May 7, 2020
Utah Seismic Safety Commission
Quarterly Meeting Minutes

On May 7, 2020, a regularly scheduled quarterly meeting of the Utah Seismic Safety Commission (USSC) was held virtually on account of COVID-19. Chair, Leon Berrett, called the meeting to order at 9:00 a.m.

Members Present:

Leon Berrett, Chair	American Public Works Association
Steve Bowman, Vice Chair	Utah Geological Survey
Keith Koper, Vice Chair	University of Utah Seismograph Stations
Kris Hamlet	Utah Division of Emergency Management
Roger Evans	Utah League of Cities and Towns
Jessica Chappell	Structural Engineers Association of Utah
Steven Bruemmer	American Institute of Architects, Utah Disaster Assistance
Patrick Tomasino	Utah Division of Facilities and Construction Management
Peter McDonough	American Society of Civil Engineers
Evan Curtis	Utah Governor's Office Planning and Budget
Meldee Love	Utah Insurance Department
Joaquin Mixco	Utah Department of Transportation
Chris DuRoss	U.S. Geological Survey (Ex-Officio)
Sean McGowan	Federal Emergency Management Agency (Ex-Officio)

USSC Staff Present:

Bob Carey	Utah Division of Emergency Management
John Crofts	Utah Division of Emergency Management
Adam Hiscock	Utah Geological Survey
Emily Kleber	Utah Geological Survey

Guests Present:

Barry Welliver	EERI
Jim Penchman	University of Utah Seismograph Center
Mark Hale	University of Utah Seismograph Center
Kyle Becker	Utah Insurance Department
Brent Maxfield	Utah Citizens for Seismic Safety
Glen Palmer	Palmer Engineering
Barry Welliver	EERI
Mark Hale	

*Please note other guests were present and not identified, due to meeting being held virtually.

Members Not Present:

Craig Kerkman	Association of Contingency Professionals

Welcome and Introduction of Members and Visitors/Approval of Minutes

Leon Berrett made introductions and invited attendees to introduce themselves.

Approval of Minutes

Leon asked for a vote on the approval of Minutes from January 23, 2020 Utah Seismic Safety Commission meeting and the Fourth Quarter joint Utah/Nevada meeting.
Evan Curtis made a motion to approve the minutes for July 23, 2020.
Steve Bowman seconded the motion to approve the minutes. The minutes were approved.
Patrick Tomasino made a motion to approve Utah/Nevada October minutes.
Evan Curtis seconded the motion to approve the minutes. The minutes were approved.

Keith Koper provided a presentation on the Utah Magna earthquake that occurred on March 18, 2020. He discussed the University of Utah Seismograph Station's role and participation with the earthquake sequence. He recognized his staff and the many participants who tirelessly worked on this sequence. He discussed the 203 seismograph stations and the resulting digitized data. He explained the strong motion seismometers and their advantages and discussed details regarding their excellent performance. He reported that there were 40,000 public responses to the University of Utah Seismograph Centers from people who reported the earthquake. His presentation showed maps of the earthquake and explained the color coding, and that warmer colors indicating stronger shaking. He reported their data was communicated quickly to all parties and that even the Governor's notes, soon after the earthquake, included one of their shake maps that they quickly pushed to partners. He shared a map of the seismometers showing the strongest motion and acceleration. They successfully captured strong motion data sets and he explained that this data is excellent because of the infrequent earthquakes along the Wasatch Front. He continued that this is a decades-long experiment which provides data and information that can be fed into many earthquake related participants from building engineers to building code professionals. They feel really good about the excellent data that they were able to capture. Unreinforced Masonry Buildings (URM) experienced the greatest amount of damage. He demonstrated analysis of the earthquake and explained that the first showed M5.7. Later they estimated that it was closer to a M5.5; however, to avoid confusion they will leave it at M5.7. The duration of main shock was two seconds. The amount of motion is what we discuss as "slip" which was about 1/3 of a meter. Over the course of two seconds that crack occurred over about 20 square kilometers. The energy disperses and spreads out from the hypocenter. He explained that it was a high-pressure response because they were working from home. Although the quake lasted two seconds it was felt longer because of the big ripples that spread out—similar to a stone being thrown into water. After the quake they were able to get out 185 temporary seismometers withing a week of the shock. He discussed the various types of seismometers and how they perform. Placing extra seismometers helps because they can do a better job detecting smaller aftershocks. As of yesterday, there have been 2,017 aftershocks. He discussed two particularly large aftershocks. He described these aftershocks as typical of an aftershock sequence. He

discussed the Magna cluster and the cluster south of the airport and that they are both the same sequence. He discussed some of the aftershocks register below zero because of the sensitivity of the equipment. This M5.7 is the biggest on the Wasatch Fault (Salt Lake Segment) that we have experienced with modern instruments along the Wasatch Fault. He discussed the Wasatch fault and antithetic faults and how they may affect each other. He demonstrated this as a very complicated fault zone.

- Important take-home points were that this M5.7 it was moderate sized earthquake, but if we have a M7 earthquake, then we would experience a release of energy that represents 90 times more energy than this moderate M5.7 quake.
- Only a small amount of stress was relieved on the northern edge of Salt Lake City segment; however, the Salt Lake City segment is still capable of producing an M7 earthquake.
- The Recurrence interval for large earthquakes (M>6.75) on the Salt Lake City thought to be 1,300-1,500 years, the last large event occurred about 1,400 years ago.

Jessica Chappell asked for clarification on the duration of the quake.

Keith explained that with larger earthquakes the shaking continues much longer. He discussed resonance of the buildings are affected from the sediments and other factors. The shaking can continue longer because of location and resonance. Looking at how these things vary, versed on the site location and how the duration varied. The G force can be stronger as well. If we have a M7 on the Salt Lake City segment it could potentially have longer duration shaking because of resonance and other factors.

Chris DuRoss asked about the difference in submissions of the lower angle and USGS solution. He asked his opinion regarding the two different solutions.

Keith Koper said he had seen five different solutions in the main shock. He discussed outliers and other factors. He said the MDWR does agree with the University of Utah Seismograph stations. He discussed some of the possible interpretations of the different solutions from the differences because of speed and accuracy accounting for differences.

Steve Bowman, Emily Kleber and Adam Hiscock

Steve discussed their participation with the University of Utah Seismograph Stations and the Utah Division of Emergency Management. The M5.7 mainshock occurred on March 18th, 2020. By 9:00 a.m. their Emergency Operations Center was activated and field teams were being mobilized. By at 9:20 the Digital Clearing House was established, which includes photos, reports and other various information that is shared with other partners and agencies. Emily Kleber, Adam Hiscock, Jessica and Craig conducted reconnaissance and documented as much damage as possible soon after the quake. Adam McKeen and Ben Erickson contributed to the event by capturing data. They now have 768 items in the clearinghouse, which has inputs from several groups. Several private citizens included information. He invited others to also submit information. He asked any information to be sent to benerickson@utah.gov. The clearinghouse data can be accessed from www.goedata.geology.gov.

Adam Hiscock discussed his field team participation. He is a drone pilot, and was able to get unique drone footage from the earthquake. He demonstrated photos and footage captured from the drone. He showed their field operation review and the aftershock sequence. He discussed that M5.7 is too small for a surface fault rupture; however, there is liquefaction and lateral spreads. He discussed Sand Boils and demonstrated photos from the earthquake. He further

discussed the Great Salt Lake Marina, damage and showed other various damages. Kennecott granted permission to enter their property for inspection near the epicenter. He discussed possible co-seismic rock fall near Ensign Peak and discussed the difficulty of determining if the rock fall was quake related.

Emily Kleber discussed the Clearing House and specifically how they received the data. She discussed the importance of a Clearing House because it is a compilation of data that other partners inside and outside of Utah are able to share and review. March 25-26th, they opened the Clearinghouse to the public for input of their photos and videos. They shared a Google Form on social media. They utilized Facebook, Instagram and Twitter for public outreach. Twitter had the most participation and inputs. Overall, this yielded 50 photos and 15 videos from the public. She demonstrated www.goedata.geology.gov and solicited anyone having more information to please submit to the Clearing House. She discussed the interactive map that Gordon Douglas from her office provided. She expects that people will be learning much more about earthquake geology from visiting this website. She demonstrated the website www.geology.utah.gov showed additional information and interactive tools found on the website. They now have a report that shows how they completed the earthquake mapping and then another map showing the base of the earthquake map. This is an improvement on where faults have been identified. She showed on the maps areas of recommended special study zones and discussed what they mean. She discussed additional tools for the entire Wasatch Fault zone that can be accessed on the webpage. She said at this point, the Wasatch Fault is mapped better than any other fault in the world. She discussed where to find Quaternary Fault and fold Maps from their website.

Chris Duross asked Adam about his presentation and about a potential geophysical study of the Great Salt Lake. He was curious if he saw other failures, rather than just sand boils.

Adam said their observed failures were pretty much what he showed on the presentation. He discussed the Antelope Island tour and some the findings.

Leon mentioned that he went to White Rock Bay on Antelope Island and also observed a few earthquake features.

Adam said that his colleague found one of the biggest mounds on White Rock Bay. Some of the earthquake features associated with the seeps soon disappeared. He further explained effects of liquification and soil collapse.

Bob Carey introduced Sheila Curtis as the Operations Manager for the Utah Division of Emergency Management (DEM). He discussed that our Emergency Operations Center (EOC) was already activated for COVID-19.

Sheila Curtis discussed the EOC's involvement, the occurrence of the earthquake, the activation efforts of the EOC, and her assessment of the situation. DEM increased the EOC activation to Level I from Level II. Level I is the highest level activation. DEM activated the different Emergency Service functions (ESFs). After the earthquake she discussed the concerns about evacuating Magna. She discussed the Emergency Management Assistance Compact (EMAC) and the "big rumors" of M9 earthquake. The State requested that Task Force One be activated. They brought in the Mitigation and Recovery folks and discussed temporary housing. They sheltered 23 individuals in hotels. There were 20 international students that were stuck at the Salt Lake City Airport. She discussed the EOC completing various missions to address the earthquake.

Bob added that this was the "designer earthquake". He discussed the live Webcast they held that morning with Seismograph Station at Salt Lake County. One of the immediate issues was

addressing the rumor of an impending M9 earthquake. Another false report was that the refineries were on fire and that there was a "run" on gasoline (especially in Utah county). They received a request form seismograph stations and that they helped placed temporary seismometers after the earthquake. He discussed his conversation with Barry Welliver and Magna. Because the earthquake was centered in Magna, local officials reached out to him. There was confusion regarding ATC-20 inspection versus a different damage assessment, which goes towards getting a Presidential Declaration. Most jurisdictions had some sort of earthquake insurance. The state requested a 30-day extension for evaluation of earthquake damage because of the pandemic. Salt Lake County conducted a survey and he requested that data it be pushed to the Clearinghouse. There is some work to do on the ATC-20 side. He mentioned that Brad Bartholomew was not at the meeting because he was busy doing COVID-19 work. Bob mentioned that Brad would have updated damage report and disaster information for the next Commission meeting.

Keith asked if there was one document that summarizes all the damage.

Bob said there was not anything yet, but they are now working to compile the information. He said it would be interesting to examine how Fix the Bricks program performed. He mentioned there was damage to homes on both sides of particular homes that underwent Fix the Bricks mitigation work. He said it will be very interesting to see the mitigation and how it performed.

Bob said that Patrick Tomasino will also provide a damage report on what the state has completed.

Jessica asked about volunteer inspectors. She there was no request for inspectors within the state.

Bob said that there was a request from Salt Lake to the State. The request was for the damage side, and not for the building safety evaluation side. He received a call from Barry Welliver, who was in the field. There were some issues of who will get paid and how. The public officials decided to back off asking outside help, and they resolved it in-house—without asking for outside ATC-20 inspectors.

Leon said because of the pandemic many buildings were empty. There were 70 buildings that needed inspection—many of the buildings were closed. Because the buildings were closed they were not under a strict time requirement for inspections and they were able to use their internal staff to conduct inspections.

Steve Bruemmer said they did a great job explaining the reasons they did not need an ATC-20 response from outside inspectors. He said areas were cleaned up even before Emily's group could conduct inspections. He inquired if there was a process to get out even earlier to document issues—before it is cleaned up.

Emily replied that on the day of the earthquake, they were onsite early and that they avoided any contact with first responders. They did not visit the mobile home park, Magna downtown area, and that there were red tags on the buildings and they worked to avoid any contact or interruption of first responders.

Bob mentioned that this is an event that would not cause a lot of damage. If it is a "big story" then it will be in the news the next day. He continued that the "next day" was not big news day for the earthquake. He continued that it is very important to look at the damage immediately so that damage history is recorded.

Jessica Chappell presented a report from the Structural Engineers Association of Utah. She discussed her personal first-hand experience as a structural engineer. She discussed structures and reviewed earthquake details, noting that there was no loss of life. She further discussed

that economic losses were estimated to be under $100 million. She spoke of shaking intensity and demonstrated a map showing shaking intensity. Salt Lake City felt a strong to moderate shaking intensity. There was a broad range of people who felt the shaking in buildings. She demonstrated a Historic Structural Damage map SHPO. Magna is a mining town and many of the structures are original structures. Salt Lake City also has many original buildings. She discussed structural versus non-structural damage. She also provided examples of non-structural damage and provided examples from the Airport. There nearly 50 homes that were tagged as failures and were only allowed to retrieve belongings. She discussed mobile homes, and URM damage and provided examples. She provided examples of damage with demonstrating X type cracks indicating building shaking and she demonstrated a multi-wide URM that was bulging. There is a lot of discussion about damage to schools. She pointed out that key points to damage to vulnerable building types are URMs and mobile homes. Extensive nonstructural damage from water leaks, falling items and mechanical elements create significant damage. No volunteer request were made to ATC-20. Current state public entities have evaluations and repairs underway and private owners no self-reporting requirement to report damage. She referenced buildings being condemned for occupancy.

Bob made a comment about people not being required to report. He said that participation was less, because of the pandemic, a lot of people did not want to report because they did not want to be evicted from their home during a pandemic.

Jessica said they have a large amount of URMs. Most of the URM homes are smaller and simpler structures, and they were not damaged as much. She mentioned that the larger URMs posed a larger threat. We currently do not have a mechanism for reporting large URM damage from owners.

Patrick Tomasino discussed that he was dispatched to do inspections over the course of a week and half. Most of the facilities he inspected were not occupied because of the pandemic. They looked at, overserved and witnessed column cracking, surface cracking, and other non-structural damage. When they did overserve structural damage, they had a structural engineer come in and review damages. The State has also created a report and is tracking repairs. He discussed ATC-20 evaluators. The ICS platform says all incidents are local and they do their own work. The state was not employed or asked to participate in outside structures or review.

Pete McDonough began by thanking Matt Bartol, Manager of Gas Operations and Seth Plazier, Supervisor of Park City Operations for providing natural gas related data. Gas Company operations center in MMI VII area. Very minor damage occurred (items falling etc.) No structural damage was reported. Buildings were designed as a moment frame in the mid-1990's. The general design guideline was that it remains functional during a worse case scenario earthquake.

- 48% of customers who turned their gas off at the meter actually had leaks. This compares to 1994 Northridge quake (MMI X), 10%: 1997 Whittier Narrows quake (MMI VIII) 22%. May be due to Dominions emphasizing that customers not turn off gas, unless a leak is suspected or structural damage occurs.
- Significant trailer park damage (approximate 49 trailers) in MMI VII. This can be expected at or above MMI VI. Fortunately, no fires occurred during this quake as they did in the Northridge.
- No main leaks. This compares to one cast iron main break and 21 steel main leaks on corroded pipe at Whittier. Dominion has an extensive medium density PE plastic pipe network, which reduced the risk. During the February 2011 Christchurch earthquake

(M6.2 MMI IX) no PE plastic pipe damage. All cast-iron pipe was retired during the 1980s and 1990s.

- Nine earthquakes valves were activated within MMI VI and VII. These appear to have activated above the ANSI standard minimum ground acceleration of 0.16g.
- Of the 391 actual leaks found on the company facilities.
    - 97% were on meter sets. These contain multiple stress points.
    - 3% were on underground service lines
        - Four tap to main leaks were found. These represented stress points.
        - One corroded steel service
- Of the 113 leaks found on customer piping, 21$ were water heater related (compared to 75%at Whittier). Most new water heater installations include strapping. This is something Dominion has stressed.

Leon discussed Salt Lake County Public Works perspective. The Emergency Coordination Center (ECC) activated and Leon spent the first day there. They required everyone be tested for COVID before entering their ECC. They discussed the possible evacuation of Magna. He demonstrated damage to various buildings including Colosomos, and showed Main Street in Magna with their damage. He described setting up barricades and providing protective closures to traffic. He showed sever URMs and their damages. They met in the Webster Building and worked with Trent Sorensen, building official, and Crystal Cobert were the leads for organizing inspections. Leon assisted them as much as he could. They had over 70 county buildings that they provided rapid visual assessments. They placard the buildings green, yellow and red. He discussed the new Magna library and the limited damage. The roof had a gas leak from the roof on the library. They discovered water leaks in some of the other county buildings. He discussed finding some gas leaks and Dominion's quick response to conducting repairs. He discussed social media rumors and their efforts to fix misinformation. He said the Utah news media did an excellent job correcting misinformation. He repeated that it was fortunate that most of the buildings were not occupied and they did not feel pressure to reopen quickly.

Jessica discussed the Wasatch Front URM Risk Reduction Strategy. It is a pilot program put together by FEMA. She discussed the project membership and the collaborative effort from various groups. National Mitigation Investment strategy is an effort to reduce risk where the entire community sees the benefit. She discussed the URM Conference from the Utah Division of Emergency management and FEMA. There is a national exercise for 2021 and that this is a great opportunity to test the resources we have in place. The main goal is to review the risk. The final draft will be completed in late September and published in the 2021 national exercise. She discussed previous publications on URM risk and mitigation programs. The team is taking these documents, engaging stake holders, and the idea is pulling in local participants who are invested in this and creating something that is right for our community. She mentioned to go the Commission website for the documents. She discussed the Introduction and background the key considerations and strategy recommendations. All of the different items are intended to look at funding suggestions. Each of the suggestions will have correlating funding solutions.

Keith Koper discussed earthquakes in Western United States. A couple of weeks after the March 18th event there was an M6.5 earthquake with 700 aftershocks in Idaho. This

earthquake happened soon after the Magna event and people had a lot of questions. There is no obvious relationship between the two events. It was unlikely there were any relationship. It was west of Chalis, Idaho in a remote area. It was a straight slip earthquake with sideways motion. It was felt in Utah; however, there was no relationship with Utah. He discussed another event near Reno, Nevada that was earlier than our Magna sequence with no relationship to the Magna earthquake.

Brent Maxfield introduced himself as concerned citizen as part of a group that refers to themselves as, Utah Citizens for Seismic Safety, who is comprised of two structural engineers, three geologist and one urban planner. Barry Welliver and Brent Maxfield are the structural engineers, three geologists are Jack Bloom, Grant Willis, John Hermance and urban Planner is Divya Chandrasekhar.

Divya Chandrasekhar thanked Brent for the introduction. She is a professor at the University of Utah and her specialty is post-disaster recovery and reconstruction. They commonly agree to discuss earthquake safety and have three goals: to provide a consistent message, mobilize support, and push for legislative action. They are here to complement and enhance the accomplishments of the Commission. They are asking to seek input on a messaging statement and seek help promote and disseminate the message. They wish to use a multi-disciplinary approach to document earthquake safety concerns from various angles using multiple institutional connections that include private sectors, public sectors, higher education, nonprofit organizations, religious institutions, and technical organizations. She said the same message should be communicated to mobile home owners as well as everyone else. The message is a one-page document. There is an earthquake problem, the threat is real, the impact will be big, there is a need for action and we have a URM problem. There is a need for action and action needs to be taken now. They would like the Commission's support and input on finalizing this document. That message, once finalized will be presented at the next Commission meeting.

Joaxin Mixco and Becky Nix presented on the Utah Department of Transportation's (UDOT) response to the earthquake response.

Joaxin explained his role as Emergency Manager for the Utah Department of Transportation (UDOT). He turned the time to Becky.

Becky described her role working with the emergency response plan and her role in the bridge inspection during the earthquake. She discussed the UDOT bridge management manual, emergency response plan, training and the ShakeCast models. On the morning of the event, the maintenance staff mobilized immediately. The also activated a second level of inspection. They had 12 teams out that morning and everyone was on-site within an hour of the event. The inspection teams reviewed the major routes first. They utilized two coordination individuals to help avoid overlap of work. She ran the reporting coordination and they maintained real-time reporting. They identified one bridge that they closed immediately. They have four levels they rate the bridges. Red-closed, orange it can be limited use, yellow there is damage but not structural problems and green is normal use. They used stickers for each of the bridges they inspected which included the date and time of inspection. The second thing they did was they used tape for inspections. As soon as you drove up to the bridge, you could quickly identify the inspection. Another tool they utilized was using Google to create maps,

and each team had real-time monitoring, so you could see if it was red, orange, yellow or green. They examined 710 bridges over two and half days. Anytime there was M3 or higher they re-inspected the bridges with their maintenance staff. Anything M4.5 or higher required structural staff return for an entire new inspection. Now they are in recovery phrase and prioritizing which structures need repairs. They had eight bridges that needed repairs after the event. They had one bridge that was closed. They used in-house crews to repair the closed bridge. They have an established contractor pool that they were able to conduct a faster repair schedule. They are now conducting reviews on what worked well and what did not. She discussed rain during the event caused problems with the stickers being affixed and they are reviewing alternatives. They are also reviewing a mobile app to be placed on phones so they can put their inputs directly into their phones and upload data later if data is not available. She discussed the UDOT website and the bridge manual is accessible online.

Leon thanked the presenters and suggested meeting July 30, 2020. Everyone agreed to have the meeting Thursday, July 30 from 9:00 a.m. to noon.

Pete asked if there were any water main breaks.
Leon clarified that there were no watermain breaks
Bob reminded the Commission that the next meeting would be an election meeting.

The meeting was ended by acclamation.