



CITY COUNCIL BRIEFING
City Council Chambers
March 18, 2014
4:00 – 5:30 p.m.

To: Members of City Council

From: Jane S. Brautigam, City Manager
Paul J. Fetherston, Deputy City Manager
Mark Beckner, Police Chief
Larry Donner, Fire Chief
Maureen Rait, Executive Director of Public Works

Subject: Flood Recovery and Emergency Preparedness – Briefing by the Boulder Office of Emergency Management

The attached report provides City Council with information on the Threat, Hazard Identification & Risk Assessment (THIRA) prepared by the Boulder City and County Office of Emergency Management (OEM) in response to the September 2013 Flood event. City and County coordination efforts continue in preparation for spring run-off and summer storms.

The THIRA report follows a format prescribed by FEMA. The intention is for a community to understand the risks it faces and by understanding its risks, make good decisions about how to manage risk, including developing needed capabilities. Risk, in this context, is the potential for unwanted, associated outcomes resulting from the September 2013 flood event, as determined by the likelihood of those outcomes and the associated consequences. Capabilities are considered in response to each hazard and potential threat and include the identification of resources and preparedness activities (including potential mitigation) needed to ensure a “capable” response.

By considering changing circumstances, a community can understand how to best manage and plan for its greatest risks across the full range of the threats and hazards it faces. The THIRA process helps communities identify what needs to be done (weighed against what can be done) and the resource requirements necessary to address anticipated and unanticipated risks.

This topic was discussed at the Feb. 25, 2014 Boulder County Commissioners meeting. The commissioners have been invited to join the City Council at its briefing on March 18. A question and answer session will follow a presentation by Michael Chard, Director of the Boulder Office of Emergency Management. City department directors and staff supporting flood recovery efforts will also be available to address questions.

As the city continues to work through the recovery phase following the September flooding, it is important to note that a high-level city team also continues to meet on a regular basis to address recovery activities. The Flood Recovery Steering Committee includes executive team and department directors of the most highly impacted departments as follows:

- City Manager's Office;
- Community Planning and Sustainability;
- Finance;
- Housing;
- Human Services;
- Open Space and Mountain Parks;
- Parks and Recreation; and
- Public Works – including Transportation and Utilities.

This committee is responsible for addressing the following high-level issues:

- Communication – internally and externally regarding the flood recovery efforts;
- Coordination – of all flood recovery related projects and efforts;
- Council Objectives – ensure that there are specific, measurable and realistic department specific goals that roll up to achieving council objectives and that they are analyzed on an on-going basis; and
- Project Prioritization – ensure that there is a comprehensive, coordinated and prioritized approach to completing projects in the recovery effort.

This group works closely with Public Safety personnel and the OEM, as in the case of this threat and hazard assessment and associated emergency preparedness efforts.

City Council briefings and updates are expected to be provided bimonthly (beginning in April) and on an as needed basis throughout in 2014.

Boulder Office of Emergency Management

THIRA

Threat, Hazard Identification & Risk Assessment

Post 2013 Front Range Flooding Disaster & 2014 Spring Run-off event

March 18, 2014

Overview

On Sept. 11, 2013, the Front Range Flooding event resulted in wide spread damage to infrastructure, property, the environment, and caused the death of ten individuals. The original disaster emergency response phase has since ended and, according to the Federal Emergency Management Agency (“FEMA”), Sept. 30 marked the official end of damage caused by the flooding.

Boulder County was the center point of this storm and received severe damage in almost every canyon from north to south and every community from the continental divide to the eastern county line boundary. The damage in each region of the county has caused unique challenges. For homeowners in the canyons, the concern is over where the creek or river should be located in the future because it now threatens their home or their neighbor’s home. Two of our communities, Jamestown and Lyons, suffered extraordinary damage to public infrastructure and private property, and are working diligently to bring their communities back. In the eastern plains, agricultural infrastructure was damaged and destroyed, and producers are trying to repair before spring. All over the county, communities are actively recovering and investing huge amounts of time and money to clean up and rebuild.

However, there is uncertainty and worry that spring run-off or monsoon rains will bring additional flooding, resulting in loss of the work that has been completed and resulting in new damage. Millions of dollars have gone into building temporary roads to allow access for residents, businesses and first responders; all of which could be lost due to spring flooding. The deposition of sediment in stream channels has greatly reduced the capacity to convey run-off causing the City of Boulder and City of Longmont to be concerned about widespread flooding in neighborhoods. Debris collected in stream channels can cause creeks to divert and damage roads and bridges and other critical infrastructure. Lastly, the Towns of Lyons and Jamestown have received significant investment in temporary recovery measures to hold their communities together and the threat of spring run-off and debris related hazards places the Towns at significant risk for further damage.

This report addresses the hazards found in every river and creek drainage that is near or goes through communities in Boulder County. The specific hazards addressed in this report are (1) reduced capacity of creeks and rivers due to deposition of sediment, rocky debris and bank avulsions, (2) woody debris deposited in huge quantities along rivers and creeks potentially causing debris dams and subsequent flash flooding, (3) debris flows and landslides causing access issues and obstructing creek and river flows and (4) the location and condition of the rivers or creeks related to structures and infrastructure, for example homes, roadways, culverts and bridges, at risk for damage or destruction.

The THIRA report also provides planning assumptions and target capabilities that mitigate, reduce or manage the hazardous conditions within this document. Each target capability is aligned with the following planning assumptions:

- Planning assumption #1: Complete assessments of each drainage and based on hazard rating assessment focus on risk reduction activities: Complete assessments of hazardous areas in each of the river drainages and deploy resources to mitigate the hazardous conditions to significantly reduce the severity of impacts if the threat becomes an event.
- Planning assumption #2: The risk cannot be completely removed or significantly reduced therefore a “Whole community planning and engagement program” must be implemented: Based upon the effectiveness of risk reduction through hazard mitigation the following activities are required (1) community preparedness education based on risks for the community, (2) First responder operational planning to flash flooding, landslides and access problems, (3) public works and road department planning to address damming of rivers and creeks and road damage due to flooding and landslides, (4) public warning planning with the local communication centers, senior policy group officials, the National Weather Service and public information officers due to complexities of spring run-off flooding and (5) Emergency evacuation site, sheltering and temporary housing planning by ESF 6 & 8 agencies to ensure displaced residents can be served in an already stressed available housing inventory.

- Planning assumption #3: A flood or landslide event happens: The spring run-off is a 100% probability and will bring normal to above average flows in river and creek basins that have minimal percentage of predictability in behavior related to overtopping of banks, side channel flooding through open avulsions in the banks, debris movement causing dams and flash flooding potential, and certain debris flows and landslides of canyon walls causing damming of rivers and creeks and road access problems: A problem is identified and reported by residents of the community, public works, road department personnel or first responders. Public works and road departments respond to remove debris dams, jamming of debris in or around critical infrastructure features, coordinate resources and communicate if the situation is stable or escalating. Communications notifies response agencies and provides warning information. Residents implement personal protective measures and follow warning information directives. Response and sheltering plans are implemented and if needed EOC support is initiated.

The final section of the THIRA includes the requirements for application of target capabilities to achieve results. An estimate of resources required to achieve the target capabilities through the use of community assets, mutual aid, county, state and Federal resources is also provided. In addition, a timeline for execution is also included to show the activities that must be coordinated and implemented over the next 60-90 days before spring run-off occurs. Due to this time critical period, long term river and creek planning is not emphasized in this report. Certain current efforts that address any risk or hazard of the THIRA will be coordinated with actions under taken as emergency protective measures.

Identify Threats and Hazards of Concern

Types of threats and hazards:

The significant threats identified in the assessment of Boulder County are as follows;

1. Flooding during spring-run off due to deposition of sand and gravel and bank erosions and avulsions.
2. Flash Flooding during spring run-off due to the movement of debris and the subsequent collection and damming holding back the river flow.
3. Thunderstorm activity that generates run-off flow exceeding river or creek capacity causing flash flooding or localized flooding of homes and roadways.
4. Ground water saturation that currently has elevated water tables causing extra flow in creeks and rivers, municipal waste water systems and private residences basements. This will cause less ground absorption and add additional flow to the run-off.
5. Snow pack currently at 150% of normal with the two statistically heaviest snow months still to come. Heavy snow packs increase the duration of spring run-off and also increase the chance of a high altitude thunderstorm that liquefies the snow pack, adding significant flow into the creeks and rivers.
6. Drinking water reservoirs are already near capacity in the region and will spill earlier than usual causing additional flow during the runoff and thunderstorm season.

Sources of threat and hazard information:

1. Debris, bank stabilization and flooding:

Boulder County Transportation personnel, City of Boulder Flood and Greenway personnel, hired engineering consultants, the Army Corps of Engineers and the National Resource Conservatory Service (“NRCS”) combined efforts and data to complete a creek / river assessment of risk and vulnerability. The assessments evaluated debris, creek and river bank conditions, structural damage or risk, breach points, road and other infrastructure vulnerability. All County information was entered into the County GIS system and made available in a map book for Boulder County. Each page of the map book identified hazard areas which included conditions, threat identification, threat level, vulnerability information and type of impact from debris constriction to flooding. The threat level index used to quantify the risk is a 4 level indicator with Level 1- being the highest risk, Level 2 moderate risk, Level 3 low risk and L4 requiring reassessment at a later date. All City information was entered into the City GIS system and made available in a map book for the City of Boulder using a similar methodology as the County.

2. Landslide and debris flow hazard information:

The United State Geologic Survey (“USGS”) conducted a countywide assessment of canyons and hillsides for stability and the likelihood of debris flows or landslides. The data accumulated states that Eastern and Southern facing slopes were the most susceptible to debris movements during the flood. The USGS feels that there is not a high likelihood of debris flows under normal snow packs, ground water levels and under normal rainfall levels. But there are factors present today that make landslides possible and worthy of mentioning in the THIRA as a threat to consider and execute planning efforts. The first is the current high level of ground saturation that exists today as seen in elevated water tables and will continue to exist possibly into 2015. Secondly, a high snowpack level at elevation that could add to ground saturation such as experienced in 2003. Lastly an intense rainfall from a thunderstorm or monsoonal flow spiked with bursts of rainfall of a lower intensity compared to a thunderstorm could also produce an environment capable of producing a landslide. The type of landslide the USGS states these conditions favor is not the debris flow types experienced during the 2013 flood. The landslide style expected is a deep cut landslide that has a tendency to be less frequent but larger in size and depth. These types of landslides do reveal themselves first through rock fall and visible shifts in formations which does provide an opportunity to identify and possibly mitigate and pre-warn residents. Bottom line as stated by the USGS is they really do not know for sure. Therefore the BOEM recommendations are to assume this is a moderate risk that requires community education, response coordination, and personal preparedness actions to properly address this hazard.

The data summary is attached to this report in a power point format. Additional assessment information and analysis is being negotiated with the USGS at this time.

3. Snow Pack and Run-Off:

The Boulder Office of the National Weather Service (NWS) is monitoring the current snow pack levels for all drainages and will constantly provide threat analysis and recommendations as conditions get closer to the actual spring run-off date to the Boulder Office of Emergency Management. This analysis will determine the appropriate triggers for public warnings.

National Weather Service Run-off Assessment as of 02/05/2014, Robert Glancy, Meteorologist, NWS.

As of February 5, 2014 the snow water equivalent in the snowpack in the South Platte Basin was 114% of normal. This allows us to be cautiously optimistic about water supplies this summer, and suggests that we will have at least a “normal snowmelt”. This of course can be highly variable based on whether the snow melts in a short period of time, or we combine snowmelt with thunderstorm rains. The picture will become much clearer around April. We are highly concerned that if we have a higher than average snowmelt, that the amount of debris in the streams and channels of Boulder County will affect runoff negatively with debris dams forming and releasing, potentially creating flash flooding and damage.

NWS works closely with the county, and can quickly issue a flash flood warning for a debris dam release, and we can access the Emergency Alert System at the request of county officials and issue Civil Emergency Messages.

Urban Drainage Flood Control District (“UDFCD”)

Email content sent to the BOEM on September 17, 2014 from Kevin Stuart P.E., UDFCD from Dave Gochis with UCAR.

I'm beginning to get concerned for the spring flows come April-May. The reasons for this are twofold, 1) snowpack values continue to pile up across the northern Front Range now approaching 150% of normal. Several of our sites in upper Boulder Creek are nearing peak SWE levels observed during 2011 which was a large year. Additionally, the persistent base flows since the September flood seem to suggest that many soils regional shallow aquifer systems are sufficiently full so that major new pulses of water input may produce a lot more runoff than normal. Even if we get normal precipitation from here through May, it looks like we're bound to have a decent runoff year. I worry about this given that a lot of the channels are still in a fragile state (particularly around roadways and infrastructure) and may not be able to withstand sustained high flows without appreciable movement.

4. Thunderstorm Related Flooding.

UDFCD and the NWS Boulder Office have a long standing relationship with the City of Boulder and Boulder County in providing flood prevention, monitoring and hydrological and meteorological services. Threat analysis and recommendations shall be provided as data and models can be utilized for risk & vulnerability assessments. Current probability and predictability recommendations are being utilized from these agencies in preparing flood thresholds, public warning thresholds, flood prediction and river and creek capacity conditions.

Factors to consider

- Likelihood of incident-
 - Spring- Run-off likelihood is 100% occurring approximately from May 1 through June 15.
 - Thunderstorm- Likelihood of Thunderstorm occurrence in drainages affected by the flood is 100%, but the severity of storms is as follows:
 - Awaiting UDFCD Data and Analysis
 - Anecdotal information- ½-1 inches per hour rainfall is common in the mountains, 1-2 inches per hour is routinely seen in the mountains and 3-4 inch plus per hour rainfall events occur 3-6 times per year in the mountains.
 - Debris related Problems- due to the amount and location of debris in and around the streams, the likelihood of debris impacting stream conveyance is 100%.

- Flooding causing road damage
- Debris jams in culverts and bridges
- Diversion of creek and river flow causing home flooding.
- Significance of threat /hazard effects
 - The most severe effect of these hazards is the risk to life. Unlike a thunderstorm where the early warning system is initially launched with detection of a storm on radar and resources can be directed to monitor the conditions and initiate public warnings. In the current state of affairs, flash flooding is likely to occur because of debris dams forming in the creek or river basin. Detection will not occur until someone notices the presence of the dam or it releases and a surge of water is smashing through homes and washing away roads. This gives very little reflex time to assess the situation notify proper authorities of the hazardous condition and little time to warn the public to take action. During the 2013 Flood two teenagers drowned on Two Mile Canyon Creek and one man in Lyons.
 - The presence of landslides also generates a life safety problem in two ways. The first is life threatening landslides that can release suddenly and without warning and impact residences in the canyons and urban interface areas of the City of Boulder. During the flood a resident of Jamestown was killed due to a debris flow that came from a lateral drainage. The presence of possible debris flows and landslides also increase the risk of earthen dams being created which also create the same flash flooding risk described earlier.
 - Based on the City/County assessment there are numerous level 1 flooding indicators due to bank erosion, blow outs or capacity problems, debris constriction, or debris collection in all drainages assessed. St. Vrain, Lefthand, Four mile Creek, Boulder Creek and South Boulder Creek are significant spring run-off drainages while all drainages are susceptible to thunderstorm related problems.
A Threat Priority Rating was established for each site and Emergency Mitigation Measures were identified to assist with recovery and preparations for spring runoff.
 - Explanation of Threat levels

Level 1- The probability and risk is high

- If woody debris is identified it has a high risk of causing damming or blocking culverts or bridges.
- Deposition of sediment will cause flooding
- Bank erosion or avulsions will not handle creek flow and cause flooding
- If a home, it is in great danger of being impacted by spring run-off.

Level 2- Moderate probability and risk

- If woody debris is identified it has a potential if erosion or the flow is achieved to cause the debris to move and possibly causing damming or blocking culverts or bridges.
- Deposition of sediment will cause flooding if a certain flow is achieved.
- Bank erosion or avulsions could possibly not handle creek flow and cause flooding if unsuspected erosion or additional flow is achieved.
- If a home, it is in possible danger because debris dams, erosion or unanticipated flow in the creeks places the residence at risk, possibly affected by spring run-off.

Level 3- Low probability and risk

- If woody debris is identified it has a low potential to cause damming or blocking culverts or bridges under normal or expected conditions.
- Deposition of sediment not likely to cause flooding unless a certain flow is achieved due to a thunderstorm or other extreme condition.

- Bank erosion or avulsions could possibly not handle creek flow and cause flooding if extreme conditions are created from damming, if extreme spring run-off conditions are present or thunderstorm activity causes severe runoff flows.
- If a home, it is unlikely to be in possible danger from spring run-off but extreme conditions such as unanticipated debris dams, erosion or unanticipated flow in the creeks places the residence at risk.

Level 4- needs to be evaluated after the spring run-off and the risk re-evaluated.

Numbers by Threat Rating- City of Boulder

- 56– Level 1
- 218 – Level 2
- 304– Level 3
- 108- Level 4

Numbers by Threat Rating- County

- 90 – Level 1
- 83 – Level 2
- 16 – Level 3
- 17 – Level 4

By Emergency Mitigation Measures-City

- 174 Bank Stabilization
- 159 Debris Removal
- 3 Berm Construction
- 261 Sediment Removal Locations
- 1 Stream Design/Realignment
- 10 Culvert Damage
- 55 Drop Structures
- 23 Flood Walls
- 38 Significant Home Damage (excludes homes totally destroyed)

By Emergency Mitigation Measures- County

- 43 Bank Stabilization
- 94 Debris Removal
- 3 Berm Construction
- 18 Restore Conveyance
- 2 Stream Design/Realignment
- 28 Culvert Assessment
- 17 Significant Home Damage (excludes homes totally destroyed)

- Damage to Property is the next significant effect these hazards create. Many homes are located along river and creek banks in Bear Canyon Creek, Boulder Creek, Four Mile, Four Mile Canyon Creek, Gregory Creek, James Creek, Lefthand Creek, Boulder and St. Vrain Creek, as well as the City of Longmont are exposed to consequences of events on these drainages. Many homes and private roads and bridges cannot sustain further bank erosion, flash flooding or debris impacts.

- Potential damage to Infrastructure, especially roads and bridges, is reported commonly in the assessment areas. Many of the roads are temporary roadways and susceptible to high flows in rivers and creeks and easily impacted if flooding conditions are present. Many of the bridges and culverts high deposition of sediment on the upstream and downstream sides reducing the flow capacity through these structures. Higher creek and river flows will cause erosion and exacerbate sediment conditions resulting in the structures to become damaged or fail.
- The Betasso Water Treatment Plant is located adjacent to a canyon that was cut off for a period of time during the September flood due to creek bank erosion and landslides. If access is again cut off for an extended period of time, there will be issues keeping the plant online due to the lack of viable routes for fuel and chemical delivery.

Threats and Hazards Context

Timing of an incident

- Spring run-off is predictable and seasonal.
- Flash flooding due to thunderstorms are detectable with radar and have about a 40 minute to 1 hour cycle from peak flow to flash flooding allowing for some warning time and risk vulnerability assessment time. Severe thunderstorm activity is generally from April 15 to October 1.
- Flooding due to debris dams and landslides are not predictable events and the time cycle from forming to impact conditions is also equally unpredictable.

Location of an incident

- Spring Run-Off – Boulder Creek, Four mile Creek, James Creek, Lefthand Creek, South Boulder Creek, and St. Vrain River, all experience runoff conditions. Bear Canyon Creek, Bluebell Canyon Creek, Boulder Slough, Coal Creek, Dry Creek No.2 Ditch, Four mile Canyon Creek, Goose Creek, Gregory Canyon Creek, Kings Gulch, Six Mile Creek, Skunk Creek, Sunshine Canyon Creek, Two Mile Canyon Creek, Viele Channel and Wonderland Creek are less susceptible to spring run-off but are exposed when thunderstorm activity occurs.
- Debris – Debris is located in all drainages but most frequently in Boulder Creek, Lefthand Canyon Creek, St Vrain, James Creek, and Four mile Creek. With the certainty of spring run-off these areas are of high concern. This does not mean to minimize the level 1 debris locations of other drainages identified in the assessments that also require attention during thunderstorm activity.
- Deposition of sediment – Is present in all drainages and especially noticed in areas where velocities slowed and deposits formed such as before and after culverts and bridges, infrastructure features and in areas where debris slowed water movement or in areas where the flood waters receded.
- Bank erosion and avulsions – most commonly found in Bear Canyon Creek, Boulder Creek, Gregory Canyon Creek, Gold Run Creek, South Boulder Creek, the St Vrain River East of Lyons all the way to Longmont, and portions of Lefthand Creek and Fourmile Creek. These areas received Level 1 risk assessments to roadways, homes and head gates to ditches.
- Debris Flows and Landslides – Steep canyons, under cut areas with an Eastern and southern facing slope.

Other conditions or circumstances that make the threat or hazard of particular concern

- **Timing** of Spring Run-off is now at the 60-90 day mark creating urgency for securing funding, prioritizing work and executing the work before spring run-off.
- **Unpredictability** in how the rivers and creeks will behave once the spring run-off starts to occur thus requiring adjustment in operational plans, community preparedness and the adjustments needed in establishing thresholds for initiating public warnings.
- **Funding** all of the mitigation projects of hazards is undetermined and future needs as critical infrastructure is impacted.
- **Presentation of Hazards** is difficult to target exactly when and where hazards conditions will occur. Also the relationship of hazardous situations upstream has potential impacts downstream and throughout the entire river or creek system. Reflex time from identification to notification of first responders and the community will be short.

Target Capabilities

Describe impacts and desired outcomes:

Cost estimate to execute the desired outcomes:

\$14 million dollars. (County Estimate)

- Spring Run-Off: estimated five year averages are being generated by the UDFCD and utilized for risk analysis vulnerability and impacts pertaining to expected flows.
 - Desired outcome:
 - FEMA Category A & B designations to remove level 1 debris areas to a 5 year flood event level to reduce likely debris related problems, armor bank erosion areas and avulsions to handle the expected spring run-off cubic feet per second flow rates and remove deposits of sediment and debris within 200 feet of all roads, culverts and bridges.
 - Conduct community preparedness meetings to educate residents on risks and actions to take to protective life and property.
 - Develop a countywide first responder flood plan to coordinate response and address access problems due to loss of roadways and bridges.
 - Create public warning protocols to ensure timely and accurate warning messaging for residents.
 - Calibrate existing evacuation and sheltering plans to address displaced residents.
- Debris: Evaluate the Level 1 debris areas identified in the assessment and prioritize the hazard to remove debris that exceeds the capability of local resources to handle and develop a removal schedule.
 - Desired outcome:
 - FEMA Category A & B designations to remove level 1 debris areas to a 5 year flood event level to reduce likely debris related problems and remove debris within 200 feet of all roads, culverts and bridges.,
 - Conduct community preparedness outreach to educate residents on risks and actions to take to protective life and property.
 - Develop a countywide first responder and public works / roads debris dam response plan to coordinate response and address access problems due to loss of roadways and bridges.
 - Create public warning protocols to ensure timely and accurate warning messaging for residents.
 - Calibrate existing evacuation and sheltering plans to address displaced residents.

- Thunderstorm Flash Flooding: Have the UDFCD and the NWS complete and 3-5 year average of rainfall events to determine likely rain run-off levels. Assess LIDAR data for creek and river capacity levels and make improvements in the problem areas to handle average rain fall estimates.
 - Desired outcome:
 - Category A & B designations to remove level 1 debris areas to a 5 year flood event level to reduce likely debris related problems, armor bank erosion areas and avulsions to handle the expected spring run-off cubic feet per second flow rates and remove deposits of sediment and debris within 200 feet of all roads, culverts and bridges.
 - Conduct community preparedness outreach to educate residents on risks and actions to take to protective life and property.
 - Develop a countywide first responder flash flood plan to coordinate response and address access problems due to loss of roadways and bridges.
 - Create public warning protocols to ensure timely and accurate warning messaging for residents.
 - Calibrate existing evacuation and sheltering plans to address displaced residents.
- Debris Flows and Landslides: Use the USGS report to locate high hazard areas and watch for abnormal rock fall, signs of shifting landscapes or rock formations.
 - Desired outcome:
 - Conduct community preparedness outreach to educate residents on risks and actions to take to protective life and property.
 - Develop a countywide first responder plan to coordinate response and address access problems due to loss of roadways and bridges.
 - Create public warning protocols to ensure timely and accurate warning messaging for residents.
 - Calibrate existing evacuation and sheltering plans to address displaced residents.

Completed target capabilities

- Risk and Hazard Assessments Completed
 - Completed hazard analysis of all rivers and creeks with on-going assessments
 - USGS landslide report
 - Complete and update THIRA
 - LIDAR data completed on all rivers and creeks
 - NRCS private property assessment
 - 5 year thunderstorm activity assessment
 - 5 year spring run-off assessment
- Emergency Response Plans
 - Update existing flood planning that involves multiple agencies and multiple disciplines by April 15, 2014.
 - Established Severe Weather protocols and radar technology in the EOC and utilized by emergency dispatch centers. Public Works and County Road Planning and table top exercise scheduled for March 5, 2014
 - Evacuation and sheltering plan
 - Rain gauge and stream gauge system currently in place (except St Vrain)
 - Work with Local communities in Lyons and Jamestown to develop creek and river “Watch Programs” by April 15, 2014.

- Community Preparedness
 - Community messaging and personal preparedness programs
 - Messaging is currently being updated and all public information resources updated, completed by April 1, 2014.
 - City and County PIOs are meeting regularly to develop messaging and provide updates as needed.
 - Community engagement and meeting schedules
 - County meetings begin March 2014.
 - City of Boulder currently developing public communication strategies and schedule.
 - City of Longmont initiating public meetings currently.
 - Intermountain alliance
 - Community engagement meeting is set for February 20, 2014
 - Boulder Mountain Third Arm Community Preparedness group
 - Boulder Mountain Fire Protection District coordinating actions and working with BOEM on future needs.
- Public Warning
 - Outdoor warning systems
 - Being tested and maintenance currently under way, the system will be operational by April 1, 2014.
 - Everbridge emergency telephone warning systems
 - Polygons created for Four mile, Boulder Mountain, western areas of Boulder.
 - Polygons being created for density areas such as Jamestown, Lyons and Lefthand Canyon residences.
 - NWS civilian warning protocol in place with the NWS (status: Completed)
 - Emergency Alert System Protocol (Status: Completed)
 - Civilian weather spotter systems (Status: Completed)
 - BCARES: Mountain Emergency Response Network: 100 Ham radio operators trained, county wide system connected to the EOC ham radio operators.

Hazard Vulnerability Assessment Matrix

EVENT	Probability	Severity Level			Preparedness Levels			Risk
		Human Impact	Property Impact	Infrastructure impact	Preparedness needs	Internal response	External response	
	Likelihood this will occur	Probability of injury or death	Physical losses and damages	Interruption of services	Preplanning	Time effective response	Mutual aid and other resources	Relative threat
Score	0= N/a 1- low 2- moderate 3- high	0= N/a 1- high 2- moderate 3- low	0= N/a 1- high 2- moderate 3- low	0= N/a 1- high 2- moderate 3- low	0-21			
Spring run-off Flooding	3	2	3	3	1	1	1	14
Woody debris dams	3	2	2	2	1	1	1	12
Woody debris jams: culverts and bridges	3	1	1	1	2	2	1	11
Landslides	2	2	2	2	1	1	1	11
Rock and mud Debris flows	2	1	1	2	1	1	2	10
Deposition of sediment due to erosion	3	1	2	2	1	1	2	12
Flash flooding from debris dams	3	3	3	3	2	3	3	20
Flash flooding from thunderstorm activity	2	1	2	2	1	1	1	10
Flash flooding from ice dams	1	1	1	1	3	3	3	13
Temporary roads washed out	3	1	3	3	2	2	2	16
Homes or structures flooded	3	1	3	1	1	1	1	11
Average score	2.5							11.72
								55.8%

Risk = Probability x Severity

What do the numbers mean?

Probability Column- The probability value is a subjective assessment of how likely the hazard will occur based on field reviews, review of data, and anecdotal reports from field personnel. An average probability score of 2.5 shows that the probability for an event to occur is above average.

Relative threat column- Provides a means to evaluate which event carries a higher degree of threat based on severity and preparedness levels. The higher the number the worse the risk or hazardous situation. The numbers can then be used to prioritize hazards. The 55.8 percent represents that the relative threat is moderate based on an average score of 11.2 out of 21 possible points.

Application for Results & Desired Outcomes

Strategic, operational and tactical plans

- Public Works and County Roads Debris and Landslide Response Plan- under development and will be in place by April 15.
- Boulder County Operational Flood Response Plan- Currently in place and being updated.
- Boulder Resource Mobilization Plan- Currently in place and being updated.
- Boulder Emergency Operations Plan- Currently in place and updated.
- Boulder Emergency Operations Center Operations Manual- Currently in place and being updated.
- Boulder Disaster Response Incident Plan- Base plan completed and hazard specific response plan being updated.
- Boulder ESF 6 & 8 Evacuation and Sheltering Plan- Currently in place and after action review from 2013 flood being incorporated into the revision of the plan.

Preparedness plans & capabilities

- Community Engagement- Strategies are in place, schedule is being created and format developed.
- Community Preparedness education- Messaging is being updated and incorporates personal preparedness, hazard identification, recognition of hazard presentation, reporting actions and protective measures to employ.
- Insurance workshops- Flood insurance awareness and policy review recommendations for residents.
- Preparedness Information & Distribution- City and county websites, media plan, social media usage, video productions and documentation updated.

Existing capability analysis

- Community Preparedness- Strong experience from previous disasters being applied, excellent strategies to accomplish goals present and implementation plan under development.
- First Responders- Excellent interagency cooperation present, joint planning efforts are strong and excellent first responder experience in handling threats identified.
- Publics Works and County Roads- Strong desire to work within mutual aid environments, exploring pre-event MOUs and desire to develop pre-event cost share understanding or agreements.
- EOC – Excellent capability to operate and support hazard environments identified in the THIRA. Strong experience in providing policy group support, developing situational awareness, resource support and ESF staffing through the Boulder Multi-agency Coordination Group.
- Resource Mobilization- Existing resource mobilization has excellent performance experience locally and integrates with all resource mobilization systems at the state and federal level.
- Incident Command and Type 3 Team- Unified command experience is strong and local Type 3 incident management team experience is strong and ready to manage complexity of hazards.
- Mass Care and Sheltering- Strong local experience in integrating with Red Cross sheltering plan, developing local capability as needed, providing transportation support and addressing access and functional needs populations.

- Public Information & Social Media- ESF 15 External Affairs / PIO experience is strong in public messaging and operating in a joint information system.
- Public Warning- Excellent familiarity with existing systems, strong experience in application of systems and procedures in place to use activate systems.

Mutual aid resources

- Existing Mutual Aid and Auto Aid Agreements- Currently in place for first responder agencies and being developed for public works organizations.
- County and City MOUs and IGAs- Being evaluated currently and under development to address the threats and hazards identified in the THIRA.
- Contracted Resources- Currently contractors are in place, RFPs are being executed to address current projects and additional resource needs are being evaluated and contractors possibly acquired to address gaps.
- Non-profits- Red Cross, Salvation Army, COVOAD, United Way and local non-profits engaged.

Regional, State and Federal resources

The following resources could be needed to respond to the various hazards that manifest as a result of spring run-off and thunderstorm activity from April 15 to Oct. 1, 2014.

- National Guard Ground Forces
- Swift Water rescue Teams
- Helicopter resources
- Urban Search and Rescue
- Mountain Rescue Teams
- Search Dogs
- Heavy Equipment
- EPA
- CDPHE
- State Patrol
- CDOT
- COVOAD

Conclusion

The importance of a THIRA is to inform, the goal is to help guide strategic decision making, and it is not to create false threats or strike fear and panic into the community. The saying “Chance favors the Prepared” has never been more salient as a state of mind or attitude for the community leaders and residents of Boulder County. Disasters never leave one singular imprint on the landscape or the community. The primary effects of the flood created secondary and tertiary hazardous conditions. The spring run-off is one example of a secondary hazard caused by the flood and the debris and thunderstorm effects would be examples of tertiary effects. Boulder County and the City of Boulder have assessed the risks, know the hazards and are strongly prepared to respond and minimize the effects of incidents.

The expected future impacts will not be on the scale seen on Sept. 11, 2013 but more likely low to moderate sized events but with a moderate to high frequency and due to proximity to life property and infrastructure a moderate to high consequence potential. The power of action cannot be stressed enough as the means to reduce the frequency, impacts and exposure to life and property.

The assessments are done, the planning is being completed, the capabilities are being developed and there is a final countdown underway. Attached to this countdown is spring run-off and an end state or finality that will measure our preparedness efforts and force us to action. Success is measured on how well administrative challenges can be removed, expedite the permitting processes, and quickly assign contractors to high priority projects before the final countdown is over. The resources needed from local, State and Federal sources is a sound investment with high returns because adequate funding levels will have a dramatic influence on reducing high level risk areas, reduce the hazardous conditions to the local capability of respond and sustain levels of service, and most of all protect lives and ensure the public’s safety, Boulder is prepared, Boulder is doing everything possible and Boulder needs additional support - time is counting down.

Respectfully,

Michael N. Chard
Director, Boulder Office of Emergency Management