Edwin Lee, Mayor
Amy Brown, Acting City Administr

City and County of SAN FRANCISCO LIFELINES COUNCIL

Thursday, April 21, 2011
2:00 PM – 4:00 PM
SPUR Urban Center

Lifelines are the systems and facilities that provide services vital to the function of an industrialized society and important to the emergency response and recovery after a natural disaster. These systems and facilities include communication, electric power, liquid fuel, natural gas, transportation (airports, highways, ports, rail and transit), water, and wastewater.
- American Society of Civil Engineering Technical Council on Lifeline Earthquake Engineering (TCLEE), 2009

CO-CHAIRS

Amy Brown
City and County of San Francisco
Acting City Administrator
General Services Agency

Chris Poland
Chair, NEHRP ACEHR
Co-Chair, SPUR Resilient Cities Initiative
Chairman, Degenkolb Engineers

REPRESENTED AGENCIES

AT&T
BART
CalTel
CalTrans
Department of Emergency Management
General Services Agency
Golden Gate Transportation District
Human Services Agency
Office of the City Administrator
PG&E
Port of San Francisco
San Francisco Airport
San Francisco Department of Public Works
San Francisco Fire Department
San Francisco Municipal Transportation Authority
San Francisco Risk Management Division
San Francisco Public Utilities Commission
SPUR
Water Emergency Transportation Authority

MEETING #5 NOTES

1) Welcome and Introductions — Amy Brown and Chris Poland, Co-Chairs

Opening remarks by Amy Brown, Acting City Administrator
Round table introduction of all participants

2) Review of Previous Meetings — Amy Brown, Co-Chair

Co-Chair Amy Brown provided a brief review of the four previous meetings:

- Meeting #1 featured the San Francisco Public Utilities Commission lifelines case study
- Meeting #2 featured presentations by the Harvard Kennedy School on "Acting in Time Against Landscape-Scale Disasters" focused on post-disaster recovery ,and the PG&E lifelines case study
- Meeting #3 featured a presentation on the performance of lifelines during the 2010 Chile earthquake by Dr. Laurie Johnson and the AT&T telecommunications case study Meeting #4 featured an introduction to the Resilient SF: Citywide Resilience Initiative by Heidi Sieck, GSA, and a presentation by the SPUR Transportation and Rebuilding Taskforce outlining SPUR's post-disaster transportation planning policy paper.

The notes of the first four meetings are finalized and include information on the background and goals of the Lifelines Council. Comments on the meeting notes should be directed to Kay Vasilyeva, GSA at kay.vasilyeva@sfgov.org.

3) Personal Experiences and Lessons from Recent Earthquakes - New Zealand (Presentation)

Ronald Mayes, Ph.D Simpson, Gumpert, and Heger

Ronald Mayes provided an overview of lessons learned in the recent earthquakes in New Zealand. Mr. Mayes was a member of the Earthquake Engineering Research Institute's (EERI) post-earthquake reconnaissance team. (A copy of the team's preliminary report can be found at http://www.eeri.org/site/images/eeri_newsletter/2011_pdf/EERI_NewZealand_EQRpt_web.pdf)

Mr. Mayes briefly described the geologic and seismic setting of New Zealand. Both earthquakes (September 2nd 2010 and February 22nd 2011) occurred on previously unmapped faults. The February 22nd earthquake (M6.3) had a duration of only 8 seconds, whereas the March 11th earthquake in Japan (M9) lasted close to 3 minutes. But, the epicenter of the February 22nd earthquake was located much closer to the city of Christchurch than the larger September 2nd (M7.1) earthquake. About 200 fatalities resulted from the second earthquake, while none occurred in the first earthquake.

Most of the damage occurred in unreinforced masonry (URM) and residential buildings. The URM damage caused 45 fatalities. Many of the URMs had been retrofitted, and many had also performed fairly well in the September 2nd earthquake. However, about 60% suffered moderate to serious damage in the February 22nd earthquake. The lessons of URM failures are very important for California. We need to be very careful about the performance expectations for retrofitted buildings and understand that retrofit requirements don't ensure earthquake-proof performance. Liquefaction has been the primary cause of extensive residential damage, with about 3,000 homes in need of total rebuilding and another 3,000 in need of major repair.

Otherwise, many buildings performed very well, and both old and new structures showed no visible damage. Buildings in New Zealand are primarily built with pre-cast and reinforced concrete materials. Most buildings with problems had some structural irregularity; some had discontinuous sheer walls. The CTV building (1986 design) completely collapsed, causing over 100 casualties. Several firms that moved into this building lost all their employees. There were also significant failures of stairwells in 3 major buildings; stairwells are important for evacuation, so there is ongoing research to find out what went wrong.

Central Business District (CBD)

The area most affected by the February 22nd earthquake was the Christchurch Central Business District (CBD). Prior to the earthquake, about 50,000 worked or lived in the CBD, but following its destruction, most residents left and had not returned 8 weeks later. Approximately 40 buildings in the CBD were damaged to varying degrees and the Christchurch government is deciding whether to stabilize, demolish, or turn them over to their owners. The process is ongoing as the City conducts careful inspections to prevent exposure to buildings that may have collapse potential. This effort is expected to take some time due to the logistical

challenges of a reduced workforce. Presently, about 25% of the damaged buildings have been red-tagged, about 25% have been yellow-tagged, and about 50% have been green-tagged; 40% of heritage buildings, similar to those that we have in San Francisco, have been red-tagged.

Building failures in the CBD occurred primarily as a result of liquefaction. Differential settlement of liquefied soils caused even newer condominium buildings to move laterally 6-18 inches, but were structurally undamaged. Steel-frame buildings performed well; concentric-braced frames did poorly.

Liquefaction

An important take-away from Mr. Mayes' presentation is the consequences of liquefaction in residential areas in coastal cities like San Francisco. The geologic and structural makeup of the CBD is similar to San Francisco's Marina District. In the CBD, liquefaction had major effects on power and sewage utilities; sewage is still not available in many areas because the below-ground pipe infrastructure is not viable. Underground rivers caused significant lateral spreading: some development areas dropped about 3 feet in elevation; cars sank into holes in areas where lateral spread was 6 feet; sand boils ejected significant quantities of sand through the spread. Universities in New Zealand used social media to mobilize 17,000 students to come to Christchurch to remove sand from residential backyards for removal by the City.

Lifelines

The performance of CBD lifelines echoes many local concerns. The water utility was out for about two weeks in severely impacted areas. Sewage was so severely impacted by liquefaction that the utility has not been bought back online. Telephone operations resumed within one day. Christchurch relies primarily on electricity, so the absence of large amounts of gas in the city reduced fire potential; the only major fire occurred in the collapsed CTV building, which lasted for about one day. Bridge damage was minor because Christchurch is a flat city. Roads were damaged by liquefaction and lateral spreading, but were largely serviceable. Their condition requires reduced driving speed, which impedes the speed of recovery. Christchurch government must decide if they will demolish buildings on the worst liquefaction land and return the area to open space.

Comments and Questions:

How is Christchurch making decisions about prohibiting rebuilding in heavily damaged neighborhoods?
The CBD and residential neighborhoods were affected by liquefaction. Many people don't want to move back in because there is no sewage, no water, and schools are damaged. They are choosing to move elsewhere. The city has started a planning process to consolidate neighborhoods or buyout property owners in the most heavily damaged areas. Two badly impacted areas are very controversial: they are very recent subdivisions that some believe should not have been developed in the first place.

4) Annual Review and Roadmap to Coordination Summary of Previous Meetings — *Amy Brown and Chris Poland, Co-Chairs*

Acting City Administrator and Lifelines Council Co-Chair Amy Brown reviewed the previous Lifelines Council meetings in depth:

- The Lifelines Council was first convened in October 2009 as a recommendation from the SPUR "Resilient City" report;
- Meeting #1: October 2009
  - This meeting went over "Resilient City" initiatives and the first case study was submitted by the San Francisco Public Utilities Commission (presently San Francisco Water Power Sewer), highlighting the interdependency between water and sewer systems;
- Meeting #2: February 2010
  - The Harvard Kennedy School of Government "Acting in Time" initiative presented their comprehensive risk management framework for responding to disasters and introduced the concept that residents will decide to "tip in" or "tip out" relatively quickly after disaster. A faster response by the City, by utilities, means people are more likely to stay in their homes and contribute to a successful recovery;
  - The second case study was presented by PG&E and illustrated how electricity is one of the most interdependent lifelines;
- Meeting #3: June 2010
  - Dr. Laurie Johnson presented on lifelines performance in Chile following the 2010 earthquake;
  - UC Berkeley introduced ShakeAlert, an early warning system for seismic activity;
  - The Council's third case study was presented by AT&T and provoked a lot of commentary. AT&T stated that they will actively block calls after a disaster to ensure first responder and priority calls can get through;
- Meeting #4: December 2010
  - Heidi Sieck, GSA, introduced the new ResilientSF program and described its current efforts to incorporate many levels of planning and preparedness into a comprehensive program;
  - A SPUR workgroup presented the Council's fourth case study on transportation systems and gaps in performance expected after several disaster scenarios;
  - DPW described the status of the priority routes program.
- Overall, it was a very productive first year; many useful presentations from lifeline providers.

Lifelines Council Co-Chair Chris Poland identified areas to focus on going forward:

- Interdependency between power and fuel;
- Ongoing priorities for planning for debris management and identifying priority transportation routes as access for repair crews will be critical to expedient recovery;
- Telecommunications targeting restoration within 72 hours;
- The role of mobile equipment located throughout the city for quick service restoration;

Mr. Poland also identified several known concerns that he hopes the Lifelines Council will address:

- It is known that our current waste water system is not resilient; although it is scheduled for seismic upgrades;
- PG&E has internal acceptable levels of risk in restoration and emergency planning;

they plan to coordination with the San Francisco EOC to address resumption of service;
- CalTRANS currently has no program for liability of repair crews;
- At present, there is no consensus on what will happen after the 72-hour period that benchmarks self-reliance and restoration. SPUR's "Resilient City" initiative ses targets beyond 72 hours. Studies are ongoing to estimate what factors encourage residents to "tip in" after a disaster to avoid a mass exodus like Christchurch.

5) Department of Emergency Management (Presentation) Rob Dudgeon, Deputy Director of DEM

Rob Dudgeon began with an overview of the Department of Emergency Management (DEM), Division of Emergency Services (DES), and identified areas for improvement and highlighted many successes.

2005 Areas for improvement:

- Response and planning agencies operated in silos;
- The Emergency Operations Center (EOC) was difficult to activate and staff: roles and responsibilities needed to be defined, mission needed to be established.

Successes:

- DEM actively provides the forum for dialogue about emergency preparedness and response and conducts other agencies; coordination is our primary task;
- The EOC activates more often for smaller events on purpose to establish and vet processes and protocols;
- Emergency managers are more able to solve problems collaboratively with a functional team-based approach;
- Experts get the information, resources, and support they need in a timely fashion;
- DEM is able to inform the public, elected officials, and coordinate public and private activities.

Because San Francisco is both a city and a county, it is different from other municipalities in that it also serves as an "operational area" in California's Standardized Emergency Management System (SEMS). Therefore, San Francisco operates in a standardized way, but is different from other municipalities. Since no agency has all the assets they need to comprehensively respond to an emergency, we have to adopt a cooperative approach with a mix of public, private, nonprofit, State, and Federal partners. DEM relies on these external links for support.

Mr. Dudgeon then outlined DEM's goals for activating the EOC:

- To activate more often on purpose, including for smaller planned and unplanned events, to get more reality in the process and condition personnel to work together, and to establish a routine and a sense of tempo;
- To solidify the process of finding resources and answering questions during stretches of wait time between periods of intense activity during an activation.

Going forward, DEM's strategic mission will address coordination and cooperation with municipalities and systems from outside of San Francisco, identifying assumptions they will have in an incident, and learning how they operate.

DEM will also increase its cooperation with the Department of Defense (DOD) because they bring tremendous capability to an incident; this cooperation will be strategic to prevent inadvertently losing control of the situation to the DOD. DEM recognizes that it's important to work out the gaps with the DOD before the crisis.

Comments and Questions:

What is the goal for continued private sector coordination?
In 2007, DEM rewrote its Emergency Response Plan, moving away from the standard template and re-evaluated roles for the EOC. DEM saw a gap between the private sector and its connection to the EOC. The Infrastructure Branch has provisions for lifelines and representatives there directly working with responders. In this reworking, DEM built in community coordination efforts with schools and universities, community groups, and private sector businesses. There is not enough space to bring in everybody, but there is a higher education council to look at preparedness and response. The goal has been to develop ways to communicate directly with stakeholders. DEM set up conference calls with financial district and private sector businesses, as well as schools/universities. The goal is now to give direct access to decision-makers in real time.

How does DEM conceptualize emergency management and recovery?
The challenge is to be comprehensive and not pass the baton. DEM is looking to change the dynamic from "response and recovery" to "response to recovery". Once we get to the restoration and recovery phase, we don't step totally out, but other management teams should still come in one continuous effort until the crisis is addressed sufficiently. This strategy is seen most often with displaced people (fire, flood, etc.) The City will pull together incident management teams to do partial activations and stay with the issue until everyone is in some temporary housing, then transitioning them to case workers.

What are some recent events where EOC has activated?

- 217 Eddy St. Apartment fire
- Smaller activations like Chinese New Year, New Year's Eve
- Partial activation for the tsunami associated with the Japanese earthquake
- Bay to Breakers racce
- Special city-wide events

In the larger regional picture, how can you pull along the neighbors? What dialogue exists?
Unfortunately many in the emergency management field have a "stay in my lane" mentality. There is a widespread idea that you do your job and pass it on. San Francisco has great city support through its constituency and Mayor's Office and we do have some agreements with neighbors, but not extensively.

6) Lifelines Interdependency Analysis — *Laurie Johnson, Ph.D, Principal, Laurie Johnson Consulting*

Dr. Johnson began by reviewing the Lifelines Council's stated objectives to:

- Develop and improve collaboration in the City and across the region.

- Understand inter-system dependencies to enhance planning, restoration and reconstruction.
- Share information about recovery plans, projects and priorities.
- Establish coordination processes for lifeline restoration and recovery following a major disaster event.

She proposed that undertaking an interdependency study could be central to helping the Lifelines Council fulfill its purpose, particularly in understanding interdependepencies among different lifeline operators and their systems, and establishing coordination processes for lifeline restoration and recovery following a major disaster.

She briefly reviewed highlights in the field of lifelines systems research, and key outcomes of that research relative to lifelines post-disaster performance and interdependency analyses and research. Largely in response to the damage to lifelines systems caused by 1971 San Fernando earthquake, lifeline engineering professionals in the U.S. pledged to start of a long-term research program to study the effects of earthquakes on all lifeline systems, and set a 30-year goal to develop a comprehensive set of standards for lifeline seismic design, construction and performance. Over the next decades, research efforts in both the U.S. and Japan helped to construct a national inventory national lifelines inventory; develop a set of lifeline vulnerability functions, describing earthquake performance characteristics as well as restoration times; create a typology of lifelines interdependencies and their consequences; and modeling the potential economic and recovery consequences of multiple lifeline disruptions. However, she cautioned that the field is still relatively young; a recent study report that nearly 75% of all the interdependency modeling research literature has been published since 2005. Some of the key challenges in modeling lifelines interdependency include: how to relate lifeline systems restorations, and whether they are complementary or competing, and how to fully integrate institutional, economic, and environmental forces into existing physical models of interdependence.

She then briefly reviewed two recent lifelines interdependency studies, both performed by different teams at the University of British Columbia (UBC). The Joint Infrastructure Interdependency Research Project at UBC constructed a lifelines interdependency model of the UBC campus that identifies interdependencies and calculating damage and losses from a scenario event. The “Analyzing Infrastructure for Disaster Resilient Communities” project at UBC took a more empirical approach, utilizing a scenario to interview a number of lifeline operators in the Vancouver region, look at their interdependencies both up- and down-stream, and identify regional concerns of of interdependence ando develop mitigation and preparedness strategies.

Dr. Johnson proposed that the Council undertake a study that is a hybrid of these two case studies, with a focus on improving response, restoration, preparedness, and coordination among operators. The study approach would include the following steps:

- Utilize a scenario already developed for the region and the city, to assess impacts and interdependencies to a range of lifeline systems. Some possibilities include the CAPSS study scenarios, or the 2006 San Andreas study.
- Create a small working group to help develop questions that each operator is to answer about system performance up- and down-stream interdependence, preparedness and coordination strategies
- Individual operators or groups of operators would then be responsible for performing

their own analysis and responding to questions. Detailed system and asset data maintained by each operator. However, the answers would be integrated and analyzed to construct a multi-system view.

- There might be follow up interviews or workshops created to evaluate responses
- From this point, then the Lifelines Council would be able to develop a more detailed scenario with key interdependencies identified, and also potentially draft Lifeline Council performance standards and preparedness coordination strategies. The performance standards from the SPUR "Resilient City" report might also be used or evaluated as part of the study to assess our ability to meet these standards.

Comments and Questions:

How do you foresee moving into the analysis, how long might that take?
First, we need to spend more time with people who've done these studies and the Lifelines Council needs to continue working on scoping our study. The first year may be more of a scoping year before we actually hand off a scenario and questions for agencies to analyze.

Regional providers and services need to keep in mind that San Francisco resiliency is just one part of a larger goal.

PG&E: We need to keep in mind the regional nature of the problem. Regional utility providers have to consider how restoration in San Francisco affects the utilities' ability to provide the same level of service in neighboring communities.

CalTRANS: We echo the regional consideration. It will be beneficial to try to engage UASI cities to spur them to do something along the same lines. San Francisco doesn't have as many routes as other cities. It would be tough for CalTRANS to comment or supply input on San Francisco only; it would be helpful to include some outreach to Oakland and San Jose.

7) Adjourn

Meetings will continue on a quarterly basis. The next meeting is targeted for August 2011 with an emphasis on the lifelines interdependency analysis.