SECTION 5: BOX ELDER COUNTY RISK ASSESSMENT & COMMUNITY SECTIONS

History and Background of Natural Hazards in Box Elder County

Flooding

Areas in Box Elder County have experienced significant impacts related to flooding in recent recorded history. Box Elder County has several large rivers and smaller tributaries that are susceptible to flooding. The Bear River is the largest river in the county. Cutler Reservoir lies mostly in Cache County, while just across the county line in Box Elder County, there is a hydroelectric dam called Cutler Dam. The existence of this dam does provide some meaningful flood control for downstream portions of the Bear River in Box Elder County. Other major rivers are the Malad River and Box Elder Creek. A number of small intermittent streams are located in some of the canyons of the Wellsville and Wasatch Mountains. Each of these streams can pose a threat in terms of flooding.

In addition a number of canals are located in the county that under certain conditions may fail or overflow and result in flooding. Also, flooding can also take place concurrently with some landslide events, particularly sediment/mud/debris flows. Flood water is rarely clean and clear, and much of the damage from flooding can be in the form of debris.

Most flooding in Box Elder County is attributed to snow melt rates in surrounding watersheds that are in excess of the capacity of the drainage systems or unusually heavy storm events that temporarily overwhelmed drainage capacity (or a combination of the both). Some limited flooding is the result of rising groundwater levels. In terms of property damage and disruption of community life, Brigham City, along with the Willard/Perry area, has been among the communities in the county most impacted by flooding. The floods of August 1923 in Willard were some of the most destructive in the state's recorded history. A significant portion of Willard was inundated by flood water and associated mud and debris flows. Four dwellings were destroyed and two women died when their homes were demolished (see cover photos).

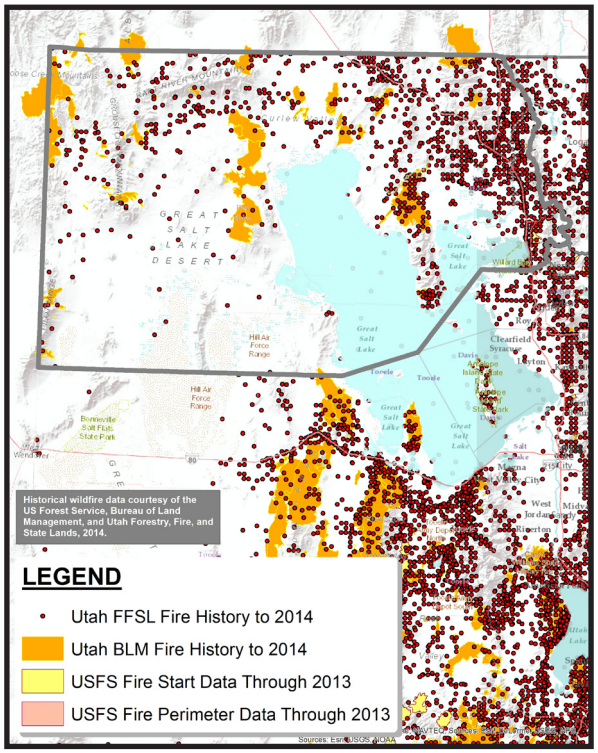
In the mid-1980's large portions of Box Elder County were negatively impacted by the rise in the level of the Great Salt Lake. A significant amount of high value wetlands and agricultural land surrounding the lake were flooded by the rise of the briny water, including the Bear River Bird Refuge. Although their immediate value was reduced by a natural dry cycle that resulted in the lake level dropping, the State of Utah installed large pumps on the lake to moderate the rise of the lake by moving the water to the west desert. These pumps can return to operation if needed.

Wildfires

The vast geographic majority of Box Elder County has minimal threat to life and property from wildfire. However, the most populated areas are at the most risk from wildfire. Much of the development in the county is at the base of the Willard and Wellsville Mountain Ranges. These steep slopes are dry and vulnerable to wildfire, which poses great risk to residents along the benches. Most of western Box Elder County consists of dry land vegetation types which are vulnerable to wildfire. While threats to life and property are not as high in these areas, grazing vegetation loss and wildlife habitat can suffer tremendously.

Major fires in Box Elder County include the "Wildcat", "Fort Ranch", "Thiokol", "Pilot Peak", "Dry Canyon", "Morris Ranch", and "West Hills" fires. In 1992 a large fire burned uncontained for over a week in the mountains above Perry City. There have also been several fires along the east slopes above Brigham City as well. In 2002 there was also a large wildfire in the Promontory area. In August, 2006, there was a wild fire near the Brigham City/Perry border that burned approximately 100 acres. The following graphic illustrates the number, general size, and general location of wildfires in Box Elder County from 1973 to 2008.

Below is a map showing historical wildfire locations in Box Elder County:



Landslides/Steep Slopes

Most of the landslide risk in Box Elder County is in Willard, Honeyville, and Perry. Unincorporated areas on the east foothills north of Brigham City and in south Willard are also in high landslide susceptibility areas. Willard and Honeyville could be substantially at risk if landslide events occurred. Most of the developed areas in these two municipalities are in what the Utah Geological Survey has designated as high landslide susceptibility areas in a 2007 data set. Floods and high water content in soils can also potentially increase damages caused by landslides, and communities should be aware of future potential risks.

Landslide events in Box Elder County have been known to damage homes, roads, and even take lives.

Debris flows associated with the 1923 flooding of Willard City were very destructive and destroyed a number of homes and buildings. Main Street Willard was covered in a thick layer of mud, rocks and debris. The force was strong enough to move large boulders.

In 1949 a five mile stretch of US 89 between South Willard and Utah Hot Springs was covered with mud, rocks and boulders.

In late May 1983 a large landslide occurred on the face of the mountain north of Willard near Facer Creek. Also in 1983-84 Three Mile Canyon near Perry City experienced a mud slide. As a result over $1 Million was spent constructing a detention basin and overflow facilities.

Recent rock falls have also occurred north of Mantua along Highway 89-91, and near Honeyville.

The Perry to south Willard area along the base of the Willard Mountains has had ongoing problems with debris flows, landslides and flash flooding. A number of debris basins have been constructed as well as other debris flow management structures. Portions of the Ogden-Brigham Canal susceptible to debris flow blockage have been placed in culverts to avoid flooding.

Earthquakes

The most populated portions of Box Elder County are located on the Intermountain Seismic Belt and the northern most segment of the Wasatch Fault. Earthquakes are common in Box Elder County, although no major earthquake resulting in significant property damage has occurred since early European settlement. Geologic evidence establishes the possibility of a major earthquake in Box Elder County.

Much of the populated corridor in Box Elder County is located near the Wasatch Fault. According to Hecker (1992), the Wasatch Fault Zone is the longest and most active normal fault in Utah. The Wasatch Fault extends from south of Malad, Idaho to western Sanpete County in Utah, much along the populated Wasatch Front. Ten distinct segments have been identified along the fault.

Based on geologic evidence of the last 6000 years, of all the studied segments of the Wasatch Fault, the Brigham City segment is the most overdue for seismic release. This segment exists along much of the populated areas of the eastern side of the county. Evidence suggests that it has been at least 3,000 years since a significant release has occurred on the Brigham City fault segment.

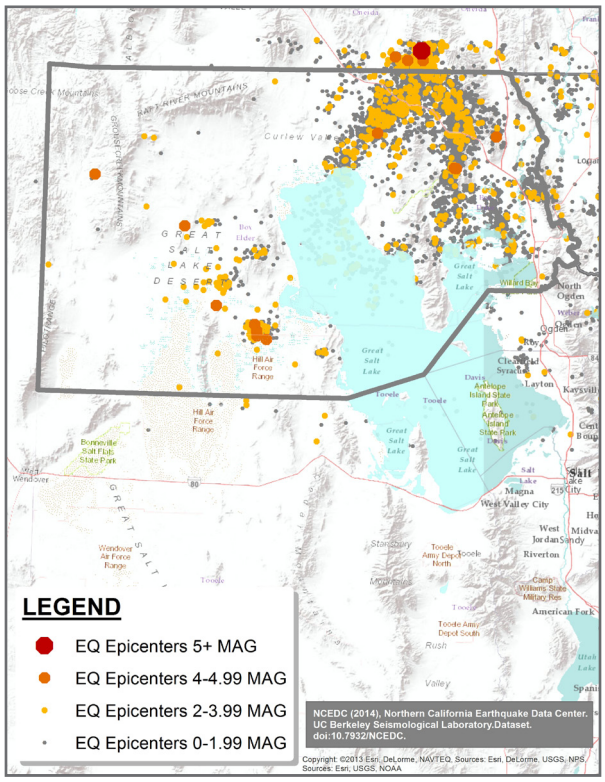
All the other studied segments of the fault indicate faulting in the last 3000 years which suggests these segments have had release of seismic energy (Hecker, 1992).

While a geological fault may not be very wide physically, damage around the fault can be detrimental. This is often referred to as the "damage zone (Susanne Janecke, personal communication, 9/25/08)." This damage zone is now thought to be much larger than recognized previously. While geologists used to recommend a general fault buffer of fifty feet on either side of the fault, they now recognize a much larger damage zone. According to the Utah Geological Survey, up thrown sides of well defined quaternary faults require planning for a 250 foot damage zone; while down thrown sides of well defined faults require planning for a 500 foot damage zone. For those faults not well defined, a general 1,000 foot damage zone should be considered (Richard Giraud, personal communication, 10/6/08; Christopher Duross, personal communication, 10/30/08; Christensen et al., 2003). Because of data inaccuracies in geologic fault data, a standard 1,000 foot damage zone was analyzed for all quaternary faults in the region.

One very important aspect of earthquake damage which is often overlooked is liquefaction. Liquefaction generally occurs when certain soil types when saturated with water can liquefy during an earthquake, moving, tilting, and destroying buildings. Whole foundations can be lifted and moved by the saturated soils. Eastern Box Elder County is largely covered by moderate-high to high liquefaction potential; especially in the lower elevation areas.

The 1934 Hansel Valley Earthquake (6.54 magnitude) is widely regarded as the state's largest earthquake in modern recorded history. Four aftershock earthquakes occurred ranging from 4.8 to 6.1 magnitudes. The epicenter was in a largely unpopulated portion of the county and little or no property damage occurred. This earthquake resulted in surface fault rupture. In 1909 a 6.0 magnitude earthquake also occurred in the Hansel Valley. More recently, an earthquake of 3.9 magnitude occurred near Tremonton on September 1, 2007. This earthquake damaged a historic structure in Tremonton which had to be demolished.

Below is a map of historical earthquake locations in Box Elder County:



Dam Failure

There are 295 active dams located in Box Elder County. Most of these dams are small detention ponds or livestock watering facilities and most pose a minimal threat to human safety or property.

Of the 295 active dams, most are designated as "low hazard" by the State of Utah Division of Water Rights. As defined by state statue, low hazard dams are those dams which, if they fail, would cause minimal threat to human life, and economic losses would be minor or limited from damage sustained.

A total of 8 dams have been designated as "moderate hazard" by the State of Utah in Box Elder County. Moderate Hazard dams which, if they fail, have a low probability of causing loss of human life, but would cause appreciable property damage including damage to public utilities.

The State of Utah has rated 5 dams in Box Elder County as "high hazard" which means that, if they fail, have a high probability of causing loss of human life or extensive economic loss, including damage to critical public utilities.

Dam failure inundation maps and emergency action plans for each of the high risk dams can be found on the Utah Division of Water Right's website at: http://waterrights.utah.gov/cgi-bin/damview.exe?Startup.

High Hazard Dams

Blue Creek Dam

The Blue Creek Dam is located one mile north of the town of Howell and has a hazard rating of high. The inundation area flows southward along blue creek, then just west of the development in Howell before ending at the Great Salt Lake basin.

Mantua Dam

The Mantua reservoir and dam have a high hazard rating. The inundation area covers the entire western side of the dam including significant amounts of the town of Mantua. Within the town, multiple homes and structures are at risk. The inundation continues westward down Box Elder Creek filling the canyon bottom and covering highway 89/91, eventually leading through the center of Brigham City. Once again, significant numbers of people, homes and businesses are within the potential inundation area.

Three Mile Creek (debris and detention basin)

Three Mile Creek detention basin is located about 0.5 miles southwest of the city of Perry. The inundation area flows westward from the dam towards the Great Salt Lake basin. Several structures as well as a section of highway 89/91 lie within the inundation area.

Cutler Dam

Cutler Dam and reservoir lie in extreme western Cache County and about four miles northeast of Fielding in Box Elder County. This facility has a hazard rating of high. The inundation area follows the Bear River flood plain first in southwestern direction and then south past Deweyville, Elwood, Honeyville, Bear River City, and finally Corrine City before ending at the Great Salt Lake. Since the inundation area remains, for the most part, within the flood plain, threats to the population and homes appear to be minimal.

A.V. Watkins Dam

A.V. Watkins Dam, otherwise known as the Willard Bay dam, runs along the southeast corner of the bay. No state data is available. See the following comments regarding safety issues for this dam.

While there are only four dams that are designated as high risk, as noted previously, every dam in the county that had inundation GIS data was analyzed. Potential losses were determined for every community in an inundation area.

No significant dam failures have occurred in Box Elder County. However, A.V. Watkins Dam, on the east side of Willard Bay, did have some leakage occurring in November of 2006. A cement-bentonite wall was placed inside the dam to correct the problem. No damages below the dam were reported, but the repairs cost approximately $17.4 million (http://www.usbr.gov/uc/feature/avwatkins/index.html).

Natural Hazard Profiles

Table 12: Box Elder County Flood Hazard Profile

Frequency	Some flooding occurs nearly every year in Box Elder County
Severity	Moderate
Location	Generally along rivers, streams, ravines, and canals.
Seasonal Pattern	Spring flooding as a result of snowmelt. Mid-late summer cloudburst events.
Duration	A few hours or up to three weeks for snowmelt flooding
Speed of Onset	1-6 hours
Probability of Future Occurrences	High-for delineated flood plains there is a 1% chance of flooding in any given year.

Table 13: Box Elder County Wildfire Hazard Profile

Frequency	Annually to some extent
Severity	Severe
Location	Dispersed throughout the whole county
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-6 hours
Probability of Future Occurrences	Very High (Since 1973, there has been an average of more than two wildfires per year that burned 1,000 acres or more)

Table 14: Box Elder County Landslide/Steep Slopes Hazard Profile

Frequency	Annually to some extent
Severity	Severe
Location	Dispersed throughout the whole county, but mostly in the mountains on the east and northwest ends of the county.
Seasonal Pattern	Generally the worst from early July to mid September (depends on drought conditions)
Duration	A few hours to two weeks
Speed of Onset	1-6 hours
Probability of Future Occurrences	Very High

Table 15: Box Elder County Earthquake Hazard Profile

Frequency	Low magnitude events occur frequently. Larger magnitude events are rare (although not necessarily on geologic time).
Severity	Potentially Catastrophic
Location	Entire County with highest frequency north of the Great Salt Lake. Surface fault ruptures are likely to occur in fault zones and liquefaction would impact most of the populated county.
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-2001 data, there is a 35.9% chance every year of an earthquake of 4.0 magnitude or greater.

Table 16: Box Elder County Dam Failure Hazard Profile

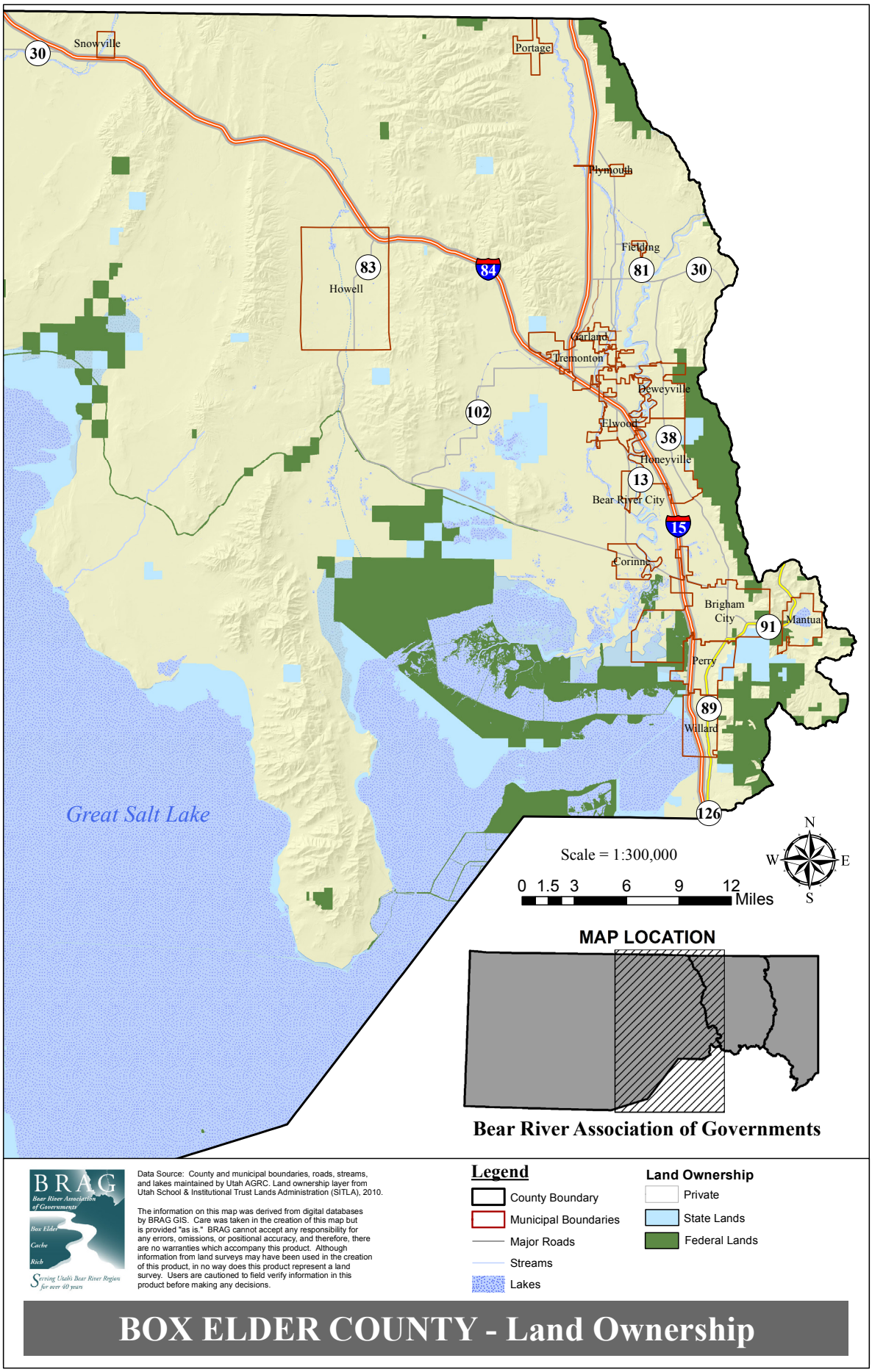
Frequency	Rare
Severity	Potentially Catastrophic
Location	Areas downstream of failed dam.
Seasonal Pattern	Anytime. Highest risk in spring during snowmelt.
Duration	A few hours
Speed of Onset	No warning
Probability of Future Occurrences	Low

Repetitive Loss Properties

There are no repetitive loss properties in Box Elder County (FEMA, 2015).

COUNTY-WIDE NATURAL HAZARD MAPS

(Please see pages 5-43 to 5-51)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Deweyville
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Bear River City
Corinne
Brigham City
Mantua
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Scale = 1:300,000
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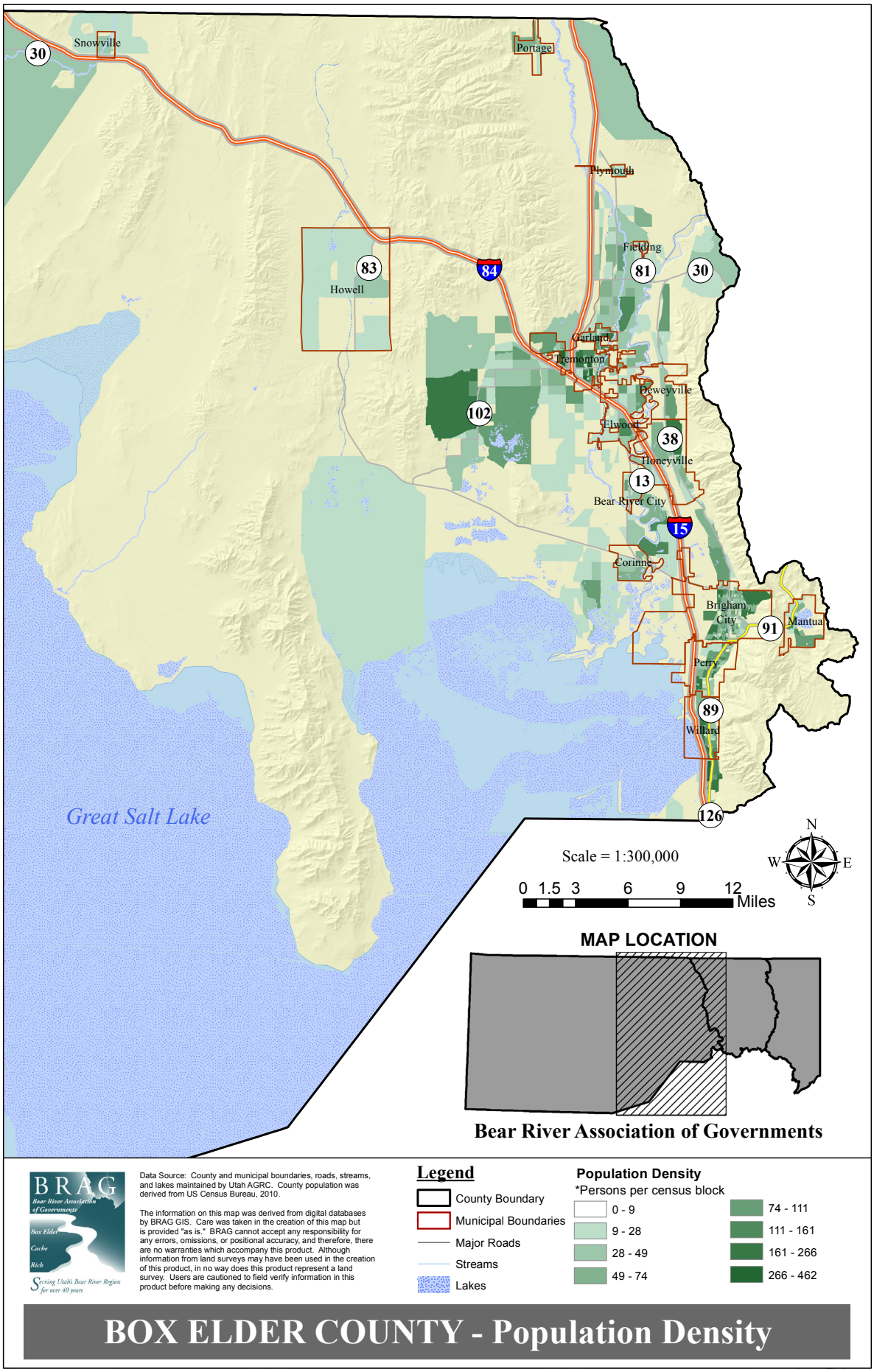
MAP LOCATION
Bear River Association of Governments
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Land ownership layer from Utah School & Institutional Trust Lands Administration (SITLA), 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Land Ownership
Private
State Lands
Federal Lands
BOX ELDER COUNTY - Land Ownership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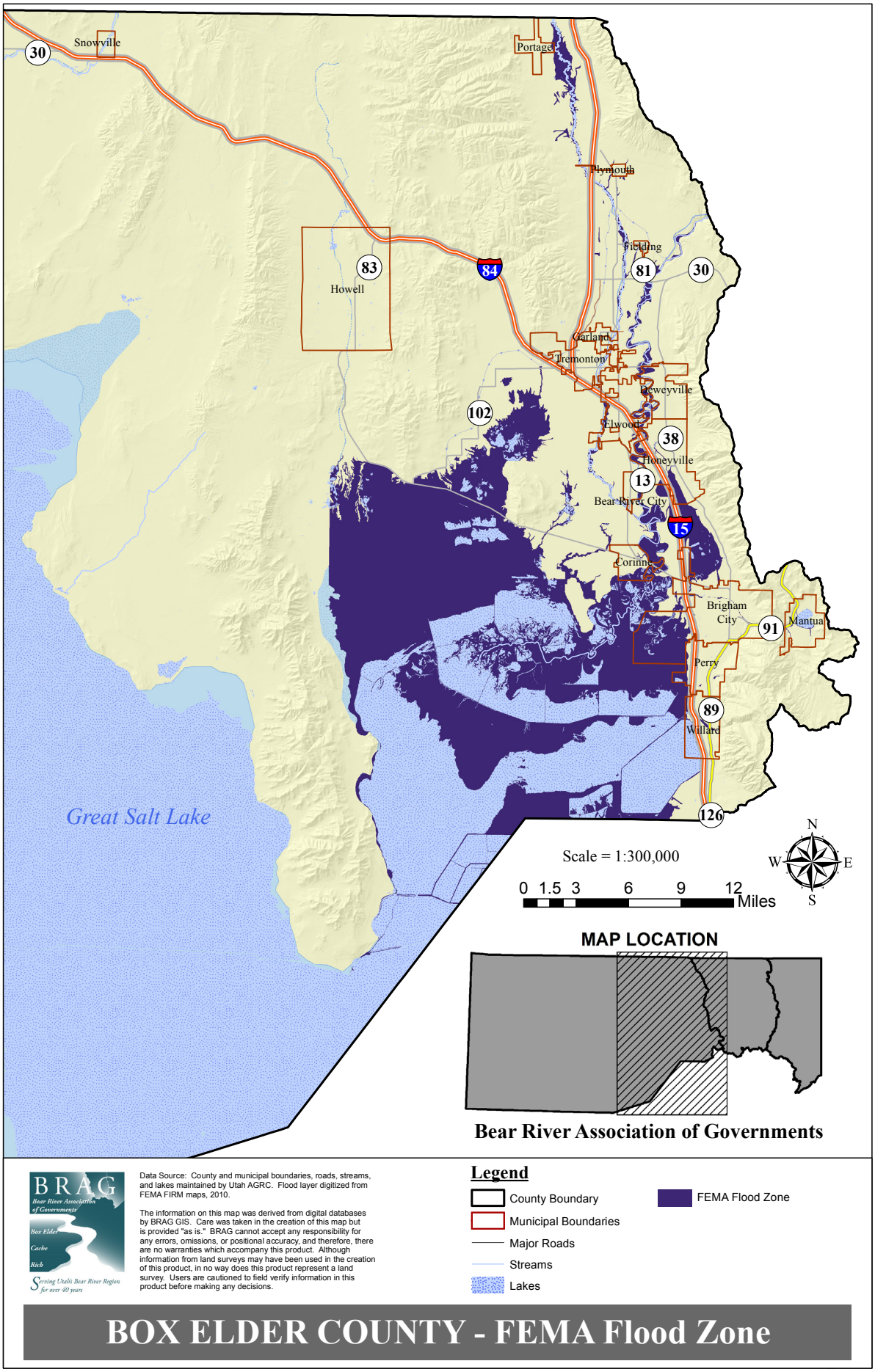
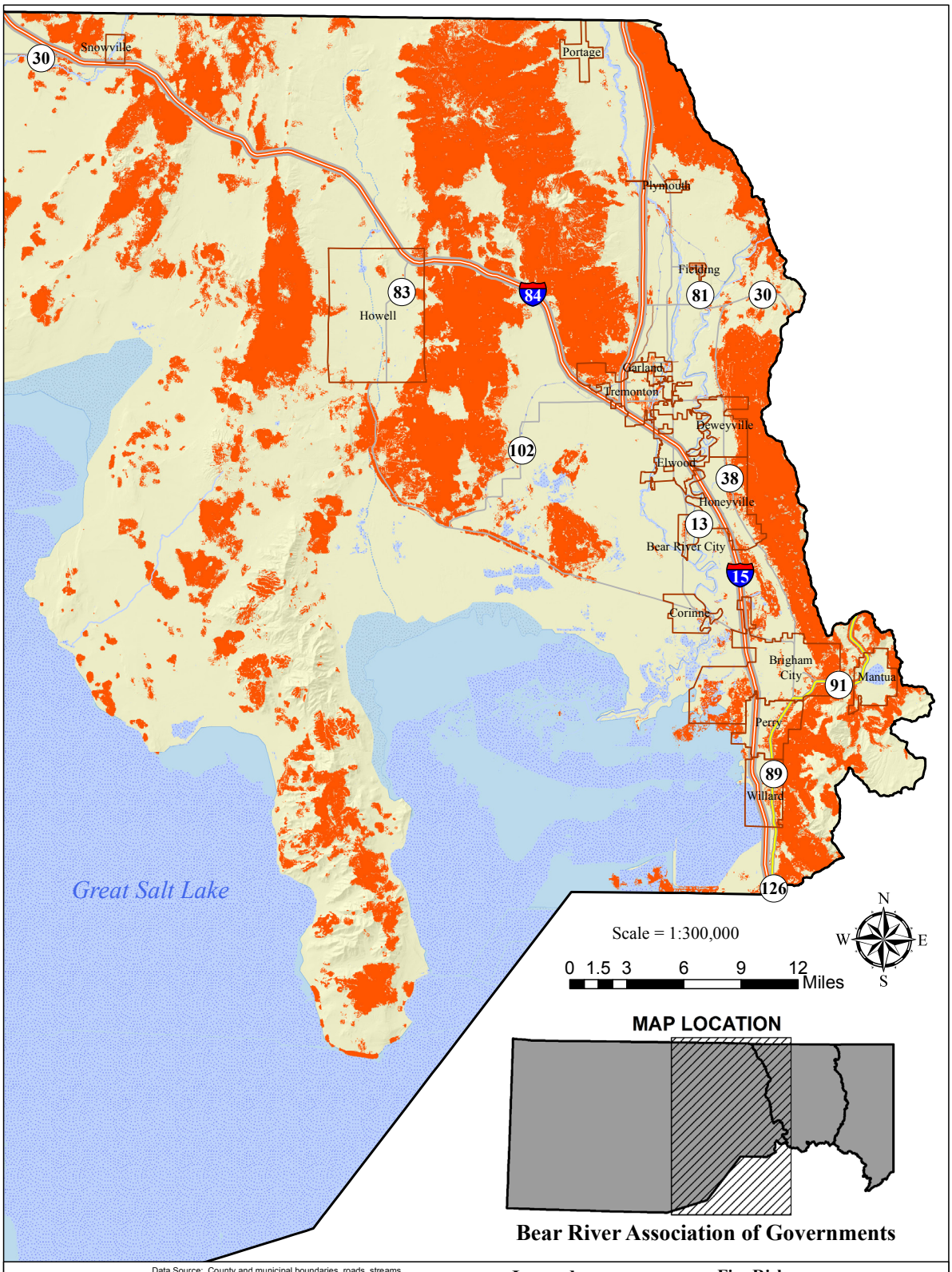
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. County population was derived from US Census Bureau, 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Population Density
*Persons per census block
0 - 9
9 - 28
28 - 49
49 - 74
74 - 111
111 - 161
161 - 266
266 - 462
BOX ELDER COUNTY - Population Density



BOX ELDER COUNTY - FEMA Flood Zone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Scale = 1:300,000
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MAP LOCATION
Bear River Association of Governments
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Fire hazard data from the Oregon Department of Forestry study "West Wide Wildfire Risk Assessment, 2013". Combines moderate to high wildfire risk based on the Fire Risk Index (FRI).
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Fire Risk
Moderate to High
BRAG
Bear River Association of Governments
Box Elder
Cache
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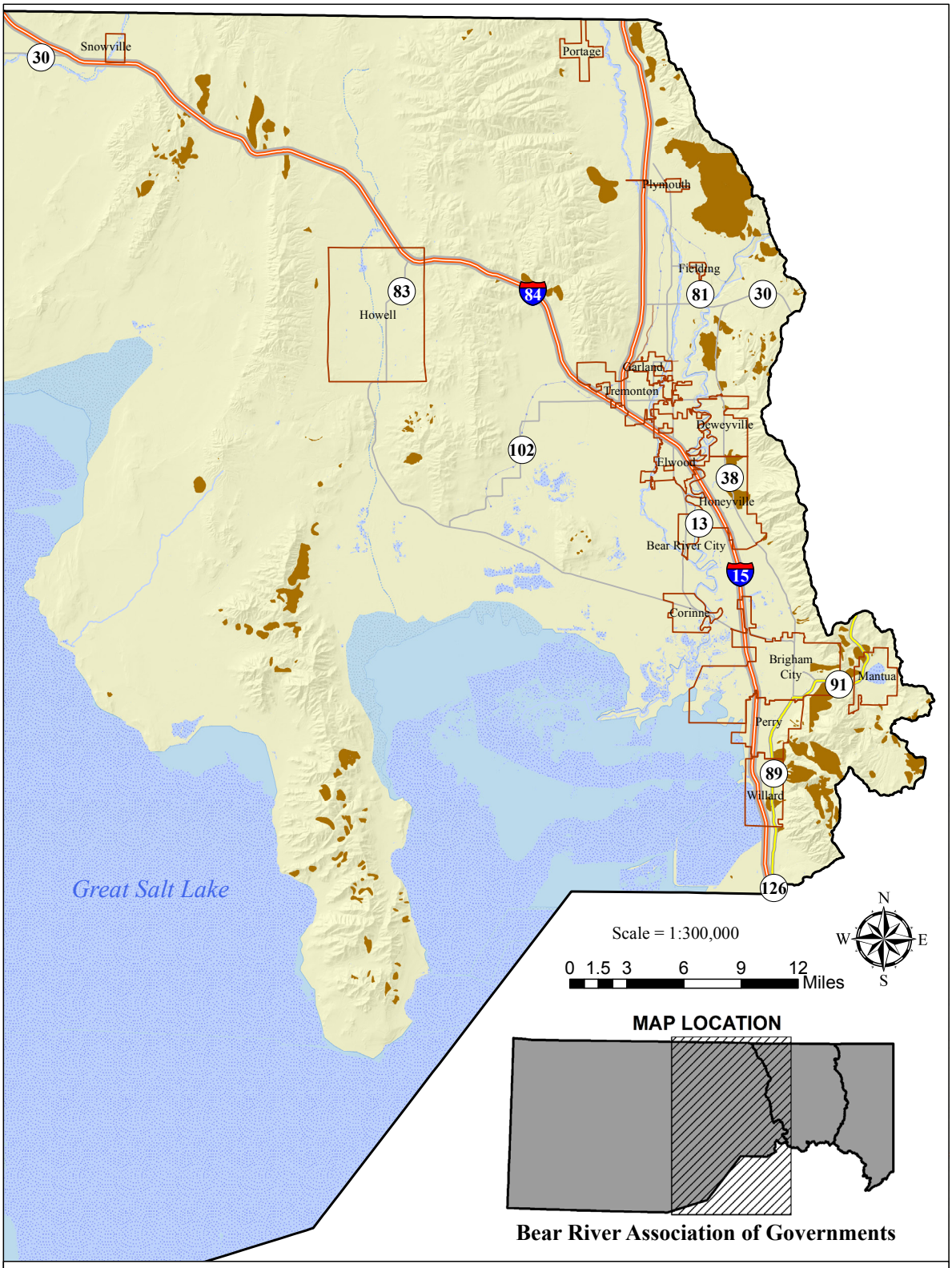
Serving Utah's Bear River Region for over 40 years
BOX ELDER COUNTY - Wildfire Hazard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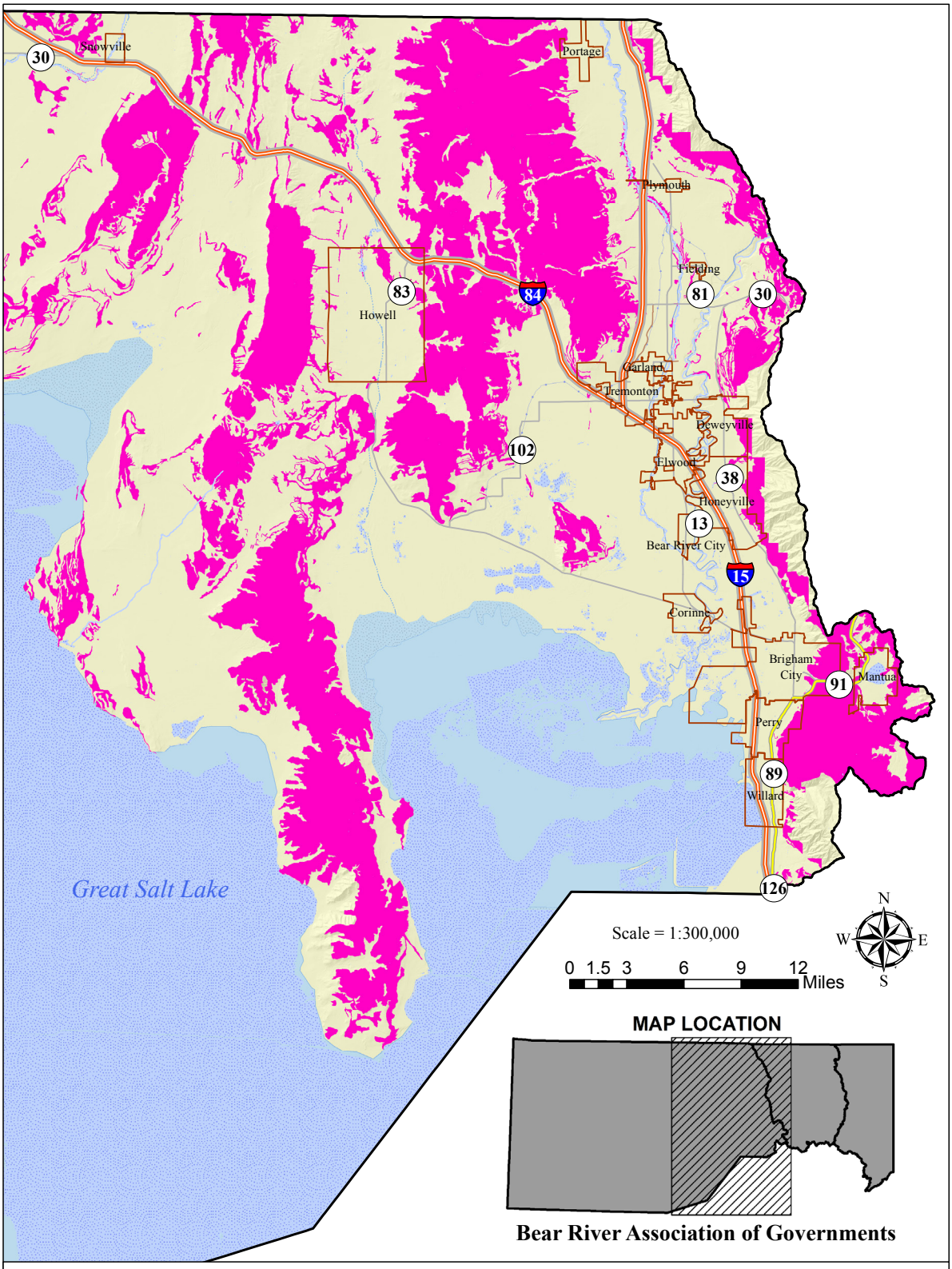
MAP LOCATION
Bear River Association of Governments
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Data obtained from the Utah Geological Survey showing landslide deposits, landslide scarps, and debris-flow travel paths, 2010.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Landslides
Deposits, scarps, and debris-flow travel paths
BOX ELDER COUNTY - Landslides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Great Salt Lake
Scale = 1:300,000
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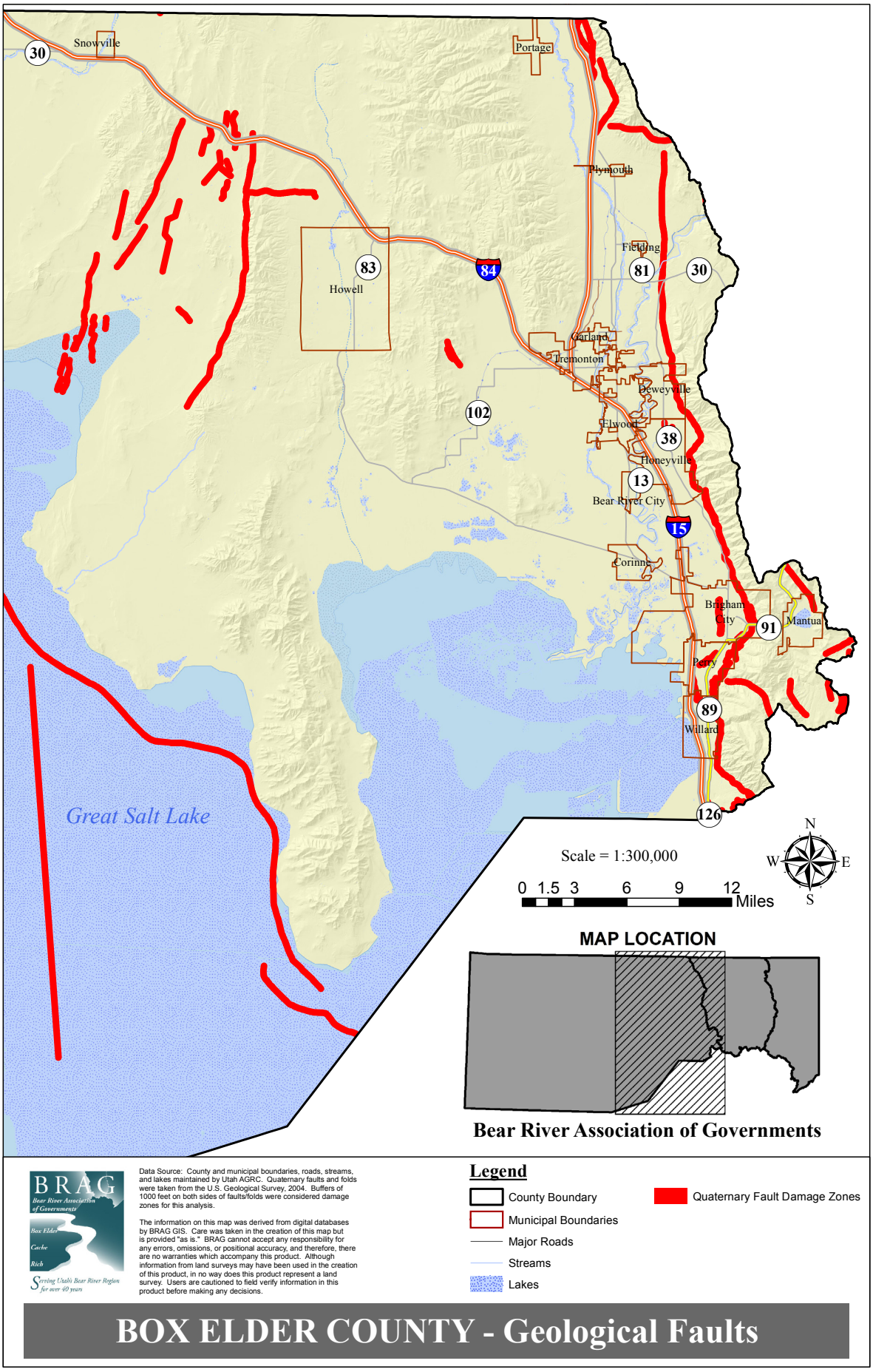
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Steep slopes derived from NRCS SSURGO Soils Database 2013 - 20% slope and higher.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Steep Slopes
20% slope and higher
BOX ELDER COUNTY - Steep Slopes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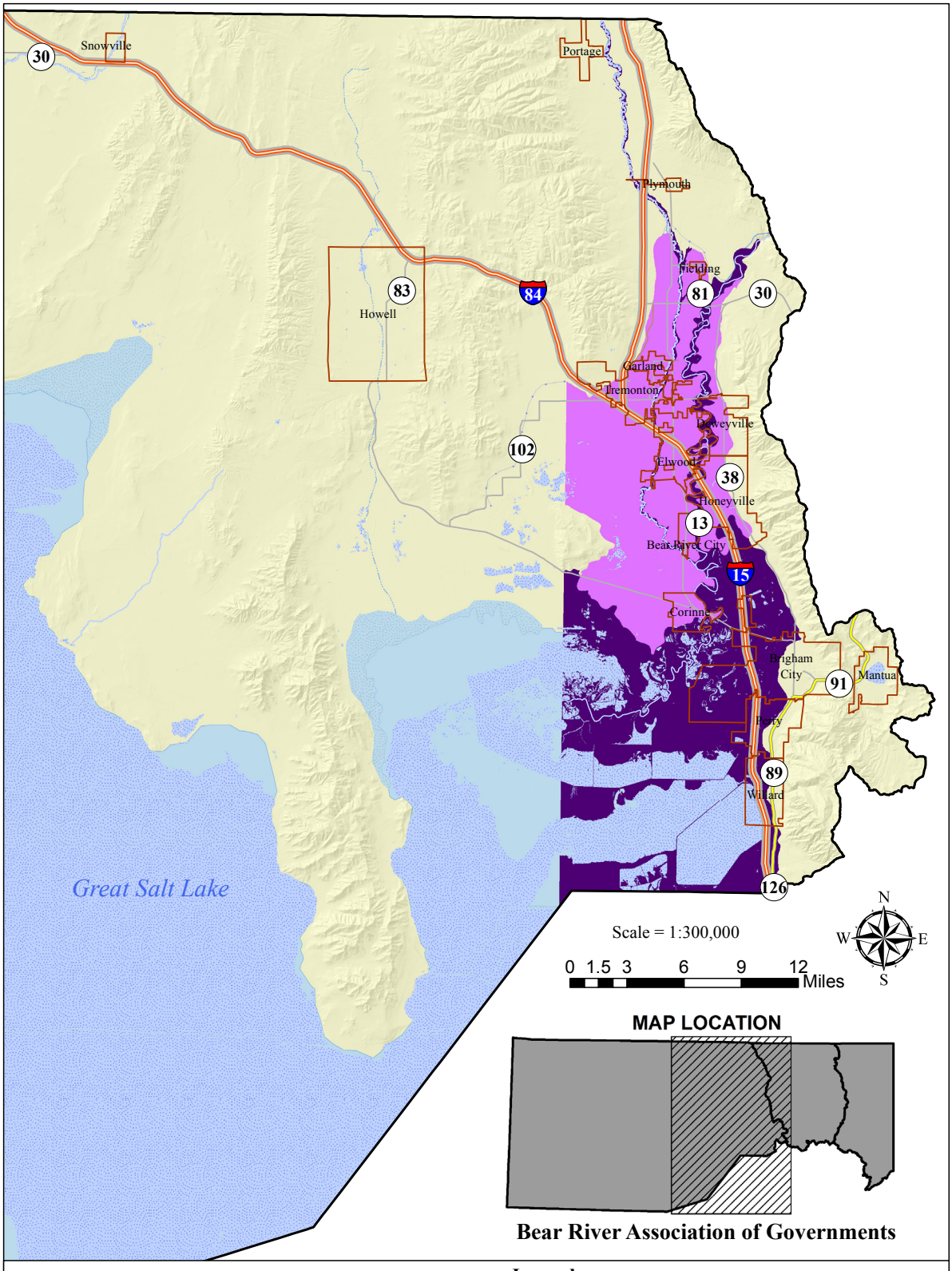
MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Quaternary faults and folds were taken from the U.S. Geological Survey, 2004. Buffers of 1000 feet on both sides of faults/folds were considered damage zones for this analysis.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Quaternary Fault Damage Zones
BOX ELDER COUNTY - Geological Faults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Great Salt Lake
Scale = 1:300,000
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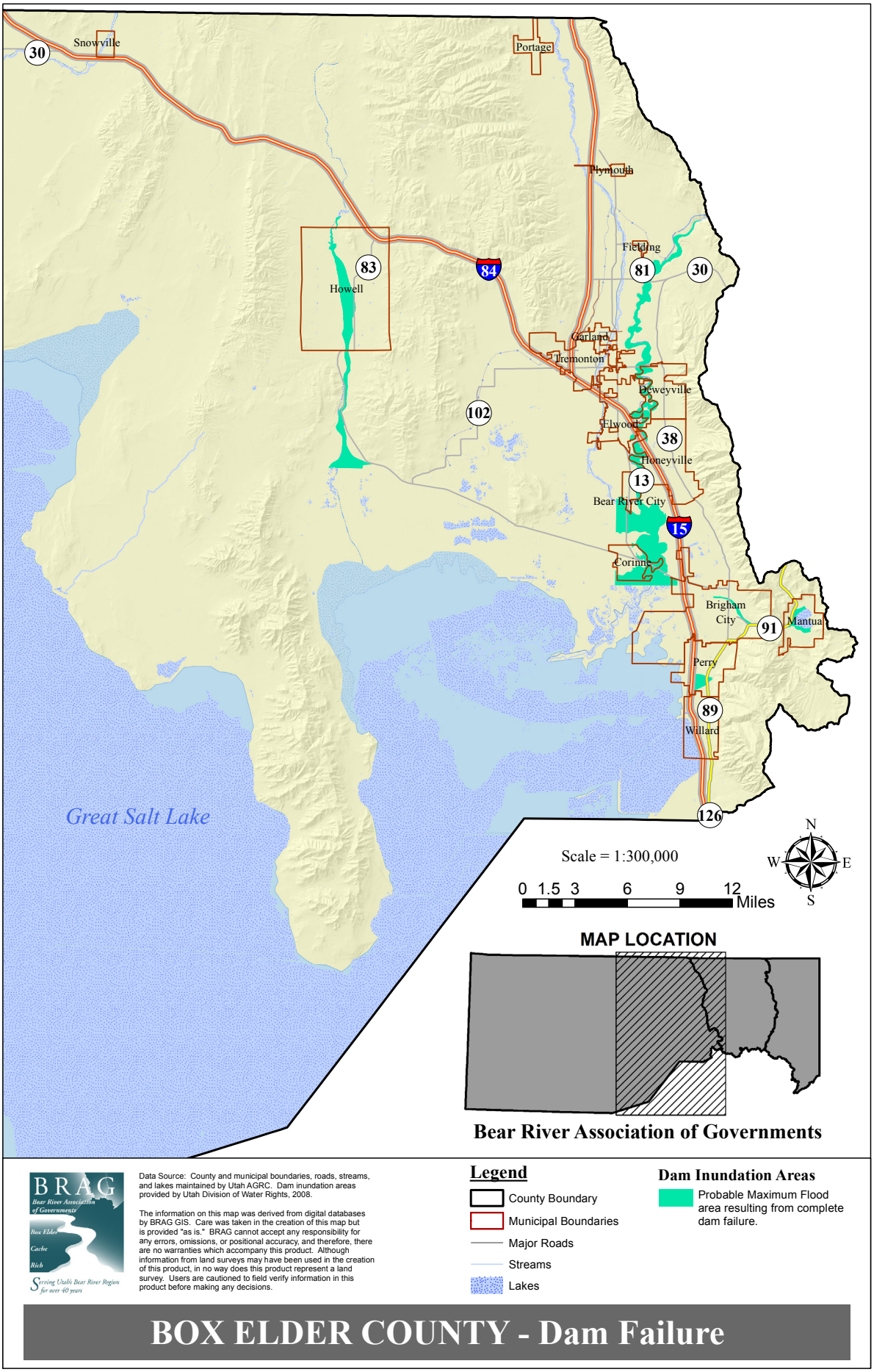
MAP LOCATION
Bear River Association of Governments
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Liquefaction potential was digitized and published by the Utah AGRC, 2001.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Liquefaction Potential
Moderate to High
High
BOX ELDER COUNTY - Liquefaction Potential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Great Salt Lake
Scale = 1:300,000
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MAP LOCATION
Bear River Association of Governments
BRAG
Bear River Association of Governments
Box Elder
Cache
Rich
Serving Utah's Bear River Region for over 40 years
Data Source: County and municipal boundaries, roads, streams, and lakes maintained by Utah AGRC. Dam inundation areas provided by Utah Division of Water Rights, 2008.
The information on this map was derived from digital databases by BRAG GIS. Care was taken in the creation of this map but is provided "as is." BRAG cannot accept any responsibility for any errors, omissions, or positional accuracy, and therefore, there are no warranties which accompany this product. Although information from land surveys may have been used in the creation of this product, in no way does this product represent a land survey. Users are cautioned to field verify information in this product before making any decisions.
Legend
County Boundary
Municipal Boundaries
Major Roads
Streams
Lakes
Dam Inundation Areas
Probable Maximum Flood area resulting from complete dam failure.
BOX ELDER COUNTY - Dam Failure

COMMUNITY SECTIONS: NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

BEAR RIVER

Analysis of hazard risk involving the community of Bear River revealed that there is potential risk resulting from **dam failure, flood, liquefaction, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, liquefaction and wildfire hazards have the greatest potential to impact the community based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Bear River City. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 17: Bear River Potential Loss Figures

Natural Hazards

Dam failure. Bear River's risk of dam failure involves the eastern portion of town that is adjacent to the Bear River and is situated downstream of Cutler Dam. Structures and amenities in these areas could experience damage if Cutler Dam were to fail. Currently, no other areas in Bear River appear to be at risk from dam failure.

Flood. The Bear River and Malad River pose threats for flooding within the community. Areas to the south and east within the jurisdiction have the greatest risk potential, with structures and features adjacent to the Bear and Malad rivers having risk. Bear River participates in NFIP, joining the program in 2010.

Liquefaction. The City of Bear River currently has moderate-high and high potential risk involving liquefaction. Areas of highest risk are located near the Bear and Malad rivers where a higher level of ground saturation may be present. Other areas of moderate-high risk are associated with the community's relatively

Bear River, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	16	5	973,974	2	729,171	2,414,610
Faults	0	0	0	0	0	0
Wildfire	754	241	34,455,401	13	1,303,229	15,694,965
Flood	13	4	1,083,452	2	729,171	2,414,610
Liquefaction	889	284	42,981,405	18	1,627,727	21,731,490
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Bear River, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0.24	126,000	0.13	195,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	2.55	1,338,750	0.82	1,230,000
Flood	0	0	0	0	0	0	0.07	36,750	0.06	90,000
Liquefaction	0	0	0	0	0	0	12.49	6,557,250	2.1	3,150,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Bear River, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 bridge
Faults					
Wildfire					
Flood					1 bridge
Liquefaction		Century School		1 place of worship	1 bridge, 2 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Bear River, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	182.36	142.45	0	0	0
Faults	0	0	0	0	0
Wildfire	47.93	249.6	0	0	0
Flood	142.83	121.49	0	0	0
Liquefaction	664.07	943.97	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Bear River, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	91.77	2.4	2.61	0	0	0
Faults	0	0	0	0	0	0
Wildfire	26.1	0.22	1.37	7.91	0	0
Flood	86.23	0.42	2.38	0	0	0
Liquefaction	102.89	2.4	5.83	11.57	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

low elevation within the surrounding landscape.

Wildfire. Bear River has some areas with moderate-high risk potential to wildfires. Most of these areas appear to be urban forested areas within the City's center. Areas adjacent to Highway 13 appear to be most at risk.

Future Development

No concerns involving potential future development within Bear River City were reported by city representatives.

Hazard Mitigation Strategies

Table 18: Bear River City Mitigation Strategies

BEAR RIVER CITY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Bear River City	Wildfire	Protect current residents and property	Work with county fire marshal to evaluate wildfire risks.	N/A	Low	2017	N/A	Bear River City and Box Elder County	Minimal	County Fire District
Bear River City	Flooding	Protect current residents and property	Review detailed ordinance of development in flood plain	Same	Low	2016	N/A	Bear River City	Minimal	Fema, State Public Safety, Brag
Bear River City	Dam Failure	Protect current residents and property	Coordinate with county emergency response for potential evacuation or bridge damage.	N/A	Medium	2016	N/A	Bear River City and Box Elder County	Minimal	County, City
Bear River City	Landslides	Protect current residents and property	Review ordinance to ensure risk areas are minimized for development.	N/A	Low	2017	N/A	Bear River City	Minimal	Utah Geo Survey, City, BRAG
Bear River City	Earthquake / Liquefaction	Protect current residents and property	Education for Planning commission and council regarding liquefaction, including loss of critical infrastructure.	N/A	Medium	2015	N/A	Bear River City, UGS	Minimal	Utah Geo Survey, BRAG
BEAR RIVER CITY - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Bear River City	Wildfire	Protect future residents and property	Review land use ordinance to ensure identified risk areas are minimized	N/A	Low	2017	N/A	Bear River City	Minimal	City, County, BRAG
Bear River City	Flooding	Protect future residents and property	Ensure proper ordinance for development in flood plain	Same	Medium	2015	N/A	Bear River City, Utah DEM	Minimal	City, FEMA, State Safety, BRAG
Bear River City	Dam Failure	Protect future residents and property	Work with county to set up local emergency response facility, fire station, first responder.	N/A	Medium	2016	FEMA,PDM,CDGB,BRAG	Bear River City	TBD	State Emergency Service, County Brag
Bear River City	Landslides	Protect current residents and property	Review ordinance to ensure risk areas are minimized for development.	N/A	Low	2017	N/A	Bear River City, UGS	Minimal	Utah Geo Survey, City, BRAG
Bear River City	Earthquake Liquefaction	Protect future residents and property	Review general plan to include liquefaction and problem soils.	N/A	Low	2016	State, Local	Bear River City, UGS	Minimal	City, Local, BRAG

BOX ELDER COUNTY (UNINCORPORATED)

Analysis of hazard risk involving the community of the unincorporated portions of Box Elder County revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslides, steep slopes, and wildfire**. These hazards have varying potential to impact life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, liquefaction, floods, and wildfire hazards have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to the unincorporated portions of Box Elder County. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Dam failure. Box Elder County's risk of dam failure involves the eastern portion of the county near incorporated municipalities. Blue Creek Dam located near Howell places a portion of the county directly south of Howell at risk to dam failure. A small segment of Sardine canyon between Mantua and Brigham City is at risk of inundation. Life, property, and various amenities located in these areas could experience damage. Additionally, portions of the county that run adjacent the Bear River below Cutler Dam also are at risk of dam failure, however most inundation areas are located within the current flood plain for the Bear River and thus are less threatening to large portions of the population. Currently, no other areas in the County appear to be at risk from dam failure.

Faults. There are fault damage zones in Box Elder County with potential to affect structures. Areas associated most greatly with fault damage zones are development areas and structures in the unincorporated

Table 19: Box Elder County Potential Loss Tables

Box Elder County, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	457	146	33,674,494	38	66,226,779	45,877,590
Faults	457	146	51,231,780	39	10,076,449	47,084,895
Wildfire	2,989	955	212,421,483	245	262,273,017	295,789,725
Flood	742	237	77,182,222	99	62,117,305	119,523,195
Liquefaction	5,841	1,866	405,039,019	334	329,074,937	403,239,870
Landslide	238	76	15,829,986	37	23,986,882	44,670,285
Slope	1,027	328	79,203,894	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	1.18	1,770,000	5.88	8,232,000	1.23	156,210	33.78	17,734,500	5.2	2,730,000
Faults	4.71	7,065,000	10.6	14,840,000	16.62	2,110,740	92.71	48,672,750	7.12	3,738,000
Wildfire	28.49	42,735,000	20.84	29,176,000	87.84	11,155,680	1335	701,043,000	37.05	19,451,250
Flood	7.71	11,565,000	9.22	12,908,000	12.99	1,649,730	176.9	92,851,500	80.69	42,362,250
Liquefaction	68.55	102,825,000	49.21	68,894,000	83.85	10,648,950	745.9	391,613,250	181.4	95,214,000
Landslide	2.42	3,630,000	6.52	9,128,000	10.38	1,318,260	197.4	103,614,000	4.89	2,567,250
Slope	0	0	14.26	19,964,000	31.42	3,990,340	951.9	499,737,000	7.95	4,173,750
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					7 bridges, 3 dams
Faults					3 bridges, 1 broadband anchor, 5 dams
Wildfire					
Flood					25 bridges, 18 dams
Liquefaction		1 airport, Box Elder Landfill		4 places of worship	90 bridges, 3 broadband anchors, 38 dams
Landslide					5 dams
Slope				1 place of worship	2 bridges, 41 dams
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	8,379.93	7,116.64	566.98	0.00	2.00
Faults	6,317.64	9,776.15	15,843.21	2.00	1.00
Wildfire	28,594.41	140,946.15	312,117.40	3.00	5.00
Flood	30,008.77	8,409.24	7,422.51	1.00	2.00
Liquefaction	76,714.07	42,413.92	167.27	12.00	7.00
Landslide	6,477.99	5,755.49	29,257.88	2.00	1.00
Slope	17,764.71	0.00	303,759.79	1.00	1.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.
[Figures also include Hansel Valley special flood hazard area potential losses]

Box Elder County, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	4,227.95	352.48	99.50	0.00	0.91	0.00
Faults	13,617.25	21,911.36	178.80	0.00	18.91	1.00
Wildfire	10,521.70	510.76	2,752.93	0.00	42.73	2.00
Flood	330,539.12	159,281.61	1,242.14	0.00	0.55	1.00
Liquefaction	123,285.79	72,075.48	713.61	0.00	0.00	0.00
Landslide	263.14	24.87	357.28	0.00	15.25	3.00
Slope	243.80	171.59	2,122.75	0.00	58.48	2.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.
[Figures also include Hansel Valley special flood hazard area potential losses]

areas along the eastern portion of the county. These areas overlap portions of the Brigham City Segment of the Wasatch Fault and could impact a variety of residential and commercial units on the areas east of Portage stretching south to Willard.

Flood. Substantial portions of Box Elder County are at risk to flooding, however risk to flooding impacts is lessened due to large portions of the flood plain existing in the uninhabited areas bordering Great Salt Lake. Structures near the Bear River Bay of the Great Salt Lake are at risk. Areas of greatest concern lie within the FEMA flood plains of the Bear and Malad Rivers in the eastern portion of the county. In particular, a large area stretching from Bear River City and Honeyville south to Brigham City and Corrine has potential to flood. Intermittent streams and drainages in the county also pose risk to structures in the region. Another area of concern is that of Hansel Valley where there exists a special flood hazard area.

Liquefaction. Areas of Box Elder County's unincorporated lands have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to liquefaction exist in the lower elevation areas on the eastern side of the county. Areas of moderate-high liquefaction risk from areas just north and west of Fielding south to areas south and west of Corrine. Some area of high risk exist within these areas, especially areas adjacent to the Bear and Malad Rivers. Other areas of high risk include areas and structures situated between Honeyville, Bear River City, Corrine, and Brigham City, as well as portions of the Bear River Bay as it enters into the Great Salt Lake.

Landslides. Isolated pockets of Box Elder County's unincorporated areas could suffer potential losses to landslides. Populations, structures, and amenities that are most likely to be impacted include eastern portions of the county in proximity to the Wellsville Mountains, other portions of the Wasatch Mountain Range, and other mountainous areas throughout the county. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Steep Slopes. Box Elder County has risk associated with steep slopes within its unincorporated areas. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wellsville and Wasatch Mountain Ranges, as well as other ranges found to the west. Areas bordering streams and rivers also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Wildfire. Box Elder County is susceptible to moderate-high risk of wildfire throughout large portions of its unincorporated areas. Moderate-high risk is most closely associated with development and amenities adjacent to mountainous areas, including portions of the Wasatch Mountains, the Wellsville Mountains, and other ranges in the region. Additionally, some areas at lower elevations are also at risk due to their proximity to adjacent jurisdictions and their urban forests or the presence of grassy and shrubby vegetation types. Wildfires have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

Future development is anticipated along portions of the Bear River. This development could face moderate to high risk involving flooding, dam failure, liquefaction, and wildfire. Developments in areas that overlap with hazards increase exposure to in terms of human life, property, infrastructure, and environmental, recreational and agricultural amenities.

Hazard Mitigation Strategies

Table 20: Box Elder County Mitigation Strategies

BOX ELDER COUNTY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Box Elder County	Dam Failure	Protect current residents and property	Warning system needed for Boy Scout camp below Cutler Dam	N/A	Medium	2016	PacifiCorp	Box Elder County, Bureau of Reclamation, Utah Dam Safety	N/A	Private
Box Elder County	Earthquake	Protect current residents and property	Retrofit the County Court House	N/A	Medium	2017	Mitigation grant	Box Elder County	$1.5 Million	N/A
Box Elder County	Flood	Protect current residents and property	Need to reconcile with recently adopted flood plain maps	N/A	Medium	2016	N/A	Box Elder County, Utah DEM	Minimal	Planning and Zoning
Box Elder County	Landslide	Protect current residents and property	Identify landslide areas and educate the property owners.	N/A	Medium	2017	N/A	Box Elder County, UGS	Minimal	Planning and Zoning
BOX ELDER COUNTY- COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Box Elder County	Dam Failure	Protect future residents and property	Make sure new building permit holders are notified of current procedure, update city watch notification system (pending)	N/A	Medium	2016	None	Box Elder County, Bureau of Reclamation, Utah Dam Safety	Minimal	Planning and Zoning
Box Elder County	Earthquake	Protect future residents and property	Identify hazardous areas and notify	N/A	Medium	2016	N/A	Box Elder County	Minimal	Planning and Zoning
Box Elder County	Flood	Protect future residents and property	Need to reconcile with recently adopted flood plain maps	N/A	Medium	2016	N/A	Box Elder County, Utah DEM	Minimal	Planning and Zoning
Box Elder County	Landslide	Protect future residents and property	Prevent building in landslide areas through planning commission	N/A	Medium	2017	N/A	Box Elder County, UGS	Minimal	Planning and Zoning

BRIGHAM CITY

Analysis of hazard risk involving the community of Brigham City revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslides, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction and fault damage have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Brigham City. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Dam failure. Brigham City has risk to dam failure involving Mantua Reservoir. Areas at risk include the mouth of Sardine Canyon and along Box Elder Creek. Life, structures and amenities in these areas could be effected in the case of a dam failure event.

Faults. Brigham City has potentially the greatest risk of fault damage in Box Elder County due to its large number of population located within the fault damage zone. The eastern portions of the city, especially areas of the foothills and bench, lie along portions of the Northern Wasatch Fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer catastrophic damage in the event of a large earthquake.

Table 21: Brigham City Potential Loss Figures

Brigham City, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	873	279	45,421,393	14	2,714,950	16,902,270
Faults	5,296	1,692	241,231,151	50	22,317,078	60,365,250
Wildfire	776	248	54,575,507	106	100,830,048	127,974,330
Flood	288	92	14,770,407	11	17,457,674	13,280,355
Liquefaction	1,750	559	107,591,100	138	105,642,781	166,608,090
Landslide	222	71	16,199,172	1	254,800	1,207,305
Slope	210	67	16,419,123	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Brigham City, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0.87	1,305,000	0.08	112,000	0.57	72,390	11.69	6,137,250	8.34	12,510,000
Faults	7.04	10,560,000	5.78	8,092,000	2.06	261,620	58.9	30,922,500	5.27	7,905,000
Wildfire	5.31	7,965,000	3.29	4,606,000	4.41	560,070	28.28	14,847,000	11.6	17,400,000
Flood	0.08	120,000	0.39	546,000	4.9	622,300	13.32	6,993,000	6.06	9,090,000
Liquefaction	22.24	33,360,000	5.82	8,148,000	14.24	1,808,480	263.3	138,237,750	24.32	36,480,000
Landslide	0	0	0.77	1,078,000	0	0	7.35	3,858,750	1.28	1,920,000
Slope	0	0	2.86	4,004,000	0.81	102,870	21.05	11,051,250	4.4	6,600,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Brigham City, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure				1 place of worship	1 bridge, 1 dam
Faults	Brigham City Ambulance, Brigham City Emergency Services	Triumph Center for Youth, Facility, Box Elder High, Young Intermediate school	7 health care facilities	6 places of worship	1 bridge, 1 dam, 11 broadband anchors
Wildfire					
Flood	Fish and Wildlife Service Office of Law Enforcement				4 bridges, 1 broadband anchor, 1 dam
Liquefaction	5 law enforcement offices, 1 EMS station, 1 Fire Station, 1 correctional facility	18 schools, 1 airport, 7 public facilities	20 healthcare facilities	22 places of worship	14 bridges, 53 broadband anchors, 6 dams
Landslide					
Slope					2 bridges, 1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Brigham City, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Acres	# of Miles
Dam Failure	79.11	246.85	0.00	0.00	0.00
Faults	80.12	771.01	0.00	1.00	0.00
Wildfire	288.06	381.62	0.00	0.00	0.00
Flood	438.39	255.29	0.00	0.00	0.00
Liquefaction	3,539.76	2,062.91	0.00	0.00	0.00
Landslide	0.00	1.56	0.00	0.00	0.00
Slope	0.00	1.66	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Brigham City, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	6.42	3.62	6.12	16.77	0.30	2.00
Faults	6.72	4.65	5.21	54.95	5.41	3.00
Wildfire	2,976.77	185.71	29.52	52.44	8.52	2.00
Flood	6,258.58	450.97	42.86	16.78	0.06	2.00
Liquefaction	7,165.79	489.91	4.87	0.00	0.00	0.00
Landslide	0.00	0.00	2.62	3.80	0.00	0.00
Slope	0.40	0.71	9.24	0.00	10.07	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Flood. Portions of Brigham City are at risk to flooding. Areas most susceptible to flooding are in areas of the city to the west of Interstate 15. These areas are influenced by the Bear River as it enters the Bear River Bay of the Great Salt Lake. Other areas of concerns with the city include areas adjacent to Box Elder Creek, as well as structures in proximity to the portion of the Ogden-Brigham (Pineview) Canal and the Perry Canal. Intermittent streams and drainages in the city also pose risk to structures within jurisdictional boundaries. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Following fault damage, liquefaction poses the greatest risk to human life and property in Brigham City. Areas of Brigham City have high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to liquefaction exist in the lower elevation areas on the eastern side of the city. Areas of high risk exist approximately 2 miles east of Interstate 15 and west of the I-15. Liquefaction occurring in these areas poses a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Landslides. Isolated portions of Brigham City could suffer potential losses to landslides. Populations, structures, and amenities that are most likely to be impacted include eastern portions of the county in proximity to the Wellsville Mountains, other portions of the Wasatch Mountain Range, and other mountainous areas throughout the county. Landslides have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Steep Slopes. Brigham City has risk associated with steep slopes within its jurisdictional boundaries. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Over 200 people and 67 structures are estimated to be at risk from steep slopes.

Wildfire. Brigham City is susceptible to moderate-high risk of wildfire in portions of the city. Moderate-high risk is most closely associated with development and amenities adjacent to mountainous areas, including portions of the Wasatch Mountains, the Wellsville Mountains, and other ranges in the region. Additionally, some areas at lower elevations are also at risk due to their proximity to urban forests, such as the city center, or the areas of grassy and shrubby vegetation types, such as west of I-15 and the northwest portion of the jurisdiction that borders I-15. Wildfires have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

Future development is anticipated in areas of the valley floor, as well as in areas of higher elevation that border more mountainous areas of the Wasatch and Wellsville mountain ranges. Higher elevation developments could face moderate to high risk wildfire as it is considered to be in the wildland-urban interface zone of wildfire risk. Future development in the valley floors could be impacted by liquefaction in the case of an earthquake. Additionally, if such development occurs in the far western portion of the jurisdiction, it could be at risk to flood damage. Developments in areas that overlap with hazards increase exposure to in terms of human life, property, infrastructure, and environmental, recreational and agricultural amenities.

Hazard Mitigation Strategies

Table 22: Brigham City Mitigation Strategies

BRIGHAM CITY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Brigham City	Earthquake	Protect current residents and property	Seismic upgrade of Brigham City Chamber of Commerce Building	N/A	High	2017	Brigham City, FEMA Grants, Historical Preservation	Brigham City and Chamber of Commerce	$350,000	UGS, County
Brigham City	Earthquake	Protect current residents and property	Complete seismic upgrade to Brigham City Hall	N/A	High	2018	Brigham City, Grants	Brigham City	$400,000	UGS, County
Brigham City	Dam Failure	Protect current residents and property	Work with local, state, and county governments to determine risk and potential response tactics to prevent loss and damage.	N/A	Medium	2017	Brigham City	Brigham City and Bureau of Reclamation/State Dam Safety	Minimal	Utah DEM, FEMA, BRAG
Brigham City	Landslide	Protect current residents and property	Determine areas of risk and educate officials and the public on risk areas, especially related to water sources and power failure. Also could affect electrical power generatior	N/A	Medium	2017	Brigham City	Brigham City	Minimal	Utah DEM, UGS, USGS
Brigham City	Slope	Protect current residents and property	Determine slope percentages representing greatest risk to residents and property.	N/A	Medium	2017	Brigham City, UGS, USGS	Brigham City, UGS	Minimal	Utah DEM, UGS, USGS
Brigham City	Wildfire	Protect current residents and property	Work with Utah FFSL on exploring potential WUI and/or CWPP plan for eastern benches.	N/A	Medium	2018	Brigham City, Utah FFSL	Brigham City, Utah FFSL	Minimal	Utah FFSL, County
Brigham City	Flood	Protect current residents and property	Work with state agencies and BRAG to review current flood hazard areas and update. Replace culverts to allow more water storage in Mantua Reservoir. Work with property owners and city staff to keep Box Elder channel free of debris.	Work with state floodplain manager to make sure city is compliant with NFIP and make changes as necessary.	Medium	2017	BRAG	Brigham City, BRAG	Minimal	BRAG, FEMA
Brigham City	Anything causing Power Failure	Protect current residents and property	Generator backup at the City Hall/ EOC	N/A	High	2016	Brigham City, Grants	Brigham City	$200,000	State DEM, FEMA, BRAG
Brigham City	Anything causing Power Failure	Protect current residents and property	Generator Backup of Varous Major Culinary Water Wells	N/A	High	2016	Brigham City, FEMA Grants	Brigham City	$400,000	State DEM, FEMA, BRAG

BRIGHAM CITY - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Brigham City	Earthquake	Protect future residents and property	Seismic upgrade of Brigham City Chamber of Commerce Building	N/A	High	2017	Brigham City, FEMA Grants, Historical Preservation	Brigham City and Chamber of Commerce	$350,000	UGS, County
Brigham City	Earthquake	Protect future residents and property	Complete seismic upgrade to Brigham City Hall	N/A	High	2018	Brigham City, Grants	Brigham City	$400,000	UGS, County
Brigham City	Dam Failure	Protect future residents and property	Educate local officials and the public on potential risks from dam failure.	N/A	Medium	2017	Brigham City	Brigham City and Bureau of Reclamation/State Dam Safety	Minimal	Utah DEM, FEMA, BRAG
Brigham City	Landslide	Protect future residents and property	Determine areas of risk and educate officials and the public on risk areas, especially related to water sources and power failure. Also could affect electrical power generatior	N/A	Medium	2017	Brigham City	Brigham City, UGS	Minimal	Utah DEM, UGS, USGS
Brigham City	Slope	Protect future residents and property	Review current ordinances and mapping to determine ways to better protect future residences and property	N/A	Medium	2017	Brigham City, UGS, USGS	Brigham City	Minimal	Utah DEM, UGS, USGS
Brigham City	Wildfire	Protect future residents and property	Review current ordinances and mapping to determine ways to better protect future residences and property	N/A	Medium	2018	Brigham City, Utah FFSL	Brigham City	Minimal	Utah FFSL, County
Brigham City	Flood	Protect future residents and property	Work with FEMA, State DEM, and others to explore updating the floodplain ordinance to better protect future structures and property. Protect flood channels from future growth to mitigate damage to residents and property.	Work with state floodplain manager to make sure city is compliant with NFIP and make changes as necessary.	Medium	2017	BRAG	Brigham City, BRAG, Utah DEM	Minimal	BRAG, FEMA
Brigham City	Anything causing Power Failure	Protect future residents and property	Generator backup at the City Hall/ EOC	N/A	High	2016	Brigham City, Grants	Brigham City	$200,000	State DEM, FEMA, BRAG
Brigham City	Anything causing Power Failure	Protect future residents and property	Generator Backup of Varouis Major Culinary Water Wells	N/A	High	2016	Brigham City, FEMA Grants	Brigham City	$400,000	State DEM, FEMA, BRAG

CORRINE

Analysis of hazard risk involving the community of Corrine revealed that there is potential risk resulting from **dam failure, flood, liquefaction, and wildfire**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as dam failure, and wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts floods appear to have less potential for impacts. Other natural hazard types not mentioned were found to have no potential impacts to Corrine. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 23: Corinne Potential Loss Figures

Natural Hazards

Dam failure. Corrine has risk to dam failure involving Cutler Reservoir and would be heavily impacted in such an event. Areas most at risk include portions of the eastern and southern parts of the community, as these areas are in close proximity to the Bear River. Substantial risk to human life, structures and amenities in these areas could be effected in the case of a dam failure event.

Flood. Portions of Corrine City are at risk to flooding. Corrine participates in NFIP. Areas most susceptible to flooding are southern portion of the community. These areas are influenced by the Bear River as it enters the Bear River Bay of the Great Salt Lake. There is also some potential flood hazard in the Mill Run areas to the north. Portions of the Bear River flood plain also border most the city except its western

Corrine, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	326	104	1,838,200	12	13,272,120	14,487,660
Faults	0	0	0	0	0	0
Wildfire	294	94	12,287,864	11	1,319,900	13,280,355
Flood	81	26	1,127,852	10	3,174,986	12,073,050
Liquefaction	754	241	31,594,000	47	51,185,874	56,743,335
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Corrine, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0.82	1,230,000	0	0	0	0	5.45	2,861,250	0.09	135,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.89	1,335,000	0	0	0	0	1.02	535,500	0	0
Flood	0.03	45,000	0	0	0	0	2.16	1,134,000	0	0
Liquefaction	2.9	4,350,000	0	0	0	0	18.3	9,607,500	1.24	1,860,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.

[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).

[3] Based on estimates from Logan Light and Power, 2015.

[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.

[5] Based recent Cache County and regional project cost estimates, 2015.

Corrine, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 dam
Faults					
Wildfire					
Flood					1 dam
Liquefaction	Corrine Fire Department	Corinne Early Learning Center, 1 public facility		1 place of worship	3 broadband anchors, 2 dams
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Corrine, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	697.64	52.13	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	43.65	4.91	0.00	0.00	0.00
Flood	535.64	92.92	0.00	0.00	0.00
Liquefaction	1,820.66	169.32	0.00	0.00	0.00
Landslide	0.00	0.00	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Corrine, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	481.89	65.68	7.73	0	0	0
Faults	0	0	0	0	0	0
Wildfire	19.6	6.02	0.12	0	0	0
Flood	470.77	65.09	7.25	0	0	0
Liquefaction	500.04	65.68	10.69	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

edge. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Corrine City have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the western edge of the jurisdiction that border the Bear River, and in areas along the south portion of the jurisdiction. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to Corrine with nearly 750 people at risk and nearly 300 structures.

Wildfire. Corrine is susceptible to moderate-high risk of wildfire in small portions of the city. Moderate-high risk is most closely associated with development and amenities near the Bear River in areas of grassy and shrubby vegetation types. Wildfires have the potential to impact over 300 people in the City, as well as over 100 structures.

Future Development

No concerns involving potential future development within Corrine were reported by city representatives.

Hazard Mitigation Strategies

Table 24: Corinne Mitigation Strategies

**Corinne did not provide mitigation strategies for this plan update.*

DEWEYVILLE

Analysis of hazard risk involving the community of Deweyville revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from dam failures, faults, floods, landslides, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Deweyville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 25: Deweyville Potential Loss Figures

Deweyville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	3	1	436,825	3	726,520	3,621,915
Faults	9	3	1,247,574	0	0	0
Wildfire	203	65	9,680,432	5	674,945	6,036,525
Flood	3	1	436,825	3	726,520	3,621,915
Liquefaction	391	125	20,259,886	14	1,325,320	16,902,270
Landslide	59	19	3,011,439	3	166,850	3,621,915
Slope	63	20	3,755,313	1	35,955	1,207,305
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Natural Hazards

Dam failure. Deweyville's risk of dam failure involves the western portions of the jurisdiction that border the Bear River. If Cutler Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Currently, there appears to be little development in this area, so widespread impacts appear limited.

Faults. Deweyville has risk of fault damage in along a portion the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer damage in the event of a large earthquake, however, widespread damage from faulting is not likely due to the lower amount of development in this portion of the jurisdiction.

Flood. Portions of Deweyville are at risk to flooding. Deweyville does not participate in NFIP,

Deweyville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0.14	73,500	0	0
Faults	0	0	0	0	2.85	361,950	4.25	2,231,250	0.15	225,000
Wildfire	0.07	105,000	0	0	4.26	541,020	7.15	3,753,750	1.09	1,635,000
Flood	0	0	0	0	0	0	0.07	36,750	0	0
Liquefaction	4.06	6,090,000	0	0	9.25	1,174,750	21.89	11,492,250	3.19	4,785,000
Landslide	0	0	0	0	0	0	1.13	593,250	0.13	195,000
Slope	0	0	0	0	0.91	115,570	3.27	1,716,750	0.75	1,125,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Deweyville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction					1 place of worship
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Deweyville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	231.11	248.00	0.00	0.00	0.00
Faults	1.00	6.94	0.00	0.00	0.00
Wildfire	22.83	63.76	0.00	3.00	0.00
Flood	191.59	187.60	0.00	0.00	0.00
Liquefaction	1,794.75	1,926.69	0.00	1.00	0.00
Landslide	52.43	73.37	0.00	1.00	0.00
Slope	1.18	0.00	0.00	1.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Deweyville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	333.1	0.37	3.5	0	0	0
Faults	0	0	2.55	0	3.24	0
Wildfire	10.93	0.13	6.16	0	3.29	0
Flood	338.15	0.37	3.41	0	0	0
Liquefaction	422.46	3.34	8.96	0	0	0
Landslide	0	0	0.14	0	0.13	0
Slope	0	0	3.48	0	1.69	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

likely because its risk of flooding is less than other communities in the region. Areas most susceptible to flooding are western portions of the community that fall with the Bear River's flood plain. Additionally, there is some risk of flood from drainages exiting the Wellsville Mountains on the eastern portion of the city. Floods resulting in these areas pose a threat to human life, structures, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Deweyville Town have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the western edge of the jurisdiction that border the Bear River. Areas of moderate-high liquefaction risk exist throughout the rest of the community in lower elevation area below the benches and hilly areas. Liquefaction has the greatest potential to impact human life and structures with nearly 400 people at risk and nearly 140 structures.

Landslides. Isolated portions of Deweyville could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern portions of the town in proximity to the Wellsville Mountains, as well as some area along the banks of the Bear River. Landslides have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Nearly 60 people and 20 structures are estimated to be at risk within the jurisdiction.

Steep Slopes. Deweyville has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wellsville Mountain Range. Areas bordering streams and rivers also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Nearly 60 people and 20 structures are estimated to be at risk within the jurisdiction.

Wildfire. Deweyville is susceptible to moderate-high risk of wildfire in eastern portions of the city such as the benches and hilly areas adjacent to the Wellsville Mountains. Wildfires have the potential to impact over 200 people in the City, as well as nearly 70 structures.

Future Development

No concerns involving potential future development within Deweyville were reported by city representatives.

Hazard Mitigation Strategies

**Deweyville Town did not provide mitigation strategies for this plan update.*

ELWOOD

Analysis of hazard risk involving the community of Elwood revealed that there is potential risk resulting from **dam failure, flood, liquefaction, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from dam failures, faults, floods, landslides, and slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Elwood. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 26: Elwood Town Potential Loss Figures

Natural Hazards

Dam failure. Elwood's risk of dam failure involves the eastern portions of the jurisdiction that border the Bear River. If Cutler Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Currently, there appears to be little development in this area, so widespread impacts appear limited.

Flood. Portions of Elwood are at risk to flooding. Elwood does not participate in NFIP, yet its risk of flooding poses risk for several aspects of the town and its population. Areas most susceptible to flooding are western portions of the community that fall with the Malad River's flood plain, as well as eastern portions of the town that fall within or border portions of the Bear River flood plain. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Elwood, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	13	4	946,472	6	1,277,720	7,243,830
Faults	0	0	0	0	0	0
Wildfire	56	18	3,876,186	5	1,325,890	6,036,525
Flood	88	28	5,503,744	13	2,840,260	15,694,965
Liquefaction	1,042	333	69,326,487	40	10,227,080	48,292,200
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau

Elwood, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	1.65	866,250	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0	0	0.24	360,000
Flood	0	0	0	0	0	0	2.34	1,228,500	0.7	1,050,000
Liquefaction	3.23	4,845,000	5.55	7,770,000	0	0	36	18,900,000	14.75	22,125,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Elwood, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					4 bridges
Liquefaction				1 place of worship	14 bridges, 1 dam
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Elwood, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	174.15	157.28	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	21.67	33.00	0.00	0.00	0.00
Flood	304.86	178.59	0.00	0.00	0.00
Liquefaction	4,186.75	4,694.65	0.00	3.00	0.00
Landslide	0.00	0.00	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Elwood, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	185.84	0.76	1.39	0	0	0
Faults	0	0	0	0	0	0
Wildfire	26.13	0	0.58	0	0	0
Flood	265.08	9.79	5.46	0	0	0
Liquefaction	361.56	11.78	20.03	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Liquefaction. Areas of Elwood Town have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the eastern edge of the jurisdiction that border the Bear River. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to impact human life and structures with over 1000 people at risk and nearly 340 structures.

Wildfire. Elwood is susceptible to moderate-high risk of wildfire in small portions of the town with steeper slopes and grassy and shrubby vegetation types. These areas are found primarily near the Bear and Malad Rivers. Wildfires have the potential to impact over 50 people in the town, as well as over 20 structures.

Future Development

No concerns involving potential future development within Elwood were reported by city representatives.

Hazard Mitigation Strategies

Table 27: Elwood Town Mitigation Strategies

ELWOOD - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Elwood	Dam Failure	Protect current residents and property	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2020	Utah Division of Water Rights, Local	Elwood and Utah Division of Water Rights	Minimal	Utah Division of Water Rights, Local
Elwood	Flood	Protect current residents and property	Using subdivision and Development regulations to regulate development in Potential flood risk areas.	N/A	High	2020	State, FEMA	Elwood	N/A	N/A
Elwood	Earthquake	Protect current residents and property	Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps	N/A	Medium	2020	State, Local	Elwood and UGS	Minimal	State, Local
Elwood	Liquefaction	Protect current residents and property	Educate current residents and businesses regarding steps to prepare old structures.	N/A	High	2020	State, Local	Elwood and UGS	Minimal	Federal, State, Local Training
ELWOOD - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Elwood	Dam Failure	Protect current residents and property	Work with the Utah Division of Water Rights and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2020	Utah Division of Water Rights, Local	Elwood and Utah Division of Water Rights	Minimal	Utah Division of Water Rights, Local
Elwood	Flood	Protect future residents and property	Update town ordinance with durable surface drainage project.	Surface drainage project	High	2020	State, Fema	Elwood	$10,000,000	State, Fema, Local
Elwood	Earthquake	Protect future residents and property	Develop and identify hazard zones	N/A	Medium	2020	State, Local	Elwood and UGS	Minimal	State, Local
Elwood	Liquefaction	Protect future residents and property	Tools in place for building codes	N/A	High	2020	State, Local	Elwood and UGS	Minimal	Federal, State, Local

FIELDING

Analysis of hazard risk involving the community of Fielding revealed that there is potential risk resulting from **liquefaction, steep slopes and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Fielding. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Liquefaction. Areas of Fielding have moderate-high risk of liquefaction in the event of an earthquake. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to impact human life and structures with over 400 people at risk and nearly 140 structures.

Steep Slopes. Fielding has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly areas and areas bordering streams and rivers. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. An estimated 16 people and 7 structures are at risk within the jurisdiction.

Table 28: Fielding Potential Loss Figures

Fielding, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Earthquakes	0	0	0	0	0	0
Wildfire	391	125	16,302,576	10	258,492	12,073,050
Flood	0	0	0	0	0	0
Liquefaction	426	136	17,853,623	11	415,256	13,280,355
Landslide	0	0	0	0	0	0
Slope	16	5	760,486	2	4,800	2,414,610
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Fielding, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Earthquakes	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	1.66	871,500	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	5.71	2,997,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0.11	57,750	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Fielding, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction	Fielding Fire Department & EMS	Fielding School		1 place of worship	4 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Fielding, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	31.58	111.91	0	1	0
Flood	0	0	0	0	0
Liquefaction	112.68	263.08	0	1	0
Landslide	0	0	0	0	0
Slope	2.98	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Fielding, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Earthquakes	0	0	0	0	0	0
Wildfire	0.68	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0.95	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Fielding is susceptible to moderate-high risk of wildfire in small portions of the town. Moderate-high risk is most closely associated with development and amenities near areas of greater slopes with grassy and shrubby vegetation types. Wildfires have the potential to impact over 390 people in the town, as well as over 130 structures.

Future Development

No concerns involving potential future development within Fielding were reported by city representatives.

Hazard Mitigation Strategies

**Fielding Town did not provide mitigation strategies for this plan update.*

GARLAND

Analysis of hazard risk involving the community of Garland revealed that there is potential risk resulting from **flood, liquefaction, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, earthquakes resulting in liquefaction, as well as wildfire have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from flooding appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Garland. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Flood. Portions of Garland are at risk to flooding. Garland does participate in NFIP as of September, 2010. Areas most susceptible to flooding are eastern portions of the community that fall with the Malad River's flood plain. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Garland have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas that border the Bear River. Areas of moderate-high liquefaction risk exist throughout the rest of the community. Liquefaction has the greatest potential to impact human life and structures with over 2200 people at risk and over 750 structures.

Table 29: Garland City Potential Loss Figures

Garland, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	964	308	38,154,327	32	3,137,358	38,633,760
Flood	9	3	800,621	1	59,300	1,207,305
Liquefaction	2,235	714	86,721,168	62	11,757,423	74,852,910
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Garland, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.56	840,000	0	0	0	0	3	1,575,000	0.13	195,000
Flood	0.045	67,500	0	0	0	0	0.24	126,000	0	0
Liquefaction	3.62	5,430,000	0.33	462,000	0	0	16.49	8,657,250	0.93	1,395,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Garland, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					2 bridges
Liquefaction	Garland Fire Station, Garland Police Department	5 schools	1 healthcare facility	4 places of worship	3 bridges, 7 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Garland, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	24.59	128.41	0	0	0
Flood	28.69	0	0	0	0
Liquefaction	600.13	1029.47	0	1	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Garland, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1.54	0	0.44	0	0	0
Flood	12.59	0	1.37	0	0	0
Liquefaction	16.2	0	2.3	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Garland is susceptible to moderate-high risk of wildfire in small portions of the city. Moderate-high risk is most closely associated with development and amenities near steeper slopes along the Malad River or areas of grassy and shrubby vegetation types, as well as urban forested areas. Wildfires have the potential to impact over 950 people in the town, as well as 340 structures.

Future Development

No concerns involving potential future development within Garland were reported by city representatives.

Hazard Mitigation Strategies

Table 30: Garland City Mitigation Strategies

GARLAND - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Garland	Flood	Protect current residents and property	Work with state, local, and other agencies to determine local flood risk and ways to prevent damage to homes and businesses.	Work with state floodplain manager regarding NFIP compliance and improvements.	High	2015	City	Garland and Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Garland	Liquefaction	Protect current residents and property	Education and outreach to officials and residents.	N/A	Medium	2016	City	Garland and UGS	Minimal	Utah DEM, UGS, USGS, BRAG
Garland	Wildfire	Protect current residents and property	Meet with other surrounding jurisdictions to improve emergency response and coordination.	N/A	Medium	2016	Utah FFSL, City	Garland, Box Elder County	Minimal	Utah DEM, Utah FFSL, BRAG
Garland	Dam Failure	Protect current residents and property	Work with various government agencies to determine risk to residents.	N/A	Low	2017	Utah DEM, FEMA, BRAG	Garland, Bureau of Reclamation, Utah Dam Safety	Minimal	Utah DEM, FEMA, BRAG
GARLAND - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Garland	Flood	Protect future residents and property	Work with state, local, and other agencies to determine local flood risk and ways to prevent damage to homes and businesses.	Work with state floodplain manager regarding NFIP compliance and improvements.	High	2015-2016	N/A	Garland, Utah DEM	$55	N/A
Garland	Liquefaction	Protect future residents and property	Education and outreach to officials and residents.	N/A	Medium	2016	City	Garland and UGS	Minimal	Utah DEM, UGS, USGS, BRAG
Garland	Wildfire	Protect future residents and property	Work with Utah FFSL and others to explore the possibility of working on a WUI plan with other neighboring communities.	N/A	Medium	2016	Utah FFSL, City	Garland, Utah FFSL	Minimal	Utah DEM, Utah FFSL, BRAG
Garland	Dam Failure	Protect future residents and property	Work with Utate Dam Failure to find ways to minimize risk to future structures and residents.	N/A	Low	2017	Utah DEM, FEMA, BRAG	Garland, Bureau of Reclamation, Utah Dam Safety	Minimal	Utah DEM, FEMA, BRAG

HONEYVILLE

Analysis of hazard risk involving the community of Honeyville revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire, earthquakes resulting in liquefaction, as well as landslides have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from dam failures, faults, floods, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Honeyville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Dam failure. Honeyville's risk of dam failure involves the western portions of the jurisdiction that border the Bear River. If Cutler Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Currently, there appears to be little development in this area, so widespread impacts appear limited.

Faults. Honeyville has risk of fault damage in along a portion the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer significant damage in the event of a large earthquake, with nearly 140 people at risk and 50 structures.

Flood. Portions of Honeyville are at risk to

Table 31: Honeyville Potential Loss Figures

Honeyville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	28	9	2,984,952	3	2,453,149	3,621,915
Faults	141	45	9,801,341	4	1,315,608	4,829,220
Wildfire	1,005	321	54,768,811	38	6,540,412	45,877,590
Flood	69	22	5,974,607	3	2,216,839	3,621,915
Liquefaction	645	206	45,599,874	19	5,395,556	22,938,795
Landslide	723	231	36,405,119	24	1,651,234	28,975,320
Slope	97	31	7,323,317	7	1,684,308	8,451,135
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Honeyville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0.22	308,000	0.6	76,200	1.46	766,500	0.08	120,000
Faults	0.85	1,275,000	0	0	1.3	165,100	3.61	1,895,250	1.52	2,280,000
Wildfire	0.71	1,065,000	0	0	9.24	1,173,480	14.4	7,560,000	4.3	6,450,000
Flood	0.58	870,000	0.45	630,000	1.44	182,880	4.72	2,478,000	3.61	5,415,000
Liquefaction	6.76	10,140,000	3.47	4,858,000	14.36	1,823,720	49.15	25,803,750	7.9	11,850,000
Landslide	0.17	255,000	0.04	56,000	2.74	347,980	9.65	5,066,250	1.92	2,880,000
Slope	0.12	180,000	0	0	3.79	481,330	3.29	1,727,250	2.65	3,975,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Honeyville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 bridge
Faults					
Wildfire					
Flood					2 bridges
Liquefaction	BE Central Fire, Honeyville Fire Department	Head Start Honeyville		2 places of worship	4 bridges, 2 dams, 3 broadband anchors
Landslide	Box Elder Central Fire District, Honeyville Fire Department, Honeyville Ambulance Services, Honeyville Ambulance			1 place of worship	3 broadband anchors
Slope					1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Honeyville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	794.93	253.27	0.00	0.00	0.00
Faults	438.96	5.93	3.29	1.00	0.00
Wildfire	1,463.80	335.44	1.83	1.00	0.00
Flood	1,555.25	1,089.04	31.39	0.00	0.00
Liquefaction	8,124.37	1,204.65	31.83	1.00	0.00
Landslide	618.67	3.33	0.09	0.00	0.00
Slope	86.77	14.87	2.42	1.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Honeyville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	253.27	0.00	4.57	0.00	0.00	0.00
Faults	5.93	3.29	2.78	0.00	0.00	1.00
Wildfire	335.44	1.83	11.61	0.00	1.73	5.00
Flood	1,089.04	31.39	14.51	0.00	0.00	0.00
Liquefaction	1,204.65	31.83	19.88	0.00	0.00	0.00
Landslide	3.33	0.09	2.65	0.00	0.29	4.00
Slope	14.87	2.42	5.56	0.00	0.96	4.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

flooding. Honeyville does participate in NFIP. Areas most susceptible to flooding are eastern portions of the community bordering the Wellsville Mountains, local areas canals, Salt Creek, and portions of the Bear River Flood Plain. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Honeyville have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas in the southern portion of the jurisdiction near Salt Creek as well as near portions of the Bear River along the western edge of the jurisdiction. Areas of moderate-high liquefaction risk exist throughout the rest of the community, except the higher elevation areas on the east side of the jurisdiction. Liquefaction has the 3rd greatest potential to impact human life and structures with over 640 people at risk and nearly 220 structures.

Landslides. Isolated portions of Honeyville could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern portions of the town in adjacent to portions of Highway 38, as well as some area along the banks of the Bear River. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Landslides have the 2nd greatest potential to impact human life and structures with over 720 people and nearly 250 structures at risk, including emergency response facilities.

Steep Slopes. Honeyville has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wellsville Mountain Range. Areas bordering streams, rivers, and drainages also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Ninety-seven people and 38 structures are estimated to be at risk within the jurisdiction.

Wildfire. Honeyville is susceptible to moderate-high risk of wildfire in eastern portions of the city such as the benches and hilly areas adjacent to the Wellsville Mountains, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 1000 people and 350 structures at risk.

Future Development

No concerns involving potential future development within Honeyville were reported by city representatives.

Hazard Mitigation Strategies

Table 32: Honeyville Mitigation Strategies

HONEYVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Honeyville	Earthquake / Fault / Liquefaction	Protect current residents and property	Work with local officials and neighboring communities to determine local earthquake risk to residents.	N/A	Medium	2017	City	Honeyville, UGS	Minimal	State, County, BRAG
Honeyville	Flood	Protect current residents and property	Determine risk to local residents from flood prone areas east of town.	Work with State floodplain manager to be compliant with NFIP.	Medium	2017	City	Honeyville, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Honeyville	Slope	Protect current residents and property	Work with state and local agencies to determine local risk to high slope areas and risk to residents.	N/A	Medium	2017	City	Honeyville, UGS	Minimal	UGS, USGS, BRAG
Honeyville	Wildfire	Protect current residents and property	Work with Utah FFSL to discuss possibility of WUI plan.	N/A	High	2017	State, County	Honeyville, Utah FFSL	$100,000	Utah FSSL, Local
Honeyville	Dam Failure	Protect current residents and property	Educate citizens on possibility of dam failure and train emergency response.	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Dam Failure	Protect current residents and property	Educate citizens on possibility of dam failure and train emergency response.	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Landslide	Protect current residents and property	Education and work with UGS to update hazard mapping.	N/A	Medium	2017	City, Utah UGS	Honeyville, UGS	Minimal	BRAG, Utah UGS, Engineering Firms
HONEYVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Honeyville	Earthquake / Liquefaction/ Fault	Protect future residents and property	Education and review future faults/ liquefaction- review ordinances to see if there area ways to better protect future homes from earthquake damage.	N/A	Medium	2017	City	Honeyville, UGS	Minimal	State, County, BRAG
Honeyville	Flood	Protect future residents and property	Review current ordinances to see if more can be done to protect future residents and property.	Work with State floodplain manager to be compliant with NFIP.	Medium	2018	City	Honeyville, Utah DEM	Minimal	Utah DEM, FEMA, BRAG
Honeyville	Slope	Protect future residents and property	Explore possiblity of more strict sensitive lands ordinance which includes steep slope areas.	N/A	Medium	2019	City	Honeyville, UGS	Minimal	UGS, USGS, BRAG
Honeyville	Wildfire	Protect future residents and property	Education and Improve on Emergency Response staff and equipment	N/A	High	2017	State, County	Honeyville, Utah FFSL	$100,000	Utah FSSL, Local
Honeyville	Dam Failure	Protect future residents and property	Educate residents on conservation in hazard areas. Ordinance revisions	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Dam Failure	Protect future residents and property	Educate residents on conservation in hazard areas. Ordinance revisions	N/A	Low	2017	City	Honeyville, Bureau of Reclamation, Utah Dam Safety	Minimal	State, County
Honeyville	Landslide	Protect future residents and property	Education and update hazard mapping	N/A	Medium	2017	City, Utah UGS	Honeyville, UGS	Minimal	BRAG, Utah UGS, Engineering Firms

HOWELL

Analysis of hazard risk involving the community of Howell revealed that there is potential risk resulting from **dam failure, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, dam failure has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes and wildfire appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Howell. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Dam failure. Howell's risk of dam failure involves portions of the jurisdiction that border the Blue Creek drainage below Blue Creek Dam. This area is located in the center of jurisdiction. If Blue Creek Dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the Bear River could suffer serious impacts. Dam failure is likely to cause the greatest loss of human life in the community of all natural disasters. Currently, there appears to be enough development in this area to impact nearly 50 people and 22 structures.

Slopes. Howell has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly and mountainous areas and areas bordering drainages, streams and rivers. Steep slopes have the

Table 33: Howell Town Potential Loss Figures

Howell, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	50	16	1,290,248	6	439,837	7,243,830
Faults	0	0	0	0	0	0
Wildfire	16	5	636,934	8	553,035	9,658,440
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	16	5	670,841	4	418,103	4,829,220
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Howell, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0.2	280,000	0	0	3.22	1,690,500	0.88	1,320,000
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0.2	280,000	0	0	2.33	1,223,250	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	4.57	2,399,250	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Howell, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					1 dam
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					2 bridges
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Howell, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns	
	Agricultural	Farming	Grazing	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	1,768.60	198.95	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	735.45	322.24	0.00	0.00	0.00
Flood	0.00	0.00	0.00	0.00	0.00
Liquefaction	0.00	0.00	0.00	0.00	0.00
Landslide	0.00	0.00	0.00	0.00	0.00
Slope	471.40	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Howell, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	837.98	133.91	16.56	0	0	0
Faults	0	0	0	0	0	0
Wildfire	25.88	0.26	5.94	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	14.35	9.04	10.15	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. An estimated 16 people and 9 structures are at risk within the jurisdiction.

Wildfire. Howell is susceptible to moderate-high risk of wildfire in isolated portions of the town, such as the benches and hilly areas adjacent to the mountainous areas and areas with steeper slopes or grassy and shrubby vegetation. Wildfires have the potential to impact an estimated 16 people in the town, as well as nearly 13 structures.

Future Development

No concerns involving potential future development within Howell were reported by community representatives.

Hazard Mitigation Strategies

Table 34: Howell Mitigation Strategies

HOWELL - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Howell	Wildfire	Protect current residents and property	Install fire hydrant on south end to fill water trucks	N/A	Medium	2017	Howell Town	Howell	$2,500	Howell Town Water Fund
Howell	Flood-Dam Failure	Protect current residents and property	Follow up on information received from test holes	N/A	Medium	2017	Local	Howell	Minimal	Bureau of Reclamation, Blue Creek Irrigation Co.
Howell	Earthquake	Protect current residents and property	Identify structures requiring retrofit	N/A	Medium	2017	State or Federal	Howell, UGS	$50,000	DHS, FEMA, BRAG
HOWELL - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Howell	Wildfire	Protect future residents and property	Install fire hydrant on south end to fill water trucks	N/A	Medium	2017	Howell Town	Howell	$2,500	Howell Town
Howell	Flood-Dam Failure	Protect future residents and property	Follow up on information received from test holes	Follow up on information received from test holes	Medium	2017	Local, County	Howell	N/A	Bureau of Reclamation, Blue Creek Irrigation Co.
Howell	Earthquake	Protect future residents and property	Incorporate Emergency Plan	N/A	Medium	2017	County	Howell, UGS	Minimal	County

MANTUA

Analysis of hazard risk involving the community of Mantua revealed that there is potential risk resulting from **dam failure, faults, floods, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, dam failure and floods create the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes, wildfire, and landslides appear to have less potential for impacts, yet still pose risks to human life. Liquefaction and faults also pose a degree of risk, however, these risks are substantially less as human life is not as greatly in jeopardy. Other natural hazard types not mentioned were found to have no potential impacts to Mantua. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 35: Mantua Potential Loss Figures

Natural Hazards

Dam failure. Mantua's risk of dam failure involves the portions of the jurisdiction located below Mantua Reservoir. If Mantua Reservoir were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the dam could suffer serious impacts. Dam failure is the greatest risk to human life and structures in the community with potential to impact over 200 residents and nearly 80 structures.

Faults. Mantua has risk of fault damage in along eastern portions of the town. Widespread damage from faulting is not likely due to the lower amount of development in this portion of the jurisdiction. No threats to life or structures are currently expected within the jurisdiction.

Flood. Portions of Mantua are at risk to flooding. Mantua does participate in NFIP as areas within the jurisdiction have substantial risk to impacts. Areas most susceptible to flooding are portions of the community bordering Mantua Reservoir, as well as por-

Mantua, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	219	70	10,666,853	11	434,808	13,280,355
Faults	0	0	0	0	0	0
Wildfire	50	16	2,854,704	5	108,242	6,036,525
Flood	97	31	4,222,315	7	242,907	8,451,135
Liquefaction	0	0	0	0	0	0
Landslide	13	4	761,773	3	57,177	3,621,915
Slope	41	13	2,137,038	6	218,422	7,243,830
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Mantua, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	4.33	2,273,250	0.12	180,000
Faults	0	0	0	0	0	0	0.16	84,000	0	0
Wildfire	0	0	0	0	0	0	1.37	719,250	0.08	120,000
Flood	0	0	0	0	0	0	1.48	777,000	0.05	75,000
Liquefaction	0	0	0	0	0	0	20.74	10,888,500	0	0
Landslide	0	0	0.26	364,000	0	0	1.49	782,250	0	0
Slope	0	0	0	0	0	0	2.83	1,485,750	0.4	600,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Mantua, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	Mantua Police Dept.				1 bridge, 1 broadband anchor, 1 dam
Faults					
Wildfire					
Flood					1 bridge, 2 dams
Liquefaction	Mantua Police Dept., Mantua Fire Dept.			1 place of worship	1 bridge, 3 broadband anchors, 3 dams
Landslide					
Slope					1 bridge
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Mantua, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	177.84	284.36	0	0	0
Faults	99.53	0.86	0	0	0
Wildfire	15.9	23.69		0	0
Flood	16.14	59.82	0	1	
Liquefaction	0	0	0	0	0
Landslide	18.9	26.9		0	0
Slope	17.08	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Mantua, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	#of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	77.12	18.79	2.43	0	0	0
Faults	0	0	0.65	0	0	0
Wildfire	2.11	0	1.98	0	0	0
Flood	531.8	518.58	5.3	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0.41	0	1.1	0	0	0
Slope	4.75	2.91	3.22	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

tions of the Big Creek drainage below the reservoir and areas of Box Elder Creek. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Mantua have risk of liquefaction in the event of an earthquake. Liquefaction does not appear to pose a great risk to human life in the jurisdiction. However there is some risk to critical facilities, as well as some infrastructure.

Landslides. Isolated portions of Mantua could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include western and northern portions of the town west of Highway 89/91. Landslides have the potential to impact life, structures, infrastructure, environmental, and agricultural features in the jurisdiction. Landslides have potential to impact human life and structures with an estimated 13 people and 7 structures at risk.

Steep Slopes. Mantua has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact life, property, infrastructure, and other features in the jurisdiction. An estimated 41 people and 19 structures are at risk within the jurisdiction.

Wildfire. Mantua is susceptible to moderate-high risk of wildfire in isolated portions of the town, such as the benches and hilly areas adjacent to the mountainous areas and areas with steeper slopes or grassy and shrubby vegetation. Wildfires have the potential to impact an estimated 50 people in the town, as well as nearly 20 structures.

Future Development

No concerns involving potential future development within Mantua were reported by community representatives.

Hazard Mitigation Strategies

Table 36: Mantua Town Mitigation Strategies

MANTUA - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Mantua	Dam Failure	Protect current residents and property	Work with Utah Dam Safety and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2016	Utah Division of Water Rights, Local	Mantua, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Mantua	Wildfire	Protect current residents and property	Map and assess vulnerability to wildfire. Talk with Utah FSSL about writing a community wildfire protection plan and encourage fire wise ordinances and buildings.	N/A	Low	2016	Utah FSSL, Local	Mantua, Utah FFSL	Minimal	Utah FSSL, Local
Mantua	Flood	Protect current residents and property	Reconcile current development with soon to be adopted FEMA floodplain maps for Box Elder County for NFIP communities. For non-NFIP communities, talk with Utah ESHS about the benefits of NFIP.	Investigate benefits of NFIP compliance vs. Non compliance for town and residents.	High	2015-2016	FEMA, Local	Mantua, Utah DEM	Minimal	FEMA, Utah ESHS
Mantua	Landslide	Protect current residents and property	Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps	N/A	Low	2016	State, Local	Mantua, UGS	Minimal	State, Local
Mantua	Earthquake	Protect current residents and property	Map and assess community vulnerability to seismic hazards.	N/A	Low	2015	State, Local	Mantua, UGS	Minimal	State, Local

MANTUA - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Mantua	Dam Failure	Protect future residents and property	Review current town ordinance to determine if changes are required to prevent the endangerment of future structures.	N/A	Low	2016	Utah Division of Water Rights, Local	Mantua, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Mantua	Wildfire	Protect future residents and property	Reduce the risk through land use planning within the land use management code.	N/A	Low	2016	Utah FSSL, Local	Mantua, Utah FFSL	Minimal	Utah FSSL, Local
Mantua	Flood	Protect future residents and property	Review flood plain maps for Box Elder County, determine if areas within town limits are affected. Consider what if any action should be taken. Identify flood plain in town emergency preparedness plan, with actions to be taken.	N/A	High	2015-2016	FEMA, Local	Mantua, Utah DEM	Minimal	FEMA, Utah ESHS
Mantua	Landslide	Protect future residents and property	Manage development in landslide hazard areas.	N/A	Low	2016	State, Local	Mantua, UGS	Minimal	State, Local
Mantua	Earthquake	Protect future residents and property	Incorporate earthquake mitigation into local planning. Protect critical facilities and infrastructure to reduce potential damage to critical facilities and infrastructures.	N/A	Low	2015	State	Mantua, UGS	Minimal	State

PERRY

Analysis of hazard risk involving the community of Perry revealed that there is potential risk resulting from **dam failure, faults, flood, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire, earthquakes resulting in liquefaction and fault damage, and dam failure have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, landslides, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Perry. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Dam failure. Perry's risk of dam failure involves the portions of the jurisdiction located below the Three Mile Creek Dam, which is a retention basin for Perry Canyon. If the dam were to become breached, populations, structures, infrastructure, lands, and amenities adjacent the dam could suffer serious impacts. Dam failure is the 4th greatest risk to human life and structures in the community with potential to impact over 500 residents and nearly 200 structures.

Faults. Perry has risk of fault damage in along a portion the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer damage in the event of a large earthquake. Damage in the fault zone could result in the 3rd greatest risk to human life with over

Table 37: Perry City Potential Loss Figures

Perry, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	582	186	39,335,240	8	1,427,234	9,658,440
Faults	930	297	68,546,347	25	9,512,139	30,182,625
Wildfire	3,230	1,032	228,609,539	58	32,732,408	70,023,690
Flood	25	8	1,678,900	1	665,000	1,207,305
Liquefaction	736	235	53,730,878	25	19,393,095	30,182,625
Landslide	38	12	1,912,842	3	133,635	3,621,915
Slope	72	23	9,146,313	4	2,607,700	4,829,220
Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Perry, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	4.67	2,451,750	0	0
Faults	1.82	2,730,000	1.19	1,666,000	3.45	438,150	15.95	8,373,750	2.5	3,750,000
Wildfire	0.07	105,000	0	0	2.6	330,200	15.77	8,279,250	3.05	4,575,000
Flood	0	0	0	0	0.58	73,660	0.74	388,500	0.53	795,000
Liquefaction	3.73	5,595,000	0	0	4.03	511,810	58.31	30,612,750	0.53	795,000
Landslide	0	0	0	0	0.64	81,280	1.95	1,023,750	0.73	1,095,000
Slope	0	0	0	0	2.35	298,450	5.26	2,761,500	1.68	2,520,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Perry, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure	EMS Perry, Perry Police Dept.			1 place of worship	1 broadband anchor
Faults		Three Mile Creek School			2 bridges, 1 broadband anchor
Wildfire					
Flood					1 dam
Liquefaction	Perry Police Dept., EMS Perry	2 schools	3 healthcare facilities		3 bridges, 4 dams, 4 broadband anchors
Landslide					
Slope					1 dam
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Perry, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# Farms	# of Barns
Dam Failure	260.76	361.20	0.00	1	0.00
Faults	688.80	839.69	0.00	0.00	0.00
Wildfire	454.51	644.24	0.00	0.00	0.00
Flood	111.47	93.41	0.00	0.00	0.00
Liquefaction	1,866.73	1,835.40	0.00	0.00	0.00
Landslide	73.36	45.18	0.00	0.00	0.00
Slope	27.96	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Perry, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	3.44	0	1.09	0	0	0
Faults	22.77	4.31	5.24	0	3.89	9
Wildfire	151.07	1.39	6.42	0	3.95	8
Flood	415.65	60.33	2.76	0	0.59	3
Liquefaction	757.52	66.75	8.88	0	0	0
Landslide	0	0.12	0.97	0	0.86	7
Slope	0.05	0.09	3.29	0	3.7	9
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

900 people at risk. Additionally, over 325 structures are at risk.

Flood. Portions of Perry are at risk to flooding. Perry does participate in NFIP as areas within the jurisdiction have substantial risk to impacts. Areas most susceptible to flooding are portions of the community west of I-15. Eastern drainages originating in the Wasatch Mountains also pose risk, such as Three Mile Creek and Black Slough drainages. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Perry have high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas to the west of Highway 89. Liquefaction has the 3rd greatest potential to impact human life and structures with over 700 people at risk and nearly 250 structures.

Landslides. Isolated portions of Perry could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern portions of the town in adjacent to portions of Highway 89, as well as some area along the Wasatch Front Mountain Range. Landslides have the potential to impact life, structures, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Landslides have the potential to impact human life and structures with an estimated 38 people and nearly 15 structures at risk.

Steep Slopes. Perry has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wasatch Mountain Range. Areas bordering streams, rivers, and drainages also appear to have an increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Seventy-two people and 27 structures are estimated to be at risk within the jurisdiction.

Wildfire. Perry is susceptible to moderate-high risk of wildfire primarily in eastern portions of the city such as the benches and hilly areas adjacent to the Wasatch Mountains, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 3,200 people and 1,075 structures at risk.

Future Development

Concerns involving new development exist for development along the east side of the city on the bench and hillsides. These areas appear to be at risk to a variety of natural hazards, such as wildfire, earthquake faulting, landslides, and steep slope failures. New developments located at the base of drainages originating in the Wasatch Mountain are also at risk to flood damage during server weather events. Any new development located below the Perry Retention Basin for Three Mile Creek would also be a risk to dam inundation.

Hazard Mitigation Strategies

Table 38: Perry City Mitigation Strategies

PERRY - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Perry	Dam Failure	Protect current residents and property	Work with the Utah Dam Safety and other groups to utilize Emergency Action Plans on a local level.	N/A	Low	2016	Utah Division of Water Rights, Local	Perry, Utah Dam Safety	Minimal	Utah Division of Water Rights, Local
Perry	Drought	Protect current residents and property	Develop process to work with county and state on regular basis to evaluate water levels and inform citizens.	N/A	Low	2017	Local	Perry, Box Elder County, Utah Climate Center	Minimal	Local, County, State
Perry	Flood	Protect current residents and property	Make sure that Perry City understands state of emergency and how to get county and state involved.	N/A	Low	2016	Local	Perry, Utah DEM	Minimal	Local
Perry	Landslide	Protect current residents and property	Develop a process when building permit is applied for and inform or handout safety zone map to all who apply.	N/A	Low	2017	Local	Perry, UGS	Minimal	Local
Perry	Severe Weather	Protect current residents and property	Develop and understand emergency protocols locally and when to declare state of emergency.	N/A	Low	2017	Local	Perry	Minimal	Local
Perry	Steep Slopes	Protect current residents and property	Work with state and other groups to utilize emergency action plans at local level.	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local
Perry	Earthquake	Protect current residents and property	Develop or update an environmental safety zone - with identified hazard areas, disclosure/education, hazard maps	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local

PERRY - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Perry	Dam Failure	Protect future residents and property	Review city ordinances and update city maps containing flood plains.	N/A	Low	2016	Local	Perry, Utah Dam Safety	Minimal	Local
Perry	Drought	Protect future residents and property	Develop handout to give to residents based on goal #1	N/A	Low	2017	Local	Perry, Box Elder County, Utah Climate Center	Minimal	Local
Perry	Flood	Protect future residents and property	Review city ordinances and update city maps with flood plains.	N/A	Low	2016	Local	Perry, Utah DEM	Minimal	Local
Perry	Landslide	Protect future residents and property	Develop or update an environmental safety zone with identified hazardous areas disclosure and education maps.	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local
Perry	Severe Weather	Protect future residents and property	Incorporate weather reporting into city webpage.	N/A	Low	2017	Local	Perry	Minimal	Local
Perry	Steep Slopes	Protect future residents and property	Review city ordinances and update city plans and maps.	N/A	Low	2017	Local	Perry, UGS	Minimal	Local
Perry	Earthquake	Protect future residents and property	Identify any structure that would be unsafe or needing an update.	N/A	Low	2017	State, Local	Perry, UGS	Minimal	State, Local

PLYMOUTH

Analysis of hazard risk involving the community of Plymouth revealed that there is potential risk resulting from **flood, liquefaction, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, liquefaction and steep slopes appear to pose no risks to human life, yet still pose risks to other features and amenities in the community. Other natural hazard types not mentioned were found to have no potential impacts to Plymouth. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 39: Plymouth Potential Loss Figures

Natural Hazards

Flood. Portions of Plymouth are at risk to flooding. Plymouth does not participate in NFIP. Areas within the jurisdiction do not appear to have large risk to impacts, except for one commercial building and some agricultural production land. Areas most susceptible to flooding appear to be the result of adjacent water sources that are currently serviced in the town by piped drains. Should these drains or infrastructure fail, the town could see flooding occur at a greater level.

Liquefaction. Areas of Plymouth have risk of liquefaction in the event of an earthquake. Liquefaction has low risk to impact human life and structures, with most risk associated with small portions of infrastructure, agricultural lands, and environmental features.

Steep Slopes. Plymouth has risk associated with steep slopes within its boundaries. Areas of great-

Plymouth, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	113	36	4,678,671	7	20,337,429	8,451,135
Flood	0	0	0	1	43,765	1,207,305
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Plymouth, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0.01	15,000	0	0	0	0	0.39	204,750	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0.02	30,000	0	0	0	0	4.87	2,556,750	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Plymouth, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction	Plymouth Fire and EMS Station				3 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Plymouth, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	26.45	21.41	0	0	0
Flood	1.66	0.03	0	0	0
Liquefaction	2	0	0	0	0
Landslide	0	0	0	0	0
Slope	1.68	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Plymouth, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0.02	0	0	0
Flood	0	0	0.07	0	0	0
Liquefaction	0	0	0.07	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0.03	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

est concern have slopes of over 20%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact some environmental features and agricultural lands in the jurisdiction. No risk to life or structures is estimated.

Wildfire. Plymouth is susceptible to moderate-high risk of wildfire in northern and eastern portions of the town, such as the hilly areas adjacent to more mountainous areas surrounding the jurisdiction. Some lower lying grassy and shrubby areas in the town are also at risk. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 110 people and 40 structures at risk.

Future Development

No concerns involving potential future development within Plymouth were reported by community representatives.

Hazard Mitigation Strategies

Table 40: Plymouth Town Mitigation Strategies

PLYMOUTH - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Plymouth	Flood	Protect future residents and property	Learn about the NFIP program and consider joining so residents can purchase flood insurance.	N/A	Low	2015	Public Safety Budget	Plymouth, Utah DEM	N/A	Area CERT
Plymouth	Earthquake	Protect future residents and property	Educate home owners on safety techniques to follow during and after an earthquake through our CERT.	N/A	Low	2015	Public Safety Budget	Plymouth, Box Elder County	$100	Area CERT
Plymouth	Wildfire	Protect future residents and property	Fire Marshal to show elected officials potential threats and educate the residents.	N/A	Low	2015	N/A	Plymouth, Box Elder County	N/A	Box Elder County Fire Marshal
Plymouth	Landslides	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT
Plymouth	Steep Slopes	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT

PLYMOUTH - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Plymouth	Flood	Protect future residents and property	Learn about the NFIP program and consider joining so residents can purchase flood insurance.	N/A	Low	2015	Public Safety Budget	Plymouth, Utah DEM	N/A	Area CERT
Plymouth	Earthquake	Protect future residents and property	Educate home owners on safety techniques to follow during and after an earthquake through our CERT.	N/A	Low	2015	Public Safety Budget	Plymouth, Box Elder County	$100	Area CERT
Plymouth	Wildfire	Protect future residents and property	Fire Marshal to show elected officials potential threats and educate the residents.	N/A	Low	2015	N/A	Plymouth, Box Elder County	N/A	Box Elder County Fire Marshal
Plymouth	Landslides	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT
Plymouth	Steep Slopes	Protect future residents and property	Pinpoint vulnerable areas and educate the elected officials and the residents.	N/A	Low	2015	Public Safety Budget	Plymouth, UGS	$100	Area CERT

PORTAGE

Analysis of hazard risk involving the community of Portage revealed that there is potential risk resulting from **flood, liquefaction, and wildfire**. These hazards have varying potential to impact critical facilities, infrastructure, agriculture, and environmental features within municipal boundaries. Currently, wildfire has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, liquefaction and steep slopes appear to pose no risks to human life, yet still pose risks to other features and amenities in the community. Other natural hazard types not mentioned were found to have no potential impacts to Plymouth. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Flood. Portions of Plymouth are at risk to flooding. Plymouth does not participate in NFIP. Areas within the jurisdiction do not appear to have large risk to impacts, except for one commercial building and some agricultural production land. Areas most susceptible to flooding appear to be the result of adjacent water sources that are currently serviced in the town by piped drains. Should these drains or infrastructure fail, the town could see flooding occur at a greater level.

Liquefaction. Areas of Portage have high risk of liquefaction in the event of an earthquake. The limited areas are susceptible to high risk liquefaction along the eastern edge of the jurisdiction that border the Malad River. Liquefaction has the greatest potential to impact critical facilities, as well as infrastructure within the jurisdiction.

Table 41: Portage Potential Loss Figures

Portage, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Portage, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power Lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0.09	47,250	0	0
Flood	0	0	0	0	0	0	0.13	68,250	0	0
Liquefaction	0.55	825,000	0	0	0	0	9.25	4,856,250	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.

[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).

[3] Based on estimates from Logan Light and Power, 2015.

[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.

[5] Based recent Cache County and regional project cost estimates, 2015.

Portage, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction	Portage Fire and Rescue (EMS)			1 place of worship	2 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Portage, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	3.7	2.22	0	0	0
Flood	40.06	0	0	0	0
Liquefaction	2.41	0	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Portage, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0
Flood	8.21	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Wildfire. Portage is susceptible to moderate-high risk of wildfire in western portions of the city such as the benches and hilly areas adjacent to mountainous regions, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to some infrastructure and agricultural lands in the jurisdiction, but are predicted to pose a risk to human life or structures within the town.

Future Development

Concerns involving new development exist for development in a canyon to the south of the town center. These areas appear to be at risk to a variety of natural hazards, such as wildfire, and steep slope failures, and flooding. New developments located at the base of drainages could also be at risk to flood damage during server weather events.

Hazard Mitigation Strategies

Table 42: Portage Town Mitigation Strategies

PORTAGE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Portage	Earthquake	Protect current residents and property	Review and update natural hazard and earthquake plan	N/A	Low	2017	N/A	Portage, UGS	Minimal	BRAG, LOCAL, STATE, COUNTY
Portage	Wildfire	Protect current residents and property	Purchase new fire engine	N/A	High	2015	FEMA, State, CDBG	Portage, Utah DEM	$315,000	FEMA, State, BRAG
Portage	Steep Slopes	Protect current residents and property	current mapping and hazards	N/A	Medium	2017	N/A	Portage, UGS	N/A	BRAG, County
Portage	Urban Fire and Public Health	Protect current residents and property	take down old homes in town that are uninhabitable	N/A	Medium	2016	State, Federal	Portage, Utah DEM	$20,000	State
PORTAGE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Portage	Earthquake	Protect future residents and property	Review and update natural hazard and earthquake plan	N/A	Low	2017	N/A	Portage, UGS	Minimal	BRAG, LOCAL, STATE, COUNTY
Portage	Wildfire	Protect future residents and property	Update ordinances to limit amount of hay in town	N/A	High	2016	N/A	Portage, Utah DEM	Minimal	County, State, Land use ordinance
Portage	Steep Slopes	Protect future residents and property	Update Ordinances	N/A	Medium	2017	N/A	Portage, UGS	Minimal	BRAG, State
Portage	Urban Fire and Public Health	Protect future residents and property	take down old homes in town that are uninhabitable	N/A	Medium	2016	State, Federal	Portage, Utah DEM	$20,000	State

SNOWVILLE

Analysis of hazard risk involving the community of Portage revealed that there is potential risk resulting from **wildfire**. Wildfire has varying potential to impact human life, infrastructure, agriculture, and environmental features within municipal boundaries. Currently, wildfire has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Snowville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 43: Snowville Town Potential Loss Figures

Natural Hazards

Wildfire. Snowville is susceptible to moderate-high risk of wildfire in eastern and southern portions of the city such as the benches and hilly areas adjacent to mountainous regions, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with nearly 70 people and 35 structures at risk.

Future Development

No concerns involving potential future development within Snowville were reported by community representatives.

Snowville, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	69	22	1,636,062	17	2,746,329	20,524,185
Flood	0	0	0	0	0	0
Liquefaction	0		0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Snowville, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	0	0	0	0	0	0	0.46	241,500	0	0
Flood	0	0	0	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Snowville, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood					
Liquefaction					
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Snowville, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0	0	0	0	0
Faults	0	0	0	0	0
Wildfire	73.11	117.87	0	0	0
Flood	0	0	0	0	0
Liquefaction	0	0	0	0	0
Landslide	0	0	0	0	0
Slope	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Snowville, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ Riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0.45	0	0.9	0	0	0
Flood	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

Hazard Mitigation Strategies

Table 44: Snowville Town Mitigation Strategies

SNOWVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Snowville	Wildfire	Protect current residents and property	Work with FFSL to determine fire risks.	N/A	High	2017	FFSL	Snowville, Utah FFSL	Minimal	FFSL, BRAG, EM
Snowville	Severe Weather	Protect current residents and property	working with rocky mountain power to improve resiliency of power and infrastructure. And also get a number of oxygen and other needs requiring power.	N/A	High	2015	Local	Snowville, Rocky Mountain Power	Minimal	Rocky Mountain Power
Snowville	Earthquake	Protect current residents and property	Work with state and local to assess risks retrofitting town hall. Also education and awareness.	N/A	Medium	2018	Utah Geological survey, Utah EM, BRAG,	Snowville, UGS, Utah DEM	Minimal	Utah Geological Survey, Utah EM, BRAG
Snowville	Dam Failure	Protect current residents and property	Assess the risk; education for residents	N/A	Low	2019	BRAG, Local	Snowville, Bureau of Reclamation, Utah Dam Safety	Minimal	State of Idaho and Utah, BRAG
Snowville	Drought	Protect current residents and property	Educate citizens for water and food preservation. Work toward implementing water conservation plan.	N/A	Medium	2017	Rural Water, Brag, Local, State	Snowville, Utah Climate Center, NOAA	Minimal	Rural Water, BRAG
SNOWVILLE - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Snowville	Wildfire	Protect future residents and property	Work with FFSL to determine fire risks.	N/A	High	2017	FFSL	Snowville, Utah FFSL	Minimal	FFSL, BRAG, EM
Snowville	Severe Weather	Protect future residents and property	working with rocky mountain power to improve resiliency of power and infrastructure. And also get a number of oxygen and other needs requiring power.	N/A	High	2015	Local	Snowville, Rocky Mountain Power	Minimal	Rocky Mountain Power
Snowville	Earthquake	Protect future residents and property	Work with state and local to assess risks retrofitting town hall. Also education and awareness.	N/A	Medium	2018	Utah Geological survey, Utah EM, BRAG,	Snowville, UGS, Utah DEM	Minimal	Utah Geological Survey, Utah EM, BRAG
Snowville	Dam Failure	Protect future residents and property	Assess the risk; education for residents	N/A	Low	2019	BRAG, Local	Snowville, Bureau of Reclamation, Utah Dam Safety	Minimal	State of Idaho and Utah, BRAG
Snowville	Drought	Protect future residents and property	Water development, develop secondary water source.	N/A	Medium	2017	USDA, Rural Water, BRAG, Local	Snowville, Utah Climate Center, NOAA, Bear River Water Conservation District	N/A	USDA, Rural Water, BRAG, Local

TREMONTON

Analysis of hazard risk involving the community of Tremonton revealed that there is potential risk resulting from **floods, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfire and earthquakes resulting in liquefaction have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, landslides, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Tremonton. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 45: Tremonton Potential Loss Figures

Natural Hazards

Flood. Portions of Tremonton appear at risk to flooding. Tremonton began NFIP participation in 2010. Areas within the jurisdiction associated most closely with risk include the flood plain of the Malad River, which meanders through town. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmental, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Tremonton have moderate-high and high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas on the eastern portion of the jurisdiction that border the Malad River. Areas of moderate-high liquefaction risk exist throughout the rest of the community except the far western portion. Liquefaction has the greatest potential to impact human life and structures with

Tremonton, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	2,542	812	122,330,061	173	110,773,788	208,863,765
Flood	44	14	3,094,709	12	3,707,359	14,487,660
Liquefaction	6,482	2,071	300,699,052	260	184,647,520	313,899,300
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Tremonton, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0	0	0	0
Wildfire	1.7	2,550,000	0	0	1.1	139,700	15.55	8,163,750	1.87	2,805,000
Flood	0	0	0	0	0	0	0.25	131,250	0	0
Liquefaction	5.05	7,575,000	4.83	6,762,000	1.51	191,770	59.08	31,017,000	9.75	14,625,000
Landslide	0	0	0	0	0	0	0	0	0	0
Slope	0	0	0	0	0.37	46,990	0.31	162,750	0	0
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Tremonton, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					
Wildfire					
Flood		2 public facilities			2 bridges
Liquefaction	Tremonton Fire Dept. & EMS, Tremonton Police Dept.	3 schools, 6 public facilities	7 healthcare facilities	8 places of worship	24 bridges, 13 broadband anchors
Landslide					
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Tremonton, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0.00	0.00	0.00	0.00	0.00
Faults	0.00	0.00	0.00	0.00	0.00
Wildfire	200.79	714.66	0.00	0.00	1.00
Flood	47.50	1.33	0.00	0.00	0.00
Liquefaction	0.00	0.00	0.00	1.00	2.00
Landslide	1,768.28	3,476.52	0.00	0.00	0.00
Slope	0.00	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Tremonton, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	28.05	0	2.68	13.71	0	3
Flood	41.46	0	2.24	12.58	0	3
Liquefaction	78.45	0	12.11	38.28	0	3
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
Poorly Drained Soils	0	0	0	0	0	0

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

over 6,400 people at risk and over 300 structures.

Landslides. Isolated portions of Tremonton could suffer potential losses to landslides. Agricultural lands are estimated to be at risk in portions of the town. No risk to life or structures is estimated.

Steep Slopes. Tremonton has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact some infrastructure in the jurisdiction, but potential losses are estimated to be minimal.

Wildfire. Tremonton is susceptible to moderate-high risk of wildfire in western portions of the city, such as the benches and hilly areas adjacent to mountainous regions, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the 2nd greatest number of people in the town, with possibly over 2,500 people and nearly 1,000 structures at risk.

Future Development

Concerns involving future development exist for earthquakes throughout the city, due to its high potential for liquefaction. Future development could potentially occur in areas along the Malad River flood plain, which would increase the exposure of human life, structures, and other amenities to flooding. Future development is likely to also continue in the northwest portion of town. Development in these areas could be more susceptible to wildfire risk.

Hazard Mitigation Strategies

Table 46: Tremonton City Mitigation Strategies

TREMONTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Tremonton	Wild land Urban Interface	Protect current residents and property	Continue education and project manpower assistance for defensible space in homes located within the CWPP.	N/A	High	2015	Annual FD wages budget	Tremonton City, Utah FFSL	$2,000	TFD wild land equipment and personnel
Tremonton	Earthquake	Protect current residents and property	Public awareness safety fair for earthquake dangers and recommended practices.	N/A	Medium	2016, 2019	EM budget	Tremonton, UGS	$500 (building rental)	ACH Intermediate School, local and regional vendors, local and state expert presenters.
Tremonton	Earthquake	Protect current residents and property	Public awareness campaign for earthquake preparedness (EM website, CERT Training, local preparedness presentations, booth at hospital and other safety fairs).	N/A	High	2020 the annually	EM wages and budget	Tremonton, UGS	varied	County preparedness kit, internet resources
Tremonton	Wildfire	Protect future residents and property	Monitor fire break status	N/A	Medium	2020 and annually	EM budgets	Tremonton, Utah FFSL	Varies	N/A
Tremonton	Flood	Protect current residents and property	Update ordinances as needed for NFIP compliance	planning and zoning update	Medium	2020 and annually	N/A	Tremonton, Utah DEM	N/A	N/A

TREMONTON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Tremonton	Wild land Urban Interface	Protect future residents and property	Provide annual education for new residents on wildfire issues, invite residents to participate in CWPP projects.	N/A	Medium	2020	EM wages and expense budget	Tremonton City, Utah FFSL	minimal outside of EM budget	City buildings (public meetings)
Tremonton	Earthquake	Protect future residents and property	Update building codes for earthquake protection	N/A	High	2020 and annually	inspector budget	Tremonton, UGS	varies	N/A
Tremonton	Earthquake	Protect future residents and property	Public awareness campaign for earthquake preparedness (EM website, CERT Training, local preparedness presentations, booth at hospital and other safety fairs).	N/A	High	2020 and annually	EM wages and budget	Tremonton, UGS, Box Elder County	varied	County preparedness kit, internet resources
Tremonton	Wildfire	Protect future residents and property	Monitor fire break status	N/A	Medium	2020 and annually	EM budgets	Tremonton, Utah FFSL	Varies	N/A
Tremonton	Flood	Protect future residents and property	Update ordinances as needed for NFIP compliance	planning and zoning update	Medium	2020 and annually	N/A	Tremonton, Utah DEM	N/A	N/A

WILLARD

Analysis of hazard risk involving the community of Willard revealed that there is potential risk resulting from **faults, floods, liquefaction, landslide, steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfires, earthquakes resulting in liquefaction and fault zone damage, as well as landslides have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, and steep slopes appear to have less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Willard. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Table 47: Willard City Potential Loss Figures

Natural Hazards

Faults. Willard has risk of fault damage in along a section of the northern portion of the Wasatch Fault. The eastern portions of the town, especially areas of the foothills and bench, lie along portions of the fault, which historically is the most overdue for activity in the region. Human life, structures, and other amenities in the fault zone could suffer damage in the event of a large earthquake. Damage from faulting is likely to impact an estimated 47 people and nearly 30 structures.

Flood. Portions of Willard appear at risk to flooding. Willard is an NFIP participant. Areas within the jurisdiction associated most closely with risk include areas adjacent to Facer, Willard, Cook, Holmes, and Pearsons Canyons, and portions of the town near Willard Bay Reservoir. Willard Creek meanders through town from east to west and poses the greatest risk of flooding within the city. Floods resulting in these areas pose a threat to human life, structures, critical facilities, infrastructure, and other environmen-

Willard, UT, Residential & Commercial Development at Risk						
Hazard Type	~Residents at Risk*	Residential Units at Risk		Commercial Units at Risk		
		# Units	$ Value**	# Units	$ Value**	$ Potential Revenue Loss***
Dam Failure	0	0	0	0	0	0
Faults	47	15	6,108,935	11	5,217,838	13,280,355
Wildfire	1,687	539	100,825,948	37	9,254,891	44,670,285
Flood	91	29	8,117,945	6	1,118,593	7,243,830
Liquefaction	485	155	39,688,959	28	9,559,454	33,804,540
Landslide	876	280	44,887,987	16	1,081,105	19,316,880
Slope	13	4	1,414,597	1	149,458	1,207,305
Poorly Drained Soils	0	0	0	0	0	0

* Based on average persons per owner household for Box Elder County from 2013 American Community Survey, which is 3.13.

** Current Market Value per parcel. Numbers were derived from Box Elder County parcels data provided by Box Elder County GIS personnel.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm ($1,207,305). Derived from 2007 Survey of Business Owners for Box Elder County, US Census Bureau.

Willard, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	$ Value[1]	# of Miles	$ Value[2]	# of Miles	$ Value[3]	# of Miles	$ Value[4]	# of Miles	$ Value[5]
Dam Failure	0	0	0	0	0	0	0	0	0	0
Faults	0.47	705,000	1.55	2,170,000	2.13	270,510	7.88	4,137,000	2.37	3,555,000
Wildfire	2	3,000,000	0	0	3.55	450,850	11	5,775,000	2.3	3,450,000
Flood	0.15	225,000	0	0	0.21	26,670	1.67	876,750	0.26	390,000
Liquefaction	4.96	7,440,000	0	0	6.88	873,760	43.61	22,895,250	0.29	435,000
Landslide	0	0	0.15	210,000	0.5	63,500	7.28	3,822,000	0.55	825,000
Slope	0	0	0	0	0.94	119,380	1.82	955,500	1.14	1,710,000
Poorly Drained Soils	0	0	0	0	0	0	0	0	0	0

[1] Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah.
[2] Based on average replacement cost estimates for gas lines ranging from 2-inches-20 inches in diameter. These cost are based solely on labor and material costs, and may vary based on time, scope, and site specific variations (Questar, May 2015).
[3] Based on estimates from Logan Light and Power, 2015.
[4] Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015.
[5] Based recent Cache County and regional project cost estimates, 2015.

Willard, UT, Critical Facilities at Risk					
Hazard Type	Critical Facilities Types				
	Emergency	Schools/Public	Health Care	Places of	Infrastructure
Dam Failure					
Faults					3 dams
Wildfire					
Flood					1 dam
Liquefaction	Willard Police Department, Willard Fire and First Responders,	Willard School, Willard Bay State Park Rangers		1 place of worship	2 bridges, 5 dams, 7 broadband anchors
Landslide	Willard City Fire Department and First Responders, Willard Police Dept.	Willard School			6 broadband anchors
Slope					
Poorly Drained Soils					

Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.

Willard, UT, Agricultural Features at Risk					
Hazard Type	Lands at Risk			Farms & Barns****	
	Agriculture Production*	Farm Land**	Grazing***	Century Farms	Historic Barns
	# of Acres			# of Farms	# of Barns
Dam Failure	0.00	0.00	0.00	0.00	0.00
Faults	401.12	506.64	0.00	0.00	0.00
Wildfire	213.70	518.12	0.00	0.00	0.00
Flood	161.40	91.60	0.00	0.00	0.00
Liquefaction	1,471.23	1,542.88	0.00	0.00	0.00
Landslide	94.55	199.82	0.00	0.00	0.00
Slope	1.64	0.00	0.00	0.00	0.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00

* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.
**Lands that are suitable for farming purposes based on soil type and composition, as describe in the 2013 Natural Resource Conservation Service, SSURGO datasets.
*** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)
**** Based on data compiled by the Bear River Association of Governments.

Willard, UT, Environmental & Recreational Features at Risk						
Hazard Type	Environmental Features at Risk			Recreational Features at Risk		
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00
Faults	73.13	6.14	2.93	0.00	2.11	2.00
Wildfire	80.57	9.67	3.74	13.71	2.03	2.00
Flood	1,138.41	947.89	1.80	12.58	0.00	0.00
Liquefaction	1,362.76	974.41	1.03	38.28	0.00	0.00
Landslide	0.00	0.56	0.84	0.00	0.52	2.00
Slope	0.00	0.00	1.71	0.00	1.55	2.00
Poorly Drained Soils	0.00	0.00	0.00	0.00	0.00	0.00

Note: Total acres of land, miles of streams and trails, and amenities were identified using multiple data sources including: Utah AGRC, U.S. Fish and Wildlife Service, U.S. Forest Service, U.S. Geological Survey, Utah Division of Water Resources, and public and community leader input.

tal, recreational, and agricultural amenities and lands within city limits.

Liquefaction. Areas of Willard have areas of high risk of liquefaction in the event of an earthquake. The majority of areas susceptible to high risk liquefaction exist in the lower elevation areas to the west of Highway 89. Liquefaction has the 3rd greatest potential to impact human life and structures with over 480 people at risk and nearly 175 structures.

Landslides. Isolated portions of Willard could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include portions of the town adjacent to portions of Highway 89, as well as some areas along the Wasatch Front Mountains. Landslides have the potential to impact life, property, critical facilities, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Landslides have the 2nd greatest potential to impact human life and structures with over 870 people and nearly 300 structures at risk, include emergency response facilities.

Steep Slopes. Willard has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found in areas directly adjacent to mountainous areas of the Wasatch Mountain Range. Areas bordering streams, rivers, and drainages also appear to have some increased exposure to risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Thirteen people and 5 structures are estimated to be at risk within the jurisdiction.

Wildfire. Willard is susceptible to moderate-high risk of wildfire in eastern portions of the city such as the benches and hilly areas adjacent to the Wasatch Mountains, as well as some lower lying grassy and shrubby areas in the town. Wildfires have the potential to impact the greatest number of people in the town, with possibly over 1650 people and 550 structures at risk.

Future Development

Future development is expected on the southern portion of Willard in areas both to the east and west of Highway 89, with an expected 150 units on the east side of the highway, and an expected 200+ units on the west of the highway. Future development on the east side of Highway 89 may be exposed to greater risk involving wildfire, earthquake faulting, steep slopes, and landslides. In the case of extreme weather events, flooding may also occur if canyons experience large volumes of rain or snowfall. Development to the west of the Highway 89 may be exposed to greater risk involving liquefaction and landslides, as well as some risk to flooding in the case of severe weather. Care should be taken during the construction of these developments to ensure risks to hazards are mitigated prior to areas becoming populated.

Hazard Mitigation Strategies

Table 48: Willard City Mitigation Strategies

WILLARD - COMMUNITY MITIGATION STRATEGIES										
Protecting Current Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Willard	Flood	Protect current residents and property	Flood control district to protect and identify areas of high flood plain.	N/A	High	2015	Property Tax	Willard, Willard Flood Control Board, Utah DEM	$6,000	DWQ, Dam Safety
Willard	Wildfire	Protect current residents and property	Certify our Fire Dept. in wild lands fire fighting	N/A	High	2015	$500 per member city budget and grants	Willard, Utah FFSL	$500 per member	Grants
Willard	Landslide	Protect current residents and property	Work with city engineer and flood control to identify areas of high risk.	N/A	High	2016	N/A	Willard, UGS	$5,000	N/A
Willard	Earthquake	Protect current residents and property	CERT Training program for residence	N/A	High	2015	Participant fee	Willard	$600	Utah State Govt
Willard	Steep Slopes	Protect current residents and property	Identify areas with Engineer and classify as sensitive zones	N/A	Medium	2016	City Budget	Willard, UGS	$200	City Budget

WILLARD - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	**Hazard**	**Goal**	**Action**	**Action (For NFIP Compliance, if Applicable)**	**Priority (High, Medium, Low)**	**Time-frame (Year)**	**Potential Funding Sources**	**Responsible Entity**	**Estimated Cost**	**Resources**
Willard	Flood	Protect future residents and property	Keep Willard flood control running and included in future development.	N/A	High	2016	Future property taxes and building permit fees	Willard, Willard Flood Control Board, Utah DEM	$10,000	Property tax
Willard	Wildfire	Protect future residents and property	Annual wild lands firefighting training for new fire fighters	N/A	High	2016	Grants	Willard, Utah FFSL	$500 per member	County of Box Elder and State of Utah
Willard	Landslide	Protect future residents and property	Once high risk areas are identified put them in the sensitivity zone for protection from development.	N/A	High	2016	City budget	Willard, UGS	$200	City budget
Willard	Earthquake	Protect future residents and property	Ongoing CERT Training scheduled semi annually	N/A	High	2015 and for next 5 years	Participant fee	Willard	$600	State Emergency Fund
Willard	Steep Slopes	Protect future residents and property	Discourage development of sensitive zones by ordinance	N/A	High	2016	City Budget	Willard, UGS	$200	City budget