stress, volume and speed of decision-making required in an actual crisis situation.”¹²⁰ Outer objectives will focus on players meeting training events and standards as defined in the FEMA Qualification System at the individual level. Team-level outer objectives will focus on National Incident Management System compliance with respect to *National Preparedness Goal* core capabilities.

Inner objectives relate to the scenario itself and what players want to achieve. For example, players may want to provide search and rescue for 10,000 survivors, provide mass care and shelter for 100,000, or evacuate 50,000 within 72 hours.

a. *Play Flow and Setup*

72-Hours is a simultaneous play game that is synchronized through an operational tempo (Figure 10). Although the specific operational tempo is unique to *72-Hours*, it is based on the generic operational tempo in FEMA’s *Regional Incident Support Manual*.¹²¹ Players address their individual responsibilities such as filling in the map, ordering water, and reviewing media. But the asynchronous nature of their positions forces them to collaborate on ordering and managing missions. Furthermore, disasters have scheduled events such as calls with governors and the President. There are also planning meetings, tactics meetings and change of shift briefs. This schedule brings people back together in a turn-like environment. In fact, it is this nature of disaster response that lends *72-hours* to development as a board game prototype. The operational tempo provides the basis for turns. Even in a board game, though, information cards can be turned over periodically to

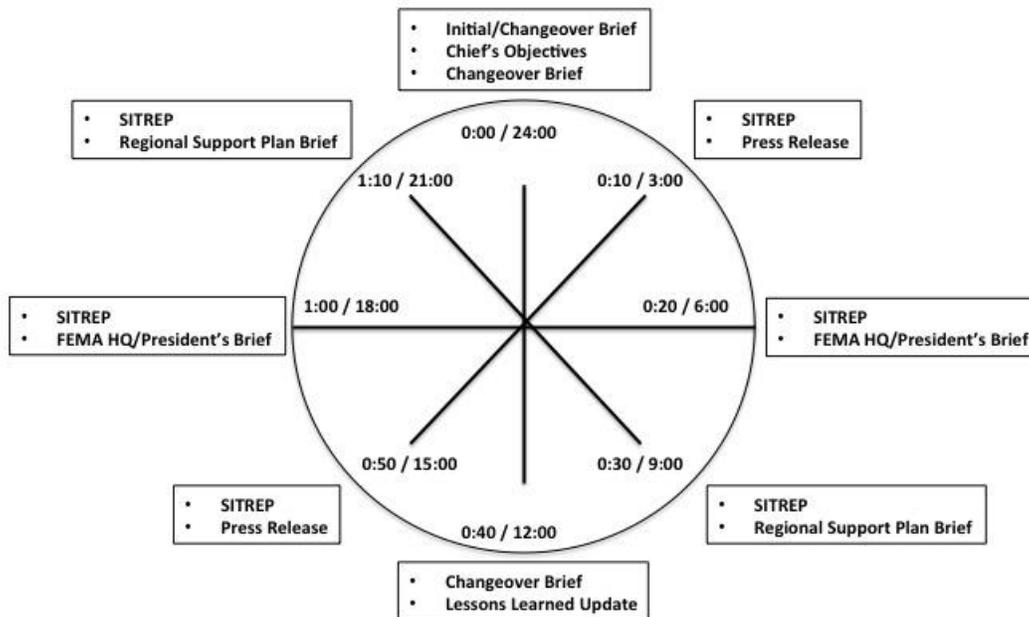
¹¹⁹ Ibid.

¹²⁰ Lachlan MacKinnon & Liz Bacon, “Developing Realistic,” 1, l.mackinnon@gre.ac.uk, e.bacon@gre.ac.uk.

¹²¹ Federal Emergency Management Agency, *Regional Incident Support Manual*, 104.

feed information. For example, newsfeed cards are turned over every minute to simulate the flow of information in real life. The game will move forward in 10-minute, nominal turns. This will apply pressure to players to decide and act quickly. It also enables a board game prototype.

Figure 10. Game Operational Tempo



Note that 0:40/12:00 means 40 minutes of game time simulating 12 hours of actual time. After Federal Emergency Management Agency, *Regional Incident Support Manual*, 104.

(1) Setup

Players login to their works stations just as they would for an actual disaster. They check in to the disaster using a simulated process in FEMA's Deployment Tracking System as well as Web EOC. All players have visibility on each other's' respective positions. Players review their FEMA Qualification System position description and task requirements (cards for the board game). The game then uses that same guide to prompt players throughout the game to complete necessary tasks as well as give them a personal score. In a fully integrated training environment, players would export the results to document their FEMA Qualification System certification level. Players then simply set up their desktop display according to their preference. The common operating picture

map would have little information to begin with, simulating players have just reported to the Regional Response Coordination Center and no information has been integrated yet. As with the real world, players may want to set up links to the *Regional Incident Support Manual*, any existing Regional Response Coordination Center guides, and existing disaster plans.

The prototype requires more setup. Players will log into the NICS training incident and configure the map to their preference. They can also log into the actual Deployment Tracking System if the FEMA Region prefers. Players can use the actual *Regional Incident Support Manual* or reference their player cards to review their position description and unique authorities. Players either upload the Excel workbook that has planning guides and spreadsheets or they become familiar with the printed versions. Players should review and have both the pre-scripted mission assignments and blank resource request forms within easy reach of all players. Players should also shuffle the resource fulfillment cards and place them face down within reach of all players. Players place the turn bin within reach of all players and set the turn market on turn compartment 1. Each 10-minute turn has 15 situational input cards. Players should shuffle the cards and keep them within their respective turn numbers sections. Set both the situational input (one minute) timer and the turn (10 minute) timer to zero. The Excel workbook and player cards are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>.

(2) Disaster Strikes

The information feed begins with a synopsis of what has occurred and a general description of the disaster effects. As with real life, little detail will be available in the opening minutes. In the prototype, start the one-minute and ten-minute timers. The Situational Assessment Section Leader should read the initial situation and start turning over situational input cards every minute.

(3) Initial Response Operations

Players need to make immediate requests for resources to fill out their Regional Response Coordination Staff. For example, if players would like to use DOD assets during the game, they must order them in a mission assignment. Each mission assignment takes time to fill and funds to pay for. During lower level game scenarios, the initial call up must be managed well. Without a Presidential Disaster Declaration, FEMA Regions have very little “surge account” funds to pay for mission assignments. Due to this variable, even playing low-level disasters can be a challenging resource management problem. Players will establish initial priorities and objectives. Players will execute response missions based on assumptions about survivor needs. For example, players can use census data to determine the population of the affected city and make assumptions about the potential size of the affected population. Real world disaster plans could be referenced to estimate the requirements. Since disaster plans have assumptions about the area and population effects of a disaster scenario, they are a good place for players to begin and can guide them about initial response before requests come in from the city or state.

(4) Mid-term Response Operations

As players synthesize the information into a common operating picture, players will adjust their strategy to maximize the response. Their initial actions based on planning assumptions may be incorrect and players will need to adjust their plan. Information flow is overwhelming and players will have to prioritize because they will not be able to react to everything. Ordered personnel and materiel will be moving into position, infrastructure repairs will begin based on the players’ strategy. The main mental shift for players in the mid-term will be to move from ordering items to employing them.

b. Game Clock

Each minute of game play equates to 18 minutes of real time. Every 10 minutes equates to three hours and every hour equates to 18 hours.

- Pre-game: Players login and assume their respective roles. They review their position requirements and organize their workstations. Position summaries are in Appendix B.
- Game Start: Initial situation brief.
 - **Chief of Regional Response Coordination** develops the internal objectives for the team and briefs them.
 - **Situation Awareness Section** briefs the team on the initial situation. The section also sets the operational tempo to synchronize the team's efforts.
 - **Planning Support Section** briefs the team on existing plans, if they exist. This is especially important in later versions of the game in which teams may use actual disaster scenarios and plans.
 - **RRCS Staff Support** accounts for all players and ensures they are logged in.

Continuous Actions:

- **Chief of Regional Response Coordination** leads the entire effort and keeps the team focused on the objectives and moving forward.
- **Situation Awareness Section** continuously updates the map and shares information with players.
- **Planning Support Section** uses situational information to develop the Regional Support Plan that will be briefed every 40 minutes starting at 30 minutes into game play. The Regional Support Plan will define the team's actions for the following 12-hour operational period. In this case, the first regional response plan will be for the 12–24 hour timeframe (40 minutes-1:20 game time).
- **Resource Support Section** continuously processes and tracks support requests. The section briefs the status of support requests every 40 minutes at the changeover brief.
- **RRCS Staff Support** continuously supports other sections through Department of Defense resource support, legal evaluation of actions, capturing of lessons learned, and External Affairs interaction.

Every Minute

- **Situational Awareness Section** draws a situational input card (Appendix C). While the situation inputs should build in the general sense, players should receive inputs in a random order. This will provide players with a new look and different problems each time they play. For example, during one session players may first be presented with a housing community being devastated. In another session, they may first be presented with the hospitals being devastated. Since resources are limited, once they are committed to one area, a second major problem provides a challenge to players. The Situation Awareness Section will need to both quickly fill out the map and provide team members with essential information.

0:10

- **Chief of Regional Response Coordination** refines the team's objectives if required.
- **Situation Awareness Section** provides the first situation report (SITREP) to inform the team of current status.
- **Planning Support Section** holds a tactics meeting in which it receives input from team members regarding requirements and resources.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction, and any other staff problems. External Affairs provides press release and answers questions at a press conference. Ideally, artificial intelligence would ask questions such as the number of fatalities, injuries, displaced people, and unaccounted for people based on the games knowledge of situation and how many resources have been placed to deal with the problems. A game master could also interject. Artificial intelligence and/or the game master should ask follow up questions such as when actions will occur each time External Affairs personnel do not provide an answer. Lessons learned personnel should brief the team on the points scored and status toward reaching the goal.

0:20

- **Chief of Regional Response Coordination** briefs the FEMA Administrator/President on the status of the disaster and the actions of the Regional response Coordination Staff. Ideally, artificial intelligence would ask questions such as the number of fatalities, injuries, displaced people, and unaccounted for people based on the games knowledge of situation, and how many resources have been placed to deal with the problems. A game master could also interject. Artificial intelligence and/or the game master should ask follow up questions such as when actions will occur each time the Chief could not provide an answer.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the status of the Regional Support Plan and makes requests needed to complete the plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status Department of Defense resources, external affairs interaction, and any other staff problems.

0:30

- **Chief of Regional Response Coordination** refines the team's objectives if required and provides input and guidance to the team.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the Regional Support Plan. The plan will be a general concept of where the effort will be applied in the hours of 12–24 of notional time; 40 minutes to 1:20 of actual game time. The team should base its actions over the next 40 minutes on the Regional Support Plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction, and any other staff problems. Lessons learned personnel should brief the team on the points scored and status toward reaching the goal. Furthermore, lessons learned personnel should provide feedback regarding

problems they observe with team performance and interaction. Ideally, artificial intelligence will provide both individuals and the team regarding their points earned and progress toward their goal on their dashboards.

0:40

- **Chief of Regional Response Coordination** briefs the objectives for the next 12-hour operational period.
- **Situation Awareness Section** provides the changeover briefing (Appendix G). This is a briefing that summarizes the activities of the past 12 hours (40 minutes game time) and prepares the team for the new shift over the next 12-hour operational period.
- **Planning Support Section** briefs the initial concepts of the next Regional Support Plan. This plan will cover the 24–36 hour time frame (1:30 – 2:00 game time).
- **Resource Support Section** provides an overview brief of the past 12 hours (40 minute game time) regarding requests, how many requests were filled, and the status and location of inbound resources.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction, and any other staff problems. Since Department of Defense is so important in a response, the Defense Coordinating Element should be able to provide a status of all forces. Lessons learned personnel should brief the team on the points scored and status toward reaching the goal. Furthermore, lessons learned personnel should provide feedback regarding problems they observe with team performance and interaction. Ideally, artificial intelligence will provide both individuals and the team regarding their points earned and progress toward their goal on their dashboards.

0:50

- **Chief of Regional Response Coordination** refines the team's objectives if required.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** holds a tactics meeting in which it receives input from team members regarding requirements and resources.

- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction, and any other staff problems. External Affairs provides press release and answers questions at a press conference. Ideally, artificial intelligence would ask questions such as the number of fatalities, injuries, displaced people, and unaccounted for people based on the games knowledge of situation and how many resources have been placed to deal with the problems. A game master could also interject. Artificial intelligence and/or the game master should ask follow up questions such as when actions will occur each time External Affairs personnel do not provide an answer. Lessons learned personnel should brief the team on the points scored and status toward reaching the goal.

1:00

- **Chief of Regional Response Coordination** briefs the FEMA Administrator/President on the status of the disaster and the actions of the Regional Response Coordination Staff. Ideally, artificial intelligence would ask questions such as the number of fatalities, injuries, displaced people, and unaccounted for people based on the games knowledge of situation and how many resources have been placed to deal with the problems. A game master could also interject. Artificial intelligence and/or the game master should ask follow up questions such as when actions will occur each time the Chief could not provide an answer.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the status of the Regional Support Plan and makes requests needed to complete the plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status Department of Defense resources, external affairs interaction, and any other staff problems.

1:10

- **Chief of Regional Response Coordination** refines the team's objectives if required and provides input and guidance to the team.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the Regional Support Plan. The plan will be a general concept of where the effort will be applied in the hours of 12–24 of notional time; 40 minutes to 1:20 of actual game time. The team should base its actions over the next 40 minutes on the Regional Support Plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction, and any other staff problems. Lessons learned personnel should brief the team on the points scored and status toward reaching the goal. Furthermore, lessons learned personnel should provide feedback regarding problems they observe with team performance and interaction. Ideally, artificial intelligence will provide both individuals and the team regarding their points earned and progress toward their goal on their dashboards.

1:20

- **Chief of Regional Response Coordination** briefs the objectives for the next 12-hour operational period.
- **Situation Awareness Section** provides the changeover briefing (Appendix G). This is a briefing that summarizes the activities of the past 12 hours (40 minutes game time) and prepares the team for the new shift over the next 12-hour operational period.
- **Planning Support Section** briefs the initial concepts of the next Regional Support Plan. This plan will cover the 24–36 hour time frame (1:30 – 2:00 game time).
- **Resource Support Section** provides an overview brief of the past 12 hours (40 minute game time) regarding requests, how many requests were filled, and the status and location of inbound resources.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction, and any other staff

problems. Since Department of Defense is so important in a response, the Defense Coordinating Element should be able to provide a status of all forces. Lessons learned personnel should brief the team on the points scored and status toward reaching the goal. Furthermore, lessons learned personnel should provide feedback regarding problems they observe with team performance and interaction. Ideally, artificial intelligence will provide both individuals and the team regarding their points earned and progress toward their goal on their dashboards.

- The operational tempo would continue for two more cycles until 72 hours (4 hours of game time) are complete.

Videos of the prototype overview, setup, and game play are available at <http://hdl.handle.net/10945/46412>.

3. Mechanics

a. Physics

While an ideal game has players moving through the disaster space in real time, the first generation would be more basic and simplified. Players will receive reports of the disaster's effects on the game space rather than have to move through it.

While future version of the game may run real time in an MMO environment, the early version will simulate 72 hours over a four-hour game. In attempting to create a game that covers 72 hours in just four, the manipulation of time will be perhaps the greatest break from reality. Time will obviously have to be accelerated. Each hour of real time will represent 18 hours of game time, making 40 minutes equal to a twelve-hour shift. Accordingly, media and other reports will have to be clear and descriptive enough to allow players to make decisions quickly.

While the game clock will be accelerated, the physics of spatial relationship should remain realistic. If it would take 24 hours to move a search and rescue team from another state, then players will have to wait a corresponding amount of time. The game map need not cover the entire country. Rather, tables can be used with locations of resources in order to quickly estimate time to deploy and employ them. For example, the scenario based in Sacramento, CA need not include a map going as far as Chicago. But it

is important for search and rescue teams in Chicago to take a realistic amount of time to reach the disaster area. In the prototype, the resource fulfillment cards use chance to determine where the resources come from and how long they will take to deploy. Players place the resource request in the bin corresponding to the turn in which the resource will be available.

While eventual versions of *72-Hours* may have players moving through the game space, initial versions are largely command and coordination focused and rely on information sharing and collaboration.

For obstacles, players will have to work through the problem of obstacles associated with disaster damage. Debris is one of the major problems that must be dealt with in catastrophic disasters. The initial game briefing will provide players with an initial damage description. The players will then have to clear or find ways around/over the obstacles to complete their mission(s). Future versions of the game could even allow pre-disaster preparedness or mitigation efforts based on budget constraints to see the effect on the overall response. For example, players may choose to spend grant dollars building local debris management capabilities to quickly clear roads.

Movement of assets and personnel within the game will be simulated based on time-space constraints. As long as there is a clear path, assets will be able to move from home stations and staging areas to mission locations. The game will report assets/personnel on station at an appropriate time.

While an eventual version may have players moving many objects in the game space, the initial version takes place at a command and coordination center with few objects to move and/or manipulate. Those objects that need to be manipulated will be selected by having the players scroll over the object. Again, the focal point of the game is teamwork and collaboration.

b. Work Station Interaction

Players will interact with the game environment as they would in real life. That is, their typical “tools” are a computer, telephones, faxes, displays, and interfaces that simulate a real-world environment.

Applications: Given the great variation in applications and workstations in use by emergency managers and first responders, the simulated collaboration tools will be generic in nature and not attempt to simulate applications such as Web EOC. For example, not every state/territory uses Web EOC as a collaboration tool. And even those that use Web EOC have different disasters they log into. FEMA Region IX personnel in Oakland California would have to monitor three Web EOC disasters for the same event; their own, the State of California’s, and the National Response Coordination Center’s. The game would actually be more elegant than real life because players would act in a truly collaborative space. Due to the accelerated timeline, the display must be intuitive and easy to operate. In addition to the basic collaboration application, players should have actual or simulated applications for webinars, chat sessions, video conferencing, geospatial information system mapping, and action requests. While the game would simplify FEMA’s Resource Request Form, the process should be simulated within the game. The flow would follow from FEMA’s *Regional Incident Support Manual* with different team members required to approve requests, certify that funds are available, and track ordering and movement of personnel and resources (see Figures 5 and 6).

Switches, Buttons, and Other Interfaces: Typical computer workstation controls will exist. However, the game will also require shortcuts and controls in order to look around the gaming environment and zoom in on such objects as common displays. Players should also be able to contact each other through the game interface. The game should support headsets for aural cues and telephonic player interactions. As a minimum, players should have text chat sessions. Detailed displays of phones, Faxes, and other common equipment should be available upon player selection. The game should simulate instant messaging clients such as Microsoft Lync for text, audio, and video based collaborative sessions. These tools are not only simple and efficient communication tools available in the real world; they are also very useful in reviewing interactions and

correspondence. In summary, since the game is based on a command and coordination center, it should look and feel very much like that environment.

c. Economy

While catastrophic disasters appear to have a blank checkbook, the requesting, certifying, and tracking of funds follows an orderly process that should be maintained within the game. FEMA Regions have a very small amount of funds in their pre-disaster surge accounts. Therefore, they can only provide a limited response until a Presidential disaster declaration is declared and more funds are made available. They must request more in order to expand operations. In a lower level disaster, there may be very finite and limited funds available to respond. Players may have to contract with a cheaper, contract option to move resources rather than using an expensive DOD option. Even in a larger disaster where funds are more plentiful, there may be delays as headquarters or even Congressional approval must be obtained to expand operations. The game should track the commitment and expenditure of funds and force players to consider this constraint. In addition, future versions of the game could involve preparedness grant funds that players would have to decide how to use and run excursions to see how they could improve their response performance.

d. *Screen Flow*

Figure 11 is a preliminary wireframe of what the players' screen may look like.

Figure 11. Preliminary Wireframe



Screenshot from the researchers game, SimCity and after “Next-Generation Incident Command System (NICS),” Sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>; Wikipedia, “Deepwater Horizon oil spill,” Embedded video, “Deepwater_Horizon_fire_seen_by_US_Coast_Guard_Helicopter,” accessed September 12, 2015, https://en.wikipedia.org/wiki/Deepwater_Horizon_oil_spill; David J. Phillip, April 20, 1996, whcuradio.com/news/030030-20-years-later-oklahoma-city-bombing-murrah-building.

Non-player characters and avatars should be available to provide a sense of working with others in a room and enhance the environment. However, a high degree of realism is not necessary.

The desktop is a dashboard with generic representation of a collaborative workstation. The basic screen should be map based with a geospatial information system

such as Google Maps. In addition to the basic map, other sections of the screen will provide players with essential information and allow them to interface with other aspects of the game world.

The map is a collaborative space where players may see the known situation, build a response plan, and watch the plan play out. The game should be designed so the majority of the play takes place on the map display. Next-Generation Incident Command System is a good approximation of what the basic dashboard might look like.

Chat Client: A chat client should be the focal point for interaction with both non-player characters and other players. Because of the importance of this form of communication within the game (vis-à-vis face to face and telephonic) the chat window should be prominent and present on all major displays.

Media feeds should be available on the main dashboard. However, players should be able to move to a separate window for expanded information, simulated television, and more involved chat sessions. Simulated news reporting and social media feeds should be available to the players to add realism.

Players should be able to interface via video chat, webinars, and simulated video teleconferencing.

FEMA has a deliberate process for sharing information as well as for creating and servicing action requests. A list of the pertinent FEMA forms to be duplicated is in Table 4.

Table 4. Standard Forms for Disaster Response

| Form Name | Description |
|-------------------|---------------------------------------|
| FEMA Form 010-0-7 | Resource Request Form |
| ICS Form 201 | Incident Brief |
| ICS Form 202 | Incident Objectives |
| ICS Form 203 | Organizational Assignment List |
| ICS Form 205A | Communications List |
| ICS Form 206 | Medical Plan |
| ICS Form 207 | Incident Organization Chart |
| ICS Form 209 | Incident Status Summary |
| ICS Form 214 | Activity Log |
| ICS Form 225 | Incident Personnel Performance Rating |

Incident Command System Forms to be replicated in the Game.

These forms are specifically designed for incident management people in the field so they should be modified to reflect the organization of the Regional Response Coordination Center. A more intuitive interface may be developed to ease the filling of the forms, but the game should provide a representation of the actual form to enhance reality. To the maximum extent possible, the forms should be auto-populated. For example, when players sign into the game and assume their roles, the information should be automatically transferred to a Regional Response Coordination Center organizational chart and contact list. Documents such as ICS Form 203, and “Organization Assignment List,” and ICS Form 207, “Incident Organization Chart,” should be already filled out with non-player character names and identification. The game should provide artificial intelligence for the characters identified in ICS forms 203 and 207. These characters should be represented on the bottom of the players screen as in Figure 11. In later versions of the game; external players will replace the non-player characters.

C. GAME OPTIONS

The main option for players should be the selection of the level of disaster. Players also need to develop and record their inner objectives (ICS Form 202) and determine how well they did at meeting those objectives at the end of the game. Future versions of the game should allow a game master to use real scenarios based on actual plans. However, the initial version could have a set location such as FEMA Emergency Management Institute's fictional "Columbia" or the Sacramento, CA scenario presented in this game design document and the prototype. This would allow early development and enhancement to focus on mechanics and players' interactions rather than spending great amounts of time and cost just developing the basic setup for the many locations possible across the U.S. (and even the world). An option could also be to play the game over three days in real time. In addition, based on the number of players available, the game should be expandable with real players taking the place of non-player characters such as governors.

Since *72-Hours* is a serious game with the intention for players to learn actual roles and responsibilities, playing back and saving game play is essential. This will allow after action review and to capture lessons learned to improve future performance.

As a serious game, cheats should be minimized. However, since the purpose is training, players are not constrained to the information presented in the game. They can use any real world plans and data sources to help them play the game. Easter Eggs could be useful for inspiring desired behaviors. For example, FEMA emphasizes the Whole Community concept. Players could receive Easter Eggs when they explore and discover the elderly, people with access and functional needs, and people with disabilities. Or, perhaps players are rewarded when they look for and/or organize a community response team that then brings exponential response back. Due to FEMA's focus on the Whole Community and historical problems in Hurricane Katrina and Hurricane Sandy in caring for homebound or bed-ridden populations, players should receive bonus points in the game for seeking out and finding these people within the game. The game will need to randomly place these Easter Eggs with each session.

D. STORY, SETTING, AND CHARACTERS

1. Story and Narrative

While later versions of the game should allow for individual game masters to use scenarios based on their respective plans, the first version is based on a flood in Sacramento, CA. According to the 2013 California Multi-Hazard Mitigation Plan, flooding is the second most frequent disaster (behind wildfire), accounting for the second highest amount of losses (behind earthquake), and the most fatalities.¹²² Due to the universality of storms and flooding disasters, early versions of the game will focus on this disaster. The general flow of the narrative is similar to the real world when a catastrophic situation strikes. At first, there is a dearth of information and responders scramble to react. Then, information can flow in so quickly from so many sources that response and support personnel become overwhelmed and have difficulty reacting appropriately. The situation can be exasperated by media reports. For example, one finding in the Chile Earthquake was media reporting regarding one collapsed building resulted in a large response to that location at the exclusion of others.¹²³ The game can provide increasing amounts of information like this to both inform players and distract them to determine if they get drawn to one area and exclude others.

First 12 Hours

It is late winter and early spring. After a week of heavy rain in the region that has saturated the ground and left reservoirs at capacity, a severe storm formed and struck the region producing wind damage and flooding. An early snowmelt has also exasperated the situation. Both the Sacramento and American Rivers are expected to reach the top of the levees within the next 72 hours. People in low-lying farmland are in the middle of a

¹²² California Governor's Office of Emergency Services, *California Multi-Hazard Mitigation Plan*, (Sacramento, CA: October, 2013), 115, accessed April 18, 2015, http://hazardmitigation.ca.gov/docs/SHMP_Final_2013.pdf.

¹²³ American Red Cross Multidisciplinary Team, *Report on the 2010 Chilean Earthquake and Tsunami Response*, (U.S. Geological Survey, Reston, VA: 2011), 46, accessed April 18, 2015, <http://pubs.usgs.gov/of/2011/1053/of2011-1053.pdf>.

voluntary evacuation. Sacramento is especially concerned about the community of Natomas (100,000 residents), which is protected on all sides by levees.

Emergency management personnel are preparing a mandatory evacuation order for the community due to soil instability from ground saturation. The Regional Response Coordination Center has been partially activated to monitor the situation when they receive a report that the levee protecting Natomas has failed. In addition to the flooding, winds with a steady state of 35 miles per hour, gusting to 60 exist and are forecast for the next 12 hours. The state and county emergency operations centers are activated, but overwhelmed. It is expected the entire area will be too flooded to drive (two feet of water) within a few hours and eventually every home will be submerged. The Sacramento Municipal Utility District has preemptively shut off power to the area expected to be covered by a 500-year flood. Twenty-five of 105 of the city's flood control pumps are operating on backup generator power. The other 80 will need generators. Personnel have been dispatched to manually close Sacramento's 15 floodgates. They each take hours to close and also cut off road traffic at those levee crossings.

In addition to Natomas, the downtown area is flooding. Five major hospitals are in the 200-year floodplain. They have 2,000 beds and represent $\frac{2}{3}$ of Sacramento County's hospital capacity.¹²⁴ Sutter Medical Center downtown is already experiencing several inches of flooding and water is expected to inundate the facility up to six feet.

Sacramento International and Sacramento Executive Airports are flooded and out of service. Interstates 5 and 80; State Highway 99; the light rail system; and the interstate rail system are all cut off. The rail and highway lines from the North, South, and West are all cut off. An unknown number of vehicles are stranded. The only evacuation routes available for Sacramento residents are now east along Interstate 80 and Highway 50. The water and wastewater systems are also now down due to the electrical failure and contamination.

¹²⁴ Matt Weiser and Philip Reese, "What if a Superstorm Strikes Sacramento? Flooding Danger Puts the Capital at Risk Worse than Sandy," *The Sacramento Bee*, November 18, 2012, 12:00 A.M., accessed April 18, 2015, <http://www.sacbee.com/news/weather/article2575974.html>.

Communications, to include the Internet are down due to flooding and power loss at the exchange. Some cell towers are operational on battery back up, but circuits are overloaded. Battery life is estimated at three hours before the cell network is lost as well. Without electricity, no fuel is available.

Thousands of visitors are stranded in downtown hotels as they are cut off. Several hotels with generators in basements have lost power due to the flooding. Motorists are stranded throughout the city as well as highways. Even the Governor got stranded at his house downtown when he went home for personal supplies.

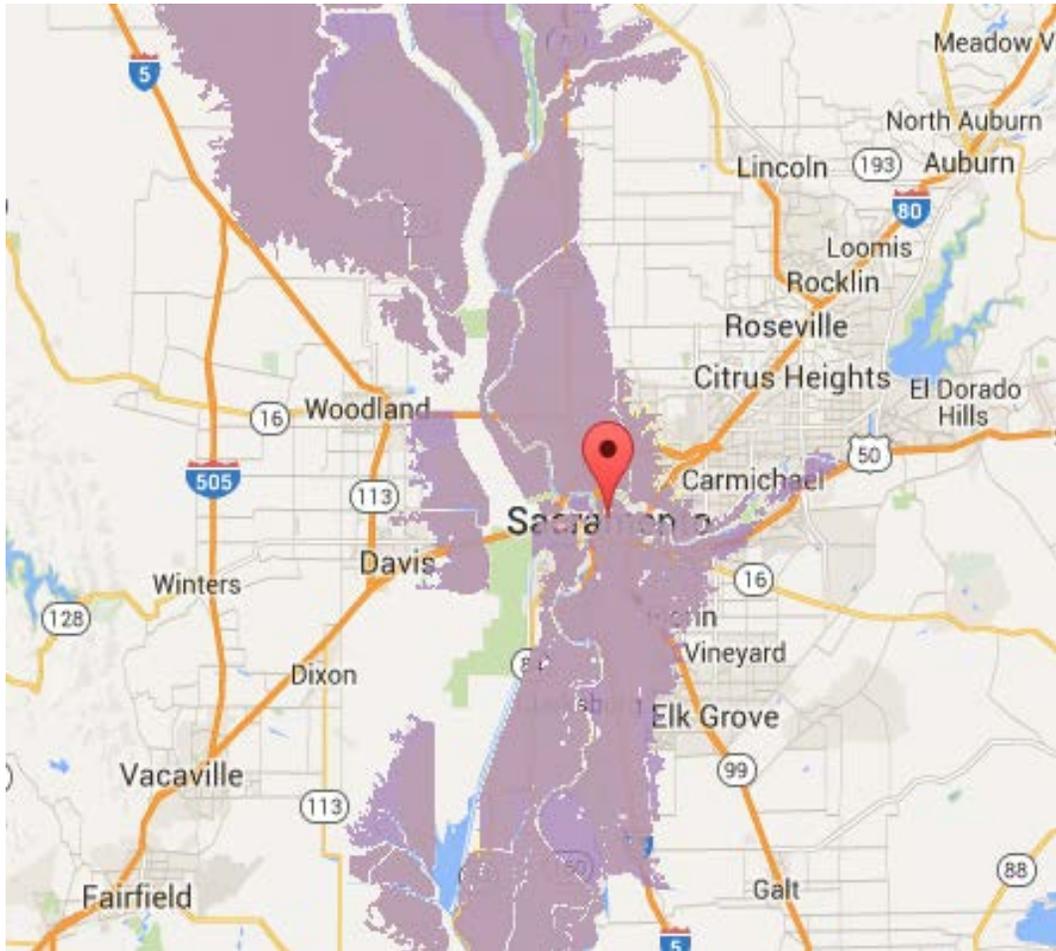
The governor has activated the National Guard, but needs Federal assistance immediately. Due to the power and communications failures, little information is getting out. By the end of the first 12 hours, the President has granted a Presidential Disaster Declaration and allocated \$30 million.

12–24 Hours

While traditional media emerges and reports at major locations like hospitals, social media reports outnumber them as survivors reach higher ground. What is clear is more than 100,000 are now affected and need mass care and sheltering. The Sleep Train Arena, within the inundation zone, has more than 17,000 seats¹²⁵ and an unknown number of people have evacuated to the facility. Tens of thousands are injured and there are thousands of fatalities. The weather prevents airborne operations for twelve hours. At the end of the first 24 hours, the city is reeling as it is literally unable to save itself. Surrounding cities send aid but are facing more than 100,000 people trapped or evacuating and in need of immediate shelter. Most of the information that is available is from Ham radio operators and survivors. The game will feed information through both traditional media and social media at an accelerating rate. The flood inundation zone is shown in Figures 12 and 13.

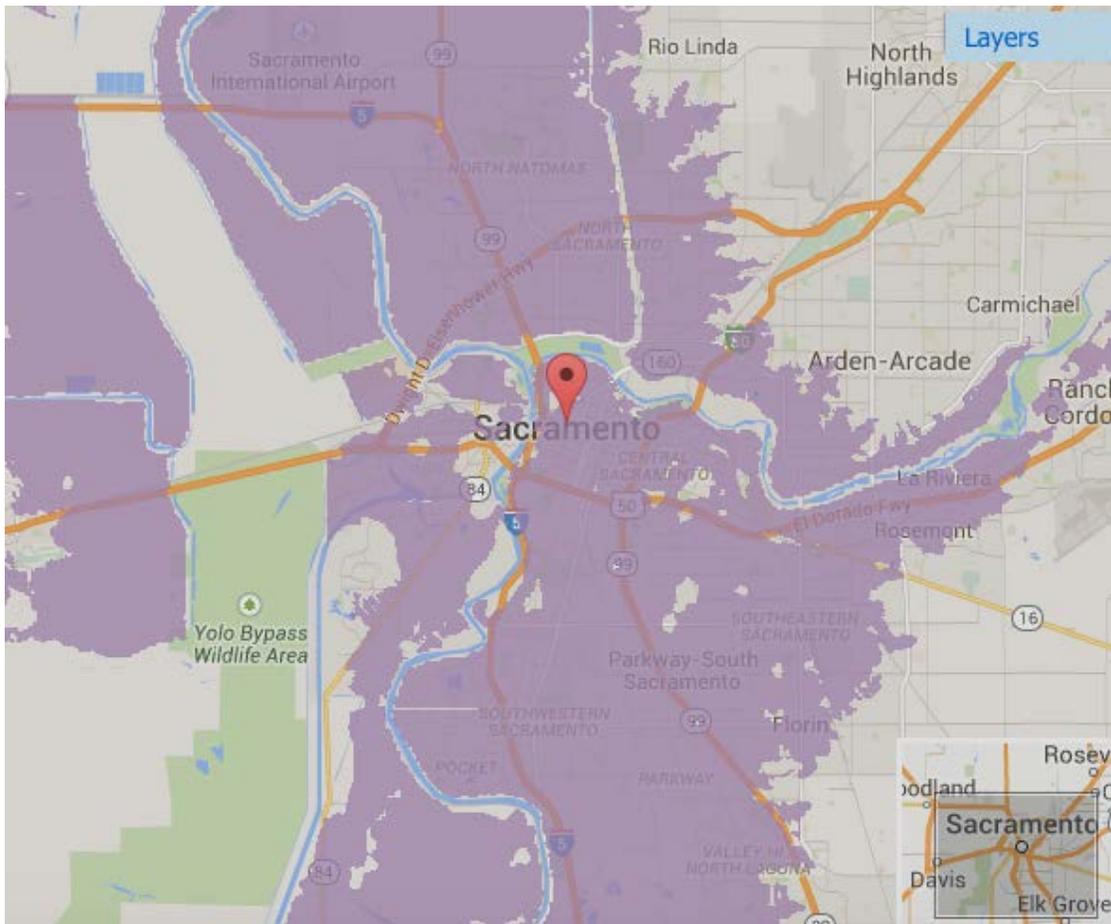
¹²⁵ “Sleep Train Arena,” Wikipedia, accessed September 11, 2015, http://en.wikipedia.org/wiki/Sleep_Train_Arena.

Figure 12. Flood Inundation Zone



Screen shot of the State of California, Department of Water Resources, Best Available Map, accessed June 20, 2015, <http://gis.bam.water.ca.gov/bam/>.

Figure 13. Flood Inundation Zone Zoom In



From a screen shot of the State of California, Department of Water Resources, Best Available Map, accessed June 20, 2015, <http://gis.bam.water.ca.gov/bam/>.

24–36 Hours

Although the river has crested, rain and flooding continue for the next several days as engineers determine how to shore up the breach in the levee. Every home in Natomas is flooded up to rooftops. An unknown number of survivors are on their roofs and the cold, windy weather make hypothermia a major concern. Flood control pumps from other areas of the country or the world are unavailable for weeks. As the winds die down, over flight is possible, situational awareness increases and search and rescue operations begin. The game will start feeding information at an ever-increasing rate about locations of survivors needing food, water, and shelter. There will also be an increasing number of people stranded at hotels, hospitals, apartments, and homes. Information

requests will flow in from the press, the state, FEMA Headquarters, Congressional leaders and the President. Massive offers of aid will also arrive. The state and county emergency operations centers are becoming more active and making requests for personnel, supplies, and evacuation.

36–48 Hours

The flooding is not getting worse, but the water and rain remain. More than one million people in the Sacramento Metropolitan Area are impacted by the disaster.¹²⁶ Based on where the players focus aid effort, some critical infrastructure will begin to be repaired; roads, railroads, power, and communication systems. Spontaneous volunteers are pouring in, but thousands of them now need food, water and shelter as they help the responders. Traditional media is reporting of U.S. Government incompetence and neglect of people at the hardest hits areas. The first National Guard troops arrive in the area to help the response but need to be provided base camps. All surrounding communities are overwhelmed with survivors. Since $\frac{2}{3}$ of Sacramento County's hospital beds are in the flood inundation zone, the surrounding area lacks the capacity to handle the surge. The Red Cross and other non-profit organizations cannot provide mass care and shelter for so many people so quickly. Evacuations are needed immediately.

48–60 Hours

Supplies and personnel arrive as ordered by the players. Players decide where to stage and deploy supplies and personnel to help. While some critical infrastructure has been repaired, most are out. There are reports of bodies floating in the most flooded areas. People wave from rooftops and balconies for help as they have been without food, water, and utilities for more than two days. Although some catch rainwater, it is an urgent race now to stave off people succumbing to thirst and exposure. There are many, competing priorities, search and rescue, fatality management, mass care and sheltering.

¹²⁶ Matt Weiser and Philip Reese, "What if a Superstorm Strikes Sacramento?"

60–72 Hours

Personnel and resources continue to flow in where players have designated as well as where the game's AI reports local efforts. Spontaneous, uncoordinated actions by citizens and non-governmental organizations are actually common during disasters. Areas that have not been reached now have increasing fatalities as seen in Hurricane Katrina.

2. Game World

Most elements of the game world will have the actual look and feel of actual Regional Response Coordination Centers.

Since players actually use standard computer displays and workstations in the conduct of their actual emergency response roles, they will have the same interface with the game. Future versions of the game would allow play on tablets and smartphones since responders actually use those platforms during disasters. Telephones and FAX machines will be displayed as icons for calls within the game. Nothing prevents players from using actual telephones or direct verbal communication if they prefer. The game will encourage users to use the chat client application. This not only enables full recording and playback within the game, but is also a good practice in real disasters for the same reason. While the players' display mimics the real world, it will have additional windows and dashboard elements that assist players with situational awareness, their performance, and the performance of the team.

As players pan around the room they should see player avatars and non-player characters to provide a sense of reality. Avatars and non-player characters do not need a high degree of realism. Furthermore, players should see a generic center with common displays, televisions, maps, and windows. Again, the intent is to provide a sense of realism and not high fidelity, so graphics can be basic. Background noise such as voice chatter also adds to the realism. Figures 14–18 are actual photos of FEMA the Region IX's Regional response Coordination Center in action during exercise Ardent Sentry, May 11, 2015. The actual Regional response Coordination Center is a very low-tech environment. Computer games can create a much richer environment than reality.

Figure 14. Map Wall of Region IX Regional Response Coordination Center



Federal Emergency Management Agency Region IX Regional Response Coordination Center during Exercise Ardent Sentry 2015, May 11, 2015.

Figure 15. Staff Briefing at Region IX Regional Response Coordination Center



Federal Emergency Management Agency Region IX Regional Response Coordination Center during Exercise Ardent Sentry 2015, May 11, 2015.

Figure 16. Front of Region IX Regional Response Coordination Center



Federal Emergency Management Agency Region IX Regional Response Coordination Center during Exercise Ardent Sentry 2015, May 11, 2015.

Figure 17. Geospatial Information Display of the Region IX Regional Response Coordination Center



Federal Emergency Management Agency Region IX Regional Response Coordination Center during Exercise Ardent Sentry 2015, May 11, 2015.

Figure 18. View of the Region IX Regional Response Coordination Staff



Federal Emergency Management Agency Region IX Regional Response Coordination Center during Exercise Ardent Sentry 2015, May 11, 2015.

Media feeds present graphics of reporters, damage, and other non-player characters. Graphics can be kept basic but add to the realistic feel.

While the initial version will focus on the inside of the Regional Response Coordination Center, future versions will have players moving through the disaster area. The graphics should have a realistic feel, but high fidelity is not necessary. The focus of the game is teamwork and decision making under pressure so graphics may be kept more basic.

3. Characters

Character descriptions will focus on *Regional Incident Support Manual* positions (Appendix B). The roles, responsibilities, and authorities of the characters are important rather than personal characteristics such as with typical first person shooter games. The game should use the *Regional Incident Support Manual* to define the positions. It should

use the FEMA Qualification System to define each position's actual performance metrics for individual scoring. The game would then provide position descriptions and prompt players throughout the game. Players should be able to select their experience level. By doing so, the game could provide more prompts for lower level players and fewer for higher level ones. The game could then appropriately prompt players to complete essential elements of their FEMA Qualification System responsibilities. More experienced players would get fewer prompts, but also be shown neglected elements at the end of the game. One note: for brevity, this document focuses on the key leaders of the *Regional Incident Support Manual*; Regional Administrator, Situational Awareness Section Leader, Planning Section Leader, Resource Support Section Leader, and the Regional Response Coordination Center Support Leader. Even during early versions of the game and in the prototype, additional members of each of these sections will be required for success.

4. Scoring

Table 5 displays what scoring might look like for individual FEMA Qualification System (FQS) positions. Table 5 competencies, behaviors and tasks are taken directly from the "FEMA Incident Support Position Task Book; R24 Resource Support Section Chief."¹²⁷ The table from the position task book has been condensed and modified to include a possible point system for individual scoring. Many of the numerical designations are generically used in multiple FQS task books so the numbers are not necessarily sequential. Again, Table 4 contains the actual tasks required to be a qualified Regional Response Coordination Staff, Resource Support Section Chief and no tasks have been added or deleted in this paper. Representative point values for each task are included to demonstrate the relative importance of the tasks. Simple, administrative tasks are the baseline with a value of 1. They are easy to accomplish, but of lower importance the mission-oriented tasks. Mission-oriented tasks such as 5.5.2, Approving Action Request Forms, have values up to 4. In this example, the sum of all point is 100.

¹²⁷ Federal Emergency Management Agency, "FEMA Incident Support Position Task Book; R24 Resource Support Section Chief," 3-13.

Therefore, the acquisition of points based on completed tasks represents a percentage toward attaining Resource Support Section Chief certification.

Table 5. Resource Support Section Chief FEMA Qualification System Task Scoring

| Task Description | Task Value |
|--|------------|
| Competency 2: Exhibits Leadership —Influences, guides, and directs assigned personnel to accomplish objectives and desired outcomes in a rapidly changing, high-risk environment. | 21 |
| Behavior 2.2: Assesses the situation and adapts one’s understanding based on varying perspectives | 10 |
| 2.2.1 Ascertain incident level capabilities | 1 |
| 2.2.2 Assess the nature and scope of the incident/event | 2 |
| 2.2.3 Assess what the major unmet needs are | 2 |
| 2.2.4 Ascertain what the NRCC’s priorities are for the next NRCS operational period at each shift change briefing | 1 |
| 2.2.5 Ascertain what the Joint Field Office’s priorities are for the next RRCS operational period at each shift change briefing | 2 |
| 2.2.6 Ascertain what additional Emergency Support Functions, if any, have been activated by the RRCC staff at each shift change briefing | 1 |
| 2.2.7 Ascertain what FEMA, Emergency Support Function agencies, State(s), and the voluntary agencies are doing in terms of current and planned operations at each shift change briefing | 1 |
| Behavior 2.3: Leads and supports assigned personnel | 6 |
| 2.3.1 Establish Section assignments based on the objectives for the Section | 1 |
| 2.3.2 Monitor and adjust work assignments within the Section | 1 |
| 2.3.3 Ensure continuous coverage in the Resource Support Section work area | 1 |

| Task Description | Task Value |
|--|------------|
| 2.3.4 Ensure the Regional Watch Center contacts the appropriate Emergency Support Function primary points of contact to request representation on the RRCS | 1 |
| 2.3.5 Ensure the activation of appropriate Emergency Support Functions and other Federal agencies | 1 |
| 2.3.6 Activate the appropriate Resource Support Section Group Supervisors based on Emergency Support Function, other Federal agency, private sector, and non-government organization representation required in the RRCS | 1 |
| Behavior 2.5: Creates a collaborative environment across functional areas/external stakeholders | 5 |
| 2.5.1 Collaborate on objectives with the C-RRCS and other Section Chiefs to establish Section assignments | 2 |
| 2.5.2 Ensure coordination with interagency representatives and partners to provide the full spectrum of resources to fulfill requests received from the Regional and incident levels | 1 |
| 2.5.3 Coordinate with the NRCC Resource Support Section Chief to fulfill requirements, when appropriate | 1 |
| 2.5.4 Provide the NRCC Resource Support Section Chief the RRCC objectives from the Regional Support Plan to support the development of NRCC objectives for each operational period | 1 |
| Competency 3: Collaborates Effectively —Promotes collaboration and works well with others to effectively accomplish the mission. | 5 |
| Behavior 3.1: Maintains working relationships | 2 |
| 3.1.1 Communicate resource management issues and status to the CRRCS | 1 |
| 3.1.2 Keep the C-RRCS, Response Division Director, and other Section Chiefs fully informed concerning current and planned Resource Support Section actions | 1 |
| Behavior 3.2: Enables cooperative and productive group interactions | 3 |
| 3.2.1 Ensure that staff integrate and coordinate their activities | 2 |

| Task Description | Task Value |
|---|------------|
| internally and externally with all levels of involved organizations and agencies | |
| 3.2.2 Meet with other Section Chiefs and Resource and Capability Branch Director to determine the Operational Tempo for reports and briefings for the shift | 1 |
| Competency 4: Communicates Effectively —Expresses information in written and verbal formats to individuals and groups effectively, taking into account the audience and nature of the information; listens to others, attends to nonverbal cues, and responds appropriately. | 8 |
| Behavior 4.1: Delivers clear, concise, complete, and correct verbal communication tailored to target audience | 3 |
| 4.1.1 Represent the Section at RRCS meetings, videoconferences, and teleconferences | 1 |
| 4.1.2 Serve as the facilitator for the daily briefing and planning meetings, if needed | 1 |
| 4.1.3 Provide or arrange an initial situation briefing for the Section staff | 1 |
| Behavior 4.2: Delivers clear, concise, complete, and correct written products tailored to target audience | 2 |
| 4.2.1 Prepare notes, charts, or handouts as appropriate during daily briefing and meetings | 1 |
| 4.2.2 Update the appropriate advisory, alert, operation orders, or activation messages, as needed | 1 |
| Behavior 4.3: Engages in effective interaction in a group setting | 3 |
| 4.3.1 Maintain the appropriate level of coordination vertically from the incident level to the NRCC | 2 |
| 4.3.2 Maintain the appropriate level of coordination with the counterpart in the Resource Support Sections of the NRCC staff and the Incident Management Assistance Team | 1 |
| Competency 5: Fulfills Position Responsibilities —Successfully assumes assigned role and fulfills responsibilities at the appropriate | 66 |

| Task Description | Task Value |
|---|-------------------|
| time, performing assigned tasks with a high level of competence. | |
| Behavior 5.1: Complies with policies and procedures | 1 |
| 5.1.1 Sign timesheets for all staff | 1 |
| Behavior 5.3: Gathers, organizes, and conveys information | 14 |
| 5.3.1 Ensure all RRCS personnel have provided emergency contact data to the appropriate person | 1 |
| 5.3.2 Exchange 24-hour contact information with the NRCC Resource Support Section Chief and provide a list of the RRCC Resource Support Section key staff | 1 |
| 5.3.3 Obtain current status of what resources have already been committed and are available for use | 3 |
| 5.3.4 Identify any support requirements which the RRCS may fulfill for personnel in the incident area | 3 |
| 5.3.5 Identify support requirements for the deployment of Incident Management Assistance Teams | 3 |
| 5.3.6 Ensure documentation for all contract vehicles (task orders, contracts, interagency agreements, purchase orders) is reviewed and approved | 3 |
| Behavior 5.4: Conducts analysis to produce actionable information and products | 1 |
| 5.4.1 Review the appropriate report for the status of actions at least twice per shift | 1 |
| Behavior 5.5: Makes timely, informed recommendations and decisions that consider facts, objectives, constraints, risks, and differing perspectives | 21 |
| 5.5.1 Formulate an initial plan of action for overall initial response to support FEMA Regional response capabilities | 3 |
| 5.5.2 Review and approve Action Request Forms and mission assignments before initial operating facility establishment | 4 |
| 5.5.3 Approve the sourcing approach and assign it a priority | 3 |

| Task Description | Task Value |
|--|------------|
| 5.5.4 Provide recommendations on what additional Emergency Support Functions to activate at the RRCC to the C-RRCS | 3 |
| 5.5.5 Provide recommendations on priority missions and any reprioritization of the NRCC support objectives for either the subsequent shift or the next operational period | 4 |
| 5.5.6 Coordinate with the C-RRCS to identify the needs of the State until the Incident Management Assistance Team is established | 4 |
| Behavior 5.6: Participates in the planning process | 8 |
| 5.6.1 Use the Regional Support Plan development process to identify specific actions required to accomplish daily RRCC objectives | 4 |
| 5.6.2 Assist the C-RRRCS in developing the Regional Support Plan objectives until the Incident Management Assistance Team is established | 4 |
| Behavior 5.7: Manages and tracks resources effectively | 14 |
| 5.7.1 Ensure organizational structure is adequate to meet incident needs | 4 |
| 5.7.2 Assess the staffing needs of the Section on a regular basis | 1 |
| 5.7.3 Delegate approval authority for resource requests as appropriate | 1 |
| 5.7.4 Provide continuous review of Resource Support Section resource requirements | 1 |
| 5.7.5 Oversee and maintain accountability for the receipt, validation, and processing of resource requests | 4 |
| 5.7.6 Ensure cost estimates for all Resource Support Section and Emergency Support Function activities are received by the Order Processing Group and funds are made available | 2 |
| 5.7.7 Ensure the funding source for all requests is correct | 1 |
| Behavior 5.9: Plans for and completes the demobilization/ transition process | 7 |

| Task Description | Task Value |
|---|------------|
| 5.9.1 Notify the Section of the RRCC deactivation and the level of remaining activity | 1 |
| 5.9.2 Ensure the effective transition of the Section activities back to the National Watch Center | 1 |
| 5.9.3 Notify the C-RRCS, Joint Field Office, National Operations Center and Regional Watch Center when the Section closes and the cessation of all reporting occurs | 1 |
| 5.9.4 Determine the closeout of taskings for each unit and report the information to the C-RRCS | 1 |
| 5.9.5 Capture after-action information from the team and ensure it is conveyed to the Lessons Learned Advisor | 2 |
| 5.9.6 Ensure a stand-down notice is sent to all the section and agency staffs with archival and documentation activities outlined | 1 |

After Federal Emergency Management Agency, “FEMA Incident Support Position Task Book; R24 Resource Support Section Chief,” 3–13.

This research into a possible individual scoring system uncovered deficiencies in the current task descriptions. For example, task 5.7.1 is “Ensure organizational structure is adequate to meet incident needs.” One could argue that this definition is too vague for an evaluator to determine if the trainee actually accomplished this task. As written, the task is far too imprecise to use for computer-based scoring. In order for a computer version of 72-Hours to use FEMA’s position task books to evaluate player performance, subject matter experts for each position would need to rewrite the tasks with more fidelity. This effort would also be useful to assist human evaluators in determining if trainees have complete tasks. Table 5 provides an example of what a breakout might be for behavior 5.7, “Manages and tracks resources effectively.” Each task is broken out into four scoring criteria; complete, good, satisfactory, and unsatisfactory. Furthermore, each of the four scoring criteria has a point value. Players will have to reach the complete level to receive 100% for the task. Within a spreadsheet, a simple “yes” for task completion will result in the correct number of points being assigned. In Table 6, completions levels

for each task have been assigned as a sample of what the position task book scoring might look like after a 12-hour shift in the Regional Response Coordination Center. In this sample, the fictional Resource Support Section Chief is doing a good job with managing the funds. However, due to the time it is taking to fulfill the resource requests, it appears the resource Support Section Chief is not doing a good job managing his workload and staff. The individual is 45% toward reaching the certification requirement for this task.

Table 6. Sample Sub-Task Scoring Criteria for Task 5.7

| Task Description | Value / Competency & Behavior Subtotal | Complete (Yes/No) | Completion / Competency & Behavior Subtotal |
|---|--|-------------------|---|
| <i>Behavior 5.7: Manages and tracks resources effectively</i> | 14 | "Yes" | 45% |
| 5.7.1 Ensure organizational structure is adequate to meet incident needs | 4 | "Yes" | 1 |
| Complete. All resource requests are processed through the required Resource Support Section staff queues within 1 hour of receipt. | 4 | | 0 |
| Good. All resource requests are processed through the required Resource Support Section staff queues within 2 hours of receipt. | 2 | | 0 |
| Satisfactory. All resource requests are processed through the required Resource Support Section staff queues within 4 hours of receipt. | 1 | Yes | 1 |
| Unsatisfactory. At least one resource request is processed through the required Resource Support Section staff queues in excess of 4 hours | 0 | | 0 |

| Task Description | Value / Competency & Behavior Subtotal | Complete (Yes/No) | Completion / Competency & Behavior Subtotal |
|---|--|-------------------|---|
| of receipt. | | | |
| 5.7.2 Assess the staffing needs of the Section on a regular basis | 1 | "Yes" | 0.25 |
| Complete. All resource requests are processed through the required Resource Support Section staff queues within 1 hour of receipt for 8 consecutive hours. | 1 | | 0 |
| Good. All resource requests are processed through the required Resource Support Section staff queues within 2 hours of receipt for 8 consecutive hours. | 0.5 | | 0 |
| Satisfactory. All resource requests are processed through the required Resource Support Section staff queues within 4 hours of receipt for 8 consecutive hours. | 0.25 | Yes | 0.25 |
| Unsatisfactory. At least one resource request is processed through the required Resource Support Section staff queues in excess of 4 hours of receipt for 8 consecutive hours. | 0 | | 0 |
| 5.7.3 Delegate approval authority for resource requests as appropriate | 1 | "Yes" | 0.5 |
| Complete. All resource requests within the Resource Support Section Chief's queue are acted on within 15 minutes. | 1 | | 0 |
| Good. All resource requests within the Resource Support Section Chief's queue are acted on | 0.5 | Yes | 0.5 |

| Task Description | Value / Competency & Behavior Subtotal | Complete (Yes/No) | Completion / Competency & Behavior Subtotal |
|---|--|-------------------|---|
| between 15 and 30 minutes. | | | |
| Satisfactory. All resource requests within the Resource Support Section Chief's queue are acted on between 30 and 45 minutes. | 0.25 | | 0 |
| Unsatisfactory. At least one resource request within the Resource Support Section Chief's queue is acted on in greater than 45 minutes. | 0 | | 0 |
| 5.7.4 Provide continuous review of Resource Support Section resource requirements | 1 | "Yes" | 0.5 |
| Complete. The Resource Support Section Chief actively sequences through the Resource Request Form board every 30 minutes. | 1 | | 0 |
| Good. The Resource Support Section Chief actively sequences through the Resource Request Form board every 30 to 45 minutes. | 0.5 | Yes | 0.5 |
| Satisfactory. The Resource Support Section Chief actively sequences through the Resource Request Form board every 45 to 60 minutes. | 0.25 | | 0 |
| Unsatisfactory. The Resource Support Section Chief actively sequences through the Resource Request Form board in excess of every 60 minutes. | 0 | | 0 |
| 5.7.5 Oversee and maintain accountability for the receipt, validation, and processing of resource requests | 4 | "Yes" | 1 |
| Complete. All resource requests are entered, sourced, and ordered within 1 hour of receipt. | 4 | | 0 |

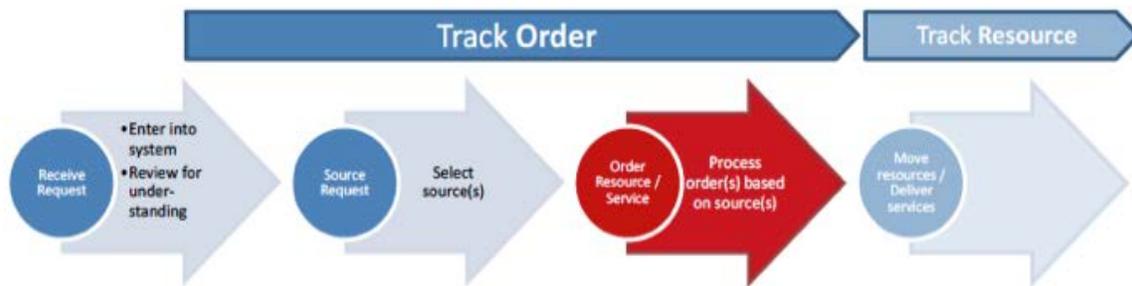
| Task Description | Value / Competency & Behavior Subtotal | Complete (Yes/No) | Completion / Competency & Behavior Subtotal |
|--|--|-------------------|---|
| Good. All resource requests are entered, sourced, and ordered within 2 hours of receipt. | 2 | | 0 |
| Satisfactory. All resource requests are entered, sourced, and ordered within 4 hours of receipt. | 1 | Yes | 1 |
| Unsatisfactory. At least one resource request is entered, sourced, and ordered in greater than 4 hours of receipt. | 0 | | 0 |
| 5.7.6 Ensure cost estimates for all Resource Support Section and Emergency Support Function activities are received by the Order Processing Group and funds are made available | 2 | "Yes" | 2 |
| Complete. All resource requests received by the Order Processing Group have funds available to source the request. | 2 | Yes | 2 |
| Good. All resource requests received by the Order Processing Group have funds available to source the request within 2 hours. | 1 | | 0 |
| Satisfactory. All resource requests received by the Order Processing Group have funds available to source the request within 4 hours. | 0.5 | | 0 |
| Unsatisfactory. At least one resource request received by the Order Processing Group requires more than 4 hours to have funds available. | 0 | | 0 |
| 5.7.7 Ensure the funding source for all requests is correct | 1 | "Yes" | 1 |
| Complete. 100% of the resource requests have | 1 | Yes | 1 |

| Task Description | Value / Competency & Behavior Subtotal | Complete (Yes/No) | Completion / Competency & Behavior Subtotal |
|--|--|-------------------|---|
| the correct funding source allocated to them. | | | |
| Good. 90% of the resource requests have the correct funding source allocated to them. | 0.5 | | 0 |
| Satisfactory. 80% of the resource requests have the correct funding source allocated to them. | 0.25 | | 0 |
| Unsatisfactory. Less than 80% of the resource requests have the correct funding source allocated to them. | 0 | | 0 |

After Federal Emergency Management Agency, “FEMA Incident Support Position Task Book; R24 Resource Support Section Chief,” 3–13.

Since the Resource Support Section Chief’s overall objective is to effectively and efficiently deliver resources to disaster survivors, the scoring breakout reflects generally how quickly the Resource Support Section Chief accomplishes the task. The focus of the Resource Support Section team’s performance for task 5.7 is the first three steps of the resource management and tracking process as outlined in the *Regional Incident Support Manual*, as shown in Figure 19. While there are a number of factors involved in servicing resource requests, the efficient accomplishment of these first three steps largely reflects the management of the Resource Support Section team. The sample scoring provided above in Table 5 is based on the assumption that successfully accomplishing task 5.7 is based on how well the Resource Support Section processes requests from receipt through ordering as shown in Figure 19.

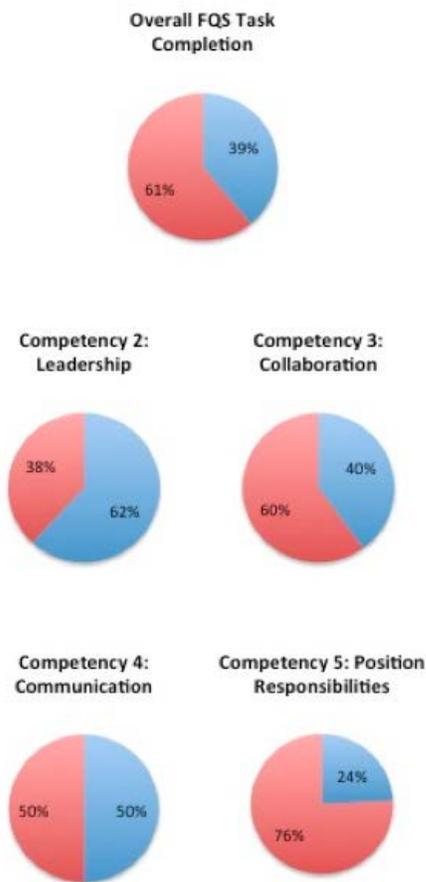
Figure 19. Centralized Resource Management and Tracking Process



From Regional Incident Support Manual, 119.

Figure 20 shows what a FQS position dashboard might look like. A sample set of completed items indicated by “Yes” has been added to the various tasks from Table 4. Based on the task values from Table 4, the completion percentage for each of the five competencies from the Resource Support Section Chief FQS position task book are displayed in the corresponding pie charts. The game could have basic pie charts, fictitious gauges, or other gamified display showing percentage toward completion of the entire task book as well as percentage completion for each competency. In addition, players could call up a task book certification checklist for greater fidelity regarding the tasks they wish to accomplish, their point values, and the player’s progress. Once they achieve one level of qualification, players could easily open additional FQS task books within the game and start working to higher levels of certification.

Figure 20. Example Dashboard for Individual FQS Task Book Score



| Task Description | Task Value | Complete (Yes/No) |
|--|------------|-------------------|
| Competency 2: Exhibits Leadership - Influences, guides, and directs assigned personnel to accomplish objectives and desired outcomes in a rapidly changing, high-risk environment. | | |
| Behavior 2.2: Assesses the situation and adapts one's understanding based on varying perspectives | | |
| 2.2.1 Ascertain incident level capabilities | 1 | Yes |
| 2.2.2 Assess the nature and scope of the incident/event | 2 | Yes |
| 2.2.3 Assess what the major unmet needs are | 2 | Yes |
| 2.2.4 Ascertain what the NRCC's priorities are for the next NRCS operational period at each shift change briefing | 1 | Yes |
| 2.2.5 Ascertain what the Joint Field Office's priorities are for the next RRCS operational period at each shift change briefing | 2 | No |
| 2.2.6 Ascertain what additional Emergency Support Functions, if any, have been activated by the RRCC staff at each shift change briefing | 1 | No |
| 2.2.7 Ascertain what FEMA, Emergency Support Function agencies, State(s), and the voluntary agencies are doing in terms of current and planned operations at each shift change briefing | 1 | No |
| Behavior 2.3: Leads and supports assigned personnel | | |
| 2.3.1 Establish Section assignments based on the objectives for the Section | 1 | Yes |
| 2.3.2 Monitor and adjust work assignments within the Section | 1 | No |
| 2.3.3 Ensure continuous coverage in the Resource Support Section work area | 1 | No |
| 2.3.4 Ensure the Regional Watch Center contacts the appropriate Emergency Support Function primary points of contact to request representation on the RRCS | 1 | Yes |
| 2.3.5 Ensure the activation of appropriate Emergency Support Functions and other Federal agencies | 1 | Yes |
| 2.3.6 Activate the appropriate Resource Support Section Group Supervisors based on Emergency Support Function, other Federal agency, private sector, and non-government organization representation required in the RRCS | 1 | Yes |
| Behavior 2.5: Creates a collaborative environment across functional areas/external stakeholders | | |
| 2.5.1 Collaborate on objectives with the C-RRCS and other Section Chiefs to establish Section assignments | 2 | Yes |
| 2.5.2 Ensure coordination with interagency representatives and partners to provide the full spectrum of resources to fulfill requests received from the Regional and incident levels | 1 | No |
| 2.5.3 Coordinate with the NRCC Resource Support Section Chief | 1 | Yes |

Table and charts were created using notional Task Values, created by the author after Federal Emergency Management Agency, "FEMA Incident Support Position Task Book; R24 Resource Support Section Chief," 3–13.

Table 7 is a sample representation of a possible scoring system for the Regional Response Coordination Staff team. In this example, one million people are affected by a disaster. Of the one million people affected, 250,000 are displaced. For this scenario, there are 100 (.01%) fatalities and 20,000 (2%) injuries. The requirements (highlighted in yellow) such as water, meals, infant-toddler kits, and others are based on generally accepted planning factors as shown in Table 8. Fatalities, injuries and uncared for displaced persons are the result of the disaster as well as the action/inaction of the Regional Response Coordination Staff. The number of fatalities, injured, and uncared for displaced persons provide a negative score. Fatalities, injuries, and displaced persons are

measured in damage with weights relative to the costs associated with the other items. The other items are given a notional dollar value per item to facilitate combining them for a total score. The notional dollar values are based on relative values between the items. For example, a life is given a value of 2 million damage points. The injured are 1/1000th of that at 2,000. Each able body, but displaced person has a value of 1/10th of an injury at 200. This should motivate people to make sure they rescue and care for as many as possible. Those that are not cared for that become injuries or fatalities cost orders of magnitude than simply caring for them. In this example, with 250,000 displaced, 100 fatalities, and 20,000 injuries, 170,000 uncared for displaced persons, the Regional Response Coordination Staff starts in the hole with a score of -274 million. Their scores will climb as they deliver commodities, and build capabilities (highlighted in green). In this sample scoring, the team will break even when they have done just enough to care for the affected population. The fatalities, injuries and displaced persons are provided generic damage points rather than dollar values out of concern for being appearing to be distasteful.

Table 7. Regional Response Center Staff Team Scoring Example

SURVIVOR AND COMMODITY POINTS

| Element | Requirements | Value (\$/element) | Amount Delivered | Damage / Score (\$) |
|--------------------------------------|---------------------|---------------------------|-------------------------|----------------------------|
| Fatalities | 100 | -2,000,000 | N/A | -200,000,000 |
| Injuries | 20,000 | -2,000 | N/A | -40,000,000 |
| Uncared for Displaced Persons | 0 | -200 | 170,000 | -34,000,000 |
| Number in Shelters | 200,000 | \$200 | 50,000 | \$10,000,000 |
| Number Evacuated | 50,000 | \$200 | 30,000 | \$6,000,000 |
| Number Rescued | 5,000 | \$2,000 | 1,000 | \$2,000,000 |

| Element | Requirements | Value (\$/element) | Amount Delivered | Damage / Score (\$) |
|---------------------------------------|--------------|--------------------|------------------|-----------------------|
| Pounds of Ice Delivered | 8,000,000 | \$16 | 4,000,000 | \$64,000,000 |
| Liters of Water Delivered | 3,000,000 | \$6 | 3,000,000 | \$18,000,000 |
| MREs Delivered | 2,000,000 | \$5 | 2,000,000 | \$10,000,000 |
| Blankets Delivered | 500,000 | \$4 | 100,000 | \$400,000 |
| Cots Delivered | 250,000 | \$4 | 100,000 | \$400,000 |
| Hygiene Kits Delivered | 20,000 | \$50 | 10,000 | \$500,000 |
| Infant-Toddler Kits Delivered | 20,000 | \$100 | 200,000 | \$2,000,000 |
| Durable Medical Equipment Delivered | 10,000 | \$100 | 5,000 | \$500,000 |
| Consumable Medical Supplies Delivered | 10,000 | \$100 | 5,000 | \$500,000 |
| Tarps Delivered | 187,500 | \$10 | 190,000 | \$1,875,000 |
| Commodity Subtotal = | | | | -\$157,825,000 |

FACILITY POINTS

| Element | Requirements | Value (\$/element) | Amount Delivered | Score (\$) |
|--------------------------|--------------|--------------------|------------------|-------------|
| Federal Medical Stations | 3 | \$1,000,000 | 2 | \$2,000,000 |
| DMAT Teams | 10 | \$300,000 | 10 | \$3,000,000 |
| DMORT Teams | 10 | \$15,000 | 10 | \$150,000 |

| Element | Requirements | Value (\$/element) | Amount Delivered | Score (\$) |
|------------------------------|--------------|--------------------|------------------|---------------------|
| FSA's Open | 3 | \$1,000,000 | 2 | \$2,000,000 |
| Type I PODs Open | 25 | \$200,000 | 10 | \$2,000,000 |
| Type II PODs Open | 0 | \$100,000 | 10 | \$1,000,000 |
| Type III PODs Open | 0 | \$50,000 | 5 | \$250,000 |
| Capability Subtotal = | | | | \$10,400,000 |

TOTALS

| | |
|----------------------------------|-----------------------|
| Grand Total = | -\$147,425,000 |
| Total Affected Population | 1,000,000 |
| Number Displaced | 250,000 |

Sample Scoring for a Regional Response Coordination Staff.

Table 8. Per Capita Commodity and Supply Requirement Planning Factors

| Daily, Per-Person Requirement | | | | | | | | | |
|--------------------------------------|----------------------|-------------------|-----------------|-------------|---------------------|---------------------------|------------------------|---------------------------|--------------|
| Ice (lbs.) | Water (liter) | MREs (Ea.) | Blankets | Cots | Hygiene Kits | Infant-Toddler Kit | Durable Medical | Consumable Medical | Tarps |
| 8 | 3 | 2 | 2 | 1 | 0.01 | 0.1 | 0.05 | 0.05 | 0.33 |

After Federal Emergency Management Agency, “Incident Management Handbook,” F-5; Federal Emergency Management Agency, “Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue,” (Washington, DC: Federal Emergency Management Agency, August, 2011), 2–10; While FEMA’s Commonly Used Sheltering Items & Servicing Listing Catalogue has a planning assumption of 10% of a shelter population needing infant-toddler kits, there is no similar assumption for durable medical equipment or consumable medical supplies. The researcher used a planning assumption of 5% of the shelter population for these items.

After Federal Emergency Management Agency. “Incident Management Handbook: FEMA B-761 / Interim, Expires: 01 January 2010.” Washington, DC, Federal Emergency Management Agency, March 2009; Federal Emergency Management Agency, “Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue,” (Washington, DC: Federal Emergency Management Agency, August, 2011), 2–10; Each of the elements in Table 7 would be tracked by the game to determine the team’s score. Since it would be extremely difficult for a Regional Response Coordination Staff team to actually stabilize a catastrophic disaster in 72 hours, they will often fail to reach this objective. Teams can use the score to determine its level of performance with each round of play. Due to the great variation and scale of numbers, the scores are far more complex than for the FQS position task books. For example, the scoring system must incorporate enormous numbers such as the requirement for eight pounds of ice per person with small numbers such as 3 Federal Staging Areas (FSAs).

5. Character Summary

The basic characters, including their roles and responsibilities, are actual positions as defined in the *Regional Incident Support Manual*. Individuals could receive feedback by way of a score that informs them about their progress toward accomplishing all required tasks in the FEMA Qualification System Position Task Book. The Regional Incident Support Staff team would first and foremost seek to achieve the inner objectives they define based on their response. In addition, the team could receive a score based on outer objectives based on *Regional Incident Support Manual* and/or other FEMA guidance. Once incorporated into the game, both individuals and teams could see their score-based performance real time.

E. LEVELS

The initial game has three basic levels, corresponding to FEMA’s disaster levels (Figure 21). The disaster scenarios get progressively more complex as the level increases.

Figure 21. FEMA Disaster Levels

| Disaster Level | Conditions |
|----------------|--|
| Level I | <ul style="list-style-type: none"> An incident of such magnitude that the available assets that were designed and put in place for the response are completely overwhelmed or broken at the local, regional, or national level. Due to the incident's severity, size, location, and actual or potential impact on public health, welfare, and infrastructure, it requires an extreme amount of direct Federal assistance for response and recovery efforts for which the capabilities to support it do not exist at any level of government. A Level I response requires extraordinary coordination among Federal, State, tribal, territorial, and local entities due to massive levels and breadth of damage, severe impact or multi-State scope. Major involvement of FEMA (full activation of relevant RRCS(s) and the NRCS), other Federal agencies (all primary ESF agencies activated), and deployment of initial response resources are required to support the requirements of the affected State(s). |
| Level II | <ul style="list-style-type: none"> An incident which, due to its severity, size, location, actual or potential impact on public health, welfare, and infrastructure requires a high amount of direct Federal assistance for response and recovery efforts. A Level II response requires elevated coordination among Federal, State, tribal, territorial, and local entities due to moderate levels and breadth of damage. Significant involvement of FEMA (RRCS activation, possible NRCS activation), other Federal agencies (some ESF primary agencies activated to support RRCS), and possible deployment of initial response resources are required to support the requirements of the affected State(s). |
| Level III | <ul style="list-style-type: none"> An incident which, due to its severity, size, location, actual or potential impact on public health, welfare, and infrastructure requires a moderate amount of direct Federal assistance. Typically this is primarily a recovery effort with minimal response requirements and existing Federal regional resources will meet requests. A Level III response requires coordination among involved Federal, State, tribal, territorial, and local entities due to minor-to-average levels and breadth of damage. Federal assistance may be limited to activation of only one or two ESF primary agencies. |

From Federal Emergency Management Agency, *Regional Incident Support Manual*, 14.

Level III—Minor

This is the lowest level of disaster in which an RRCC might be stood up. Per the *Regional Incident Support Manual*, the definition of a Level III disaster is:

With respect to *72-Hours*, the flash flood would be a caused by a partial breach of the levee. Only small segments of the city get flooded and lose power, water, wastewater, have roads and railroads left out. There are a few fatalities, hundreds of injuries, less than

one hundred need rescuing, and thousands of people displaced. Players should be able to deal with all of these challenges after several attempts and good teamwork.

Level II—Moderate

This is the next level of complexity for disaster response. Per the *Regional Incident Support Manual*, the definition of a Level II disaster is:

Moderate levels of damage, which will likely result in a major Presidential disaster declaration, with moderate federal assistance. Federal regional resources will be fully engaged, with potential involvement of federal regional offices from outside the affected area. Select national resources may also be utilized.¹²⁸

With respect to *72-Hours*, the levee breach is larger and more of the city is affected. There are tens of fatalities, hundreds of injuries, hundreds need rescuing, and tens of thousands displaced. Players will only be able to serve the survivors and stabilize the event with excellent teamwork and very timely decisions.

Level I—Massive

This is the highest level of response and few FEMA employees are actually qualified at this level. Per the *Regional Incident Support Manual*, the definition of a Level I disaster is:

This level of event will result in a Presidential disaster declaration, with major federal involvement and full engagement of federal regional and national resources.¹²⁹

With respect to *72-Hours*, there is a full levee breach that floods a 100,000-person community. Tens of thousands are stranded in the downtown area; including hospitals, hotels, and housing areas. Washed out roads, railroads, airports, isolate the city from three of four quadrants. Critical infrastructure such as power, communication lines, water, wastewater, and fuel supplies are damaged. Even the best team of players will not be able to serve all for the needs to stabilize the event in 72 hours. Players' real objective will be to serve as many disaster survivors as possible. The teams will attempt to improve

¹²⁸ Ibid.

¹²⁹ Ibid.

performance on subsequent sessions by using different strategies. Future versions of the game would allow pre-disaster preparedness activities or mitigation attempts to improve the team's performance.

Training Level

The training level will use the basic scenario to teach players the basics of their specific roles with respect to the *Regional Incident Support Manual* and FEMA Qualification System. The two main objectives will be for players to gain familiarity with their roles as well as with the game itself. It will have people sign into the disaster, navigate through the various windows, create action requests, receive input through a media feed or the chat client and have them manipulate elements on the game map.

F. INTERFACE

(1) Visual System

The visual system is basic and simulates sitting at a workstation within the Regional Response Coordination Center. The camera perspective is simply first person. While there will be media feeds, players will have limited ability to control them. As in real life, players can select a traditional media or social media feed from the map and see the conditions from that perspective. However, they will not be able to fly around with a camera. Future versions of the game could have camera feeds from first responder players. In addition, future versions may include camera feeds from drones, search and rescue aircraft or from other vehicles that may realistically be expected. One of the game conditions is forcing players to quickly work through problems without perfect information.

(2) Control System

The initial version of the game simply has players control the game through a standard PC-based workstation. Future versions should also have tablet and smartphone control systems as well for mobile players.

(3) Audio

Players should be able to communicate through headsets while using the audio/video chat client or simulated telephone. Player positions should be visible on a directory upon check in to the disaster to expedite direct calling just as with a typical chat client application.

The actual noise of a Regional Response Coordination Center actually adds to some stress and communications difficulties. In addition to background conversation, there are typically multiple televisions operating tuned to different stations such as news channels and The Weather Channel. The background conversation level should vary in intensity and volume over time corresponding to such input as a media feed showing a disaster scene, an impending meeting deadline in the operational tempo, or new information placed on the map. Cheers and congratulations should be heard at major events such as the clearing of a major highway, a mass care shelter opening, a major rescue from a large building collapse, etc.

While music is not common in a Regional Response Coordination Center, the game should have low volume, subtle music that increases in tempo as operational tempo deadlines and the end of the game approach. Regional Response Coordination Centers are emotionally charged environments. Music should add to the emotional feel.

(4) Help System

The help system will have two basic functions. First, the help system will provide assistance with the basic game controls themselves. Second, the help system will provide lookup assistance and prompts based on *Regional Incident Support Manual* and FEMA Qualification System requirements. For example, the help can show players what information is needed for various sections of a request form. Or, the game can prompt players when they are causing a backup.

G. ARTIFICIAL INTELLIGENCE

Regional Response Coordination Center personnel see the world from a macro, birds-eye view. As such, the artificial intelligence of the characters should reflect mass movements and group dynamics rather than individuals. Feeds should be available so players can track the movement of responders such as supply convoys, mass care shelters, and even major firefighting and police movement.

(1) Disaster Survivors

Disaster survivors should react similar to the guests in *SimCity* and *Rollercoaster Tycoon*. When they are in a region cut off from utilities such as power, water, wastewater, and communications, most will move away from the disaster areas toward assistance or safety. Many individual survivors should be stranded either voluntarily or involuntarily to force search and rescue requirements. Disaster survivors should react to time without food, water, and shelter by getting sick, dying. As with real life, civil disturbances, to include looting and rioting, should arise for those areas where response is delayed. Players will get cues regarding where survivors are in need of help. The dense, urban areas will be prone to more civil disturbance and crime. Exacerbating the emergence of civil disturbances, many first responders may refuse to report for duty. For example a 2005 survey for the Center for Homeland Defense and Security highlighted how police officers might react should their own communities be struck by one of the catastrophic events defined by the DHS National Planning Scenarios. While the survey was not on a national scale, it did include 75 police officers.¹³⁰ The survey results stated that 55–66%¹³¹ of the police officers said that they would stay home and care for their families rather than report to work given the catastrophes described in the National Planning Scenarios. Of course, the longer they go without help from first responders, the worse disturbances will be. Similarly, *72-Hours* should model a lack of first responders and emergency managers. The situation should deteriorate until the team source

¹³⁰ Federal Emergency Management Agency, “Emergency Planning for First Responders and Their Families,” 3, accessed June 20, 2015, <http://www.ready.gov/sites/default/files/documents/files/RRToolkit.pdf>.

¹³¹ *Ibid.*

additional help. The higher the game level, the more overwhelming the situation, and players will be forced to prioritize areas for assistance. The prototype includes input that only a fraction of Emergency Operations Center Personnel report for duty.

(2) Media Feeds

Traditional media feeds should mimic news reports of the situation. Social media feeds will be the main method players will receive this information about the disturbances and survivor needs. However, the game should also reflect communications systems becoming overwhelmed, jammed or failure.

(3) Friendly Characters

Similar to *SimCity*, first responders should move to disaster areas. News media should also move to major areas of disturbance. If there are a large number of people stranded in a hospital or dense housing area, media would move to that location and report the situation. These cues should not only provide information to players, but also overwhelm them with reports of assistance needed throughout the disaster area. Red Herrings should also be present. For example, in the Chile Earthquake Response, major news reporting at one collapsed building drew an overwhelming response and left other areas without assistance. Similarly *72-Hours* should have an overabundance of reporting from an area, especially if it is one of the few where power is available. The intent is to cause players to overreact to reporting. Reporters should ask questions of External Affairs Officers both ongoing and at periodic press releases. Other characters such as the Governor, the President, and even community leaders should also ask questions of the External Affairs officers such as:

- How many fatalities and injuries are there?
- How many are left homeless? How many are in shelters?
- Where are the shelters and distribution centers?
- How much food, water, and supplies have been moved? Supplies include tarps, tents, sanitation kits, etc.

- How do survivors request help?
- What should people do? Should they stay put? Should they evacuate?

(4) Support AI

The game should reflect and react to player input. The flood will increase in severity, crest, and then recede. Breaches in levees should continue until players move assets in place to repair them. Similarly, roads, railroads, airports, utilities, and other infrastructure will remain down until repaired. *SimCity* is a good example of a dynamic environment in which the game reacts to the player's actions. Future versions of the game with first responders would need a more dynamic environment as players maneuver through the disaster area and run into obstacles.

H. TECHNICAL

1. Target Hardware

The basic hardware is a normal PC-based workstation in the base version of the game. The game would either use or simulate collaborative applications, to include a chat client. These are the basic tools of Regional Response Coordination Center personnel. Future version should have tablet and smartphone based options to play. Since the expected hardware and software of the emergency managers is basic programs, unique hardware and software requirements are minimal.

2. Development Hardware and Software, Including Game Engine

Basic development hardware and software are all that is necessary since the game is focused on player cooperation rather than exotic effects or complex interactions.

The primary game engine strategy should be to use an existing game engine. Adapting this engine or others provides several advantages. Per Pulsipher, it is a good technique to use an existing engine in a new game.

The *SimCity*, GlassBox game engine is the baseline and has functionality that closely simulates Regional Response Coordination Staff actions and concerns. Glassbox operates by using resources, units, and maps.¹³²

Units include such features as factories. A factory in *SimCity* requires workers to operate and uses resources such as raw materials (input) to produce output that go to stores. This would be analogous to FEMA setting up distribution centers that require personnel to receive the shipments inbound and forward them on to points of distribution. The units operate using rules. Once set into motion, they operate autonomously following those rules that then trigger actions. Regional Response Coordination Staff establish facilities that equate to units in *SimCity*.

The game space itself is based on maps that define the distribution of resources throughout the game environment. These resources are terrain, natural resources, and even pollution. The maps have agents, paths, and zones. Agents carry resources from one place to another. Just as with disasters and disaster response, they can be trucks carrying commodities, pipes, carrying water, and power lines transmitting electricity. Agents are also the pedestrians moving throughout the game environment. The game can support tens of thousands of agents. Once in motion, the agents simply move until they reach a destination. They then execute a rule set. Zones run along paths and execute instructions such as new construction sites. Agents then bring the resources for those sites.

Glassbox simulates disasters such as the spreading of fire by sending out heat agents and alarm agents. Just as after a real disaster, if there are no responders, the situation will get worse.¹³³ GlassBox also simulates water tables in map layers that can become contaminated.¹³⁴ Just as with an actual disaster, water can become contaminated and make people sick. Furthermore, the game engine tracks the water usage.

¹³² Dan Moskowitz, (SimCity video), accessed June 20, 2015, http://www.simcity.com/en_US/media/video/SimCity-Insiders-Look-GlassBox-Game-Engine-Part-1.

¹³³ Dan Moskowitz, (SimCity video), accessed June 20, 2015, http://www.simcity.com/en_US/media/video/SimCity-GlassBox-Game-Engine-Part-2-Scenario-3-Fire-a.

¹³⁴ Dan Moskowitz, (SimCity video), accessed June 20, 2015, http://www.simcity.com/en_US/media/video/SimCity-GlassBox-Game-Engine-Part-3-Scenario-2-Water.

GlassBox already provides a macro-level and birds-eye view of the world similar to what FEMA's Regional Response Coordination Staff have. Essentially any city or disaster could be modelled. Since units and agents follow rule set once placed into motion, no action is actually necessary for a game master or simulation cell currently used in FEMA exercises. Disaster effects can execute according to preset rule-defined conditions. GlassBox tracks actions and player response so events are either resolved or grow in intensity. The game tracks player performance to provide immediate and end of session feedback. GlassBox supports multiplayer, online gaming environment. Players can work together to resolve problems.

The disadvantages to using the GlassBox game engine is it may not be available for licensing and in March, 2015, Electronics Arts closed down the studio that worked GlassBox. As of July 1, 2015, the researcher has not received a response from Electronic Arts regarding the use of GlassBox for this project.¹³⁵

There are other mature game engines that are available and provide low cost alternatives to GlassBox. For example, as *SimCity* has fallen out of favor due to some GlassBox difficulties, *Cities: Skyline* has risen in popularity. *Cities: Skylines* uses the Unity game engine. Unity can be downloaded for free for a personal version and for as little as \$75 per month for Unity Pro.¹³⁶ Per Epic Games, their Unreal game engine is available for free given *72-Hours* is not used for profit.¹³⁷ CryEngine is yet another game engine available for as little \$9.90 per month for an individual (Full License cost under request as of July 4, 2015).¹³⁸ In addition, the modular design of the Next-Generation Incident Command System would allow it to be used as the platform for a game.¹³⁹ Since NICS is the basis of the prototype and already a DHS-funded program, its use as the *72-Hours* platform could offer a relatively inexpensive and risk mitigating strategy.

¹³⁵ Electronics Arts, Inc., e-mail to researcher, July 1, 2015.

¹³⁶ "Get Unity," Unity, accessed September 11, 2015, <https://unity3d.com/get-unity>.

¹³⁷ Sean Gribbin, Engine Support Technician, e-mail to researcher, July 1, 2015.

¹³⁸ "Get CryEngine," Crytek, accessed September 11, 2015, <http://cryengine.com/get-cryengine>.

¹³⁹ Paul Breimyer, PhD, Technical Staff, Humanitarian Assistance & Disaster Relief (HADR) Systems, MIT Lincoln Laboratory, telephone conversation with author, August 17, 2015.

In summary, *SimCity's* GlassBox game engine has the same perspective as for the Regional Response Coordination Staff and provides functionality that would make it an excellent engine for FEMA Regional Response Coordination Center training and exercise game. It has a wide, overhead view like Regional Response Coordination Staff would have with their geospatial information system display. It also models city functions and disaster effects in a realistic manner. And with *SimCity's* basic design, players could model any city and even run excursions based on mitigation measures like more points of distribution. However, GlassBox may not be available for use. Fortunately, there are a number of well-proven game engines that are available for no, to minimal cost such as Unity, Unreal and CryEngine. In addition, it is highly feasible DHS could expand its ongoing work with the Next-Generation Incident Command System to develop a game with the application. While some of these game engines have primarily been used for first person shooter games, their extremely low price point makes them feasible and even lucrative to develop *72-Hours*.

3. Network Requirements

The base game is one of network collaboration. Therefore, a network, with the inclusion of a game master is fundamental to the game. The baseline should be 40 players simultaneously running the higher-level *Regional Incident Support Manual* positions (Appendix B). Future versions of the game should have a MMO capability to add other active players such as state and local emergency management personnel, National Guard, as well as first responders from the fire, law enforcement and EMS.

I. GAME ART

Since emergency managers use basic works stations, the game should provide a realistic feel but does not have to have high-fidelity graphics. Avatars or non-player characters should not be too cartoony, but can be stylized. In later versions of the game when first responders move through the disaster area, more emphasis on graphics will be required.

V. GAME PROTOTYPE

A. PROTOTYPE DESCRIPTION

The Prototype is a “board” game. This is in line with the industry standards of board game prototype to save on coding time and money. The one, significant difference is the board in this case is actually the online application, Next-Generation Incident Command System (NICS). Due to its proven use in managing disasters (primarily wildfires), the NICS training function reduced prototype development time, cost, and complexity. Videos of the introduction, setup, and game play for the prototype are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>.

1. Computer Board

The prototype is of a board game design except the “board” is the Next-Generation Incident Command System (NICS) application using the U.S. Army Corps of Engineers Comprehensive Study for a 500-year flood event (Figure 22).

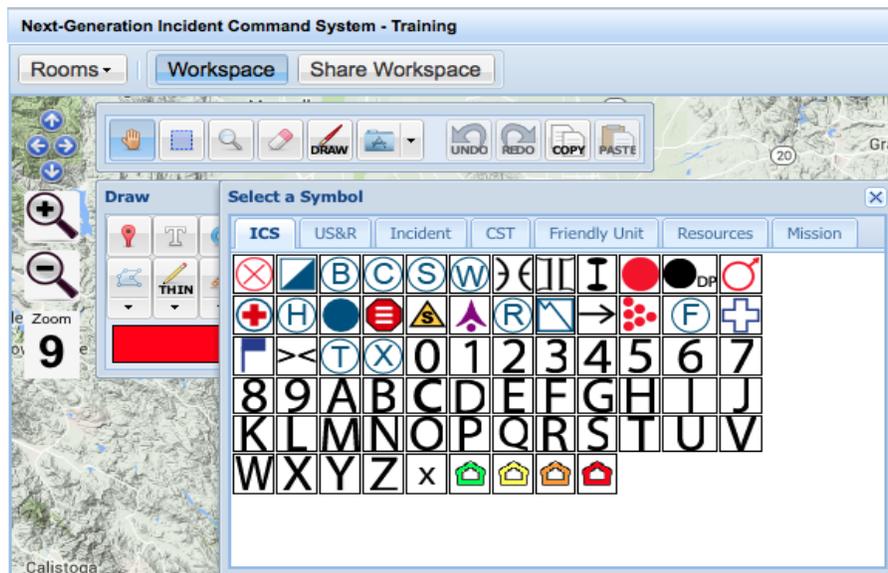
Figure 22. U.S. Army Corps of Engineers Comprehensive Study



From a screen shot of the State of California, Department of Water Resources, Best Available Map, accessed June 20, 2015, <http://gis.bam.water.ca.gov/bam/>.

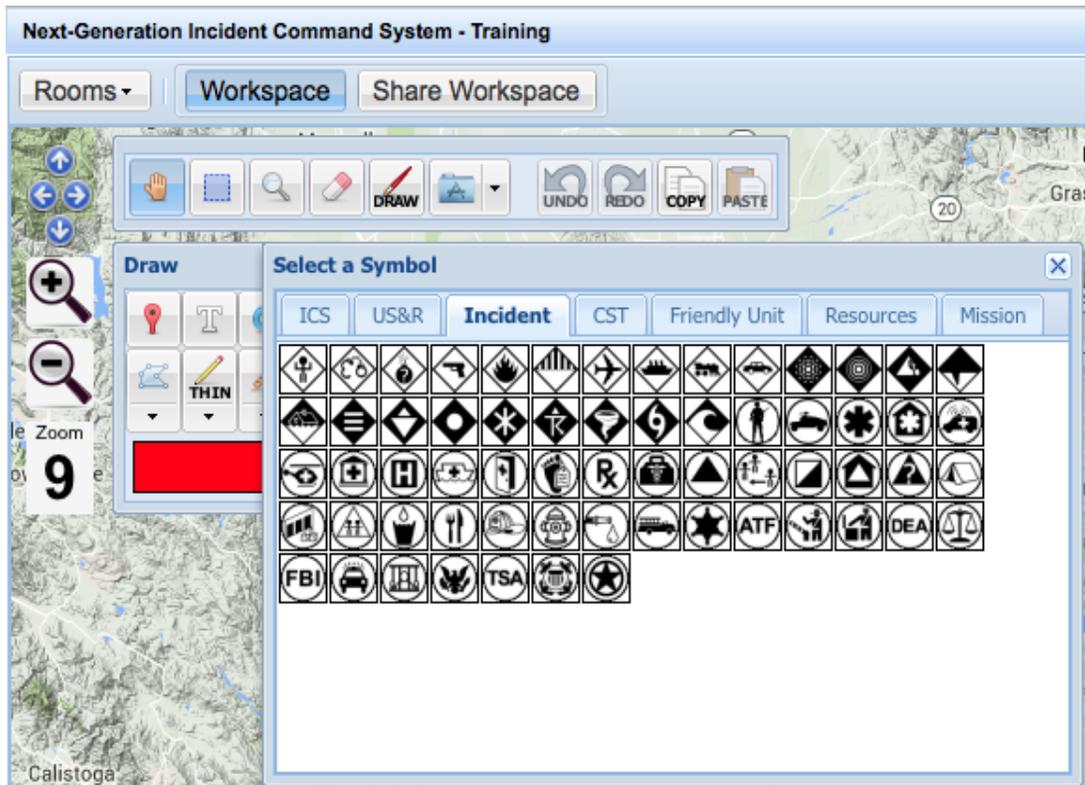
Due to the requirement to both maintain a large area perspective of the situation and also zoom in to plot specific facilities and events, a static board game is unwieldy. NICS is a free application sponsored by DHS Science and Technology, and developed by the Massachusetts Institute of Technology’s Lincoln Labs. It is currently in use primarily by fire agencies to coordinate wildfire response. NICS is ideal for the prototype because it is a proven online, collaborative environment for managing disaster response that has a training mode. NICS also fully supports the game concept of players operating both simultaneously and in a turn-based environment. For example, planners can open their own, collaborative workspace within the game incident while other players continue the current scenario. The planners could then bring other players into their workspace for a tactics meeting and to get approval for their plan. Once approved, that plan can be exported to the main scenario and executed. NICS also has the advantage of having Incident Command System symbols available for players to simply drag onto the map (Figures 23–24). This alleviates the need to create hundreds of markers for players to use during the game.

Figure 23. Sample of Incident Command System Symbols Available in NICS



Screen shot of “Next-Generation Incident Command System (NICS),” Sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015. <https://nics.ll.mit.edu/sadisplay/login.seam>.

Figure 24. Sample of Incident Symbols Available in NICS



Screen shot of “Next-Generation Incident Command System (NICS),” Sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015. <https://nics.ll.mit.edu/sadisplay/login.seam>.

The prototype game was designed and built within NICS under the training incident “CA FEMAPTAC SacFlood Game.” Game injects provide geo coordinates using the U.S. National Grid System (Figure 25) because it provides a quick method for plotting positions on maps. Since the game runs on compressed time to simulate 72 hours of operations in just four hours, four basic data layers were created to assist players:

1. “Sacramento-Political”—Three map sections that outline Downtown, Midtown, and Natomas (Figure 26).
2. “Sacramento-PODs”—Predefined actual points of distribution (POD) should exist in good disaster response plans. Since they do not exist in actual plans at the writing of this thesis, the researcher developed this data layer of 25 notional POD locations outside of flooded areas (Figure 27). This display, with the U.S. National Grid overlay is the main section of the physical prototype board.

3. “Sacramento-Flood Hazards”—this layer has a few locations of significant events that will be identified during game play. This layer would likely not be available to players in a final game since an important player task is to locate significant events and plot them on the common operating picture (Figure 28).
4. “Sacramento-Hospitals”—in the real world, the majority of Sacramento’s hospitals (2,000 beds)¹⁴⁰ lie in the 500-year floodplain used in the game scenario. Therefore, addressing the needs of major hospital failures is central to the game (Figure 29).

2. Tabletop Game Elements

In addition to the NICS-based game space, the prototype also has traditional game elements such as situation update cards that players draw every minute to simulate external information flowing into the RRCC. Since people generally like chance in games, but not necessarily dice, they draw resource sourcing cards that determine when requested resources will be available. A one-minute timer signals players to draw a situation update card. A ten-minute timer signals the end of a turn when major player actions are required such as briefings or planning meetings. There are 24 turns of ten minutes each (simulating 3 hours of real time per turn). A bin with 24 compartments provides a place for players to place their resource requests while they wait for them to be available for use. A simple clip is moved to each bin as the game progresses to track time. In addition, the physical prototype board has a turn counter.

3. Supplemental Materials

A resource book is available to players to assist them with expedited resource planning. It provides planning factors such as the amount of water, food, and medical supplies required to serve a given population. The book also provides planning and briefing sheets to guide players. Pre-scripted mission assignment cards are available for player to request resources. The basic statement of work and cost is provided just as players would have to determine in an actual disaster. Blank templates are also provided for players to request a resource that is not prescribed. When players request a resource, they draw a probability card to determine when it will be available. They place the

¹⁴⁰ Matt Weiser and Philip Reese, “What if a Superstorm Strikes Sacramento?”

resource card in the bin compartment corresponding to the instructions on the probability card.

4. Electronic Resources

All of the resources produced in hard copy in appendices of this paper are also available electronically for players to use. They are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>. In fact, given that much of the game requires recording the numbers of people in need, calculating the support requirements, and tracking the resources delivered to them, the use of spreadsheets may be far quicker and easier than using hard copies.

B. PROTOTYPE PLAN

1. Introduction

Do you have what it takes to stabilize a flooded disaster area in 72 hours? Record rains and levee breaches have produced a 500-year flood in Sacramento, California and the surrounding area; 1.5 million people! As members of FEMA Region IX's Regional Response Coordination Staff, you must stabilize the disaster within 72 hours. You and your teammates must work together to determine the exact situation and rush personnel and resources to those in need. You are racing against the clock with information flowing in constantly and constrained by Congressional fiscal appropriations.

2. Overview

In 72-Hours, you and your fellow players are members of the FEMA Region IX Regional Response Coordination Staff. Your team will need to work together to stabilize a disaster within 72 hours per FEMA Administrator guidance. The overall objective is to put personnel and resources in place to “save lives, protect property and the environment, and meet basic human needs” within this critical time frame. The team will need to quickly establish its objectives and priorities to accomplish this task.¹⁴¹

¹⁴¹ National Preparedness Goal, 1.

The game is played with a minimum of four section leader players, but the section chiefs can include typical members from their sections as needed to fulfill their roles and responsibilities. In fact, players may find the pace of the game too fast to effectively play without additional key staff members. The minimum player positions are:

- Regional Response Coordination Staff Chief
- Situational Awareness Section Chief
- Planning Section Chief
- Resource Support Section Chief
- A Regional Response Coordination Staff Support player is highly recommended.

Players win by meeting their own objectives and:

- Developing a Common Operating Picture that captures all of the information presented
- Developing Regional Response Plans that meet team objectives
- All requests are recorded and executed on Resource Request Forms
 - Personnel such as for Emergency Operations Centers
 - Facilities such as Points of Distribution (PODs)
 - Equipment such as for material handling
 - Information such as higher headquarters reports
- All resources needed are ordered and tracked
 - Commodities for survivors
 - Water
 - Food
 - Meals
 - Cots
 - Blankets

Tarps

Durable Medical Goods

Consumable Medical Supplies

Infant-toddler kits

- Costs of the response is fully accounted for and within the allowed budget
 - \$10 million per day
 - \$30 million total

Players lose if:

- Not enough commodities (ice, water, food, blankets, cots, etc.) are delivered for the displaced population remaining in Sacramento,
 - 8 pounds of ice per day
 - 3 liters of water
 - 2 meals per person per day
 - 2 blankets, 1 cot per person,
 - Infant and toddler kits have been delivered for 10% of the shelter population
 - Durable Medical Goods have been delivered for 5% of the shelter population
 - Consumable Medical Supplies have been delivered for 5% of the shelter population
- Not enough Points of Distribution (PODs) are set up and supporting the total affected (non-shelter) population,
 - 8 pounds of ice per day
 - 3 liters of water
 - 2 meals per person per day
 - 1 tarp per every 4 people per day
 - POD capabilities are:

Type I POD serves 20,000 per day,

Type II POD serves 10,000 per day,

Type II POD serves 5,000 per day

- FEMA has not established enough throughput at staging areas to deliver resources. Staging areas require:
 - An adequate facility
 - Sufficient staff
 - Sufficient material handling equipment (MHE)
- FEMA has not met all of the state’s support requests
- The Regional Response Coordination Staff has not met its own objectives

3. Game Elements

The “board” that will be used for the common operating picture (COP) is the Next-Generation Incident Command System (NICS) training incident training incident “CA FEMAPTAC SacFlood Game.”¹⁴² Players will require a login and basic instruction on the use of NICS before game play at <https://nics.ll.mit.edu/sadisplay/login.seam>.

Players must select the 500-year floodplain as well as the U.S. National Grid System data layers (Figure 25).

There are four, pre-existing data layers for the game available to players:

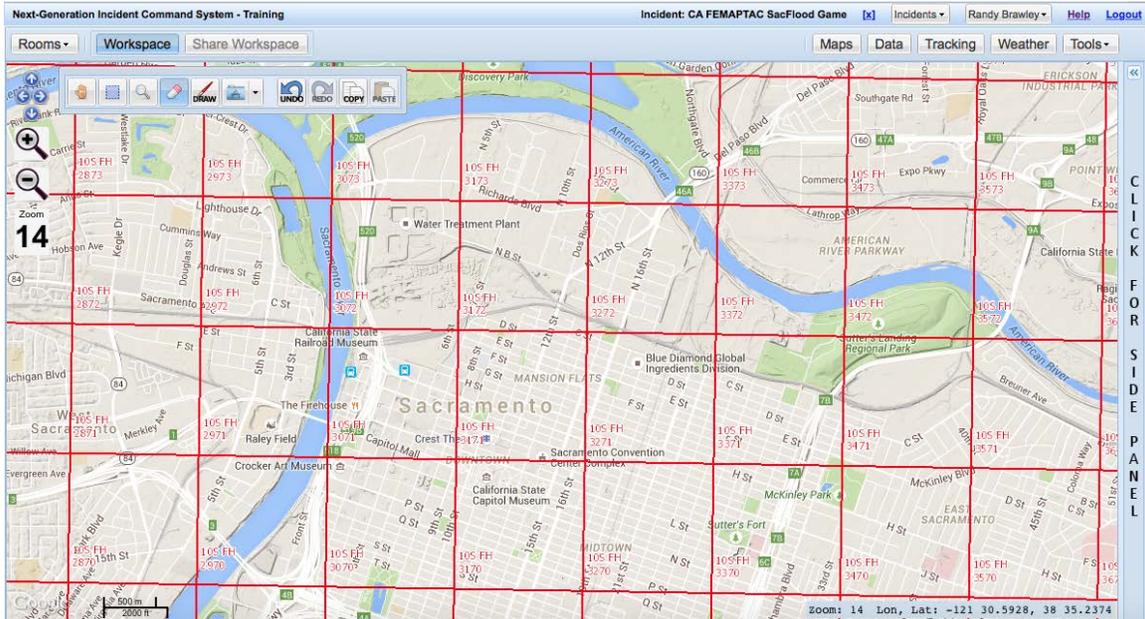
1. “Sacramento-Political”—Three map sections that outline Downtown, Midtown, and Natomas (Figure 26).
2. “Sacramento-PODs”—Predefined actual points of distribution (POD) should exist in good disaster response plans. Since they do not exist in actual plans, this data layer provides 25 notional POD locations outside of flooded areas (Figure 27).
3. “Sacramento-Flood Hazards”—this layer has a few locations of significant events that will be identified during game play. This layer would likely not

¹⁴² <https://nics.ll.mit.edu/sadisplay/login.seam>

be available to players in a final game since an important player task is to locate significant events and plot them on the common operating picture (Figure 28).

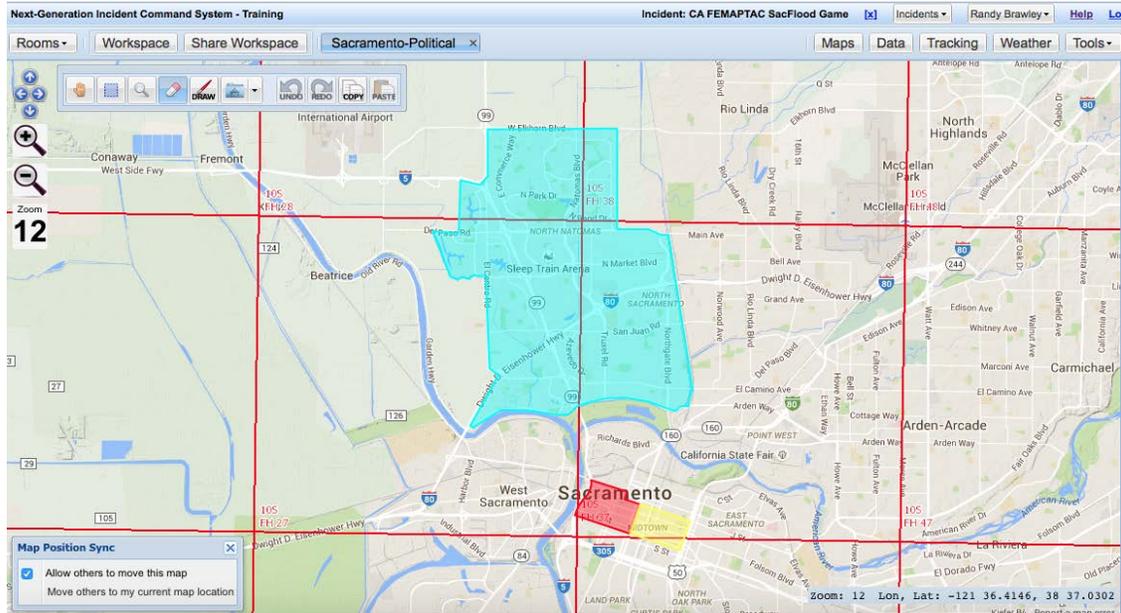
4. “Sacramento-Hospitals”—in the real world, the majority of Sacramento’s hospitals lie in the 500-year floodplain used in the game scenario. Therefore, addressing the needs of major hospital failures is central to the game (Figure 28).

Figure 25. U.S. National Grid System



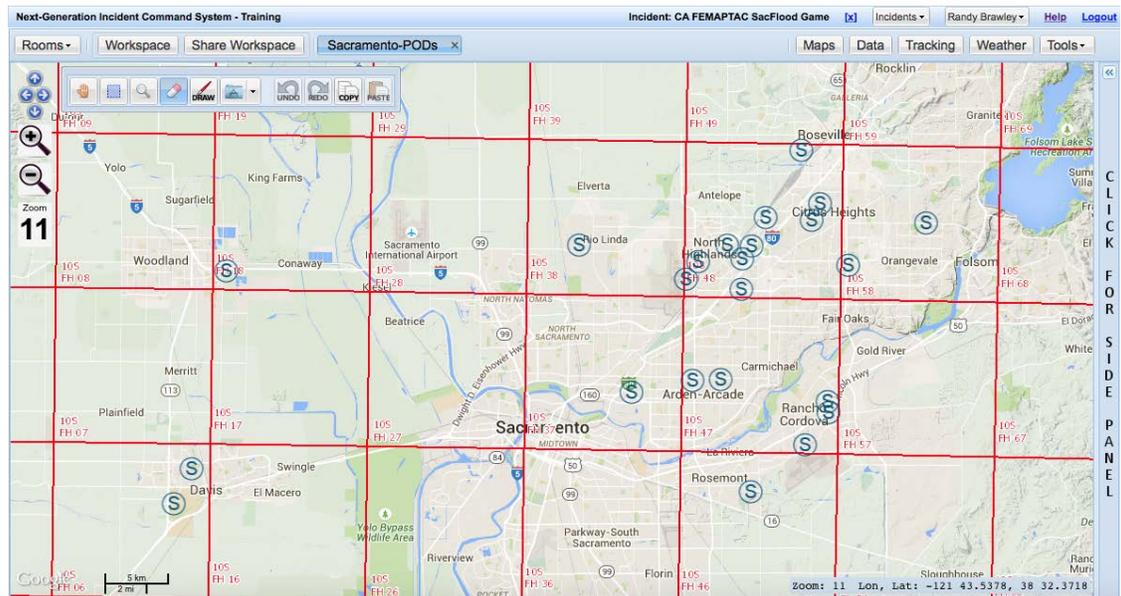
From a screen shot of the Next-Generation Incident Command System; U.S. National Grid System Data Layer. “Next-Generation Incident Command System (NICS),” sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>.

Figure 26. Sacramento Political Map



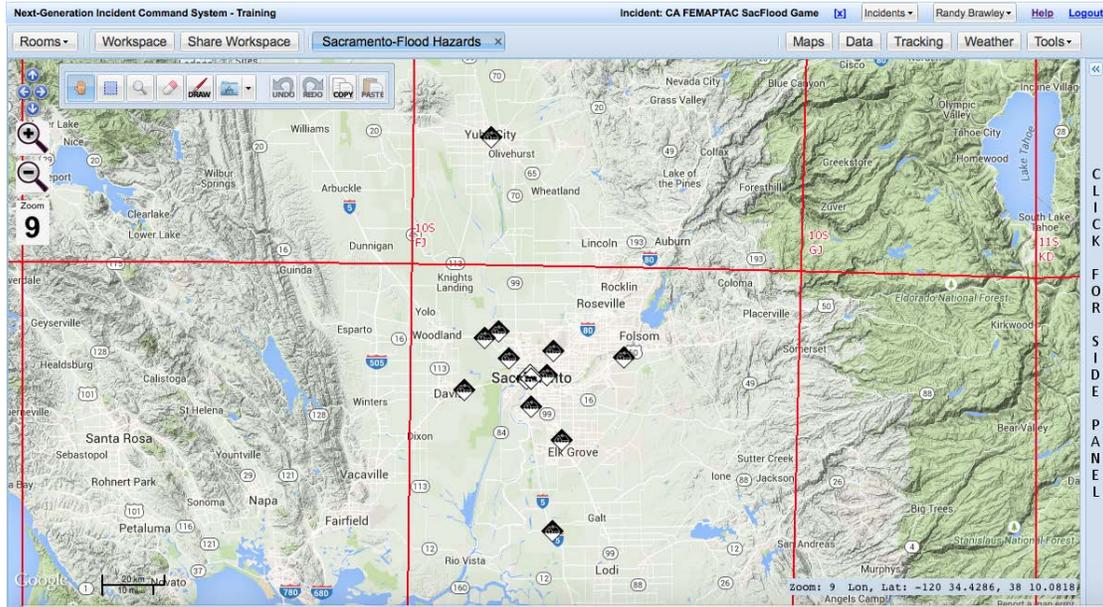
After a screen shot of the Next-Generation Incident Command System; Sacramento-Political Data Layer. “Next-Generation Incident Command System (NICS),” sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>.

Figure 27. Sacramento Points of Distribution



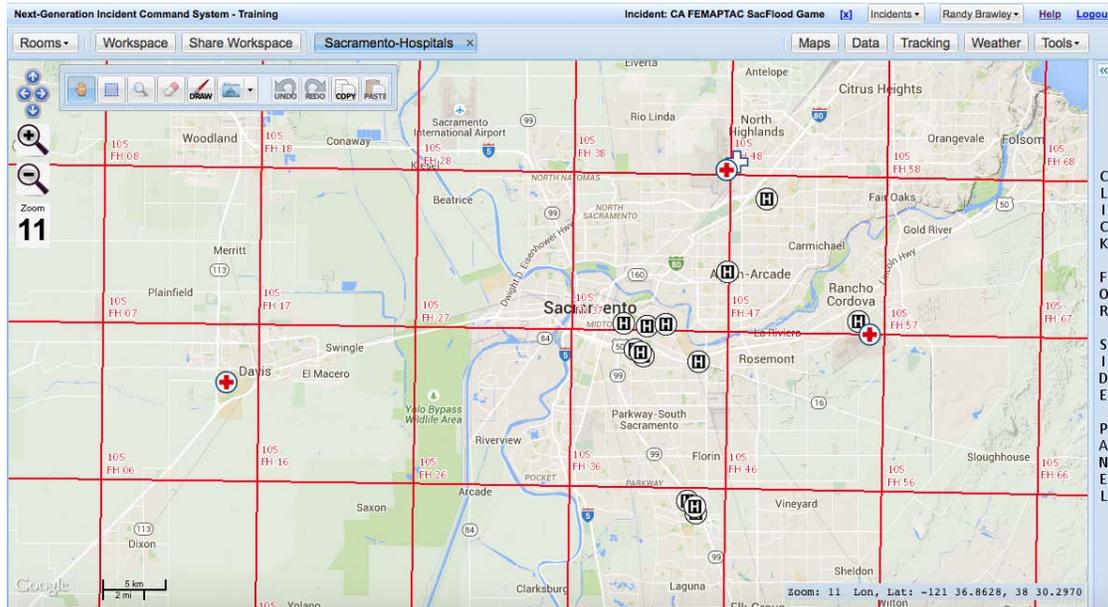
After a screen shot of the Next-Generation Incident Command System; Sacramento-PODs Data Layer. “Next-Generation Incident Command System (NICS),” sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>.

Figure 28. Sacramento Flood Hazards



After a screen shot of the Next-Generation Incident Command System; Sacramento-Flood Hazards Data Layer. “Next-Generation Incident Command System (NICS),” sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>.

Figure 29. Sacramento Area Hospitals



After a screen shot from the Next-Generation Incident Command System; Sacramento-Hospitals Data Layer. “Next-Generation Incident Command System (NICS),” sponsored by DHS S&T, Developed by MIT Lincoln Laboratory, accessed September 11, 2015, <https://nics.ll.mit.edu/sadisplay/login.seam>.

Time tracking is provided by three elements:

- A one-minute timer provides a cue for the Situational Assessment Section to turn over an information card
- A ten-minute timer to signal “turn” in which a major action is required.
- Due to the criticality of tracking time, a specific timekeeper may be warranted as part of the Regional Response Coordination Staff support. In the absence of a dedicated timekeeper, consider having the Regional Response Coordination Staff Chief maintain the overall game clock while the Situational Awareness Section Chief maintains the one-minute timer.

The resource bin has 24 turn compartments to track the movement of resources. Each compartment represents one, ten-minute turn (3 hours of real time) for resource processing/travel. At the end of each turn, the turn marker should be moved to the next compartment. When a resource is ordered, it is placed in the appropriate time cell corresponding to the expected travel and setup time. The resource(s) cannot be used and pulled from the resource tracking board until the respective game time is reached.

The reference booklet (and Excel workbook) is available to remind players of such factors as commodity ordering, the locations of search and rescue teams, FEMA warehouse locations, and the Resource Request Form process. Planning worksheets and the Excel workbook are provided both in Appendix G and are available from the Dudley Knox Library at <http://hdl.handle.net/10945/46412> for use on a computer during the game. The list of guides available to players is in Table 9.

Table 9. Player Guide Sections

| Table | Guide |
|--------------|--|
| Table 39 | Operational Tempo Chart |
| Table 40 | RRCS Objectives Worksheet |
| Table 41 | RRCS Chief Briefing Worksheet |
| Table 42 | RRCS Chief Higher HQ Briefing Worksheet |
| Table 43 | Situation Report (SITREP) Worksheet |
| Table 44 | Changeover Briefing Worksheet |
| Table 45 | Resource Support Section Briefing Worksheet |
| Table 46 | Tactics Meeting Worksheet |
| Table 47 | Regional Support Plan Worksheet |
| Table 48 | Final Performance Summary Sheet |
| Table 49 | Non-shelter Commodities |
| Table 50 | Commonly Used Sheltering Items (Individuals) |
| Table 51 | 54-Pack Generators and Other Items Status/Planning Worksheet |
| Table 52 | Federal Staging Area Status Worksheet |
| Table 53 | Point of Distribution Facility Cost Worksheet |
| Table 54 | Point of Distribution Status Worksheet |
| Table 55 | Survivor Status Worksheet |
| Table 56 | Per-Person Daily Commodity Requirement |
| Table 57 | Truck and Airlift Capacity Planning Guide |
| Table 58 | 72-Hour Ice, Water, MRE, Blanket, Cot Planning Guide |
| Table 59 | 72-Hour Hygiene Kit, Infant-Toddler Kit, Durable Medical Equipment, Consumable Medical Supplies, and Tarp Requirement Planning Guide |
| Table 60 | 72-Hour Truck and Aircraft Mission Requirement Planning Guide |
| Table 61 | FEMA Starting Commodity and Ordering Guide; Water, Commercial |

| Table | Guide |
|----------|--|
| | Meals, Low Sodium Meals, Infant-Toddler Kits |
| Table 62 | FEMA Starting Commodity and Ordering Guide; Hygiene Kits, Cots, Blankets, Tarps |
| Table 63 | FEMA Starting Commodity and Ordering Guide; 54-Power Packs, Plastic Sheeting, Consumable Medical Supplies, Durable Medical Equipment |

72-Hours Player Guide Tables Available in Appendices G-H.

A resource planning booklet, based on Tables 39–63 in Appendices G-H, is provided to help players determine the number of personnel, commodities, etc., required given the population in need. The same information is available in an Excel workbook from the Dudley Knox Library at <http://hdl.handle.net/10945/46412>.

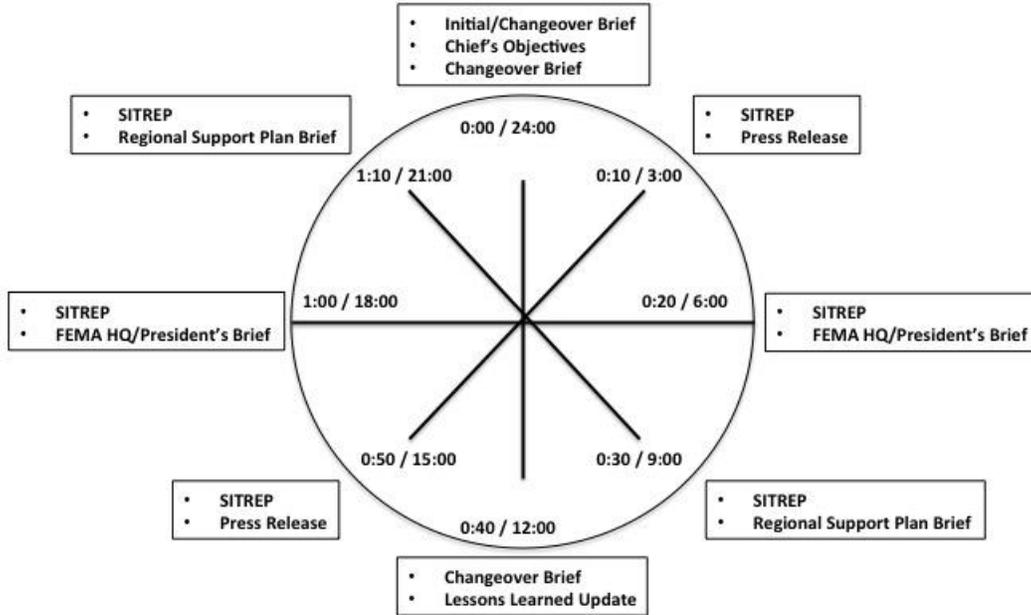
4. Game Setup

1. Payers login to NICS “CA FEMAPTAC SacFlood Game”
 - Common Operating Picture—this is the main map where the official play occurs.
 - Planning workspace—this the planners’ own workspace map to collaborate on future Regional Support Plans
2. Each of the turns has 15 situational input cards associated with it. Shuffle the situational input cards, keeping each set of 15 within their own group.
3. Place the time marker on resource bin compartment “1”
4. Each player should take a role card and become familiar with their roles and may review the actual FEMA *Regional Incident Support Manual* for further details on responsibilities

5. GAME PLAY

The operational tempo is shown in Figure 30.

Figure 30. Game Operational Tempo



Note that 0:40/12:00 means 40 minutes of game time simulating 12 hours of actual time. After Federal Emergency Management Agency, *Regional Incident Support Manual*, 104.

Each turn (Every 10 minutes on the timer, representing three hours):

- The Chief of Regional Response is the overall leader and approves the suggested resource requests and plans. The Chief may also assist all players as required in their duties.
- The appropriate people deliver their reports per the operational tempo (Appendix G)
- Every minute, the Situational Assessment Section Chief draws a Situational Input Card (Appendix C). The players may immediately react to the input.
- The Resources Section Chief makes up to 3 resource requests, for a maximum of \$10 million per day (8 turns) or \$30 million total, either with Pre-scripted Mission Assignments (Appendix D) or new Resource Request Forms (Appendix E).

- Resources from FEMA Distribution Centers are available at the designated time on the Commodity Inventory sheet.
- For all other resource requests (items not in FEMA distribution centers), the Resource Support Section Chief must draw a Resource Request Sourcing card (Appendix F). The Resource Request Sourcing card determines when that resource will be available. The Resource Support Section Chief places the resource request in the appropriate turn bin the designated number of turns in the future. If the resource will not be available until after the 24th turn, players will not be able to use it in the game. The Resource Support Section Chief may make the request again at the next turn. The Resource Support Section Chief then places the Resource Request Sourcing Card face down in the discard pile. Once all Request Resource Sourcing cards have been drawn, shuffle the discard pile and begin to draw again.
- If the team exceeds \$10 million per day or \$30 million total, they must seek Congressional approval for more funds. Players may draw one Resource Request Sourcing Card to determine when the funding will be available. If it will not be available until after 24 turns, then players must wait for the next turn to make a subsequent request.
- Allocate or reallocate up to three Federal Staging Areas or Points of Distribution. For example, shift 10 truckloads per day from one POD to another.
- The Resource Support Section reconciles inventory levels and resource requests.
- The RRCS Staff Support resets the 10-minute timer, records the funds expended and reports the amount of budget available before hitting the \$10 million per day or \$30 million total cost.

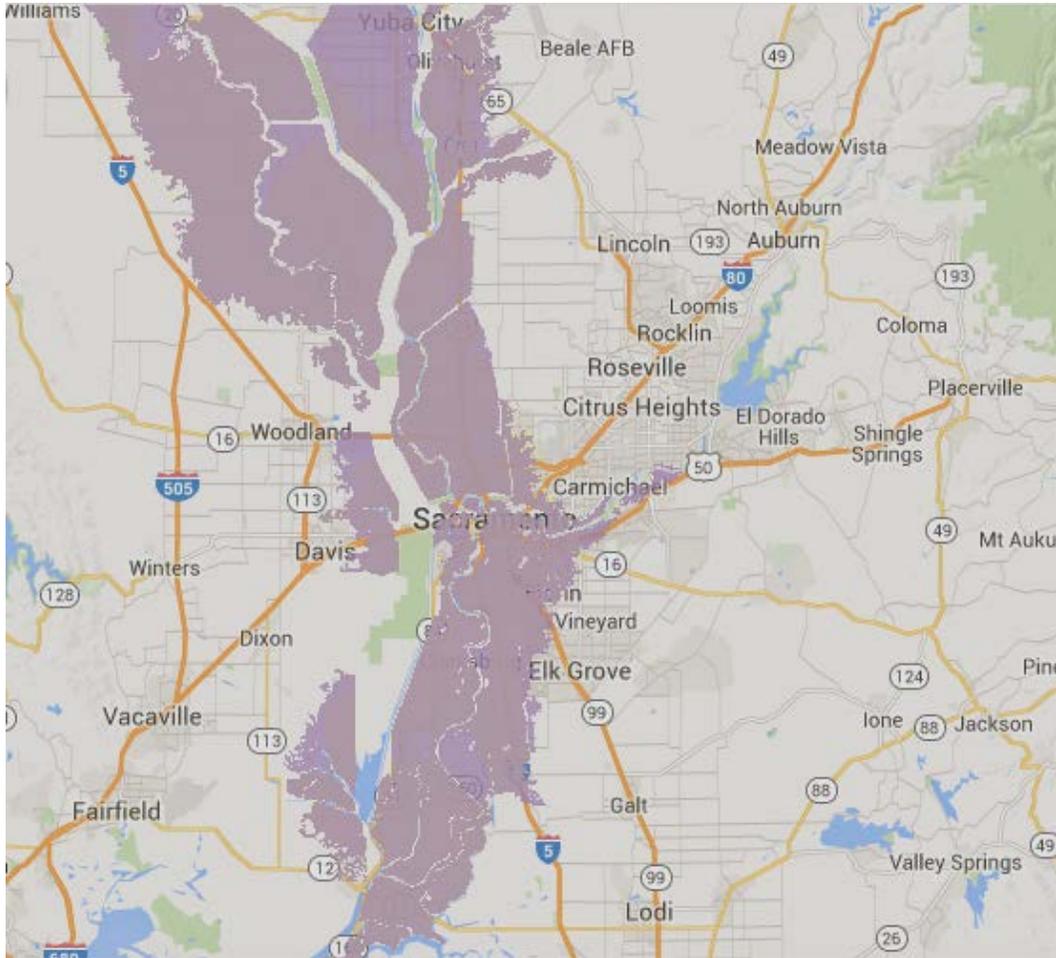
Game Start: Read the initial situation brief from the watch center.

INITIAL SITUATION BRIEF

After a week of heavy rain in the region that has saturated the ground and left reservoirs at capacity, a severe storm formed and struck the region producing wind damage and flooding. In addition, an early snowmelt has also exasperated the situation. Both the Sacramento and American Rivers are expected to reach the top of the levees

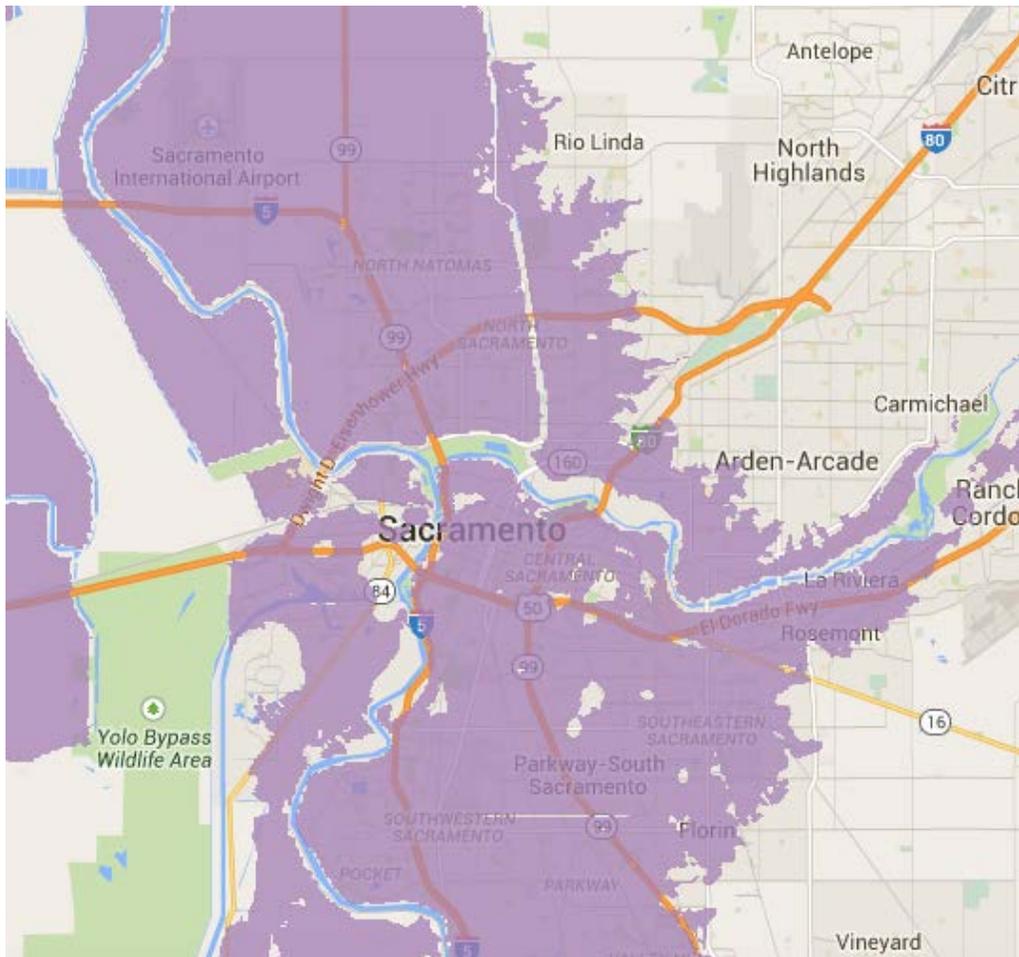
within the next 72 hours. The FEMA Region IX Regional Response Coordination Center has been activated to support potential disaster operations. Due to flood potential that has not been seen in more than a century, the initial common operating picture has been prepared with 500-year flood data (Figures 31–32).

Figure 31. U.S. Army Corps of Engineers 500-Year Floodplain Comprehensive Study



From a screen shot of the State of California, Department of Water Resources, Best Available Map, accessed June 20, 2015, <http://gis.bam.water.ca.gov/bam/>.

Figure 32. Floodplain Expanded View



From a screen shot of the State of California, Department of Water Resources, Best Available Map, accessed June 20, 2015, <http://gis.bam.water.ca.gov/bam/>.

- **Chief of Regional Response Coordination** develops the internal objectives for the team and briefs them to the team.
- **Situation Awareness Section** briefs the team on the initial situation. The section also sets the operational tempo to synchronize the team's efforts.
- **Planning Support Section** briefs the team on existing plans, if they exist. This is especially important in later versions of the game in which teams may use actual disaster scenarios and plans.
- **Resource Support Section** briefs the team on existing resources available to support the disaster response.
- **RRCS Staff Support** accounts for all players and ensures they are logged in.

Continuous Actions

- **Chief of Regional Response Coordination** leads the entire effort and keeps the team focused on the objectives and moving forward.
- **Situation Awareness Section** continuously updates the map and shares information with players.
- **Planning Support Section** uses situational information to develop the Regional Support Plan that will be briefed every 40 minutes starting at 30 minutes into game play. The Regional Support Plan will define the team's actions for the following 12-hour operational period. In this case, the first regional response plan will be for the 12–24 hour timeframe (40 minutes-1:20 game time).
- **Resource Support Section** continuously processes and tracks support requests. The section briefs the status of support requests every 40 minutes at the changeover brief.
- **RRCS Staff Support** continuously supports other sections through Department of Defense resource support, legal evaluation of actions, capturing of lessons learned, and External Affairs interaction.

Every Minute

- **Situational Awareness Section** turns over a Situational Input Card. Take the appropriate action such as passing on the action to the relevant section or update the common operating picture.

0:10

- **Chief of Regional Response Coordination** refines the team's objectives if required.
- **Situation Awareness Section** provides the first situation report (SITREP) to inform the team of current status.
- **Planning Support Section** holds a tactics meeting in which it receives input from team members regarding requirements and resources.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction.

0:20

- **Chief of Regional Response Coordination** briefs the FEMA Administrator/President on the status of the disaster and the actions of the RRCC team. The Chief should brief the team and post the briefing form.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the status of the Regional Support Plan and makes requests needed to complete the plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources and external affairs interaction. Fill out the President / higher headquarters briefing sheet regarding the numbers of fatalities, injuries, people saved in search and rescue, persons in shelters, and commodities employed. Brief the team on the status toward reaching the goal.

0:30

- **Chief of Regional Response Coordination** refines the team's objectives if required and provides input and guidance to the team.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the Regional Support Plan. The plan will be a general concept of where the effort will be applied in the hours of 12–24 of notional time; 40 minutes to 1:20 of actual game time. The team should base its actions over the next 40 minutes on the Regional Support Plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources, external affairs interaction.

0:40

- **Chief of Regional Response Coordination** briefs the objectives for the next 12-hour operational period.
- **Situation Awareness Section** provides the changeover briefing and posts the worksheet. This is a briefing that summarizes the activities of the past 12 hours (40 minutes game time) and prepares the team for the new shift over the next 12-hour operational period.
- **Planning Support Section** briefs the initial concepts of the next Regional Support Plan. This plan will cover the 24–36 hour time frame (1:30 – 2:00 game time).
- **Resource Support Section** provides an overview brief of the past 12 hours (40 minute game time) regarding requests, how many requests were filled, and the status and location of inbound resources.
- **RRCS Staff Support** briefs the status Department of Defense resources and external affairs interaction.

0:50

- **Chief of Regional Response Coordination** refines the team's objectives if required.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** holds a tactics meeting in which it receives input from team members regarding requirements and resources.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status of Department of Defense resources and external affairs interaction. Fill out the President / higher headquarters briefing sheet regarding the numbers of fatalities, injuries, people saved in search and rescue, persons in shelters, and commodities employed. Brief the team on the status toward reaching the goal.

1:00

- **Chief of Regional Response Coordination** briefs the FEMA Administrator/President on the status of the disaster and the actions of the RRCC team.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the status of the Regional Support Plan and makes requests needed to complete the plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status Department of Defense resources, external affairs interaction.

1:10

- **Chief of Regional Response Coordination** refines the team's objectives if required and provides input and guidance to the team.
- **Situation Awareness Section** provides the situation report (SITREP) to inform the team of current status.
- **Planning Support Section** briefs the Regional Support Plan. The plan will be a general concept of where the effort will be applied in the hours of 12–24 of notional time; 40 minutes to 1:20 of actual game time. The team should base its actions over the next 40 minutes on the Regional Support Plan.
- **Resource Support Section** briefs the status of resource requests and how well they have been filled.
- **RRCS Staff Support** briefs the status Department of Defense resources, external affairs interaction.

1:20

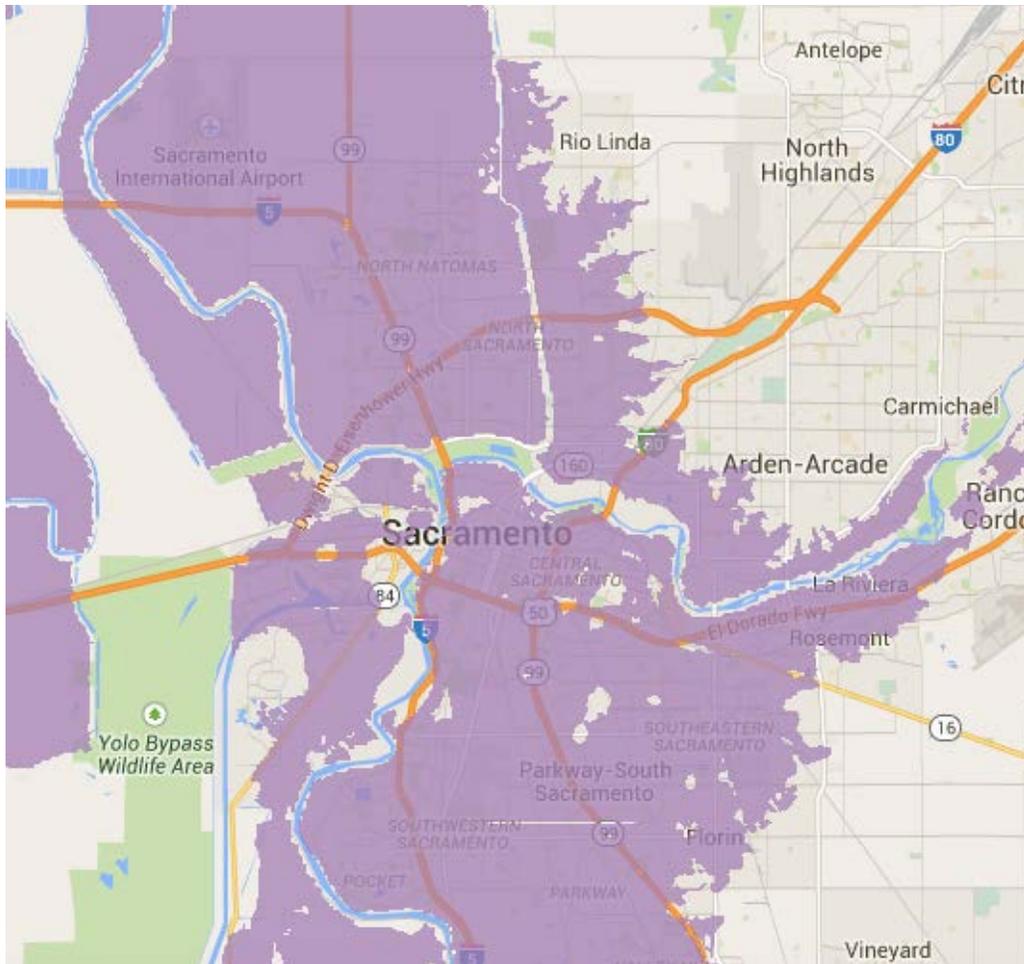
- **Chief of Regional Response Coordination** briefs the objectives for the next 12-hour operational period.
- **Situation Awareness Section** provides the changeover briefing (Appendix G). This is a briefing that summarizes the activities of the past 12 hours (40 minutes game time) and prepares the team for the new shift over the next 12-hour operational period.

- **Planning Support Section** briefs the initial concepts of the next Regional Support Plan. This plan will cover the 24–36 hour time frame (1:30 – 2:00 game time).
- **Resource Support Section** provides an overview brief of the past 12 hours (40 minute game time) regarding requests, how many requests were filled, and the status and location of inbound resources.
- **RRCS Staff Support** briefs the status of Department of Defense resources and external affairs interaction. Fill out the President / higher headquarters briefing sheet regarding the numbers of fatalities, injuries, people saved in search and rescue, persons in shelters, and commodities employed. Brief the team on the status toward reaching the goal.

The operational tempo would continue for two more cycles until 72 hours (4 hours of game time) are complete.

Review the performance to determine if the team achieved the goals. In particular, review whether the team provided for:

- All fatalities and injuries
- Displaced survivors
- Shelters for all displaced survivors
- Commodities (ice, water, food, cots, blankets, etc.) for all survivors
- The requests could have been executed given the actual ground situation
- The team processed all Action Request Forms
- The team stayed within funding allocations
- The team answered all information requests



From a screen shot of the State of California, Department of Water Resources, Best Available Map, accessed June 20, 2015, <http://gis.bam.water.ca.gov/bam/>.

6. WINNING THE GAME

At the end of the 24th turn, players evaluate their success by comparing the resource requests from the situational input cards with what they actually put in play. At its simplest, the team can fill out the team scoring worksheet (see Table 10). A positive value would result in winning and a negative score would be a loss. As part of this evaluation, players also determine if they responded to other informational requests from both the state below them, and FEMA headquarters and the President above them. Finally, players evaluate if they met their own, internal objectives. If they did not win, players should evaluate their strategy for the next round to determine what to do differently.

Table 10. Regional Response Center Staff Team Scoring Example

SURVIVOR AND COMMODITY POINTS

| Element | Requirements | Value (\$/element) | Amount Delivered | Damage / Score (\$) |
|--------------------------------------|---------------------|---------------------------|-------------------------|----------------------------|
| Fatalities | 100 | -2,000,000 | N/A | -200,000,000 |
| Injuries | 20,000 | -2,000 | N/A | -40,000,000 |
| Uncared for Displaced Persons | 0 | -200 | 170,000 | -34,000,000 |
| Number in Shelters | 200,000 | \$200 | 50,000 | \$10,000,000 |
| Number Evacuated | 50,000 | \$200 | 30,000 | \$6,000,000 |
| Number Rescued | 5,000 | \$2,000 | 1,000 | \$2,000,000 |
| Pounds of Ice Delivered | 8,000,000 | \$16 | 4,000,000 | \$64,000,000 |
| Liters of Water Delivered | 3,000,000 | \$6 | 3,000,000 | \$18,000,000 |
| MREs Delivered | 2,000,000 | \$5 | 2,000,000 | \$10,000,000 |
| Blankets Delivered | 500,000 | \$4 | 100,000 | \$400,000 |
| Cots Delivered | 250,000 | \$4 | 100,000 | \$400,000 |
| Hygiene Kits Delivered | 20,000 | \$50 | 10,000 | \$500,000 |
| Infant-Toddler Kits Delivered | 20,000 | \$100 | 200,000 | \$2,000,000 |
| Durable Medical Equipment | 10,000 | \$100 | 5,000 | \$500,000 |

| | | | | |
|--|---------|-------|---------|--------------------|
| Delivered | | | | |
| Consumable Medical Supplies Delivered | 10,000 | \$100 | 5,000 | \$500,000 |
| Tarps Delivered | 187,500 | \$10 | 190,000 | \$1,875,000 |
| Commodity Subtotal = | | | | - \$157,825,000 |

FACILITY POINTS

| Element | Requirements | Value (\$/element) | Amount Delivered | Score (\$) |
|---------------------------------|---------------------|---------------------------|-------------------------|-------------------|
| Federal Medical Stations | 3 | \$1,000,000 | 2 | \$2,000,000 |
| DMAT Teams | 10 | \$300,000 | 10 | \$3,000,000 |
| DMORT Teams | 10 | \$15,000 | 10 | \$150,000 |
| FSAs Open | 3 | \$1,000,000 | 2 | \$2,000,000 |
| Type I PODs Open | 25 | \$200,000 | 10 | \$2,000,000 |
| Type II PODs Open | 0 | \$100,000 | 10 | \$1,000,000 |
| Type III PODs Open | 0 | \$50,000 | 5 | \$250,000 |
| Capability Subtotal = | | | | \$10,400,000 |

TOTALS

| | |
|----------------------------------|----------------|
| Grand Total = | -\$147,425,000 |
| Total Affected Population | 1,000,000 |
| Number Displaced | 250,000 |

Sample of 72-Hours End of Game Scoring.

VI. CONCLUSION

The objective was to develop a serious game that could be used by the Federal Emergency Management Agency to improve performance, feedback, and engagement in Regional Response Coordination Center training and exercises. The methodology involved developing both a game design document and a prototype game that could be used to develop an actual multiplayer game to address the research question.

Conceptually, *72-Hours* is a very basic game. Players simply collaborate to determine the conditions of the flooded city, the status of the affected population and bring resources to the responders and survivors. The game must track the player's performance from both an individual and team perspective to determine if they win by serving all of the disaster survivors within 72 hours. The essential aspect of the game is it must force the players to react quickly in a stressful situation. Therefore, the game must simulate the real world by first providing very little information and then overloading the players as the game goes on. In addition, the tempo of the game must be very high. Fortunately, the requirements for such a realistic, high-stress game are well within the capability of current game designs, making the game design document itself straightforward. There are no technical constraints limiting the production of the game. In addition to GlassBox, a number of other game engines, such as Unity and CryEngine are available at a minimal cost. Since it is already funded and supported by DHS, the Next-Generation Incident Command System is also an attractive option for the game platform.

The prototype simulates the chaotic environment of a Regional Response Coordination Center by providing the players with little more than a blank map. Players draw situational input cards at a rapid pace to inform and then overload the team. The prototype also enables both simultaneous and turn-based play. Hundreds of situation input cards and resource request cards enable accelerated play. In addition, the chance-based resource sourcing cards provide a realistic environment in which resource requests often have uncontrollable delays. The most difficult aspect of the prototype was the actual resource tracking. Players may find using the Excel workbook quicker and easier than the printed worksheets in the player handbook. The workbook is available from the

Dudley Knox Library at <http://hdl.handle.net/10945/46412>. Making calculations, recording actions, and accounting for resource use is automated in a computer game. In this regard, the prototype is more difficult. Other than the mechanics of a board game, the prototype is simply derived from actual Regional Response Coordination Center operations per the *Regional Incident Support Manual*. However, like the game design document, the prototype is also straight forward and does not have limitations that prevent its use, even as a final product of this effort.

A. GAME PLAY ANALYSIS

The actual computer game is not developed under the scope of this research. The prototype is modelled after *Pandemic*, which is also a collaborative board game that forces players to race against the clock to fight a pandemic disaster. The play involves players drawing cards and taking a finite number of actions every turn to respond to the developing situation. In *Pandemic*, players lose if they draw all of the input cards and essentially run out of time. The finite number of actions (three resource requests per turn) and funding limits (\$10 million per day and \$30 million total) in *72-Hours* similarly control how much players can accomplish in a ten-minute turn. Without the limits, players could essentially order unlimited resources to distribute ubiquitously. Another limit is the starting stockpile of commodities derived from a June, 2015, FEMA report. The limits established in the game play are realistic given that there is oversight regarding disaster response expenditure. Even in catastrophic disasters, Congress can be involved in supplemental appropriations. This delay is best avoided by managing funds wisely. In addition, each resource request is a negotiation between a vendor, other government agency, and even other FEMA regions. *72-Hours* is also similar to *Pandemic* because it is time bound. Players have 24, ten-minute turns (72 hours of real time) to stabilize the disaster.

Even with experienced Regional Response Coordination Staff, playing with the minimum of five players is overwhelming. Players will have more success at keeping up with the game if they have multiple players per role to act as a team as with an actual Regional Response Coordination Staff. *Pandemic* has proven to be very fun and engaging

even though it is very difficult to actually win. Similarly, the intention for *72-Hours* as the prototype develops is for it to be similarly engaging even though players will find it extremely difficult to win.

1. Initial Observations

The prototype requires several rounds of playing and refinement with emergency managers of various experience levels. Some initial observations for playing the game are as follows.

The fast pace of the prototype requires an expert level of knowledge in the Regional Response Coordination Staff. For example, if players do not know how much of each commodity is required per person, they will have to look up the information. As a consequence, writing new resource requests in the middle of the game is a challenge. Multiple players for each primary position, similar to full, Regional Response Coordination Staff, helps to mitigate this issue. The prototype is designed on the assumption that players are already proficient in their respective positions. The prototype is not designed for novices. However, Regional Response Coordination Staff could use the prototype with extended time limits or even no time limits as a tabletop exercise platform to train beginners.

Using electronic resources instead of the printed player guide helps players with the pace. As with real life, Players must track the number of survivors and assistance requests. They must then order, pay for, and distribute the resources to the appropriate locations in a timely manner within budget constraints. This is clearly accomplished more easily using the Excel workbook provided rather than the hardcopy worksheets.

Using the Next-Generation Incident Command System (NICS) as the game environment has both advantages and disadvantages. One advantage is there can be direct, positive transfer. Since NICS is used in actual disaster response, playing *72-Hours* on the platform actually trains them to use the application. Using NICS also simplifies the actual “board” game design. An actual board game would have required hundreds of game pieces and multiple maps of varying scale. Using NICS, with the built in functionality, makes game setup and play far easier. The downside to using NICS as the

game platform is it does require players to create an account and conduct some training to become familiar with the system. This is a manageable issue given that any game and even Regional Response Coordination Center tool also requires some level of training. Just as with *SimCity* and other computer games, a final product should have a training mode.

2. Criteria

Effectiveness: Due to the scope of the thesis, the ultimate effectiveness of using serious games to assess performance of Regional Response Coordination Staff (RRCS) during training and exercises is yet to be determined. In order to maximize effectiveness, the game design was first based on actual FEMA procedures from the *Regional Incident Support Manual* and standards in the FEMA Qualification System. Although it is a board game platform, even the prototype provides immediate feedback at the end of the game for players regarding their performance. At the end of game play, they instantly know if they have served all of the survivors. The final computer version would be even better because it could track player performance throughout the game and provide a running score. Game engines such as *SimCity's* GlassBox actually calculate the use of resources and amount remaining. This feature allows players to spend less time on filling spreadsheets and more time on the actual Regional Response Coordination Center plans and processes. An important adaption of an existing game engine is simply to base the characters on RRCS positions, and their scores on the FEMA qualification System. Team scores would be based on *National Preparedness Goal* core capabilities. Based on existing game engine technology, there are no impediments to the *72-Hours* computer game evaluating player performance and providing feedback. It is also common for players of collaborative games such as *Pandemic* and *Battlestar Galactica* to discuss strategy before and after each game to improve their performance over the last round. This is nothing more than a lessons learned process, one of the HDS/FEMA weaknesses identified in both training and actual disasters such as Hurricanes Katrina and Sandy. Interestingly, in developing of the prototype, the researcher found himself greatly increasing his expertise simply through the repetition of working through the disaster

response. *72-Hours* has the potential to be extremely effective in improving DHS and FEMA training and exercises.

Cost: The cost of developing a serious game for FEMA training and exercises was surprisingly low. The prototype was built for less than \$50 plus development time. The original intent was to make a board game prototype with multiple maps, hundreds of cards and game pieces. But since the Next-Generation Incident Command System proved to be superior at no cost, it was chosen. Follow-on prototype testing would also be of marginal material cost and mainly player time.

In addition, the time and development cost of an actual computer game is estimated to be low. In particular, by using an existing game engine and simply developing and excursion of an existing game, development time can be minimized. Given that FEMA spent more than \$40 million per year between 2005 and 2010 on its exercise program, the estimated cost of less than \$100,000 and six months to develop a computer game is a marginal cost to the national exercise program. But, even if the total cost was several times this assumption, *72-Hours* would be fiscally feasible. Much of the artificial intelligence can be drawn from the prototype support materials. But one of the great savings is in future training and exercise costs. Currently, FEMA high fidelity exercises require a large simulation cell to provide the scenario injects. Every input requires an individual to contact a player and provide information. The sheer magnitude of attempting to keep an entire Regional Response Coordination Staff engaged is beyond the capacity of typical simulation cells. However, game engines such as GlassBox have rule sets that each agent follows within the game. This means that every element on the game that is using resources, is calculating effects, and stimulating player action runs without human input. Since current exercises cannot approach this level of fidelity, the future cost savings will be significant. Exercise development time is minimized because the game engine can simulate the environment. And even the need for observers is minimized because the game can provide better feedback for every player.

Realism: As described earlier in this paper, Lukoshch et al., reported that serious games could provide the realism necessary to stimulate physiological responses as actual disasters. The main effort in Regional Response Coordination Staff is in providing and

managing resources, be they personnel, commodities, facilities, or equipment. The vast majority of resources are commodities and personnel directly from FEMA, mission assignments to FEMA's partner agencies, or contracts FEMA executes. The movement and management of resources is exactly how GlassBox functions. The gaming environment can deliver a very realistic feel. The main decision FEMA would have to make is to use a more intuitive display such as in Next-Generation Incident Command System (Figures 23–29) and *SimCity* (Figure 7), or “dumb it down” to look more like the current Web EOC display (Figure 8). In short, serious games have proven to provide a high degree of realism and game engines exist that could be applied to Regional Response Coordination Center exercises.

“Good Game”: Even though the serious game would be for training, it still must be a good game in order for people to adopt it as a training platform. The game must put them in the flow channel. Lewis Pulsipher's ten criteria for good game were presented earlier and will not be repeated here except for those that pose the greatest challenge. The two criteria that may be the most difficult to fulfill are the game must present interesting challenges, and must have high activity. *72-Hours* presents cerebral challenges rather than the thrill of first-person shooter games. However, the research has found that the mental challenges in even the prototype are great and drive players to an expert level to maintain the pace. With respect to activity level, even the prototype addresses this challenge by having simultaneous play within a turn environment. For example, the Planning Section Chief and Resource Section Chief can work their specific problems simultaneously and then come together at the end of the turn according to the operational tempo, just as they do in real life. While there is no guarantee *72-Hours* will be a “good game,” there are also no obstacles either. If games like *Pandemic* and *Battlestar Galactica* are any indication, collaborative games that are difficult to actually win are still “Good Games.” In addition, *SimCity*, which is a close approximation FEMA Region operations, has been played since 1989.

Adoptability: If you build the game, will they come? Even the prototype for *72-Hours* uses workstations and an actual disaster management application. While players must complete some basic training to become competent with the game, this should be no

more difficult, and possibly easier, than learning Web EOC. The actual roles would match the Regional Response Coordination Staff positions defined in the *Regional Incident Support Manual*. The game would prompt and provide feedback regarding player performance per the FEMA Qualification System. Furthermore, performance objectives would be defined using the *National Preparedness Goal* core capabilities. In summary, the game would use the same workstations, Regional Response Coordination Center, and same procedures as the staff uses for actual disasters. The difference, is the game would present the scenario and actions in a more realistic and engaging manner than for current training and exercises. The greatest challenge to adoptability is individuals and teams will actually receive more feedback, good and bad, than they are used to today.

B. RECOMMENDATIONS

The conclusion of this research is a serious game can improve Regional Response Coordination Staff performance. One obvious example is DOD has used simulations for years to maintain and improve basic skills of combatants. While these simulations cannot completely match the real world, they can also improve skills that cannot be practiced in actual operations. For example, pilots cannot experience an engine fire or other full disaster in flight simply for training. But they can practice these with high fidelity in simulators so they are capable of working the emergency when it actually happens in flight. As efforts such as Project Pandora have demonstrated, emergency managers can similarly improve their skills through serious games. Specific research has also demonstrated a high correlation between how emergency room triage physicians act in both the game and real environment.

In addition, games can provide much better feedback than actual observers. For example, an observer may be tasked with watching a section of the Regional Response Coordination Staff for twelve hours per day for several days. It is simply not possible to provide detailed feedback two a half dozen or more trainees under such conditions. But games cannot only provide feedback based on FEMA-established performance measures, they actually play back a segment of the exercise for review.

Computer games have the ability to get players into the flow channel in a way that current training and exercises cannot match. For example, if 40 Regional Response Coordination Staff are simultaneously managing resources for their respective responsibilities, they would need close to 40 simulation cell personnel providing input to keep them fully engaged. But since game engines such as GlassBox have rules for each agent to consume, transport, and/or produce resources, each player can be fully engaged without stimulator cell input. And since the game does not get fatigued, it can maintain full engagement with players and even prompt them when their performance is substandard. Finally, rather than be a static simulation, as a multiplayer game, *72-Hours* can provide players a different look every time they play.

Based on this research, it is recommended that DHS and FEMA further explore the use of serious games for Regional Response Coordination Center training and exercises. While this paper has provided a good foundation through a game design document and prototype, much work remains to develop a final game.

Actual repeated testing of *72-Hours* with multiple groups was not possible due to the scope of this thesis. As such, the following steps are provided should DHS and FEMA desire to form a team to develop the game.

FEMA subject matter experts in Regional Response Coordination Center operations are essential to capture the requirements and descriptions of each position. In particular, FEMA Regional staff should be included. FEMA's National Integration Center and National Exercise Division should be involved since they have a stake in or has responsibility for training and exercises. In addition, FEMA's Emergency Management Institute should be included to maintain continuity between their education and the new training. DHS Science and Technology would be a logical partner for further development since that organization has an established relationship with Massachusetts Institute of Technology's Lincoln Laboratories. In 2013, Lincoln Laboratories, along

with Oak Ridge National Laboratory conducted a study on using serious game to deliver guidance for reacting to an improvised nuclear device detonation.¹⁴³

1. Plan the project: Table 2 contains a possible matrix of game design document elements and milestones.
2. Review the game design document: The team should review up through the Solution Design milestone to obtain agreement on the game design.
3. Refine and evaluate the prototype: The last step in the game design document development is to play the game. This will involve moving from a few experts familiar with the game to staff that are novices and may not be qualified in their FEMA Qualification System positions.
4. Complete the game design document: Once the prototype has been fully tested, the final results can be included in the game design document.
5. Obtain funding for full game development: Up to this point, the largest expense will be travel. If the decision is to develop the game, it will need to be included in annual program plans.
6. Complete the project through deployment, maintenance and troubleshooting

This will involve contacting with a vendor to develop the game. The primary course of action should be to use an existing game engine and make early versions of the game a modification of an existing game.

C. FINAL SUMMARY

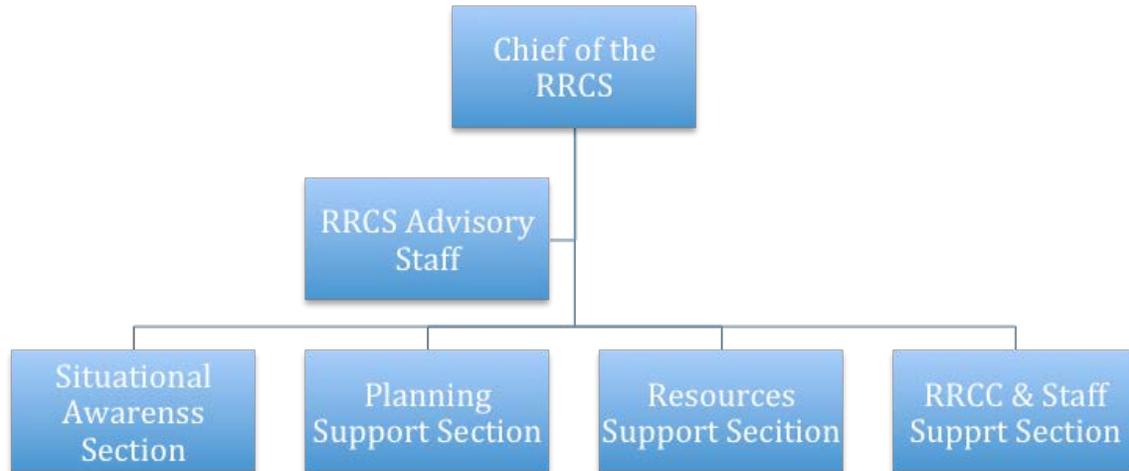
Using serious games to improve performance, feedback and engagement of FEMA Regional Response Coordination Center training and exercises is valid and feasible. Research has demonstrated the efficacy of computer games on performance, to include emergency management. Furthermore, well-proven game engines already exist that could be used to develop *72-Hours*. This research has produced a prototype of such a game. The last step is simply to put the pieces together in a project to develop and field the game.

¹⁴³ Oak Ridge National Laboratory and Lincoln Laboratory Massachusetts Institute of Technology, "Use of Serious Games in FEMA Messaging of "Get Inside, Stay Inside, Stay Tuned," (Project Report, Oak Ridge Tennessee, September 30, 2013), 1.

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APPENDIX A. REGIONAL INCIDENT SUPPORT MANUAL STAFF ORGANIZATIONAL STRUCTURE

Figure 33. Regional Response Coordination Center (RRCC) Overall Organization



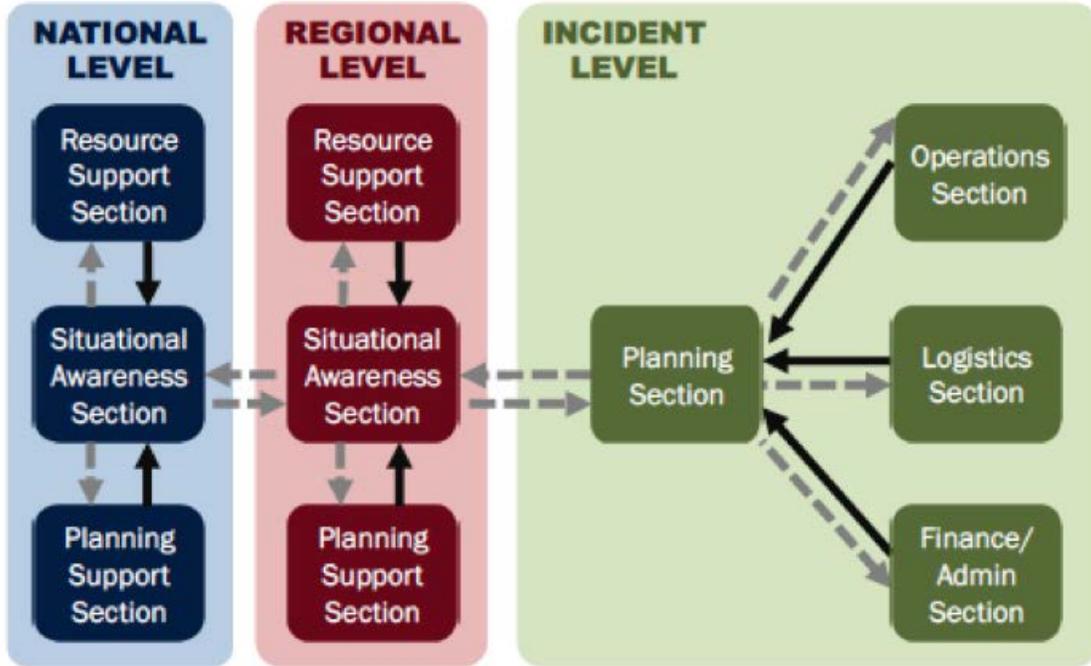
From Federal Emergency Management Agency, *Regional Incident Support Manual*, 9.

Figure 34. Chief of the Regional Response Coordination Center and Advisory Staff



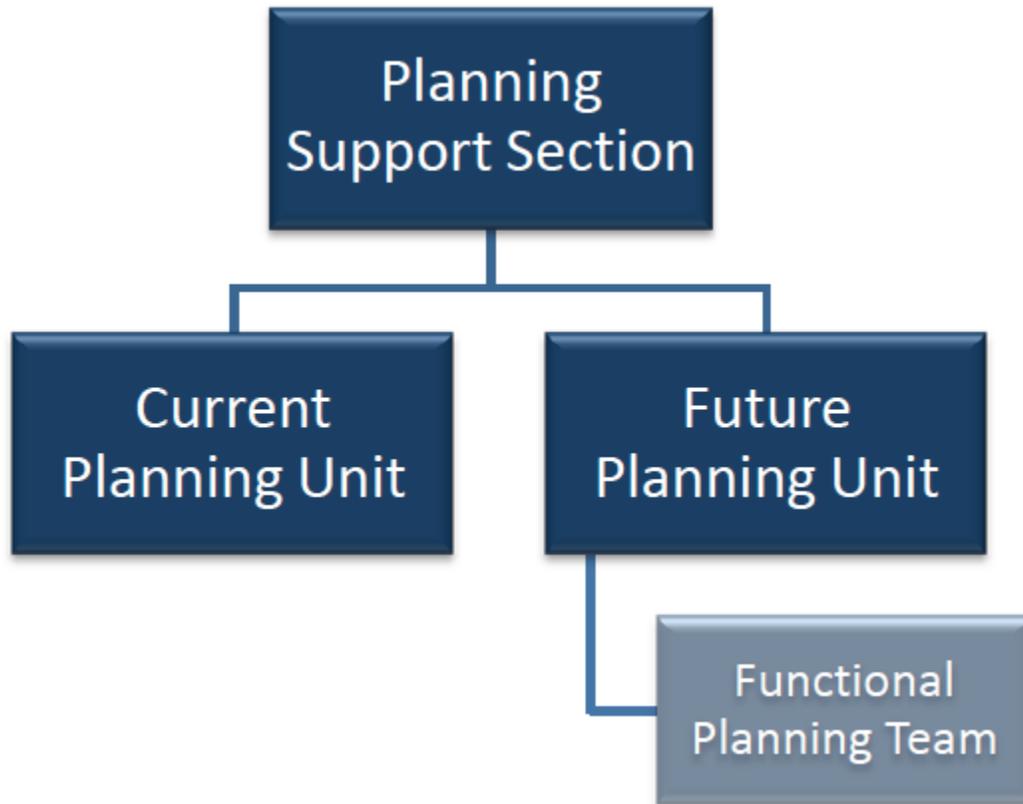
From Federal Emergency Management Agency, *Regional Incident Support Manual*, 19.

Figure 35. Situational Awareness Section



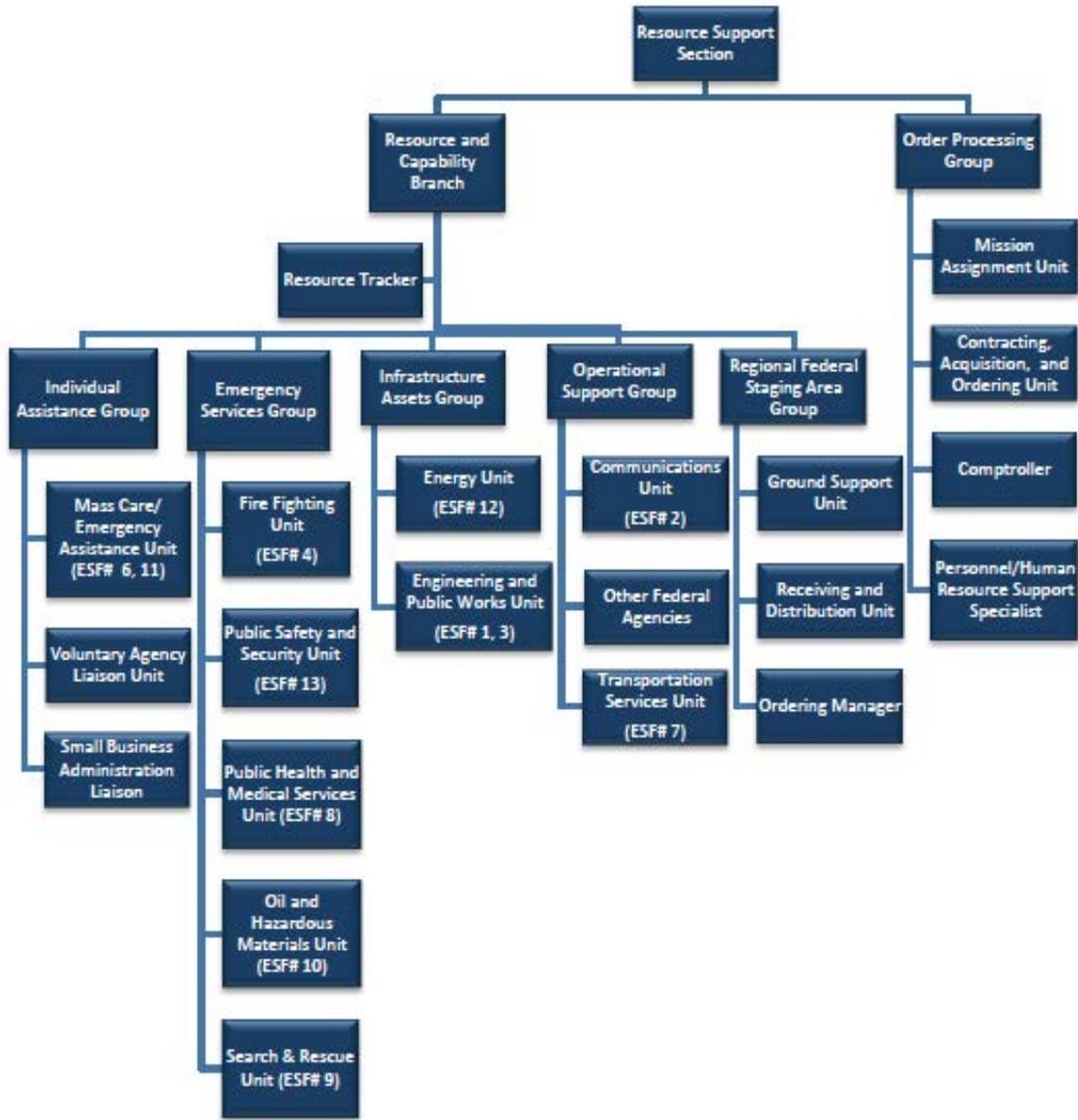
From Federal Emergency Management Agency, *Regional Incident Support Manual*, 25.

Figure 36. Regional Response Coordination Center Planning Support Section



From Federal Emergency Management Agency, *Regional Incident Support Manual*, 31.

Figure 37. Regional Response Coordination Center Resource Support Section



From Federal Emergency Management Agency, *Regional Incident Support Manual*, 36.

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APPENDIX B. REGIONAL INCIDENT SUPPORT MANUAL POSITION DESCRIPTIONS

Table 11 is a highly abbreviated summary of Regional Response Coordination Staff roles and responsibilities in Appendices B, C, D, E, and F of the *Regional Incident Support Manual*.

Table 11. Regional Incident Support Manual Positions

| Section | Primary Position | Essential Functions |
|------------------------|------------------------|--|
| Regional Administrator | Regional Administrator | <ul style="list-style-type: none"> • Principal advisor to states • Direct activation and deployment of personnel • Communicate with FEMA Administrator • Spokesman and key point of contact to media • Guide RRCS Chief |
| Chief of RRCS | Chief of RRCS | <ul style="list-style-type: none"> • Oversee the execution of the objectives • Approve all plans and orders • Approve activation and demobilization requests, including those of emergency support functions • Ensure all sections of the RRCC work in a coordinated fashion • Ensure timely delivery of federal aid • Approve essential elements of information, critical information requirements, and answers key requests for information • Approve requests for resources from the national level • Direct establishment of staging areas • Coordinate Governor's request for a Presidential Disaster Declaration • Ensure all funds are expended appropriately |
| Chief of RRCS | Deputy Chief of RRCS | <ul style="list-style-type: none"> • All functions of the chief as required |

| Section | Primary Position | Essential Functions |
|-------------------------------|--|---|
| Chief of RRCS | ESF #15 / External Affairs | <ul style="list-style-type: none"> • Develop External Affairs Message • Develop leadership talking points • Represent FEMA to other government agencies, media, and private sector • Report to RRCS on external affairs operations • Ensure news coverage is accurate • Develop messaging strategy • Advise on Joint Information Center setup and management |
| Chief of RRCS | Liaisons | <ul style="list-style-type: none"> • Advise RRCS on their respective agencies • Advise on their agencies' capabilities • Represent agency at planning sessions |
| Chief of RRCS | Lessons Learned Advisor | <ul style="list-style-type: none"> • Analyze incident observations • Provide process guidance • Develop after action report |
| Chief of RRCS | Legal Advisor | <ul style="list-style-type: none"> • Ensure all activities are legally compliant • Recommend alternatives, waivers, exceptions • Provide guidance on Presidential Declaration |
| Chief of RRCS | Disability Integration and Coordinator Advisor | <ul style="list-style-type: none"> • Provide guidance on disability policy • Recommend strategies, resources, alternatives using inclusive practices • Stay informed on individuals with disabilities |
| Chief of RRCS | Defense Coordinating Officer | <ul style="list-style-type: none"> • Coordinate and responds to validated requests for military resources • Validate requirements for military support • Forward mission assignments to the appropriate military organizations • Evaluate DOD requirements in the Regional Support Plan • Track DOD resources |
| Situational Awareness Section | Situational Awareness Section Chief | <ul style="list-style-type: none"> • Oversee information requirements, collection, analysis, distribution, and archiving of critical information |

| Section | Primary Position | Essential Functions |
|-------------------------------|----------------------------------|---|
| | | <ul style="list-style-type: none"> • Establish information requirements and reporting schedules • Conduct staff briefings • Creates common operating picture • Provide information for future planning • Oversee master files of all records • Ensure external affairs messaging is accurate |
| Situational Awareness Section | Information Collection Unit Lead | <ul style="list-style-type: none"> • Execute Information Collection Plan by coordinating/developing with: <ul style="list-style-type: none"> ○ States ○ Other federal agencies ○ Essential Support Functions (ESFs) ○ Essential Elements of Information ○ Critical Information requirements ○ Situation Reports ○ Spot Reports ○ Requests for Information • Provide information for the Common Operating Picture |
| Situational Awareness Section | Information Analysis Unit Leader | <ul style="list-style-type: none"> • Provide analysis of collected information • Compile, consolidate and analyze: <ul style="list-style-type: none"> ○ Situation reports ○ Spot reports ○ Incident plans ○ Briefings • Formulate the internal Critical Information Requests and Associated Essential Elements of Information • Deconflict contradictory information |
| Situational Awareness Section | Risk Analysis Specialist | <ul style="list-style-type: none"> • Provide analytical information from FEMA systems and modeling • Obtain hazard-specific analytical assessments of damage from all sources • Identify cascading/secondary issues |
| Situational Awareness Section | Documentation Unit Leader | <ul style="list-style-type: none"> • Supervise Reports and Briefing Specialist • Ensure products are accurate timely, well-written • Establish and Maintain Information Displays and maps |

| Section | Primary Position | Essential Functions |
|-------------------------------|---|--|
| Situational Awareness Section | Reports and Briefing Specialist | <ul style="list-style-type: none"> • Create and distribute reports <ul style="list-style-type: none"> ○ SITREP ○ SPOTREP ○ IOR • Coordinate with RRCS for RFI response • Maintain Information Displays • Provide briefings • Display meeting schedules • Develop the shift change brief |
| Situational Awareness Section | Documentation Specialist | <ul style="list-style-type: none"> • Manage records • Maintain event chronology • Take meeting notes • Post information to shared sites |
| Situational Awareness Section | Geospatial Information System (GIS) Unit Leader | <ul style="list-style-type: none"> • Produce maps, statistical data, analysis • Coordinate to help develop the COP • Coordinate remote sensing |
| Planning Support Section | Planning Support Section Chief | <ul style="list-style-type: none"> • Lead Planning Staff • Manage meeting schedule • Coordinate with IMAT Planning Chief • Coordinate with RSSC to develop COAs • Facilitate RSP based on COAs • Review deliberate plans to support incident objectives |
| Planning Support Section | Current Planning Unit Leader | <ul style="list-style-type: none"> • Supervise Planning Specialists • Lead the RSP development process • Produces, publishes, distributes the RSP <ul style="list-style-type: none"> ○ Incorporates RRCS priorities ○ Review state plans ○ Consult with IMAT ○ Review RRFs that may be included in the RSP |
| Planning Support Section | Future Planning Unit Leader | <ul style="list-style-type: none"> • Supervises Planning Specialists • Produce Crisis Action Plans <ul style="list-style-type: none"> ○ Address particular requirements • Predict resource support issues • Write COAs for crisis action plans |
| Resource | Resource | <ul style="list-style-type: none"> • Coordinate with interagency |

| Section | Primary Position | Essential Functions |
|--------------------------|---|--|
| Support Section | Support Section Chief | <ul style="list-style-type: none"> representatives and partners to provide resources • Oversee and maintain accountability for receipt, validation, and processing of resource requests • Communicate resource management issues and status to the RRCS Chief • Reviews and approves: <ul style="list-style-type: none"> ○ Task orders ○ Contracts ○ Purchase orders ○ Purchase card requests |
| Resource Support Section | Resource and Capability Branch Director | <ul style="list-style-type: none"> • Focal point for provision of resource tasks • Coordinate assigned ESFs • Validate requests <ul style="list-style-type: none"> ○ Receive requests ○ Identify sources • Provide resources and capability requirements for RSP |
| Resource Support Section | Resource Tracker | <ul style="list-style-type: none"> • Track orders and allocations from source through delivery • Track the availability of resources |
| Resource Support Section | Individual Assistance Group Supervisor | <ul style="list-style-type: none"> • Coordinate Individual Assistance including: <ul style="list-style-type: none"> ○ ESF #6—Mass Care (Red Cross) ○ ESF #11—Department of Agriculture • Coordinate Individual Assistance RRFs and Mission Assignments |
| Resource Support Section | Mass Care/ Emergency Assistance Unit Leader | <ul style="list-style-type: none"> • Ensure appropriate mass care/emergency assistance resources are identified and available |
| Resource Support Section | Voluntary Agency Unit Leader | <ul style="list-style-type: none"> • Supervise Voluntary Agency Liaison and Donations Management Specialists • Coordinate with National Voluntary Organizations, faith-based and community initiatives |
| Resource | Emergency | <ul style="list-style-type: none"> • Coordinate activities of |

| Section | Primary Position | Essential Functions |
|--------------------------|--|---|
| Support Section | Services Group Supervisor | <ul style="list-style-type: none"> ○ ESF # 4—U.S. Army Corps of Engineers ○ ESF #8—HHS ○ ESF #9—Search and Rescue ○ ESF #10—EPA ○ ESF # 13—DOJ |
| Resource Support Section | Infrastructure Assets Group Supervisor | <ul style="list-style-type: none"> • Coordinate assistance for: <ul style="list-style-type: none"> ○ Debris removal for emergency workers ○ Evacuation and return of public ○ Restoration of non-profit facilities • Coordinate federal support to infrastructure components • Coordinate assistance for public works • Prepare tasks/statements of work • Coordinate with ESF #1 - DOT <ul style="list-style-type: none"> ○ Status of transportation infrastructure ○ Transportation solutions |
| Resource Support Section | Energy Unit Leader | <ul style="list-style-type: none"> • Coordinate restoration of energy system restoration • Coordinate with ESF #12—DOE • Provide status of all energy capabilities |
| Resource Support Section | Public Works and Engineering Unit Leader | <ul style="list-style-type: none"> • Facilitate federal support to debris removal, power restoration, and infrastructure requirements |
| Resource Support Section | Operational Support Group Supervisor | <ul style="list-style-type: none"> • Coordinate with the RA, IMAT, FCO, and/or UCS to determine needs • Coordinate with DCE and all DOD support requests • Provide reports on communications, private sector, and military activities to the SAS for SITREPS • Review and Approve relevant RRFs • Prepare relevant tasks/statements of work for task orders, contracts, and purchase orders |
| Resource Support | Communications Unit Leader | <ul style="list-style-type: none"> • Provide IT support for staff • Provide audiovisual, VTC, and multi- |

| Section | Primary Position | Essential Functions |
|--------------------------|--|--|
| Section | | media support to the RRCC |
| Resource Support Section | Other Federal Agencies | <ul style="list-style-type: none"> • Coordinate with states and local entities • Initiate RRF to request federal assistance • Provide direct federal assistance to jurisdictions that lack capabilities • Coordinate with ESF #7 (GSA) to contract for personnel and services |
| Resource Support Section | Defense Coordinating Element | <ul style="list-style-type: none"> • Coordinate DOD support |
| Resource Support Section | Transportation Services Unit | <ul style="list-style-type: none"> • Coordinate the transportation of commodities, teams, and equipment • Monitor and respond to requests for transportation • Develop movement schedules and concepts of execution • Acquire and provide transportation |
| Resource Support Section | Regional Federal Staging Area Group Supervisor | <ul style="list-style-type: none"> • Coordinate with landlord • Develop site layout • Provide support services, including portable toilets, wash stations, fuel, medical needs • Coordinate security needs • Develop a federal staging area operations plan • Maintain status if resources at federal staging area • Dispatch resources in the federal staging area |
| Resource Support Section | Ground Support Unit leader | <ul style="list-style-type: none"> • Coordinate with FSA Group Supervisor to establish the layout • Provide ground transportation of resources and supplies • Collect and record information on rental, contract, and agency equipment |
| Resource Support Section | Fleet Manager | <ul style="list-style-type: none"> • Identify and obtain vehicles to meet incident requirements • Order vehicles through GSA |

| Section | Primary Position | Essential Functions |
|--------------------------|---|---|
| | | <ul style="list-style-type: none"> Track and monitors fleet usage |
| Resource Support Section | Network Manager | <ul style="list-style-type: none"> Design and manages the network |
| Resource Support Section | Receiving and Distribution Unit Leader | <ul style="list-style-type: none"> Continuously maintain and reconcile inventory Maintains status of all resources in the FSA |
| Resource Support Section | Ordering Manager | <ul style="list-style-type: none"> Manage the process of ordering supplies, equipment, personnel, teams, services, or commodities |
| Resource Support Section | Order Processing Group Supervisor | <ul style="list-style-type: none"> Receive, coordinate, and order internal and external resources for validating requests Determine the source of supply or best method to fill incident requests Ensure staff track financial obligations Coordinate and communicates status of requests and orders Coordinate with the Transportation and Movement Coordination Group Recommend best sourcing options Submit reports to the Situational Awareness Section Address funding issues Process all resource requests Administer financial matters |
| Resource Support Section | Mission Assignment Unit Leader | <ul style="list-style-type: none"> Process Resource Request Forms and Mission Assignments Organize, prepare, and maintain the Mission Assignment documentation Track the Missions Assignment activity |
| Resource Support Section | Contracting, Acquisition, and Ordering Unit Leader (CAUL) | <ul style="list-style-type: none"> Track financial information Supervise Contracting Acquisition Specialist |
| Resource Support | Contracting and Acquisition | <ul style="list-style-type: none"> Coordinate with Resource Coordination Branch on status of orders |

| Section | Primary Position | Essential Functions |
|--------------------------|---|---|
| Section | Specialist | <ul style="list-style-type: none"> • Prepare and process bids • Award and execute task orders • Prepare documentation for acquiring goods and services |
| Resource Support Section | Comptroller | <ul style="list-style-type: none"> • Ensure proper management of funds • Manage financial resource requirements • Acquire funding in support of the impacted areas • Open surge account • Transfer surge account to disaster fund • Monitor funds availability |
| Resource Support Section | Personnel / Human Resource Support Specialist | <ul style="list-style-type: none"> • Account for deployed FEMA personnel • Maintain sign-in and sign-out rosters • Deploy FEMA personnel • Track number of personnel assigned to the incident • Acquire emergency lodging agreement • Process requests for staffing needs |

After Federal Emergency Management Agency, *Regional Incident Support Manual*, 72–108.

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APPENDIX C. SITUATION INPUT CARDS

Table 12. 0–10 Minute (3 Hours) Situational Inputs: Turn 1

| The Sacramento Levee protecting Natomas has been breached in the vicinity of San Juan Road. Grid # 10S FH 253764 | Personnel were too late to close the gates and the Sacramento River has topped the levee at the Tower Bridge. It is unknown if the levee has failed. Grid #10S FH 300713 | The American River has breached the levee in the vicinity of Business 80. Grid # 10S FH 354728 |
|--|--|---|
| Sacramento International airport is closed due to standing water on the runway and rising. | Homes in Natomas are reporting 1–2 ft. of water and rising. | Caltrans is reporting vehicles stalled due to flooding on I-5 just West of the Sacramento River. It is unknown of the levee has been breached. Grid #10S FH 193813. |
| Caltrans is reporting it has closed I-80 Eastbound at Davis. Grid #10S FH 140680 | Caltrans is reporting it has closed I-5 Northbound in Thornton due to flooding. Grid #10S FH 374320 | Caltrans has reported it is closing Highway 99 Northbound at Elk Grove due to flooding. Grid #10S FH 395557 |
| Caltrans is reporting it is closing 99 Southbound at Yuba City due to flooding. Grid #10S FJ 205330 | Caltrans is reporting I-80 Westbound closed at the Business 80 interchange due to flooding. Grid #10S FH 415790 | Caltrans is reporting Highway 50 Westbound closed at Rancho Cordova due to flooding. Grid #10S FH 550770 |
| Cal OES has reported the Governor is stranded in his home near the Capital due to flooding causing stalled cars. Grid #10S FH 311709 | Sacramento Executive Airport is closed due to flooding. | Approximately 50 members of the state legislature are stranded at the Capitol due to flooding causing stalled cars. Grid # 10S FH 311709 |

Table 13. 10–20 Minute (6 Hours) Situation Inputs: Turn 2

| | | |
|---|---|---|
| <p>The California EOC is activated with partial staff. Many are stranded due to flooding. Grid #10S FH 477705</p> | <p>The Sacramento County EOC is partially activated. Many are stranded due to flooding. Grid #10S FH 388788</p> | <p>Mather Field is closed due to crosswinds. It is expected to open again in 12 hours.</p> |
| <p>Amtrak has stopped service in and out of Sacramento and is reporting 325 personnel stranded at its station. Grid #10S FH 10720</p> | <p>The light rail is closed downtown due to flooding and three, four-car trains are stranded cars with approximately 1,000 passengers are stranded in the vicinity of the downtown plaza. Grid #10S FH 311712</p> | <p>California Highway Patrol is reporting multiple vehicles stranded on Interstate 5 between Elk Grove and Woodland. The highest density is in the vicinity of Natomas.</p> |
| <p>California Highway Patrol is reporting multiple vehicles stranded on Interstate 80 in the vicinity of Natomas.</p> | <p>California Highway Patrol is reporting multiple vehicles stranded on State Highway 99 from Florin Road to North of Yuba City. The highest density is in the vicinity of Natomas.</p> | <p>California Highway Patrol and multiple helicopters services are reporting winds are too strong for rescues by air.</p> |
| <p>The Sacramento Municipal Utility District announced it is preemptively shutting down power to the inundation zone. Residents can expect a citywide blackout.</p> | <p>Water service is still operational on backup generators. The Sacramento Municipal Utility District is advising people to store as much as possible while the system is intact.</p> | <p>The Sacramento Municipal Utility District is reporting the sewage treatment pumps have failed and residents will not have wastewater services.</p> |
| <p>The FEMA Administrator wants an update at the update at 6 hours (10 minutes).</p> | <p>The State EOC is reporting only half staffing due to stranded personnel. The state is requesting mutual aid from Nevada/FEMA IMAT to fill 50 positions.</p> | <p>The Sacramento County EOC is reporting only half staffing due to stranded personnel. The state is requesting mutual aid from Nevada/FEMA IMAT to fill 50 positions.</p> |

Table 14. 20–30 Minute (12 Hours) Situational Inputs: Turn 3

| The city is activating the backup generators to 25 flood control pumps. Status is unknown. | The city is determining which of the 80 flood control pumps without generators are accessible for generator delivery. | Evacuating residents would not allow closure of some floodgates in Natomas and downtown Sacramento. An unknown number are now closed. |
|--|---|---|
| Sutter General Hospital has lost its basement generators due to flooding and is without power. Evacuation routes are cut off. 2801 L St. Grid #10S FH 333703 | Sutter Memorial Hospital is on backup power and evacuating patients. Grid #10S FH 360704 | Hospitals are reporting a lack of ambulances for evacuation due to the demand. |
| Kaiser Permanente South Hospital is reporting it has power and water supply. 2016 Morse Ave. Grid #10S FH 399738 | Mercy General Hospital currently has generator power, but is attempting to evacuate patients. 4001 J St. Grid #10S FH348703 | U.C Davis Medical Center is on generator power. 2315 Stockton Blvd. Grid #10S FH 345685 |
| Kaiser Permanente South Sacramento has power but is experiencing flooding. It needs crews and sandbags. 6600 Bruceville Rd. Grid #10S FH 376592 | Mercy General Hospital is attempting to evacuate patients. 4001 J St. Grid #10S FH 348703 | U.C Davis Medical Center is attempting to evacuate. 2315 Stockton Blvd. Grid #10S FH 345685 |
| Methodist Hospital of Sacramento Has power but is experiencing flooding. It needs crews and sandbags. 7500 Hospital Dr. Grid #10S FH 382583 | The 911 system is overloaded and people cannot get through to an operator. | The President wants an update at the 9 hours (30 minutes). |

Table 15. 30–40 Minute (15 Hours) Situational Inputs: Turn 4

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| | | |
| The National Response Coordination Center is establishing an Incident Support Base (ISB) in Reno, NV. | Social Media is barraged with messages about stranded people. The majority is in Natomas. | Airborne reporters are showing footage of the governor’s residence. |
| Airborne reporters are showing footage of stranded legislators at the state capitol. | Cell phone repeaters are failing in downtown Sacramento as backup batteries run down and/or generators run out of fuel. | Airborne reporters are showing footage of people stranded at the Delta King Hotel in Old Sacramento. Grid #10S FH 301715 |
| Airborne reporters are showing footage of people stranded at the Embassy Suites Riverfront Promenade. Grid #10S FH 301712 | Airborne reporters are showing footage of people stranded at the Holiday Inn Capitol Plaza. Grid #10S FH 304714 | Airborne reporters are showing footage of people stranded at the Vagabond Executive Inn. Grid #10S FH 305716 |
| Airborne reporters are showing footage of people stranded at the Embassy Suites Riverfront Promenade. Grid #10S FH 301712 | Airborne reporters are showing footage of people stranded at the Hyatt Regency Sacramento. Grid #10S FH 314710 | The State EOC has no Incident Action Plan, but their priorities are: <ol style="list-style-type: none"> 1. Search and Rescue downtown and Natomas. 2. Disaster Medical Assistance Teams (DMAT). 3. U.S. Army Corps of Engineers assistance repairing levee breaches. 4. U.S. Army Corps of Assistance with flood control pumps. 5. Mass care and shelter facilities. |
| The State has declared Mather Field a State Staging Area and requests assistance staffing it. | The National Response Coordination Center wants to know what is being done for the Governor. | The National Response Coordination Center wants to know what is being done for the stranded legislature. |

Table 16. 40–50 Minute (18 Hours) Situational Inputs: Turn 5

| Airborne reporters are showing footage of people stranded at the Hilton Garden Inn. Grid #10S FH296747 | Airborne reporters are showing footage of people stranded at the Hawthorne Suites Sacramento. Grid #10S FH 305733 | Airborne reporters are showing footage of people stranded at the Springhill Suites. Grid #10S FH 293747 |
|---|---|---|
| California State EOC is requesting assistance with evacuating Sutter General Hospital. Grid #10S FH 333703 | California State EOC is requesting assistance with evacuating Sutter Memorial Hospital. Grid #10S FH 360704 | California State EOC is requesting assistance with evacuating U.C. Davis Medical Center. Grid #10S FH 345685 |
| California State EOC is requesting assistance with evacuating Kaiser Permanente South Sacramento. Grid #10S FH 376592 | California State EOC is requesting assistance with evacuating Methodist Hospital of Sacramento. Grid #10S FH 376592 | California State EOC is requesting assistance with several thousand people congregating at Raley Field. Grid #10S FH 295713 |
| California State EOC is requesting assistance with several thousand people congregating at Sleep Train Arena. Grid #10S FH 289788 | California State EOC is requesting assistance with several hundred people congregating at Natomas High School. Grid #10S FH 309768 | Airborne reporters are showing footage of people stranded at the Days Inn Sacramento Downtown. Grid #10S FH 302729 |
| Airborne reporters are showing footage of people stranded at the Comfort Suites Downtown Sacramento. Grid #10S FH 301730 | The state has declared McClellan Air Park a State Staging Area and requests assistance with staffing. | California State EOC is requesting assistance with several thousand people congregating at the State Fairgrounds. Grid #10S FH364728 |

Table 17. 50–60 Minute (18 Hours) Situational Inputs: Turn 6

| Winds have died down and are within limits for helicopter rescue. | Floodwaters are reported to be 3–4 feet deep in Natomas. | Floodwaters are reported to be 5–6 feet deep in downtown Sacramento. |
|--|--|--|
| Floodwaters are reported to be 5–6 feet deep in midtown Sacramento. | The U.S. Coast Guard is moving aircraft to McClellan Air Park to support search and rescue. | The California Air National Guard's 129th Rescue Wing to McClellan Field. |
| The State EOC is requesting assistance with several hundred people congregating at East Lawn Memorial Cemetery, 4300 Folsom Blvd. Grid #10S FH 350690 | Water service has now ceased as backup generators have exhausted fuel supplies. | The Elk Grove wastewater treatment plant is flooded and shut down. |
| 10 of 25 pumping stations have stopped due to lack of fuel. | The state is moving all available California Fire helicopters to McClellan Air Park. | The state is moving all available Highway Patrol helicopters to Mather Field. |
| News Media shows a blacked out city at night with isolated lights where generators are available. | The Delta King Hotel has broken free and is floating down the Sacramento River with an unknown number of people. It is damaged from hitting the Tower Bridge. Grid #10S FH 300713 | Heavy rain and low ceilings still cover the area. River levels are still rising. |

Table 18. 1:00–1:10 Hour (21 Hours) Situational Inputs: Turn 7

| California State EOC is reporting Sutter General Hospital lost power. Grid #10S FH 333703 | California State EOC is reporting Sutter Memorial Hospital lost power. Grid #10S FH 360704 | California State EOC is reporting U.C. Davis Medical Center still has power, but is requests fuel supply because its supplier cannot make delivery. Grid #10S FH 345685 |
|--|--|---|
| California State EOC is reporting Kaiser Permanente South Sacramento lost power. Grid #10S FH 376592 | California State EOC is reporting Methodist Hospital of Sacramento lost power. Grid #10S FH 376592 | California State EOC is reporting handheld lights can be seen at Raley Field. Grid #10S FH 295713 |
| USDA reports 3,000 head of cattle at Pitto Brothers Cattle are stranded and need to move. 6235 Liberty Island Rd Dixon, CA 95620. Grid #10S FH 120460 | USDA reports 1,000 head of cattle at Ryer Island Ranch are stranded and need to move. 4868 CA-84 Walnut Grove, CA 95690 Grid #10S FH 190387 | Heritage Oaks Psychiatric Hospital is without power. 2929 Fulton Ave # 4. Sacramento, CA 95821 Grid #10S FH 423785. |
| Sutter Psychiatric Center has water on the ground floor and has lost power. 7700 Folsom Blvd Sacramento, CA 95826 Grid #10S FH 382681 | The Sacramento County Sheriff is beginning rescue operations out of Mather Field, but only one crew is available. | The California Highway Patrol is beginning rescue operations out of Mather Field with two crews. |
| Mather Field requests air traffic controller support. They are not staffed for 24-hour operations. | McClellan Air Park requires air traffic controller support. | Sacramento International is still down with water rising. |

Table 19. 1:10–1:20 Hour (24 Hours) Situational Inputs: Turn 8

| Sacramento Executive Airport is down with water still rising. | At daybreak, airborne news is showing thousands stranded at the State Capitol. Grid #10S FH 311709 | At daybreak, airborne news is showing people waving from broken windows at the Embassy Suites. Grid #10S FH 301712 |
|--|---|---|
| At daybreak, airborne news is showing people waving from broken windows at the Holiday Inn. Grid #10S FH 304714 | At daybreak, airborne news is showing people waving from broken windows at the Hyatt Regency. Grid #10S FH 314710 | At daybreak, airborne news is showing people waving from broken windows at the Sheraton Grand Sacramento Hotel. Grid #10S FH 316712 |
| The FEMA Administrator called and the President wants to know when legislators will be rescued at the Capitol. | The IMAT Operations Chief called. The County and State are completely overwhelmed. Priorities are: <ol style="list-style-type: none"> 1. Evacuate inundated hospitals. 2. DMAT teams and Federal Medical Stations (FMS). 3. Search and Rescue downtown and Natomas. 4. Mass care and shelter at McClellan and Mather. 5. U.S. Army Corps of Engineers assistance repairing levee breaches. 6. U.S. Army Corps of Assistance with flood control pumps. | American Red Cross has shelter teams at U.C. Davis and need to get into the disaster area. Grid #10S FH 079663 American Red Cross has shelter teams in Elk Grove. Grid #10S FH 407525 American Red Cross has shelter teams in Roseville and cannot get closer due to traffic. Grid #10S FH 510910 American Red Cross has shelter teams in Folsom and cannot get closer due to traffic. Grid #10S FH 580790 |
| Social Media is reporting bodies floating in the streets in downtown Sacramento. Social Media is reporting bodies floating in Natomas near the confluence of the American and Sacramento River. | Airborne news is showing thousands stranded at the Sleep Train Arena. Grid #10S FH 289788 | Water is 3–5 in midtown. Water is 5–6 feet in downtown. Water is estimated to be approaching 10 feet in Natomas. |

| <p>The IMAT Team Reports:</p> <ol style="list-style-type: none"> 1. Rescue helicopters are focusing in hospital evacuations. 2. Kaiser Permanente is overwhelmed and requesting additional people and medical facilities. Grid #10S FH 399738 3. Mass care and medical capabilities are needed at Mather and McClellan. 4. The focus on downtown overnight left Natomas with little attention. | <p>Airborne news shows thousands of pedestrians on freeway and roadway overpasses.</p> | <p>Rescue helicopter crews report seeing thousands on roofs and at windows in Natomas.</p> <p>The number of people seen on roofs and at windows downtown at homes, hotels, hospitals, apartments, etc., is countless.</p> |
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Table 20. 1:20–1:30 Hour (27 Hours) Situational Inputs: Turn 9

| | | |
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| <p>Defense Coordinating Element Reports:</p> <ol style="list-style-type: none"> 1. One National Guard Transportation Company has reached Elk Grove and is ferrying stranded motorists to Monterey Trail High School, 8661 Power Inn Road, Elk Grove, CA 95624, Grid #10S FH 398569 2. One National Guard Transportation Company is ferrying stranded motorists off of Highway 80 to U.C. Davis Aggie Stadium. Grid #10S FH 079663 | <p>IMAT Reports:</p> <ol style="list-style-type: none"> 1. California is asking for every generator available 2. California requests DMORT teams. 3. California requests food and water deliveries. It is 24 hours since many stranded have had food or water. | <p>IMAT Reports:</p> <ol style="list-style-type: none"> 1. Fatalities²⁰—confirmed, potential for hundreds. 2. Injuries—thousands, Kaiser Permanente has triage under makeshift shelters since it is the only major hospital fully functional. Grid #10S FH 376592 3. Airborne Rescues—24 at Mather; 16 at McClellan. 4. Water Rescues—75. 5. Power, water and wastewater are down in Natomas, downtown, and midtown. 200,000 without power. 6. Potential for 150,000 to be displaced. |
| <p>The State of California requests 1.4 million MREs; 2 per person for 100,000 people, for 7 days.</p> | <p>The State of California requests 2.1 million liters of water; 3 liters per person for 100,000 people for 7 days.</p> | <p>The American Red Cross requests shelter support for 300 at Monterey Trail High School, 8661 Power Inn Road, Elk Grove, CA 95624, Grid #10S FH 295713</p> |
| <p>The State of California Requests augmentation at the State EOC due to low staffing levels.</p> | <p>The State of California Requests augmentation at the Sacramento County EOC due to low staffing levels.</p> | <p>The American Red Cross requests shelter support for 300 at Monterey Trail High School, 8661 Power Inn Road, Elk Grove, CA 95624, Grid #10S FH 295713</p> |
| <p>The American Red Cross requests shelter support for 5,000 at McClellan Air Park. Grid #10S FH 404808.</p> | <p>The American Red Cross requests shelter support for 5,000 at the Sacramento VA Hospital, Mather Field. Grid #10S FH 484708</p> | <p>The American Red Cross requests transportation for its cache in Reno due to gridlocked highways.</p> |
| <p>The American Red Cross requests shelter support for 3,000 at the Yolo County Fairgrounds, 250 Gum Avenue, Woodland, CA 95776. Grid #10S FH 078805</p> | <p>The American Red Cross reports it is overwhelmed at all of its shelters and needs assistance.</p> | <p>Airborne search and rescue operations are halted after a mid-air collision between two aircraft.</p> |

Table 21. 1:30–1:40 Hour (30 Hours) Situational Inputs: Turn 10

| Airborne News shows people in boats moving through Natomas rescuing stranded people. | FEMA Headquarters Called asking for the Region IX evacuation Plan at the next update. | The rain has stopped and ceilings are higher. The river has crested, but floodwaters remain up to 10 ft. in Natomas, 6 ft. downtown, and 3 ft. in midtown. |
|---|--|---|
| Sutter Medical Foundation reports 27 fatalities due to power loss and requests more assistance evacuating. | Sutter Memorial Hospital reports 13 fatalities due to power loss and requests more assistance evacuating. | Mercy General Hospital reports 124 fatalities and requests more assistance evacuating. Grid #10S FH348703 |
| Shriners Hospital for Children has lost generator power and requests evacuation assistance. 2425 Stockton Blvd Sacramento, CA 95817 Grid #10S FH 347683 | U.C. Davis Medical Center has lost power and requests evacuation assistance. 2315 Stockton Blvd Sacramento, CA 95817 Grid #10S FH 345685 | Airborne News reports seeing more than 300 bodies in the water American River in Natomas. |
| The Governor flew in a helicopter assessment: Hundreds of homes in Natomas have people on rooftops. | Airborne search and rescue operations have resumed after the helicopter collision. | There are civil disturbance breaking out on the elevated portions of the interstate I-305/I-5 interchange. Grid #10S FH 298699 |
| The Governor flew in a helicopter assessment: Thousands of people are on upper levels of buildings in downtown and midtown. | The Governor flew in a helicopter assessment: Thousands of hotels guests are stranded. | The Governor flew in a helicopter assessment: Every hospital has people stranded. Volunteers in large trucks are spontaneously showing up at hospitals to help evacuate. |

Table 22. 1:40–1:50 Hour (33 Hours) Situational Inputs: Turn 11

| <p>The Governor flew in a helicopter assessment:</p> <p>Every raised highway overpass has people gathered.</p> | <p>FEMA Headquarters has called requesting the Region IX fuel distribution plan at the next update.</p> | <p>CNN's Anderson Cooper is reporting from Sleep Train Arena wondering where FEMA is. An estimated 20,000 people are congregated there. Grid #10S FH 289788</p> |
|---|--|---|
| <p>Social Media is reporting hundreds of people stranded at seven hotels at the intersection of I-5 and Richards Boulevard. Grid #10S FH 302731</p> | <p>The Governor requested the activation of active duty military troops to assist with evacuations.</p> | <p>Ten guests have been rescued from the Delta King, but report 20–30 were trapped when it sank at the Tower bridge. Grid #10S FH 300713</p> |
| <p>FEMA Headquarters has called requesting the Region IX Mass Care and Shelter plan at the next update.</p> | <p>One more Army National Guard company has reached Elk Grove on Highway-99 and still rescuing stranded motorists.</p> | <p>One Army National Guard company reached I-5 at Elk Grove Blvd. They report the causeway at Morrison Creek is washed out. Motorists are stranded on the other side. Grid #10S FH 318557</p> |
| <p>One more Army National Guard company has reached I-80 just East of Davis and is rescuing stranded motorists. Grid #10S FH 180690</p> | <p>One Army National Guard company reached I-5 East of Woodland. They report the approach to the causeway over the Sacramento River is washed out. Grid #10S FH 193815</p> | <p>The FEMA Administrator wants to know what the Region IX food and water distribution plan is for the stranded survivors.</p> |
| <p>A spontaneous gathering point has emerged at Howe Community Park. 2201 Cottage Way, Sacramento, CA 95825, Grid #10S FH 380740</p> | <p>A convoy of Red Cross cache has reached McClellan Field (Grid #10S FH 404808). Shelter support and cooking for 20,000 people per day.</p> | <p>A convoy of Red Cross cache has reached U.C. Davis. Shelter support and cooking for 5,000 people per day. Grid #10S FH 079663</p> |

Table 23. 1:50–2:00 Hour (36 Hours) Situational Inputs: Turn 12

| FEMA Headquarters has established and Incident Support Base at Travis AFB and has delivered 100,000 MREs. | FEMA Headquarters has 1 million liters of water departing Reno and wants Region IX to decide where to deliver it. | HHS has established a medical center at Kaiser Permanente. Grid #10S FH 376592 |
|---|--|---|
| HHS has established a medical center at the Sacramento VA Medical Center, 10535 Hospital Way Mather, CA 95655 Grid #10S FH 484707 | HHS requests support to establish a mobile hospital at the VA Northern California Health Care System: McClellan Outpatient Clinic 5342 Dudley Blvd McClellan Park, CA 95652. Grid #10S FH 404808 | ESF #1 reports Sacramento International is still flooded. |
| ESF #1 reports rail service is operational Roseville and East. | ESF #1 reports rail service is available Stockton and South | ESF #1 reports rail service is available Davis and West. |
| ESF #1 reports rail service is available Woodland and North. | ESF #1 reports Stockton Airport is operational. | Night is slowing search and rescue operations. |
| FEMA Headquarters wants to know how much food and water have been delivered to the Sleep Train Arena. Grid #10S FH 289788 | FEMA Headquarters wants to know how many blankets and cots have been delivered to Sleep Train Arena. Grid #10S FH 289788 | FEMA Headquarters wants to know how many DMAT teams have deployed to the VA Hospital at Mather Field. |

Table 24. 2:00–2:10 Hour (39 Hours) Situational Inputs: Turn 13

| FEMA Headquarters DMAT Teams have deployed to Kaiser Permanente Grid #10S FH 376592 | FEMA Headquarters DMAT Teams have deployed to the Mather VA Medical Center Grid #10S FH 484707 | Airborne news media is showing people at Raley Field fighting over supplies that are arriving. |
|--|---|---|
| Airborne news media is showing people at Sleep Train Arena fighting over supplies that are arriving. | FEMA Headquarters has 500,000 liters of water departing Reno on I-80 and wants Region IX to decide where to deliver it. | FEMA Headquarters has 500,000 liters of water departing Reno on Highway 50 and wants Region IX to decide where to deliver it. |
| FEMA Headquarters wants to know how many DMAT teams have deployed to U.C. Davis Medical Center. Grid #10S FH 345685 | ESF # 2 requests 1,000 gallons of diesel fuel for 20 cell towers. Deliver to Mather or McClellan. | The U.S. Army Corps of Engineers requests heavy lift helicopter support to assist with levee repair. |
| ESF #6 requests infant and toddler kits for 20,000; 5,000 each at Mather (Grid #10S FH 376592), McClellan, (Grid #10S FH 404808), U.C. Davis and Monterey Trail High School, Elk Grove (Grid #10S FH 2398569). | ESF #6 request Commonly Used Shelter Items (CUSI) for 100,000. Deliver to Mather (Grid #10S FH 484707) or McClellan. (Grid #10S FH 404808). | ESF #8 requests activation of the National Disaster Medical System. |
| ESF #12 reports power will remain down in Sacramento until the water recedes and uncovers transformers. | The U.S. Army Corps of Engineers requests three, 54-Packs of generators to support flood control operations. | ESF-15 requests a summary of commodities that have been delivered so far. |

Table 25. 2:10–2:20 Hour (42 Hours) Situational Inputs: Turn 14

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| <p>The State of California estimates 300,000 people are now without power and water.</p> | <p>California OES reports 10, Type III PODs open and estimates it needs 25 Type I PODs. California OES requests 15 Type I POD teams for new PODs.</p> <ul style="list-style-type: none"> • McClellan-Type III, Grid #10S FH 402812 • Mather-Type III, Grid #10S FH 479705 • Wal-Mart at Elk Grove Blvd. and 99-Type III, Grid #10S FH 404528 • Denio’s Swap Meet-Type III, Grid #10S FH 473896 • Rosemont High School-Type III, Grid #10S FH 445675 • West Side Park, Rio Linda-Type III, Grid #10S FH 33833 • El Camino Fundamental high School-Type III, Grid #10S FH 424747 • Aggie Stadium, U.C. Davis-Type III, Grid #10S FH 078661 • Rancho Cordova City Hall; 2729 Prospect Park Dr.-Type III, Grid #10S FH 494727 • Arden Fair Mall, Type III, Grid #10S FH 369738 | <p>Sacramento County estimates the following needing assistance:</p> <ul style="list-style-type: none"> • Sleep Train Arena (Grid #10S FH 289788)-20K • Raley Field (Grid #10S FH 295713)—10K • McClellan (Grid #10S FH 404808)—10K • Mather (Grid #10S FH 479705)—10K • Arden Fair Mall (Grid #10S FH 369738) - 50K • Monterey Trail High School (Grid #10S FH 295713)—5K • Downtown hotels — 20K • Motels at Richards Blvd. (Grid #10S FH 302731)—2K |
| <p>Nightfall has slowed airborne rescues to approximately 2 per hour at McClellan and Mather Field.</p> | <p>FEMA headquarters requests the Region IX evacuation plan.</p> | <p>Media is reporting exhausted, dehydrated, masses walking east away from the flood zone.</p> |
| <p>Rescuers have recovered 600 bodies.</p> | <p>Social media is viral with stories of people stranded</p> | <p>The President wants to know what is being done about the</p> |

| <ul style="list-style-type: none"> • 300 are at Sleep Train Arena (Grid #10S FH 289788) • 200 are at McClellan (Grid #10S FH 404808) • 50 are at Mather (Grid #10S FH 479705) Field • 50 are at Raley Field (Grid #10S FH 295713) | <p>downtown without power and water for a day and a half.</p> | <p>evacuating hospitals.</p> |
|---|--|--|
| <p>Levee Repair efforts have ceased for the night.</p> | <p>The State of California reports the National Guard Units have cleared stranded cars on I-5 south of Sacramento, 99 south of Sacramento, 80 west of Sacramento to the Yolo bypass, and I-5 north of Sacramento to the Sacramento river bridge (Grid # 10S FH 193814). They will move into the city in the morning.</p> | <p>California Highway Patrol is reporting gridlock on I-80 East and Highway 50 East leaving Sacramento. Stalled cars, presumably out of gas have shut down the highways.</p> |

Table 26. 2:20–2:30 Hour (45 Hours) Situational Inputs: Turn 15

| California Highway Patrol reports bumper-to-bumper traffic on I-80 and Highway-50 westbound all the way to Reno and Carson City. | FEMA Headquarters wants to know Region IX’s plan to deal with the backlog of commodities at Travis AFB. | FEMA Headquarters set up an ISB at Navy Fallon. |
|--|---|---|
| ESF #08 is requesting support to transport 10 Federal Medical Stations to treat up to 2,500 survivors. | ESF #08 is requesting 4 Federal Medical Stations at Mather Field for UC Davis Medical Center (600 patients), (UC Davis Children’s Hospital (300 patients), and Shriner’s Hospital (100 patients). | ESF #08 is requesting 4 Federal Medical Stations at McClellan Air Park (Grid #10S FH 404808) for evacuees from Sutter Memorial Hospital (350 patients) Sutter General Hospital (300 patients), and Mercy General Hospital (350 patients). |
| ESF #08 is requesting 2 Federal Medical Stations near Kaiser Permanente (Grid #10S FH 376592) for Sutter Center for Psychiatry (75 patients), Sacramento Mental Health Treatment Center (50 patients), Crestwood Psychiatric Health Facility (25 patients), Sierra Vista Hospital (100 patients), and Heritage Oaks Hospital (125 patients). | The FEMA Administrator wants to know the RRCC plan to evacuate more than 2,000 patients. | The Army National Guard has two transportation companies each at McClellan (Grid #10S FH 404808) and Mather (Grid #10S FH 479705) Field for ground transportation. |
| The McClellan State staging area is reporting only 3 trucks per hour due to traffic on Interstate 80. | The Mather state staging area is reporting only 1 truck per hour due to traffic on Highway 50. | McClellan can handle unloading/loading 1 C-17, 3 C-130s, or 4 heavy helicopters per hour. |
| Mather can handle unloading/loading 1 C-17, 3 C-130s, or 4 heavy helicopters per hour. | The rain has stopped and the sky is clearing. | The river is receding, but the levee breaches remain. |

Table 27. 2:30–2:40 Hour (48 Hours) Situational Inputs: Turn 16

| <p>Sacramento County Estimates the following needing assistance:</p> <ul style="list-style-type: none"> • Sleep Train Arena (Grid #10S FH 289788)-20K • Raley Field (Grid #10S FH 295713)—10K • McClellan (Grid #10S FH 404808)—50K • Mather (Grid #10S FH 479705)—30K • Arden Fair Mall (Grid #10S FH 369738)—50K • Monterey Trail High School (Grid #10S FH 295713)—5K • Downtown hotels—40K • Motels at Richards Blvd. (Grid #10S FH 302731)—2K • I-5 - I-80 interchange—5K | <p>Gas stations throughout the Sacramento Metropolitan Area are out of fuel.</p> | <p>All residents in the flooded areas are still without power.</p> |
|---|---|--|
| <p>Flood levels are approximately 1 ft. in downtown and midtown.</p> | <p>Sacramento County reports 50 of 105 flood control pumps on backup generator. They request a “54-pack” of generators for the remaining 40 pumps without generators.</p> | <p>All hotels in the flood zone are out of food and water. Wastewater backup is causing unimaginable conditions. Thousands of local residents converged on the hotels to get to higher ground.</p> |
| <p>There is a civil disturbance at Arden Fair Mall (Grid #10S FH 369738) as survivors are looting stores. National guard troops are responding instead of search and rescue.</p> | <p>Looting is occurring throughout downtown and midtown flooded areas. The governor is moving more national guard troops into the area.</p> | <p>Anderson Cooper is on the I-80 / I-5 overpass wondering where the federal government is.</p> |
| <p>The Red Cross and other volunteer organizations are</p> | <p>The Red Cross and other volunteer organizations are</p> | <p>The Red Cross and other volunteer organizations are</p> |

| requesting a base camp for 1,000 shelter workers at McClellan. Grid #10S FH 404808 | requesting a base camp for 1,000 shelter workers at Mather. Grid #10S FH 479705 | requesting assistance reaching the Sleep Train Arena. Grid #10S FH 289788 |
|--|---|--|
| The Red Cross and other volunteer organizations are requesting assistance reaching Raley Field. Grid #10S FH 295713 | The Red Cross and other volunteer organizations are requesting assistance reaching Downtown Hotels. | The Red Cross and other volunteer organizations are requesting assistance reaching Arden Fair Mall. Grid #10S FH 369738 |

Table 28. 2:40–2:50 Hour (51 Hours) Situational Inputs: Turn 17

| The Red Cross and other volunteer organizations are requesting a base camp for 300 shelter workers at U.C. Davis | The Red Cross and other volunteer organizations are requesting a base camp for 500 in Elk Grove. | Citizens continue to walk out of downtown and midtown to the east by the thousands as floodwater recedes. |
|---|---|--|
| Electricity has been restored to midtown areas as floodwaters have receded. 30% of the city is without power (260,000). | <p>California OES requests the status of the request for an additional 15 Type I POD teams. Current status of PODs is:</p> <ul style="list-style-type: none"> • McClellan-Type II, Grid #10S FH 402812 • Mather-Type II, Grid #10S FH 479705 • Wal-Mart at Elk Grove Blvd. and 99-Type II, Grid #10S FH 404528 • Denio’s Swap Meet-Type III, Grid #10S FH 473896 • Rosemont High School-Type III, Grid #10S FH 445675 • West Side Park, Rio Linda-Type III, Grid #10S FH 33833 • El Camino Fundamental high School-Type III, Grid #10S FH 424747 • Aggie Stadium, U.C. Davis-Type III, Grid #10S FH 078661 • Rancho Cordova City Hall; 2729 Prospect Park Dr.-Type III, Grid #10S FH 494727 • Arden Fair Mall, Type III, Grid | Due to staffing shortages, Points of Distribution are operating at a Type III level, serving 5,000 people per day each (75,000 per day). PODs in Sacramento are running short of supplies. |

| <p>Sacramento County Estimates the following needing assistance:</p> <ul style="list-style-type: none"> • Sleep Train Arena (Grid #10S FH 289788)-30K • Raley Field (Grid #10S FH 295713)—15K • McClellan (Grid #10S FH 404808)— 70K • Mather (Grid #10S FH 479705) - 35K • Arden Fair Mall (Grid #10S FH 369738)— 50K • Monterey Trail High School (Grid #10S FH 295713)— 5K • Downtown hotels— 40K • Motels at Richards Blvd. (Grid #10S FH 302731)—2K • I-5 - I-80 interchange —5K | <p>While most areas are stabilizing with survivors, residents of Natomas continue to make their way to McClellan. Sacramento County expects the final count to be about 100K at McClellan and requests mass care as well as evacuation.</p> | <p>The Federal Coordinating Officer requests a 2,000-person joint field office at Mather Field.</p> |
|--|---|---|
| <p>Caltrans reports that I-5 south of Sacramento at Morrison Creek is still washed out. Grid # 10S FH 318557</p> | <p>Caltrans reports that I-5 north of Sacramento on the east side of the Sacramento River is still washed out. Grid # 10 S FH 193813</p> | <p>Caltrans Reports that I-80 west of Sacramento at the Yolo Bypass is still washed out. Grid # 10S FH 193814</p> |
| <p>Caltrans reports that Highway 99 north of Sacramento to Yuba City is still washed out.</p> | <p>Caltrans reports that Highway 99 between Elk Grove and Sacramento is passable, but open only to responders.</p> | <p>ESF #8 requests DMORT teams for 750 bodies.</p> <ul style="list-style-type: none"> ● 350 are at Sleep Train Arena. Grid #10S FH 289788 ● 250 are at McClellan Grid #10S FH 404808 ● 75 are at Mather Field. Grid #10S FH 479705 ● 75 are at Raley Field. Grid #10S FH 295713 |

Table 29. 2:50–3:00 Hour (54 Hours) Situational Inputs: Turn 18

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| <p>Airborne search and rescue operations continue to save approximately 30 people per hour from Natomas rooftops.</p> | <p>Airborne search and rescue are slowing operations in downtown and midtown since most survivors are walking in the receding water.</p> | <p>Many cars that ran out of gas are stalled on I-80 and Highway 50 east of Sacramento. The State of California has asked Nevada for assistance in removing the vehicles from the roads.</p> |
| <p>Sacramento County requests the status of Federal Medical Stations.</p> | <p>Volunteer organizations want to know the base camp plan for the shelter volunteers.</p> | <p>Cell towers are coming up in midtown as the water recedes.</p> |
| <p>Sacramento County Reports that 10 PODs are operating at a Type II capacity. It needs support to operate at a Type I level.</p> <ul style="list-style-type: none"> • McClellan-Type II, Grid #10S FH 402812 • Mather-Type II, Grid #10S FH 479705 • Wal-Mart at Elk Grove Blvd. and 99-Type II, Grid #10S FH 404528 • Denio’s Swap Meet-Type II, Grid #10S FH 473896 • Rosemont High School-Type II, Grid #10S FH 445675 • West Side Park, Rio Linda-Type II, Grid #10S FH 33833 • El Camino Fundamental high School-Type II, Grid #10S FH 424747 • Aggie Stadium, U.C. Davis-Type II, Grid #10S FH 078661 • Rancho Cordova City Hall; 2729 Prospect | <p>Sacramento County requests FEMA’s plan to help it get to 25 Type I PODs. There are 10, Type II Pods open.</p> <ul style="list-style-type: none"> • McClellan-Type II, Grid #10S FH 402812 • Mather-Type II, Grid #10S FH 479705 • Wal-Mart at Elk Grove Blvd. and 99-Type II, Grid #10S FH 404528 • Denio’s Swap Meet-Type II, Grid #10S FH 473896 • Rosemont High School-Type II, Grid #10S FH 445675 • West Side Park, Rio Linda-Type II, Grid #10S FH 33833 • El Camino Fundamental high School-Type II, Grid #10S FH 424747 • Aggie Stadium, U.C. Davis-Type II, Grid #10S FH 078661 • Rancho Cordova City Hall; 2729 Prospect Park Dr.-Type II, Grid | <p>Sacramento County reports the number of displaced people has stabilized, but they need assistance with mass care and evacuation. The county estimates of the following needing assistance:</p> <ul style="list-style-type: none"> ● Sleep Train Arena (Grid #10S FH 289788)-30K ● Raley Field (Grid #10S FH 295713)—15K ● McClellan (Grid #10S FH 404808)—70K ● Mather (Grid #10S FH 479705)—35K ● Arden Fair Mall (Grid #10S FH 369738)—50K ● Monterey Trail High School (Grid #10S FH 295713)—5K ● Downtown hotels - 40K ● Motels at Richards Blvd. (Grid #10S FH 302731)—2K ● I-5–I-80 interchange—5K |

| <p>Park Dr.-Type II, Grid #10S FH 494727</p> <ul style="list-style-type: none"> Arden Fair Mall, Type II, Grid #10S FH 369738 | <p>#10S FH 494727</p> <ul style="list-style-type: none"> Arden Fair Mall, Type II, Grid #10S FH 369738 | |
|--|---|---|
| <p>ESF #08 is requesting the status of 4 Federal Medical Stations at Mather Field for UC Davis Medical Center (600 patients), (UC Davis Children’s Hospital (300 patients), and Shriner’s Hospital (100 patients).</p> | <p>ESF #08 is reporting that hospitals are losing patients due to lack of facilities. Fatalities the past 48 hours: UC Davis Medical Center (25), (UC Davis Children’s Hospital (15), and Shriner’s Hospital (10 patients).</p> | <p>The FEMA Administrator wants to know the fatality management plan.</p> |
| <p>The FEMA Administrator wants to know the plan for federal medical stations.</p> | <p>Caltrans and the California Highway Patrol have cleared one lane each direction on I-80 and Highway 50 for responders. 20 trucks per hour worth of commodities are reaching Sacramento.</p> | <p>Staging areas at McClellan and Mather are each reporting 5 trucks per hour are reaching each of their locations.</p> |

Table 30. 3:00–3:10 Hour (57 Hours) Situational Inputs: Turn 19

| ESF #1 reports Stockton Metropolitan Airport can handle unloading/loading 2 C-17, 6 C-130s, or 8 heavy helicopters per hour. | McClellan can now handle unloading/loading 2 C-17, 6 C-130s, or 8 heavy helicopters per hour. | Mather can now handle unloading/loading 2 C-17, 6 C-130s, or 8 heavy helicopters per hour. |
|---|---|---|
| Airborne search and rescue operations are transporting 20 people per hour from the hotels at Richards Blvd (Grid #10S FH 302731) to Mather (Grid #10S FH 479705) and McClellan. | Social media reports that the conditions for approximately 40K in downtown hotels are continuing to deteriorate with no power, water, or wastewater. | Airborne news is showing thousands of looters at the Sacramento Downtown Plaza. Grid #10S FH 311712 |
| The FDA is requesting assistance reaching the Sacramento Zoo. Grid # 10S FH 303667 | USDA reports 1,000 head of cattle at Pitto Brothers Cattle have died and need clearing. 6235 Liberty Island Rd Dixon, CA 95620. Grid #10S FH 120460 | USDA reports 500 head of cattle at Ryer Island Ranch have died and need clearing. Ryer Island Ranch 4868 CA-84 Walnut Grove, CA 95690 Grid #10S FH 190387 |
| The State of California requests augmentation of 200 people. Emergency managers are exhausted, | Caltrans and the California Highway Patrol report Highway 99 between Sacramento and Elk Grove still has standing water, but responders are moving in bumper-to- bumper traffic. | An unknown number of people stranded on light rail at the beginning of the flood are still stranded in the cars downtown. |
| Media is reporting 50 fatalities and 300 seniors stranded at Eskaton Natomas Manor without power, water, or wastewater. 2400 Northview Dr. Sacramento, CA 95833. Grid # 10S FH 325746 | Media is reporting 10 fatalities and 200 seniors stranded at Park Place Senior Community without power, water, or wastewater. 1230 N St Sacramento. Grid # 10S FH 313707 | Media is reporting 20 fatalities and 300 stranded at Chateau at Capitol Avenue without power, water, or wastewater. 2701 Capitol Ave Sacramento, CA 95816. Grid # 10S FH 331702 |

Table 31. 3:10–3:20 Hour (60 Hours) Situational Inputs: Turn 20

| <p>Media is reporting 10 fatalities and 200 seniors stranded at Pioneer House. 415 P St Sacramento, CA 95814 Grid # 10S FH 304708</p> | <p>ESF #8 requests teams to check on an estimated 3,000 seniors who depend on at-home care who need medical personnel to check on them or to be evacuated.</p> | <p>The FEMA Administrator wants to know the RRCC plan to deal with media reports of up to 4,000 seniors needing evacuation from homes.</p> |
|---|---|--|
| <p>Sacramento County reports the number of displaced people has stabilized, but they need assistance with mass care and evacuation. Estimates the following needing assistance:</p> <ul style="list-style-type: none"> ● Sleep Train Arena (Grid #10S FH 289788)-30K ● Raley Field (Grid #10S FH 295713)—15K ● McClellan (Grid #10S FH 404808)—70K ● Mather (Grid #10S FH 479705) - 35K ● Arden Fair Mall (Grid #10S FH 369738)—50K ● Monterey Trail High School (Grid #10S FH 295713)—5K ● Downtown hotels - 40K ● Motels at Richards Blvd. (Grid #10S FH 302731)—2K | <p>Sacramento County requests FEMA’s plan to help it get to 25 Type I PODs. There are 10, Type II Pods open.</p> <ul style="list-style-type: none"> ● McClellan-Type II, Grid #10S FH 402812 ● Mather-Type II, Grid #10S FH 479705 ● Wal-Mart at Elk Grove Blvd. and 99-Type II, Grid #10S FH 404528 ● Denio’s Swap Meet-Type II, Grid #10S FH 473896 ● Rosemont High School-Type II, Grid #10S FH 445675 ● West Side Park, Rio Linda-Type II, Grid #10S FH 33833 ● El Camino Fundamental high School-Type II, Grid #10S FH 424747 ● Aggie Stadium, U.C. Davis-Type II, Grid #10S FH 078661 | <p>Sacramento County requests assistance setting up 15 more PODs to have 25 total.</p> |

| <ul style="list-style-type: none"> ● I-5 - I-80 interchange - 5K | <ul style="list-style-type: none"> • Rancho Cordova City Hall; 2729 Prospect Park Dr.-Type II, Grid #10S FH 494727 • Arden Fair Mall, Type II, Grid #10S FH 369738 | |
|---|--|--|
| Media reports mass deaths at the Sacramento Zoo. Disease is a major concern. Grid # 10S FH 303667 | California OES is requesting the status of a base camp for 1,000 shelter workers at McClellan. Grid #10S FH 404808 | California OES is requesting the status of a base camp to shelter 1,000 workers at Mather. Grid #10S FH 479705 |
| The FEMA Administrator is requesting an update on the evacuation plan | California OES is the status of a base camp for 300 shelter workers at U.C. Davis | California OES is the status of a base camp for 500 in Elk Grove. |
| ESF #08 is requesting the status of 4 Federal Medical Stations at Mather Field for UC Davis Medical Center (600 patients), (UC Davis Children's Hospital (300 patients), and Shriner's Hospital (100 patients). | ESF #08 is requesting the status of evacuation sand/ or power and water restoration at : UC Davis Medical Center (30 fatalities), (UC Davis Children's Hospital (20 fatalities), and Shriner's Hospital (20 fatalities). | The governor requests a helicopter assessment fight with the Federal Coordinating Officer. |

Table 32. 3:20–3:30 Hour (63 Hours) Situational Inputs: Turn 21

| <p>California OES reports five Type I PODs open and requests full resupply (100K People). Cal OES estimates it needs PODs for 250K total.</p> <ul style="list-style-type: none"> • McClellan-Type I, Grid #10S FH 402812 • Mather-Type II, Grid #10S FH 479705 • Wal-Mart at Elk Grove Blvd. and 99-Type I, Grid #10S FH 404528 • Denio’s Swap Meet-Type I, Grid #10S FH 473896 • Rosemont High School-Type I, Grid #10S FH 445675 | <p>California OES reports five Type II PODs open and requests full resupply (50K people). Cal OES estimates it needs PODs for 250K total.</p> <ul style="list-style-type: none"> • West Side Park, Rio Linda-Type II, Grid #10S FH 33833 • El Camino Fundamental high School-Type II, Grid #10S FH 424747 • Aggie Stadium, U.C. Davis-Type II, Grid #10S FH 078661 • Rancho Cordova City Hall; 2729 Prospect Park Dr.-Type II, Grid #10S FH 494727 • Arden Fair Mall, Type II, Grid #10S FH 369738 | <p>California OES requests status of FEMA’s plans for 15 additional PODs.</p> |
|---|--|--|
| <p>Caltrans and California Highway Patrol report I-5 south at Morrison Creek is open at reduced rate of only 60 heavy vehicles per hour. Grid # 10S FH 318557</p> | <p>The FEMA Administrator requests an update on mass care and sheltering numbers from the previous report of:</p> <ul style="list-style-type: none"> ● Sleep Train Arena (Grid #10S FH 289788)—30K ● Raley Field (Grid #10S FH 295713)—15K ● McClellan (Grid #10S FH 404808)—70K ● Mather (Grid #10S FH 479705)—35K ● Arden Fair Mall (Grid #10S FH 369738)—50K ● Monterey Trail High School (Grid #10S FH 295713)—5K ● Downtown hotels—40K ● Motels at Richards Blvd. (Grid #10S FH 302731)—2K ● I-5-I-80 interchange—5K | <p>Caltrans and California Highway Patrol report I-80 east south at the Yolo Bypass is open at reduced rate of only 60 heavy vehicles per hour. Grid # 10S FH 193814</p> |

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| <p>Caltrans and California Highway Patrol report I-5 north, east of Woodland at the Sacramento River is open at reduced rate of only 60 heavy vehicles per hour. Grid # 10 S FH 193813</p> | <p>ESF-12 reports that power is returning to some parts of midtown, but downtown Sacramento, West Sacramento, and Natomas are without power (117K).</p> | <p>California OES reports sanitary conditions are deplorable and requests portable toilets for displaced people at:</p> <ul style="list-style-type: none"> ● Sleep Train Arena (Grid #10S FH 289788)-30K ● Raley Field (Grid #10S FH 295713)—15K ● McClellan (Grid #10S FH 404808)—70K ● Mather (Grid #10S FH 479705)—35K ● Arden Fair Mall (Grid #10S FH 369738)—50K ● Monterey Trail High School (Grid #10S FH 295713)—5K ● Downtown hotels—40K ● Motels at Richards Blvd. (Grid #10S FH 302731)—2K ● I-5 -I-80 interchange—5K |
| <p>ESF #08 is requesting the status of 4 Federal Medical Stations at Mather Field for UC Davis Medical Center (600 patients), (UC Davis Children’s Hospital (300 patients), and Shriner’s Hospital (100 patients).</p> | <p>ESF #08 is requesting the status of evacuation sand/or power and water restoration at: UC Davis Medical Center (30 fatalities), (UC Davis Children’s Hospital (20 fatalities), and Shriner’s Hospital (20 fatalities).</p> | <p>The Governor completed his airborne assessment and wants maximum evacuation effort at Sleep Train Arena (Grid #10S FH 289788) (30K), Downtown Hotels (40K), and Field (15K). Grid #10S FH 295713</p> |
| <p>California OES Reports the national guard reached Sleep Train Arena (Grid #10S FH 289788) and is evacuating people to McClellan at a rate of 160 per hour.</p> | <p>California OES Reports the national guard finally reached Downtown Hotels and is evacuating people to Mather at a rate of 160 per hour.</p> | <p>California OES Reports the national guard finally reached the I-80/I-5 interchange and is evacuating people to Mather at a rate of 80 per hour.</p> |

Table 33. 3:30–3:40 (66 Hours) Situational Inputs: Turn 22

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| <p>Water in midtown has receded to 3–6 inches. Streets are jammed as they self-evacuate to the California State Fair Grounds.</p> | <p>California OES requests a Type I POD at the California State Fairgrounds.</p> | <p>ESF #6 reports a spontaneous shelter has sprung up at the California State Fairgrounds. An estimated 10,000 people have collected and need mass care or evacuation.</p> |
| <p>Caltrans and California Highway Patrol report I-5 north, east of Woodland at the Sacramento River is open at reduced rate of only 120 heavy vehicles per hour. Grid # 10S FH 193813</p> | <p>Caltrans and California Highway Patrol report I-80 east at the Yolo Bypass is open at reduced rate of only 120 heavy vehicles per hour. Grid # 10S FH 193814</p> | <p>Caltrans and California Highway Patrol report I-5 north at Morrison Creek is open at reduced rate of only 120 heavy vehicles per hour. Grid #10S FH 318557</p> |
| <p>ESF-12 reports power will remain out for an estimated 260K for 3–6 months due to flooded substations.</p> | <p>Sacramento, Yolo, and Sutter counties have boil water alerts (859K people). California OES requests water delivery from FEMA.</p> | <p>Wastewater service is still out for Sacramento and Elk Grove due to flooding at the treatment plant.</p> |
| <p>ESF #08 is requesting the status of 4 Federal Medical Stations at Mather Field for UC Davis Medical Center (600 patients), (UC Davis Children’s Hospital (300 patients), and Shriner’s Hospital (100 patients).</p> | <p>California OES reports five Type I PODs open at the locations below and requests full resupply (100K People). Cal OES estimates it needs PODs for 250K total.</p> <ul style="list-style-type: none"> • McClellan-Type I Grid #10S FH 402812 • Mather-Type I - Grid #10S FH 479705 • Wal-Mart at Elk Grove Blvd. and 99-Type I, Grid #10S FH 404528 • Denio’s Swap Meet-Type I, Grid #10S FH 473896 • Rosemont High School-Type I, Grid #10S FH 445675 | <p>California OES reports five Type I PODS open at the locations below and requests full resupply (100K people). Cal OES estimates it needs PODs for 250K total.</p> <ul style="list-style-type: none"> • West Side Park, Rio Linda-Type I, Grid #10S FH 33833 • El Camino Fundamental high School-Type I, Grid #10S FH 424747 • Aggie Stadium, U.C. Davis-Type I, Grid #10S FH 078661 • Rancho Cordova City Hall; 2729 Prospect Park Dr.-Type I, Grid #10S FH 494727 • Arden Fair Mall, Type I, Grid #10S FH 369738 |

| California OES reports ten, Type I PODs (200K) and now estimates it needs 5 more Type II PODs (50K). | ESF #08 estimates the following hospitals will be closed for 30 days for mold remediation: UC Davis Medical Center (600 patients), (UC Davis Children's Hospital (300 patients), and Shriners' Hospital (100 patients). | Airborne media is reporting 2K people at Motels at Richards Blvd. (Grid #10S FH 302731) have not received help. |
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Table 34. 3:40–3:50 Hour (69 Hours) Situational Inputs: Turn 23

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| <p>ESF #10 reports high levels of contamination in floodwater with people reporting severe skin infections. The EPA is warning people not to wade into floodwater.</p> | <p>Caltrans and California Highway Patrol report a backup all the way from Vallejo to I-80 east at the Yolo Bypass. Grid # 10S FH 193814</p> | <p>Caltrans and California Highway Patrol report a backup from Stockton to I-5 north at Morrison Creek. Grid # 10S FH 318557</p> |
| <p>ESF #11, USDA is requesting status on assistance with 1,000 head of cattle dead at Pitto Brothers Cattle have died and need clearing. 6235 Liberty Island Rd Dixon, CA 95620. Grid #10S FH 120460</p> | <p>ESF #11, USDA is requesting status on assistance with 500 head of cattle dead at Ryer Island Ranch have died and need clearing. Ryer Island Ranch 4868 CA-84 Walnut Grove, CA 95690 Grid #10S FH 190387</p> | <p>The Human Society is reporting FEMA has done nothing for the animals in the Sacramento Zoo. Grid # 10S FH 303667</p> |
| <p>Looting is rampant throughout Sacramento due to people going almost 3 days without food and water supply.</p> | <p>Water has receded in downtown Sacramento and is 6 in. - 2 ft. deep.</p> | <p>Water remains 3–5 ft. throughout Natomas</p> |
| <p>ESF #3, U.S. Army Corps of Engineers reports the levee is shored up in downtown Sacramento at the Tower Bridge and requests the status of generator request to operate 105 pumps.</p> | <p>ESF #3, U.S. Army Corps of Engineers reports the levee is shored up in downtown Sacramento and requests the status of generator request to operate 105 pumps.</p> | <p>ESF #3, U.S. Army Corps of Engineers reports the levee is shored up at the American River in the vicinity of Business 80. Grid #10S FH 354728.</p> |
| <p>ESF #3, U.S. Army Corps of Engineers has partially shored up the levee breach in Natomas in the vicinity of San Juan Road. Grid #10S FH 253764.</p> | <p>The Federal Coordinating Official and the IMAT are supporting California OES, but have not taken control.</p> | <p>The FEMA Administrator landed at Travis AFB and wants the RRCC to coordinate a helicopter fly over.</p> |

Table 35. 3:50–4:00 Hour (72 Hours) Situational Inputs: Turn 24

| The FEMA Administrator wants to know the status on stabilizing the event in 72 hours. | The FEMA Administrator wants to know how many people are displaced and in shelters. How many cots and blankets have FEMA delivered. | The FEMA Administrator wants to know how many people FEMA has evacuated. |
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| The FEMA Administrator wants to know how much water FEMA has delivered to Sacramento. | The FEMA Administrator wants to know how many meals FEMA has delivered to Sacramento. | The FEMA Administrator wants to know how many patients are in Federal Medical Stations currently set up in Sacramento and how many DMAT teams are on site. |
| The FEMA Administrator wants to know how many fatalities there are and how many DMORT teams are on site. | The FEMA Administrator wants to know how many generators have been delivered. | The FEMA Administrator wants to know how much ice has been delivered. |
| The Congress wants to know how much money FEMA has spent. | | |

APPENDIX D. PRE-SCRIPTED MISSION ASSIGNMENTS

Table 36 is based on actual pre-scripted mission assignments used by FEMA Region IX in an exercise. While they are educated estimates, except where noted, the numbers are representative values created by the author.

Table 36. Pre-scripted Mission Agreement Cards

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| <p style="text-align: center;">DOD</p> <p>Request NORTHCOM DCO / DCE (including as necessary SEPLO/EPLO) assistance at the Joint Field Office or other location specified by FEMA in the vicinity of Sacramento. \$50,000.</p> | <p style="text-align: center;">ESF-5</p> <p>Provide as a FEMA Incident Support Base (ISB) in support of disaster operations in the vicinity of Sacramento. All local, State, and mutual aid resources have been exhausted; non-DOD 5 national assets are exhausted or do not have the capacity to meet this requirement. \$450,000</p> | <p style="text-align: center;">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing marine transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> |
| <p style="text-align: center;">DOD</p> <p>Request DCO/DCE (including, as necessary SEPLO/EPLO) assistance at the RRCC and/or other location specified by FEMA in support of disaster operations in the vicinity of Sacramento. \$20,000. (Does not count toward the 3 requests per turn)</p> | <p style="text-align: center;">ESF-5</p> <p>Provide a Federal Staging Area (FSA) in support of disaster operations in the vicinity of Sacramento. All local, State, and mutual aid resources have been exhausted, non-DOD 5 national assets are exhausted or do not have the capacity to meet this requirement. \$450,000</p> | <p style="text-align: center;">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing marine transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> |

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| <p style="text-align: center;">DOD</p> <p>Provide ground transportation to move 500,000 lbs. cargo and/or passengers using DOD ground transportation assets in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000—\$1 per lb.</p> | <p style="text-align: center;">ESF-5</p> <p>Provide a Federal Staging Area (FSA) in support of disaster operations in the vicinity of Sacramento. All local, State, and mutual aid resources have been exhausted, non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$450,000</p> | <p style="text-align: center;">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> |
| <p style="text-align: center;">DOD</p> <p>Provide ground transportation to move 500,000 lbs. cargo and/or passengers using DOD ground transportation assets in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000—\$1 per lb.</p> | <p style="text-align: center;">ESF-5</p> <p>Provide a Federal Staging Area (FSA) in support of disaster operations in the vicinity of Sacramento. All local, State, and resources have been exhausted, non-DOD 5 national assets are exhausted or do not have the capacity to meet this requirement. \$450,000</p> | <p style="text-align: center;">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> |
| <p style="text-align: center;">DOD</p> <p>Provide ground transportation to move 500,000 lbs. cargo and/or passengers using DOD ground transportation assets in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000—\$1 per lb.</p> | <p style="text-align: center;">ESF-6</p> <p>Request for transport of 86,100 Red Cross Heater Meals (78 standard pallets)</p> <p>41x48x72 per pallet</p> <p>82 cubic feet 1,115 pounds per pallet</p> <p>Red Cross can deliver to Wright Patterson, OH.</p> | <p style="text-align: center;">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> |

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| <p style="text-align: center;">DOD</p> <p>Provide ground transportation to move 500,000 lbs. cargo and/or passengers using DOD ground transportation assets in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000—\$1 per lb.</p> | <p style="text-align: center;">ESF-6</p> <p>Request for transport of 86,100 Red Cross Heater Meals (78 standard pallets) 41x48x72 per pallet</p> <p>82 cubic feet 1,115 pounds per pallet</p> <p>Red Cross can deliver to Scott AFB, IL.</p> | <p style="text-align: center;">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> |
| <p style="text-align: center;">DOD</p> <p>Provide ground transportation to move 500,000 lbs. cargo and/or passengers using DOD ground transportation assets in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000—\$1 per lb.</p> | <p style="text-align: center;">ESF-6</p> <p>Request for transport of 86,100 Red Cross Heater Meals (78 standard pallets) 41x48x72 per pallet</p> <p>82 cubic feet 1,115 pounds per pallet</p> <p>Red Cross can deliver to Andrews AFB, MD.</p> | <p style="text-align: center;">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide GEOINT support for the FEMA Rapid Needs Assessment (RNA) IMAT Team in support of disaster operations in the vicinity of Sacramento. \$30,000</p> |
| <p style="text-align: center;">DOD</p> <p>Provide heavy lift (25,000 lb. load) rotary wing aircraft (to conduct movement of personnel and supplies in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—50 missions at \$2 per lb.</p> | <p style="text-align: center;">ESF-6</p> <p>Request for transport of 86,100 Red Cross Heater Meals (78 standard pallets) 41x48x72 per pallet</p> <p>82 cubic feet 1,115 pounds per pallet</p> <p>Red Cross can deliver to Joint Base Lewis-McChord, WA.</p> | <p style="text-align: center;">ESF-8</p> <p>HHS will provide NDMS Disaster Medical Assistance Team (DMAT) (250 patients per team for 72 hours) for emergency medical assistance to support disaster operations in the vicinity of Sacramento. \$425,000.</p> |

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| <p style="text-align: center;">DOD</p> <p>Provide medium lift, rotary wing aircraft to conduct search and rescue in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$125,000 for 10 missions.</p> | <p style="text-align: center;">ESF-6</p> <p>Activate Corporation for National and Community Service (CNCS) to the FEMA Region IX Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #6 in support of Pre-Declaration disaster operations in the vicinity of Sacramento. \$10,000</p> <p>(Does not count toward the 3 requests per turn)</p> | <p style="text-align: center;">ESF-8</p> <p>HHS will provide NDMS Disaster Medical Assistance Team (DMAT) (250 patients per team for 72 hours) for emergency medical assistance to support disaster operations in the vicinity of Sacramento. \$425,000.</p> |
| <p style="text-align: center;">DOD</p> <p>Provide medium lift, rotary wing aircraft to conduct search and rescue in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$125,000 for 10 missions.</p> | <p style="text-align: center;">ESF-7</p> <p>Provide for the transport of fuel to distribution points and generators in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$900,000.</p> | <p style="text-align: center;">ESF-8</p> <p>HHS will provide NDMS Disaster Medical Assistance Team (DMAT) (250 patients per team for 72 hours) for emergency medical assistance to support disaster operations in the vicinity of Sacramento. \$425,000.</p> |
| <p style="text-align: center;">DOD</p> <p>Assistance Requested: Provide strategic transportation (130,000 pounds per mission) to move cargo and/or passengers in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—8 missions at \$2 per pound.</p> | <p style="text-align: center;">ESF-7</p> <p>Request 40–1 to GSA to provide contract to move 30 infant-toddler kits from Distribution Centers nationwide to Sacramento. \$100,000.</p> | <p style="text-align: center;">ESF-8</p> <p>HHS will provide NDMS National Veterinary Response Team for emergency medical assistance to support disaster operations in the vicinity of Sacramento. \$250,000</p> |

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| <p style="text-align: center;">DOD</p> <p>Assistance Requested: Provide strategic transportation (130,000 pounds per mission) to move cargo and/or passengers in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—8 missions at \$2 per pound.</p> | <p style="text-align: center;">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and move 120,000 liters of water from Distribution Center Moffett to Sacramento (40,000 people per day) \$150,000.</p> | <p style="text-align: center;">ESF-8</p> <p>Activate the Department for Health and Human Services (HHS) to the FEMA Region IX Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #8 in the vicinity of Sacramento. 75,000. (Does not count toward the 3 requests per turn)</p> |
| <p style="text-align: center;">DOD</p> <p>Assistance requested: Provide medium lift rotary wing aircraft to fly assessment teams in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000 - 50 missions at \$10,000 per mission.</p> | <p style="text-align: center;">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and move 120,000 liters of water from Distribution Center Moffett to Sacramento (40,000 people per day) \$150,000.</p> | <p style="text-align: center;">ESF-8</p> <p>Activate Health and Human Services (HHS) to the FEMA National Response Coordination Center (NRCC) to perform duties of Emergency Support Function (ESF) #8 in the vicinity of Sacramento. \$6,000. (Does not count toward the 3 requests per turn)</p> |
| <p style="text-align: center;">DOD</p> <p>Provide C-130 aircraft (40,000 lb. load) to conduct movement of personnel and supplies in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—31 missions at \$2 per pound of commodities moved.</p> | <p style="text-align: center;">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and move 120,000 liters of water from Distribution Center Moffett to Sacramento (40,000 people per day) \$150,000.</p> | <p style="text-align: center;">ESF-9</p> <p>Activate Urban Search and Rescue to the FEMA Region IX Regional Response Coordination Center (RRCC), IMATs and or IOF to perform duties of Emergency Support Function (ESF) #3, in the vicinity of Sacramento. \$60,000. (Does not count toward the 3 requests per turn)</p> |
| <p style="text-align: center;">DOD</p> <p>Provide C-130 aircraft (40,000 lb. load) to conduct movement of personnel and</p> | <p style="text-align: center;">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and move 120,000 liters of</p> | <p style="text-align: center;">ESF-9</p> <p>Transport one, Type III Urban Search and Rescue team in the vicinity of</p> |

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| <p>supplies in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—31 missions at \$2 per pound of commodities moved.</p> | <p>water from Distribution Center Moffett to Sacramento (40,000 people per day) \$150,000.</p> | <p>Sacramento. \$75,000.</p> |
| <p>DOD Provide C-130 aircraft (40,000 lb. load) to conduct movement of personnel and supplies in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—31 missions at \$2 per pound of commodities moved.</p> | <p>ESF-7 Request 40-1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000.</p> | <p>ESF-9 Transport one, Type III Urban Search and Rescue team in the vicinity of Sacramento. \$75,000.</p> |
| <p>DOD Provide C-130 aircraft (40,000 lb. load) to conduct movement of personnel and supplies in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—31 missions at \$2 per pound of commodities moved.</p> | <p>ESF-7 Request 40-1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000.</p> | <p>ESF-9 Transport one, Type III Urban Search and Rescue team in the vicinity of Sacramento. \$75,000.</p> |

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| <p align="center">DOD</p> <p>Provide C-130 aircraft (40,000 lb. load) to conduct movement of personnel and supplies in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$2,500,000—31 missions at \$2 per pound of commodities moved.</p> | <p align="center">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000.</p> | <p align="center">ESF-9</p> <p>Transport one, Type III Urban Search and Rescue team in the vicinity of Sacramento. \$75,000.</p> |
| <p align="center">ESF-1</p> <p>Activate Department of Transportation (DOT) to the FEMA Region undefined Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #1 in the vicinity of Sacramento. \$10,000. (Does not count toward the 3 requests per turn)</p> | <p align="center">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000.</p> | <p align="center">ESF-9</p> <p>Transport one, Type III Urban Search and Rescue team in the vicinity of Sacramento. \$75,000.</p> |
| <p align="center">ESF-2</p> <p>Activate National Communications System (NCS) to the FEMA Region IX Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #2 in the vicinity of Sacramento. \$40,000. (Does not count toward the 3 requests per turn)</p> | <p align="center">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000.</p> | <p align="center">ESF-9</p> <p>Deploy one, Type III Urban Search and Rescue team in the vicinity of Sacramento for 7 days. \$250,000</p> |
| <p align="center">ESF-3</p> <p>Activate U.S. Army Corps of Engineers (USACE) to the FEMA Region IX Regional Response Coordination Center (RRCC), IMATs and or IOF to perform duties of</p> | <p align="center">ESF-7</p> <p>Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000.</p> | <p align="center">ESF-9</p> <p>Deploy one, Type III Urban Search and Rescue team in the vicinity of Sacramento for 7 days. \$250,000</p> |

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| Emergency Support Function (ESF) #3, in the vicinity of Sacramento. \$60,000 (Does not count toward the 3 requests per turn) | | |
| ESF-3 Provide Emergency Route Clearance in support of disaster operations in the vicinity of Sacramento. All local, State, and non-DOD national assets are exhausted or do not have the capacity to meet this requirement. \$500,000—two crews 24/7 for 7 days. | ESF-7 Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000. | ESF-9 Deploy one, Type III Urban Search and Rescue team in the vicinity of Sacramento for 7 days. \$250,000 |
| ESF-3 Activate and pre-position Type 3 elements associated with the Temporary Emergency Power mission to provide for event specific planning and preparation as directed by FEMA. \$75,000 | ESF-7 Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000. | ESF-9 Deploy one, Type III Urban Search and Rescue team in the vicinity of Sacramento for 7 days. \$250,000 |
| ESF-3 Provide Infrastructure Assessment Planning and Response Team (PRT) assets and support personnel to execute rapid structural assessments of affected infrastructure. \$3,000,000 | ESF-7 Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000. | ESF-9 Deploy one, Type III Urban Search and Rescue team in the vicinity of Sacramento for 7 days. \$250,000 |
| ESF-3 Provide Debris Planning and Response Team (PRT), support personnel and contractor resources to coordinate and execute all necessary actions associated with debris clearance and removal. \$5,000,000 | ESF-7 Request 40–1 to GSA to provide contract to establish and provide 150,000 Liters of water (50,000 people per day) \$200,000. | ESF-10 Activate Environmental Protection Agency (EPA) to the FEMA National Response Coordination Center (NRCC) to perform duties of Emergency Support Function (ESF) #10 in the vicinity of Sacramento. \$6,000 (Does not count toward the 3 requests per turn) |

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| <p align="center">ESF-3</p> <p>Provide Type 3 temporary emergency power generation to the affected area as directed by FEMA. \$3,000,000</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-10</p> <p>Provide technical assistance to State, Tribal, and/or local jurisdictions for the drinking water and wastewater infrastructure/safety mission. \$400,000</p> |
| <p align="center">ESF-3</p> <p>Activate the U.S. Army Corps of Engineers (USACE) to the FEMA Region IX Regional Response Coordination Center (RRCC) IMATs, IOF or JFO to perform duties of Emergency Support Function (ESF) #3 in support of Post-Declaration disaster operations in the vicinity of Sacramento. \$300,000. (Does not count toward the 3 requests per turn)</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-11</p> <p>Activate United States Department of Agriculture (USDA) to the FEMA Region undefined Regional Response Coordination Center (RRCC) to perform the duties of Emergency Support Function (ESF) #11 in support of Pre-Declaration disaster operations in the vicinity of Sacramento. USDA is activated through the Animal Plant and Health Inspection Service (APHIS) Agency. \$10,000. (Does not count toward the 3 requests per turn)</p> |
| <p align="center">ESF-3</p> <p>Acquire, deploy, install, operate, and maintain a "54-Pack" of generators for 7 days. \$2,500,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-11</p> <p>Activate Department of Interior (DOI) to the FEMA Region IX Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #11 in support of Pre-Declaration disaster operations in the vicinity of Sacramento. \$10,000. (Does not count toward the 3 requests per turn)</p> |

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| <p align="center">ESF-3</p> <p>Acquire, deploy, install, operate, and maintain a "54-Pack" of generators for 7 days. \$2,500,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-12</p> <p>Activate Department of Energy (DOE) to the FEMA Region undefined Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #12 in the vicinity of Sacramento. \$40,000. (Does not count toward the 3 requests per turn)</p> |
| <p align="center">ESF-3</p> <p>Acquire, deploy, install, operate, and maintain a "54-Pack" of generators for 7 days. \$2,500,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-12</p> <p>Activate Department of Energy (DOE) to the FEMA National Response Coordination Center (NRCC) to perform duties of Emergency Support Function (ESF) #12 in the vicinity of Sacramento. \$10,000. (Does not count toward the 3 requests per turn)</p> |
| <p align="center">ESF-3</p> <p>Acquire, deploy, install, operate, and maintain a "54-Pack" of generators for 7 days. \$2,500,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-12</p> <p>DOE requires a power systems technical expert forward deployed to Sacramento to support energy assessment and facilitation of energy restoration efforts. \$25,000</p> |
| <p align="center">ESF-4</p> <p>U.S. Forest Service establishes a base camp to support 500 responders for 14 days. \$750,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |

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| <p align="center">ESF-4</p> <p>U.S. Forest Service establishes a base camp to support 500 responders for 14 days. \$750,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$20,000</p> |
| <p align="center">ESF-4</p> <p>U.S. Forest Service establishes a base camp to support 500 responders for 14 days. \$750,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |
| <p align="center">ESF-4</p> <p>U.S. Forest Service establishes a base camp to support 500 responders for 14 days. \$750,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide 100,000 Meals (50,000 people per day) \$500,000.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |

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| <p align="center">ESF-4</p> <p>U.S. Forest Service establishes a base camp to support 500 responders for 14 days. \$750,000.</p> | <p align="center">ESF-7</p> <p>Activate General Services Administration (GSA) to the FEMA Region IX Regional Response Coordination Center (RRCC) to perform duties of Emergency Support Function (ESF) #7 in support of Pre-Declaration disaster operations in the vicinity of Sacramento. \$10,000. (Does not count toward the 3 requests per turn)</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$20,000</p> |
| <p align="center">ESF-4</p> <p>Activate U.S. Forest Service to the FEMA Region IX Regional Response Coordination Center (RRCC), IMATs and or IOF to perform duties of Emergency Support Function (ESF) #3, in the vicinity of Sacramento. \$60,000 (Does not count toward the 3 requests per turn)</p> | <p align="center">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |
| <p align="center">ESF-5</p> <p>Push 10 Infant - toddler kits (serves 1,000 children) from Distribution Center Moffett to Sacramento. \$10,000</p> | <p align="center">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |

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| <p align="center">ESF-5</p> <p>10 each DISC Packs (500 Laptops) \$100,000</p> | <p align="center">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |
| <p align="center">ESF-5</p> <p>Transportation Required - movement of MERS Telecommunication equipment from Bothell, Washington, to Sacramento, CA. \$500,000</p> | <p align="center">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation services. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |
| <p align="center">ESF-5</p> <p>Activate United States Coast Guard (USCG) to provide staff support to FEMA Regional Response Coordination Center, Joint Field Office (JFO), and/or other teams/locations as directed by FEMA in the vicinity of Sacramento. \$10,000</p> <p>(Does not count toward the 3 requests per turn)</p> | <p align="center">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution a. Request 40-1 to GSA to provide contract to establish and provide ongoing ground transportation. 5,000,000 lbs. at \$2,500,000—\$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |

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| <p align="center">ESF-5</p> <p>Provide a Federal Staging Area (FSA) in support of disaster operations in the vicinity of Sacramento. All local, State, and resources have been exhausted, non-DOD 5 national assets are exhausted or do not have the capacity to meet this requirement. \$450,000</p> | <p align="center">ESF-7</p> <p>Transport cargo and equipment as directed by FEMA from Federal Staging Areas to Sacramento Points of Distribution as directed by FEMA. Request 40-1 to GSA to provide contract to establish and provide ongoing marine transportation services. 5,000,000 lbs. at \$2,500,000 - \$.5 per pound. Delivery limits based on road/railroad/airport capacity.</p> | <p align="center">ESF-13</p> <p>Provide Armed Federal Officers/Agents to perform Force Protection duties for DMATs or a shelter-Possibility of Strike team employed at the shelters 6 personnel per team with controlled substances 1-Law Enforcement agent per strike team.) In the vicinity of Sacramento. \$50,000</p> |
| <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide material handling equipment for a Type-I POD or Federal Staging Area for 7 days. \$25,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide material handling equipment for a Type-I POD or Federal Staging Area for 7 days. \$25,000.</p> | <p align="center">ESF-7</p> <p>Request 40-1 to GSA to provide contract to establish and provide material handling equipment for a Type-I POD or Federal Staging Area for 7 days. \$25,000.</p> |
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| <p align="center">ESF-7</p> | <p align="center">ESF-7</p> | <p align="center">ESF-7</p> |

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| Request 40-1 to GSA to provide contract to establish and provide material handling equipment for a Type-I POD or Federal Staging Area for 7 days. \$25,000. | Request 40-1 to GSA to provide contract to establish and provide material handling equipment for a Type-I POD or Federal Staging Area for 7 days. \$25,000. | Request 40-1 to GSA to provide contract to establish and provide material handling equipment for a Type-I POD or Federal Staging Area for 7 days. \$25,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. | ESF-5 Deploy One Type-I POD / ISB Team / Base Camp Team for 7 Days/ \$300,000. |
| ESF-7 | ESF-7 | ESF-7 |

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| <p>Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
| <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
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| <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
| <p>ESF-7</p> | <p>ESF-7</p> | <p>ESF-7</p> |

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| <p>Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
| <p>ESF-7 Material Handling Equipment</p> <p>request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
| <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
| <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000</p> | <p>ESF-7 Material Handling Equipment</p> <p>Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000</p> |
| <p>ESF-7</p> | <p>ESF-7</p> | <p>ESF-7</p> |

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| Material Handling Equipment Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000 | Material Handling Equipment Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000 | Material Handling Equipment Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000 |
| ESF-7 Material Handling Equipment Request 40-1 to GSA to provide contract for MHE for a Type III POD; 1 forklift (\$13,500) and 1 pallet jack \$500) for 4 weeks. \$14,000 | ESF-7 Material Handling Equipment Request 40-1 to GSA to provide contract for MHE for a Type II POD; 2 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$28,000 | ESF-7 Material Handling Equipment Request 40-1 to GSA to provide contract for MHE for a Type I POD/FSA/ISB/Base Camp; 3 forklifts (\$27,000) and 1 pallet jack \$1,000) for 4 weeks. \$42,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
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| POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
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| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |
| ESF-5 POD Staffing (Type III) ESF-5 Provide personnel for a Type III POD for one week. \$150,000 | ESF-5 POD Staffing (Type II) ESF-5 Provide personnel for a Type II POD for one week. \$190,000 | ESF-5 POD Staffing (Type I) POD Personnel ESF-5 Provide personnel for a Type I POD for one week. \$415,000 |

The pre-scripted mission assignments are based on the actual FEMA Region IX, pre-scripted mission assignment library. They have been modified for game simplicity. After Federal Emergency Management Agency, "Schedule of Equipment Rates," accessed July 7, 2015, <https://www.fema.gov/schedule-equipment-rates>; After U.S. Department of Health and Human Services, "Medical Assistance," accessed July 8, 2015, <http://www.phe.gov/Preparedness/support/medicalassistance/Pages/default.aspx#ndms>; After Federal Emergency Management Agency, "Incident Management Handbook"; The materiel movement costs are representative to demonstrate that DOD airlift is the most expensive method, commercial airlift is less expensive, and ground shipment is the least expensive; The manpower costs are based on an assumed labor rate plus per diem for Sacramento, CA; The POD locations are realistic, but notional and selected by the researcher to be outside of the Sacramento and San Joaquin River Basins Comprehensive Study (2002) 500-year floodplain.

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APPENDIX E. RESOURCE REQUEST FORMS

Table 37. Resource Request Form Cards

| | | |
|---|---|---|
| Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ |
| Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ |
| Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ |
| Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ |
| Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ | Who: _____ What: _____ When: _____ Where: _____ Why: _____ How: _____ Cost: _____ |

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APPENDIX F. RESOURCE REQUEST SOURCE CARDS

Table 38. Resource Request Scoring Cards

| | | |
|---|---|---|
| Resource is unavailable Delivery in 24 turns. | Resource is unavailable Delivery in 24 turns. | Resource is available in Northern California. Delivery in 4 turns. |
| Resource is available in Northern California. Delivery in 4 turns. | Resource is available in Northern California. Delivery in 4 turns. | Resource is available in Northern California. Delivery in 4 turns. |
| Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. |
| Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. |
| Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. |
| Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. |
| Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. |
| HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. |

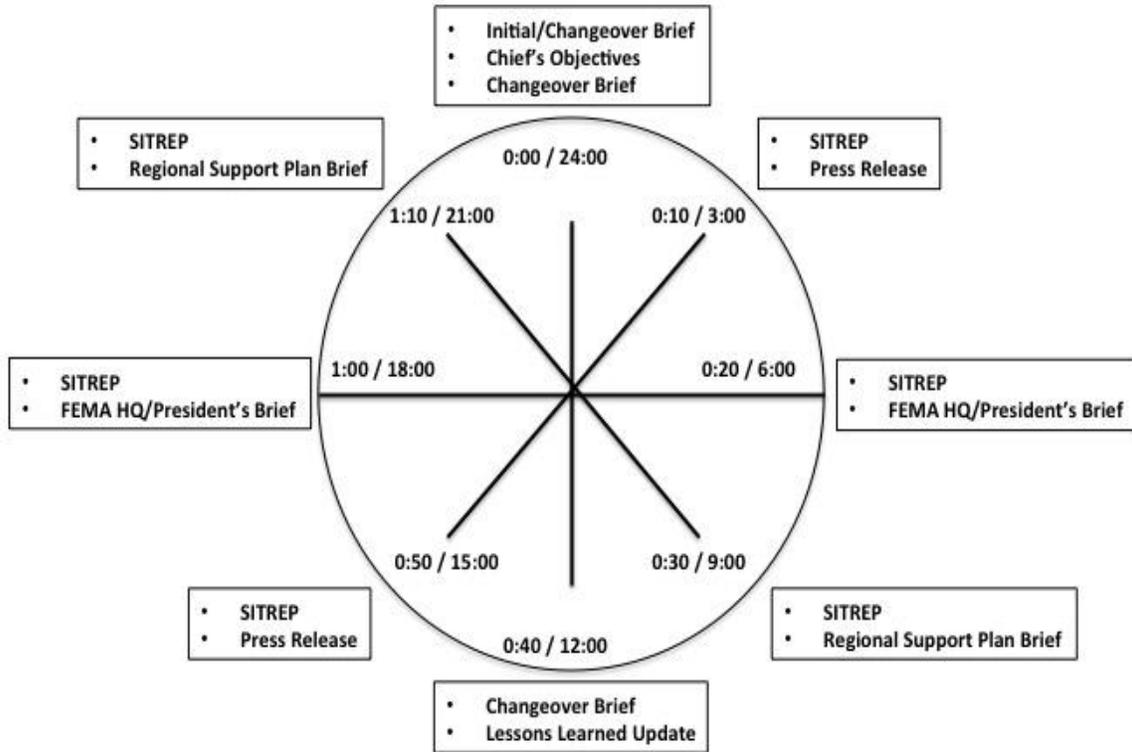
| | | |
|---|---|---|
| Resource is unavailable Delivery in 24 turns. | Resource is unavailable Delivery in 24 turns. | Resource is available in Northern California. Delivery in 4 turns. |
| Resource is available in Northern California. Delivery in 4 turns. | Resource is available in Northern California. Delivery in 4 turns. | Resource is available in Northern California. Delivery in 4 turns. |
| Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. |
| Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. | Resource is available from Central Time Zone. Delivery in 12 turns. |
| Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. |
| Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. |
| Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is from the Mountain Time Zone. Delivery in 8 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. | Resource is in the Pacific Time Zone. Delivery in 6 turns. |
| HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. |
| HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. | HQ Pushed to Resource early. Available in 2 turns. |

The movement of resources is based on simplified assumptions about time to move from the various locations to Sacramento California. The chance factor is based on the role of two, six-sided dice. Seventy-two cards are available to minimize shuffling during the game.

APPENDIX G. PLAYER RESOURCE BOOK

A. OPERATIONAL TEMPO CYCLE

Figure 38. Game Operational Tempo



Note: 0:40/12:00 means 40 minutes of game time simulating 12 hours of actual time. After Federal Emergency Management Agency, *Regional Incident Support Manual*, 104.

Table 39. Operational Tempo Chart

| Turn | Time | RRCS Chief | Situational Awareness Section | Planning Support Section | Resource Support Section | RRCS Staff Support |
|------|------|---------------------------------------|-------------------------------|---|--|---|
| 1 | 0:10 | Brief team objectives | SITREP | Tactics Meeting | Brief resource requests / status | DOD Support / External Affairs interaction |
| 2 | 0:20 | Briefs President/ Higher HQ | SITREP | Briefs Status of Regional Support Plan | Brief resource requests / status | DOD Support / Presidential / HHQ briefing sheet. Status toward reaching objectives. |
| 3 | 0:30 | Update objectives as required | SITREP | Brief Regional Support Plan for the next 4 turns. | Brief resource requests / status | DOD Support / External Affairs interaction |
| 4 | 0:40 | Brief objectives for the next 4 turns | Changeover brief | Brief concept for the next RSP under development. | Summary of the first 4 turns. Status of inbound resources. | DOD Support / External Affairs interaction |
| 5 | 0:50 | Update objectives as required | SITREP | Tactics Meeting | Brief resource requests / status | DOD Support / Presidential / HHQ briefing sheet. Status toward reaching objectives. |
| 6 | 1:00 | Briefs President /Higher HQ | SITREP | Briefs Status of Regional Support Plan | Brief resource requests / status | DOD Support / External Affairs |

| Turn | Time | RRCS Chief | Situational Awareness Section | Planning Support Section | Resource Support Section | RRCS Staff Support |
|------|------|---------------------------------------|-------------------------------|---|--|---|
| | | | | | | interaction |
| 7 | 1:10 | Update objectives as required | SITREP | Brief Regional Support Plan for the next 4 turns. | Brief resource requests / status | DOD Support / External Affairs interaction |
| 8 | 1:20 | Brief objectives for the next 4 turns | Changeover brief | Brief concept for the next RSP under development. | Summary of the last 4 turns. Status of inbound resources. | DOD Support / External Affairs interaction |
| 9 | 1:30 | Update objectives as required | SITREP | Tactics Meeting | Brief resource requests / status | DOD Support / Presidential / HHQ briefing sheet. Status toward reaching objectives. |
| 10 | 1:40 | Briefs President/ Higher HQ | SITREP | Briefs Status of Regional Support Plan | Brief resource requests / status | DOD Support / External Affairs interaction |
| 11 | 1:50 | Update objectives as required | SITREP | Brief Regional Support Plan for the next 4 turns. | Brief resource requests / status | DOD Support / External Affairs interaction |
| 12 | 2:00 | Brief objectives for the next 4 turns | Changeover brief | Brief concept for the next RSP under development. | Summary of the first 4 turns. Status of inbound resources. | DOD Support / External Affairs interaction |
| 13 | 2:10 | Update objectives | SITREP | Tactics Meeting | Brief resource | DOD Support / |

| Turn | Time | RRCS Chief | Situational Awareness Section | Planning Support Section | Resource Support Section | RRCS Staff Support |
|------|------|---------------------------------------|-------------------------------|---|---|---|
| | | as required | | | requests / status | Presidential / HHQ briefing sheet. Status toward reaching objectives. |
| 14 | 2:20 | Briefs President / Higher HQ | SITREP | Briefs Status of Regional Support Plan | Brief resource requests / status | DOD Support / External Affairs interaction |
| 15 | 2:30 | Update objectives as required | SITREP | Brief Regional Support Plan for the next 4 turns. | Brief resource requests / status | DOD Support / External Affairs interaction |
| 16 | 2:40 | Brief objectives for the next 4 turns | Changeover brief | Brief concept for the next RSP under development. | Summary of the last 4 turns. Status of inbound resources. | DOD Support / External Affairs interaction |
| 17 | 2:50 | Update objectives as required | SITREP | Tactics Meeting | Brief resource requests / status | DOD Support / Presidential / HHQ briefing sheet. Status toward reaching objectives. |
| 18 | 3:00 | Briefs President / Higher HQ | SITREP | Briefs Status of Regional Support Plan | Brief resource requests / status | DOD Support / External Affairs interaction |
| 19 | 3:10 | Update objectives | SITREP | Brief Regional Support Plan | Brief resource | DOD Support / |

| Turn | Time | RRCS Chief | Situational Awareness Section | Planning Support Section | Resource Support Section | RRCS Staff Support |
|-----------|-------------|---------------------------------------|-------------------------------|---|--|---|
| | | as required | | for the next 4 turns. | requests / status | External Affairs interaction |
| 20 | 3:20 | Brief objectives for the next 4 turns | Changeover brief | Brief concept for the next RSP under development. | Summary of the first 4 turns. Status of inbound resources. | DOD Support / External Affairs interaction |
| 21 | 3:30 | Update objectives as required | SITREP | Tactics Meeting | Brief resource requests / status | DOD Support / Presidential / HHQ briefing sheet. Status toward reaching objectives. |
| 22 | 3:40 | Briefs President / Higher HQ | SITREP | Briefs Status of Regional Support Plan | Brief resource requests / status | DOD Support / External Affairs interaction |
| 23 | 3:50 | Update objectives as required | SITREP | Brief Regional Support Plan for the next 4 turns. | Brief resource requests / status | DOD Support / External Affairs interaction |
| 24 | 4:00 | Brief attainment of objectives | Changeover brief | Brief concept for the next RSP under development. | Summary of the last 4 turns. Status of inbound resources. | DOD Support / External Affairs interaction |

After Federal Emergency Management Agency, *Regional Incident Support Manual*, 104.

B. REGIONAL RESPONSE COORDINATION CHIEF REPORTS

Table 40. RRCS Objectives Worksheet

| RRCS Objectives—Turn 1 | | | |
|------------------------|----------|-------|-------------|
| Obj. No. | Priority | Title | Description |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| 7 | | | |
| 8 | | | |
| 9 | | | |
| 10 | | | |

Table 41. RRCS Chief Briefing Worksheet

| RRCS Chief Brief—Every Turn | |
|-----------------------------|--|
| Objectives Update | |
| Resource request approval | |
| Special Requests | |
| | |
| | |
| | |

Table 42. RRCS Chief Higher HQ Briefing Worksheet

| RRCS Chief Higher HQ Briefing—Every 2 turns starting with Turn 2 | |
|--|--|
| Objectives | |
| Fatalities | |
| Injuries | |
| Number displaced | |
| Number in shelters | |
| Number of shelters | |
| Number evacuated | |
| Lbs. of ice delivered | |
| Liters of water | |
| MREs delivered | |
| Funds Expended | |

C. SITUATIONAL ASSESSMENT BRIEFINGS

Table 43. Situation Report (SITREP) Worksheet

| SITREP—Every Turn Except Changeover Brief | |
|---|--|
| # Total Affected | |
| # Fatalities | |
| # Injuries | |
| # Displaced | |
| # In shelters | |
| # Evacuated | |
| # Needing rescue | |
| | |
| | |
| | |
| | |

Table 44. Changeover Briefing Worksheet

| Changeover Brief—Every Four Turns | |
|---|--|
| ESF #1: Airport, road, railroad, port status | |
| ESF #2: Communication system status | |
| ESF #3: U.S. Army Corps status | |
| ESF #4: U.S. Fire Surface | |
| ESF #5: No. displaced, evacuated, ice, water, MREs, other commodities needed/delivered. | |
| ESF #6: No. in shelters, evacuated, resources and commodities needed. | |
| ESF# 7: Status of contracts. | |
| ESF #8: Hospital status, DMAT/DMORT/ FMSs needed and deployed. | |
| ESF #9: Number requiring search and rescue/complete. | |
| ESF #10: EPA update | |
| ESF #11: Livestock/foul needs. | |
| ESF #12: DOE status of power supply. | |
| ESF #13: DOJ security/civil disturbance status and needs. | |
| ESF #14: Recovery status | |
| ESF #15: External affairs update. | |

D. RESOURCE SUPPORT SECTION BRIEFINGS

Table 45. Resource Report Section Briefing Worksheet

| Commodity Status Update—Every Turn | |
|--------------------------------------|--|
| FSA's required/open | |
| No. of personnel moved/needed. | |
| Lbs. of ice required/distributed | |
| Liters of water required/distributed | |
| # MREs required/distributed | |
| # PODs required/open | |
| Ground movement status/needs. | |
| Air movement status/needs. | |
| | |
| | |
| | |

E. PLANNING SECTION BRIEFINGS

Table 46. Tactics Meeting Worksheet

| Tactics Meeting - Every 4th turn starting with 1 | |
|--|--|
| Review Objectives | |
| Planning Team | |
| Threats and hazards | |
| Risks | |
| Priorities | |
| Goals and objectives | |
| Course of action | |
| Resource needs | |
| Information needs | |
| Planning Map | |
| | |
| | |
| | |

Table 47. Regional Support Plan Worksheet

| Regional Support Plan – Every fourth turn starting with 3 | |
|---|--|
| Review Objectives | |
| Divisions/branches | |
| Resources needed | |
| Logistics capabilities | |
| Supporting agencies capabilities & limits | |
| Facility capabilities & limitations | |
| Transportation system capabilities & limitations | |
| Ground movement scheme | |
| Air movement scheme | |
| Map review | |
| | |
| | |

APPENDIX H. RESOURCE PLANNING GUIDES

A. FINAL SCORE SHEET

Table 48. Final Performance Summary Sheet

| Resource / Summary | Requirement | Delivered / Count | Success/Failure (+/-) |
|--------------------------------------|---------------|-------------------|-----------------------|
| Fatalities | N/A - Summary | | |
| Injuries | N/A - Summary | | |
| Affected Population | N/A - Summary | | |
| Funds Expended (Under \$30 million?) | | | |
| Population in Shelters | | | |
| Ice (8 lbs. each/day) | | | |
| Water (3 liters each/day) | | | |
| Meals (2 each/day) | | | |
| Blankets (2 Per Sheltered Person) | | | |
| Cots (1 Per Sheltered Person) | | | |
| Tarps (1 Per 4 People) | | | |

| Resource / Summary | Requirement | Delivered / Count | Success/Failure (+/-) |
|---|-------------|-------------------|-----------------------|
| Infant-Toddler Kits (10% of Shelter Population) | | | |
| Durable Medical Equipment (5% of Shelter Population) | | | |
| Consumable Medical Supplies (5% of Shelter Population) | | | |
| Hygiene Kits (1 per 100 People) | | | |
| Hospital Beds Needed | | | |
| Federal Medical Stations (250 Patients Per Day) | | | |
| DMATs Employed (250 Patients Per Day) | | | |
| DMORTs Employed | | | |
| FSAs Established | | | |
| PODs Supported | | | |
| 54-Packs Delivered | | | |

| Resource / Summary | Requirement | Delivered / Count | Success/Failure (+/-) |
|--|-------------|-------------------|-----------------------|
| (36 Low Voltage Gens; 18 High Voltage Gens Each) | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |

B. RESOURCE STATUS/PLANNING WORKSHEETS

Table 49. Non-shelter Commodities

| Affected Population—Non-Shelter | | | |
|--|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Ice—8 lbs. Per Person Per Day | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Drinking Water—3 Liters Per Person Per Day | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

| Bulk Water—1 Gallon Per Person Per Day | | | |
|--|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Meals—2 Per Person Per Day | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Tarps—.25 Per Person (1 for every 4 people) | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

Table 50. Commonly Used Sheltering Items (Individuals)

| Affected Population in Shelters | | | |
|-----------------------------------|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Water—3 Liters Per Person Per Day | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Meals—2 Per Person Per Day | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Blankets—2 Per Person | | | |
| 1 | 2 | 3 | 4 |

| | | | |
|--|--------------------|--------------------------|----------------------------------|
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Cots—1 Per Person | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Final Performance Summary | | | |
| Resource / Summary | Requirement | Delivered / Count | Success/Failure (+/-) |
| Fatalities | N/A - Summary | | |
| Injuries | N/A - Summary | | |
| Affected Population | N/A - Summary | | |
| Funds Expended (Under \$30 million?) | | | |
| Population in Shelters | | | |
| Ice (8 lbs. each/day) | | | |

| | | | |
|---|--|--|--|
| Water (3 liters each/day) | | | |
| Meals (2 each/day) | | | |
| Blankets (2 Per Sheltered Person) | | | |
| Cots (1 Per Sheltered Person) | | | |
| Tarps (1 Per 4 People) | | | |
| Infant-Toddler Kits (10% of Shelter Population) | | | |
| Durable Medical Equipment (5% of Shelter Population) | | | |
| Consumable Medical Supplies (5% of Shelter Population) | | | |
| Hygiene Kits (1 per 100 People) | | | |
| Hospital Beds Needed | | | |
| Federal Medical Stations (250 Patients Per Day) | | | |

| | | | |
|---|--|--|--|
| DMATs Employed (250 Patients Per Day) | | | |
| DMORTs Employed | | | |
| FSAs Established | | | |
| PODs Supported | | | |
| 54-Packs Delivered (36 Low Voltage Gens; 18 High Voltage Gens Each) | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |
| Other Request | | | |

After Federal Emergency Management Agency, "Incident Management Handbook," F-5; Federal Emergency Management Agency, "Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue," (Washington, DC: Federal Emergency Management Agency, August, 2011), 2-10; While FEMA's Commonly Used Sheltering Items & Servicing Listing Catalogue has a planning assumption of 10% of a shelter population needing infant-toddler kits, there is no similar assumption for durable medical equipment or consumable medical supplies. The researcher used a planning assumption of 5% of the shelter population for these items.

Table 51. 54-Pack Generators and Other Items Status/Planning Worksheet

| 54-Pack of Generators (36 Low Voltage 18 High Voltage) & Other | | | |
|---|----|----|----|
| Low Voltage Requirements—1 Per Pump/Communications Tower/Small Facility | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Low Voltage Delivered—1 Per Pump/Communications Tower/Small Facility | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| High Voltage Requirements—1 Per Large Facility/Shelter/Hospital/School | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

| High Voltage Delivered—1 Per Large Facility/Shelter/Hospital/School | | | |
|---|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Other | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Other | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

C. FEDERAL STAGING AREA FACILITY REPORT

Table 52. Federal Staging Area Status Worksheet

| FSA-1 (88 Staff Members/3 Forklifts Minimum) | | | |
|--|--------------------------|--------------------------|--------------------------|
| Facility Activated (Y/N) | Full Staff (88) (Y/N) | MHE—3 Forklifts (Y/N) | Throughput Trucks/Hour |
| | | | |
| FSA-2 (88 Staff Members/3 Forklifts Minimum) | | | |
| Facility Activated (Y/N) | Full Staff (88) (Y/N) | MHE—3 Forklifts (Y/N) | Throughput Trucks/Hour |
| | | | |
| Other Staging Area (88 Staff Members/3 Forklifts Minimum) | | | |
| Facility Activated (Y/N) | Full Staff (88) (Y/N) | MHE—3 Forklifts (Y/N) | Throughput Trucks/Hour |
| | | | |
| Other Staging Area (88 Staff Members/3 Forklifts Minimum) | | | |
| Facility Activated (Y/N) | Full Staff (88) (Y/N) | MHE—3 Forklifts (Y/N) | Throughput Trucks/Hour |
| | | | |
| Other Staging Area (88 Staff Members/3 Forklifts Minimum) | | | |
| Facility Activated (Y/N) | Facility Activated (Y/N) | Facility Activated (Y/N) | Facility Activated (Y/N) |
| | | | |

After Federal Emergency Management Agency, “FEMA Incident Support Position Task Book: R24 Resource Support Section Chief,” Pre-decisional draft, Washington, DC, July 15, 2013.

D. POINT OF DISTRIBUTION (POD) STATUS REPORT

Table 53. Point of Distribution Facility Cost Worksheet

| POD Type | People Per Day | Staff Required | Fork-lifts | Pallet Jacks | Four Week MHE Cost | Four Week Personnel Cost | Four Week Total Cost |
|----------|----------------|----------------|------------|--------------|--------------------|--------------------------|----------------------|
| I | 20,000 | 88 | 3 | 3 | \$42,000 | \$415,000 | \$457,000 |
| II | 10,000 | 40 | 2 | 2 | \$28,000 | \$190,000 | \$218,000 |
| III | 5,000 | 23 | 1 | 1 | \$14,000 | \$150,000 | \$164,000 |

After The manpower costs are based on an assumed labor rate plus per diem for Sacramento, CA; Federal Emergency Management Agency, "Schedule of Equipment Rates," accessed July 7, 2015, <https://www.fema.gov/schedule-equipment-rates>.

Table 54. Point of Distribution Status Worksheet

| Circle the Level of Activation (I/II/III) | | | |
|---|---|---|--|
| POD 1 | POD 2 | POD 3 | POD 4 |
| McClellan Commissary 5507 Dudley Blvd McClellan Park, CA 95652 Grid #10S FH 402812 | Mather Sports Park 3755 Schriever Avenue Mather, CA 95655 Grid #10S FH 479705 | Wal-Mart 8465 Elk Grove Blvd Elk Grove, CA 95758 Grid #10S FH 404528 | Denio's Farmers Market & Swap Meet; 1551 Vineyard Rd. Roseville, CA 95678 Grid #10S FH 473896 |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| POD 5 | POD 6 | POD 7 | POD 8 |
| Rosemont High School: 9594 Kiefer Blvd, | Westside Park 6601 W. 2nd St. Rio Linda, CA | Country Club Plaza 2310 Watt Ave. Sacramento, CA | Aggie Stadium, U.C. Davis, Davis, CA 95616 |

| | | | |
|---|---|---|--|
| Sacramento, CA 95827 Grid #10S FH 445675 | 95673 Grid #10S FH 33833 | 95825 Grid #10S FH 407747 | Grid #10S FH 078661 |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| POD 9 | POD 10 | POD 11 | POD 12 |
| Target 10881 Olson Dr. Rancho Cordova, CA 95670 Grid #10S FH 493734 | Arden Fair 1689 Arden Way # 1167, Sacramento, CA 95815 Grid #10S FH 369738 | Elk Grove Regional Park 9950 Florin Rd., Elk Grove, CA Grid #10S FH 418507 | Rancho Cordova City Hall 2729 Prospect Park Dr. Rancho Cordova, CA 95670 Grid #10S FH 494727 |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| POD 13 | POD 14 | POD 15 | POD 16 |
| Sunrise Mall 6041 Sunrise Mall, Citrus Heights, CA 95610 Grid #10S FH 505822 | Mesa Verde High School 7501 Carriage Dr. Citrus Heights, CA 95621 Grid #10S FH 481851 | Grand Oaks Shopping Center 7931 Auburn Blvd, Citrus Heights, CA 95610 Grid #10S FH 486862 | Wal-Mart Supercenter 5821 Antelope Rd. Sacramento, CA 95842 Grid #10S FH 451852 |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| POD 17 | POD 18 | POD 19 | POD 20 |
| Elkhorn Plaza Shopping Center | Costco Wholesale 2299 Bronze Star | Davis Senior High School | Highland Community Sports |

| | | | |
|--|---|--|--|
| 5345 Elkhorn Blvd, Sacramento, CA 95842 Grid #10S FH 443833 | Dr. Woodland, CA 95776 Grid #10S FH 108813 | 315 West 14th Street, Davis, CA 95616 Grid #10S FH 088684 | Park North Highlands, CA 95660 Grid #10S FH 409823 |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| POD 21 | POD 22 | POD 23 | POD 24 |
| Highlands High School 6601 Guthrie Street, North Highlands, CA 95660 Grid #10S FH 427834 | Foothill High School 5000 McCloud Drive, Sacramento, CA 95842 Grid #10S FH 437826 | Target 5001 Madison Avenue, Sacramento, CA 95841 Grid #10S FH 437806 | EL Camino Fundamental high School 4300 El Camino Avenue, Sacramento, CA 95821 Grid # 10S FH 424747 |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| POD 25 | POD 26 | POD 27 | POD 28 |
| Casa Roble Fundamental high School 9151 Oak Avenue, Orangevale, CA 95662 Grid #10S FH 554851 | Other | Other | Other |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |
| Level I / II / III | Level I / II / III | Level I / II / III | Level I / II / III |

The POD locations are realistic, but notional and selected by the researcher to be outside of the Sacramento and San Joaquin River Basins Comprehensive Study (2002) 500-year floodplain.

E. SURVIVOR REPORT

Table 55. Survivor Status Worksheet

| Fatalities | | | |
|---------------------------|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Injuries | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Total Affected Population | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

| Number of Survivors in Shelters | | | |
|---|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Hospital Beds Needed | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| Federal Medical Stations Established (250 Patients) | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

| Patients Needing Care | | | |
|---|----|----|----|
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| DMATs Employed (35-Person Standard DMAT—250 Patients Per Day) | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |
| DMORTs Employed (31 Personnel) | | | |
| 1 | 2 | 3 | 4 |
| 5 | 6 | 7 | 8 |
| 9 | 10 | 11 | 12 |
| 13 | 14 | 15 | 16 |
| 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 |

F. 72-HOUR COMMODITY REQUIREMENTS

Table 56. Per-person Daily Commodity Requirement

| Daily, Per-person Requirement | | | | | | | | | |
|--------------------------------------|----------------------|------------------|----------------|-------------|---------------------|---------------------------|------------------------|---------------------------|--------------|
| Ice (lbs.) | Water (liter) | MRE (Ea.) | Blanket | Cots | Hygiene Kits | Infant-Toddler Kit | Durable Medical | Consumable Medical | Tarps |
| 8 | 3 | 2 | 2 | 1 | 0.01 | 0.1 | 0.05 | 0.05 | 0.33 |

After Federal Emergency Management Agency, “Incident Management Handbook,” F-5; Federal Emergency Management Agency, “Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue,” (Washington, DC: Federal Emergency Management Agency, August, 2011), 2–10; While FEMA’s Commonly Used Sheltering Items & Servicing Listing Catalogue has a planning assumption of 10% of a shelter population needing infant-toddler kits, there is no similar assumption for durable medical equipment or consumable medical supplies. The researcher used a planning assumption of 5% of the shelter population for these items.

Table 57. Truck and Airlift Capacity Planning Guide

| Movement Planning Assumptions (lbs.) | | | |
|---|-------------------|-------------|--------------|
| Truck Load | Helicopter | C-17 | C-130 |
| 40,000 | 25,000 | 160,000 | 40,000 |

Vehicle payloads are simplified, but representative of actual capabilities. After Federal Emergency Management Agency, “Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue,” (Washington, DC: Federal Emergency Management Agency, August, 2011), 2–10; \U.S. Air Force, “C-17 Globemaster III,” accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104523/c-17-globemaster-iii.aspx>; Boeing, “CH-47 Chinook,” accessed July 8, 2015, <http://www.boeing.com/defense/ch-47-chinook/>; U.S. Air Force, “C-17 Globemaster III,” accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104523/c-17-globemaster-iii.aspx>; U.S. Air Force, “C-130 Hercules,” accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104517/c-130-hercules.aspx>.

Table 58. 72-Hour Ice, Water, MRE, Blanket, Cot Planning Guide

| Number in Shelters | Ice (lbs.) | Water (liter) | MREs (Ea.) | Blanket | Cots |
|---------------------------|-------------------|----------------------|-------------------|----------------|-------------|
| 1,000,000 | 24,000,000 | 9,000,000 | 6,000,000 | 2,000,000 | 1,000,000 |
| 900,000 | 21,600,000 | 8,100,000 | 5,400,000 | 1,800,000 | 900,000 |
| 800,000 | 19,200,000 | 7,200,000 | 4,800,000 | 1,600,000 | 800,000 |
| 700,000 | 16,800,000 | 6,300,000 | 4,200,000 | 1,400,000 | 700,000 |
| 600,000 | 14,400,000 | 5,400,000 | 3,600,000 | 1,200,000 | 600,000 |
| 500,000 | 12,000,000 | 4,500,000 | 3,000,000 | 1,000,000 | 500,000 |
| 400,000 | 9,600,000 | 3,600,000 | 2,400,000 | 800,000 | 400,000 |
| 300,000 | 7,200,000 | 2,700,000 | 1,800,000 | 600,000 | 300,000 |
| 200,000 | 4,800,000 | 1,800,000 | 1,200,000 | 400,000 | 200,000 |
| 100,000 | 2,400,000 | 900,000 | 600,000 | 200,000 | 100,000 |
| 90,000 | 2,160,000 | 810,000 | 540,000 | 180,000 | 90,000 |

| Number in Shelters | Ice (lbs.) | Water (liter) | MREs (Ea.) | Blanket | Cots |
|---------------------------|-------------------|----------------------|-------------------|----------------|-------------|
| 80,000 | 1,920,000 | 720,000 | 480,000 | 160,000 | 80,000 |
| 70,000 | 1,680,000 | 630,000 | 420,000 | 140,000 | 70,000 |
| 60,000 | 1,440,000 | 540,000 | 360,000 | 120,000 | 60,000 |
| 50,000 | 1,200,000 | 450,000 | 300,000 | 100,000 | 50,000 |
| 40,000 | 960,000 | 360,000 | 240,000 | 80,000 | 40,000 |
| 30,000 | 720,000 | 270,000 | 180,000 | 60,000 | 30,000 |
| 20,000 | 480,000 | 180,000 | 120,000 | 40,000 | 20,000 |
| 10,000 | 240,000 | 90,000 | 60,000 | 20,000 | 10,000 |
| 9,000 | 216,000 | 81,000 | 54,000 | 18,000 | 9,000 |
| 8,000 | 192,000 | 72,000 | 48,000 | 16,000 | 8,000 |
| 7,000 | 168,000 | 63,000 | 42,000 | 14,000 | 7,000 |
| 6,000 | 144,000 | 54,000 | 36,000 | 12,000 | 6,000 |
| 5,000 | 120,000 | 45,000 | 30,000 | 10,000 | 5,000 |
| 4,000 | 96,000 | 36,000 | 24,000 | 8,000 | 4,000 |
| 3,000 | 72,000 | 27,000 | 18,000 | 6,000 | 3,000 |
| 2,000 | 48,000 | 18,000 | 12,000 | 4,000 | 2,000 |
| 1,000 | 24,000 | 9,000 | 6,000 | 2,000 | 1,000 |
| 500 | 12,000 | 4,500 | 3,000 | 1,000 | 500 |
| 100 | 2,400 | 900 | 600 | 200 | 100 |

After Federal Emergency Management Agency, "Incident Management Handbook," F-5.

Table 59. 72-Hour Hygiene Kit, Infant-Toddler Kit, Durable Medical Equipment, Consumable Medical Supplies, and Tarp Requirement Planning Guide

| Number in Shelters | Hygiene Kits | Infant-Toddler Kit | Durable Medical | Consumable Medical | Tarps |
|---------------------------|---------------------|---------------------------|------------------------|---------------------------|--------------|
| 1,000,000 | 10,000 | 100,000 | 50,000 | 50,000 | 333,333 |
| 900,000 | 9,000 | 90,000 | 45,000 | 45,000 | 300,000 |
| 800,000 | 8,000 | 80,000 | 40,000 | 40,000 | 266,667 |
| 700,000 | 7,000 | 70,000 | 35,000 | 35,000 | 233,333 |
| 600,000 | 6,000 | 60,000 | 30,000 | 30,000 | 200,000 |
| 500,000 | 5,000 | 50,000 | 25,000 | 25,000 | 166,667 |
| 400,000 | 4,000 | 40,000 | 20,000 | 20,000 | 133,333 |
| 300,000 | 3,000 | 30,000 | 15,000 | 15,000 | 100,000 |
| 200,000 | 2,000 | 20,000 | 10,000 | 10,000 | 66,667 |
| 100,000 | 1,000 | 10,000 | 5,000 | 5,000 | 33,333 |
| 90,000 | 900 | 9,000 | 4,500 | 4,500 | 30,000 |
| 80,000 | 800 | 8,000 | 4,000 | 4,000 | 26,667 |
| 70,000 | 700 | 7,000 | 3,500 | 3,500 | 23,333 |
| 60,000 | 600 | 6,000 | 3,000 | 3,000 | 20,000 |
| 50,000 | 500 | 5,000 | 2,500 | 2,500 | 16,667 |
| 40,000 | 400 | 4,000 | 2,000 | 2,000 | 13,333 |
| 30,000 | 300 | 3,000 | 1,500 | 1,500 | 10,000 |
| 20,000 | 200 | 2,000 | 1,000 | 1,000 | 6,667 |
| 10,000 | 100 | 1,000 | 500 | 500 | 3,333 |
| 9,000 | 90 | 900 | 450 | 450 | 3,000 |

| Number in Shelters | Hygiene Kits | Infant-Toddler Kit | Durable Medical | Consumable Medical | Tarps |
|---------------------------|---------------------|---------------------------|------------------------|---------------------------|--------------|
| 8,000 | 80 | 800 | 400 | 400 | 2,667 |
| 7,000 | 70 | 700 | 350 | 350 | 2,333 |
| 6,000 | 60 | 600 | 300 | 300 | 2,000 |
| 5,000 | 50 | 500 | 250 | 250 | 1,667 |
| 4,000 | 40 | 400 | 200 | 200 | 1,333 |
| 3,000 | 30 | 300 | 150 | 150 | 1,000 |
| 2,000 | 20 | 200 | 100 | 100 | 667 |
| 1,000 | 10 | 100 | 50 | 50 | 333 |
| 500 | 5 | 50 | 25 | 25 | 167 |
| 100 | 1 | 10 | 5 | 5 | 33 |

After Federal Emergency Management Agency, “Incident Management Handbook,” F-5; Federal Emergency Management Agency, “Commonly Used Sheltering Items & Services Listing (CUSI-SL) Catalogue,” (Washington, DC: Federal Emergency Management Agency, August, 2011), 2–10.

G. 72-HOUR SHIPPING REQUIREMENTS

Table 60. 72-Hour Truck and Aircraft Mission Requirement Planning

| Number in Shelters | Truck Loads/Day | Helicopter Flts./Day | C-17's Flts./Day | C-130 Flts./Day |
|---------------------------|------------------------|-----------------------------|-------------------------|------------------------|
| 1,000,000 | 200 | 267 | 50 | 200 |
| 900,000 | 180 | 240 | 45 | 180 |
| 800,000 | 160 | 214 | 40 | 160 |
| 700,000 | 140 | 187 | 35 | 140 |
| 600,000 | 120 | 160 | 30 | 120 |
| 500,000 | 100 | 134 | 25 | 100 |
| 400,000 | 80 | 107 | 20 | 80 |
| 300,000 | 60 | 80 | 15 | 60 |
| 200,000 | 40 | 54 | 10 | 40 |
| 100,000 | 20 | 27 | 5 | 20 |
| 90,000 | 18 | 24 | 5 | 18 |
| 80,000 | 16 | 22 | 4 | 16 |
| 70,000 | 14 | 19 | 4 | 14 |
| 60,000 | 12 | 16 | 3 | 12 |
| 50,000 | 10 | 14 | 3 | 10 |
| 40,000 | 8 | 11 | 2 | 8 |
| 30,000 | 6 | 8 | 2 | 6 |
| 20,000 | 4 | 6 | 1 | 4 |
| 10,000 | 2 | 3 | 1 | 2 |
| 9,000 | 2 | 3 | 1 | 2 |

| Number in Shelters | Truck Loads/Day | Helicopter Flts./Day | C-17's Flts./Day | C-130 Flts./Day |
|---------------------------|------------------------|-----------------------------|-------------------------|------------------------|
| 8,000 | 2 | 3 | 1 | 2 |
| 7,000 | 2 | 3 | 1 | 2 |
| 6,000 | 2 | 3 | 1 | 2 |
| 5,000 | 1 | 2 | 1 | 1 |
| 4,000 | 1 | 2 | 1 | 1 |
| 3,000 | 1 | 2 | 1 | 1 |
| 2,000 | 1 | 2 | 1 | 1 |
| 1,000 | 1 | 2 | 1 | 1 |
| 500 | 1 | 2 | 1 | 1 |
| 100 | 1 | 2 | 1 | 1 |

Vehicle payloads are simplified, but representative of actual capabilities. After U.S. Air Force, "C-17 Globemaster III," accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104523/c-17-globemaster-iii.aspx>; U.S. Air Force, "C-130 Hercules," accessed July 8, 2015, <http://www.af.mil/AboutUs/FactSheets/Display/tabid/224/Article/104517/c-130-hercules.aspx>; Boeing, "CH-47 Chinook," accessed July 8, 2015, <http://www.boeing.com/defense/ch-47-chinook>; Federal Emergency Management Agency, "Incident Management Handbook," F-5.

H. STARTING COMMODITY INVENTORY

Table 61. FEMA Starting Commodity and Ordering Guide: Water, Commercial Meals, Low-Sodium Meals, Infant-Toddler Kits

| Commodities | Time to Deliver | Water | Commercial Meals | Reduced Sodium Meals | Infant-Toddler Kits |
|----------------|-----------------|------------------|------------------|----------------------|---------------------|
| Units | N/A | (liters) | (ea.) | (ea.) | (ea.) |
| DC-Atlanta | 18 Turns | 1,441,644 | 840,292 | 2,364,648 | 20 |
| DC-Fort Worth | 12 Turns | 2,035,350 | 604,212 | 1,334,518 | - |
| DC-Moffett | 4 Turns | 498,240 | - | 381,288 | 10 |
| DC-Frederick | 18 Turns | 1,576,434 | 447,682 | 1,055,872 | 20 |
| Thu-Cumberland | 18 Turns | 2,090,436 | - | 326,112 | |
| California | 4 Turns | 100,000 | 100,000 | | - |
| Red Cross | 12 Turns | 10,000 | 40,000 | | |
| NGOs | 18 Turns | 15,000 | 10,000 | | |
| Private Sector | 18 Turns | 100,000 | 0,000 | | |
| TOTAL | | 7,867,104 | 2,042,186 | 5,462,438 | 50 |

After FEMA Commodity Availability: All DC Moffett Commodities are Available. 50% of stock of other distribution centers is available. Numbers are representative of the FEMA Logistics Readiness Report Summary, May 12, 2015.

Table 62. FEMA Starting Commodity and Ordering Guide: Hygiene Kits, Cots, Blankets, Tarps

| Commodities | Time to Deliver | Hygiene Kits | Cots | Blankets | Tarps, 20x25 |
|----------------|-----------------|----------------|----------------|------------------|----------------|
| Units | N/A | (ea.) | (ea.) | (ea.) | (sheets) |
| DC-Atlanta | 18 Turns | 36,650 | 11,878 | 401,607 | 250,695 |
| DC-Fort Worth | 12 Turns | 50,000 | 31,882 | 202,350 | 137,401 |
| DC-Moffett | 4 Turns | - | 22,018 | 53,864 | 8,631 |
| DC-Frederick | 18 Turns | 32,096 | 41,227 | 215,377 | 3,180 |
| Thu-Cumberland | 18 Turns | 20,000 | 27,434 | 535,657 | - |
| California | 4 Turns | - | 5,000 | 5,000 | - |
| Red Cross | 12 Turns | - | 100,000 | | |
| NGOs | 18 Turns | - | | | |
| Private Sector | 18 Turns | - | | | 4,000 |
| TOTAL | | 138,746 | 239,439 | 1,413,855 | 403,907 |

After FEMA Commodity Availability: All DC Moffett Commodities are Available. 50% of stock of other distribution centers is available. Numbers are representative of the FEMA Logistics Readiness Report Summary, May 12, 2015.

Table 63. FEMA Starting Commodity and Ordering Guide: 54-Power Packs, Plastic Sheeting, Consumable Medical Supplies, Durable Medical Equipment

| Distribution Center | Time to Deliver | Generators (54-power packs) | Blue Roof Plastic Sheeting, 20x100 | CMS Kits (Consumable Medical Supplies) | DME Kits (Durable Medical Equipment) |
|----------------------|-----------------|-----------------------------|------------------------------------|--|--------------------------------------|
| Units | N/A | (ea.) | (rolls) | (ea.) | (ea.) |
| DC- Atlanta | 18 Turns | 32 | 8,045 | 2 | 3 |
| DC- Fort Worth | 12 Turns | 32 | 51,006 | 2 | 4 |
| DC- Moffett | 4 Turns | 32 | 8,578 | 2 | 2 |
| DC- Frederick | 18 Turns | 32 | 12,989 | 1 | 3 |
| Thu-Cumberland | 18 Turns | 32 | 5,759 | - | 1 |
| California | 4 Turns | 2 | 35,000 | - | - |
| Red Cross | 12 Turns | 1 | | | |
| NGOs | 18 Turns | - | | | |
| Private Sector | 18 Turns | 72 | | | |
| OVERALL TOTAL | | 235 | 121,377 | 7 | 13 |

After FEMA Commodity Availability: All DC Moffett Commodities are Available. 50% of stock of other distribution centers is available. Numbers are representative of the FEMA Logistics Readiness Report Summary, May 12, 2015.

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