

PRE-DISASTER MITIGATION PLAN

TOOELE COUNTY, UTAH



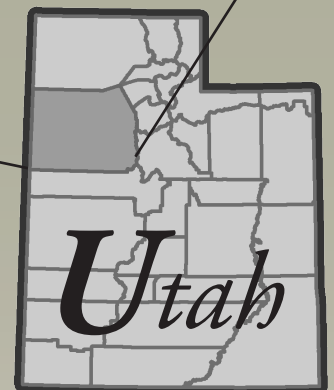
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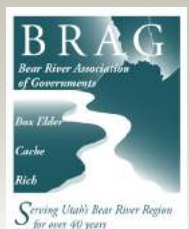


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SECTION 1: PRE-REQUISITES & ADOPTION BY THE LOCAL JURISDICTIONS

INTRODUCTION & PLAN PURPOSE

The eight jurisdictions in Tooele County are vulnerable to natural, technological, and human-caused hazards that have the possibility of causing serious threat to the health, welfare, and security of our citizens. The cost of response and recovery from potential disasters, both in terms of potential loss of life or property, can be lessened when attention is turned to mitigating their impacts before they occur or re-occur.

This plan attempts to identify the region's hazards, understand vulnerabilities and craft solutions that can significantly reduce threat to life and property. The plan is based on the premise that hazard mitigation works! With increased attention to managing natural hazards, communities can do much to reduce threats to existing citizens and avoid creating new problems in the future. In addition, many solutions can be implemented at minimal cost.

This is not an emergency response or management plan. Certainly, the plan can be used to identify weaknesses and refocus emergency response planning, which is an important mitigation strategy. However, the focus of this plan is to support better decision making directed toward avoiding future risks, and the implementation of activities or projects that will eliminate or reduce the risk for those that may already have exposure to a natural hazard threat.

How The Plan Is Organized

Section 1 introduces the plan, outlines the plan including scope, purpose, and goals, lists participating communities, and includes commentary on changes in the plan from earlier versions. Section 2 gives a general regional background including basic demographic, economic, and physiographic characteristics. Section 3 documents the planning process, public involvement, and summarizes information on natural hazards in Tooele County.

Section 4 is the county-wide risk assessment section. Because of the uniformity of the hazard risk throughout the county and the similarity of vulnerabilities, severe weather, drought, agricultural hazards, radon, avalanche, tornado,

tsunami, volcanic, and problem soils were addressed or discussed on a regional level. This section also includes commentary regarding implications of the potential effects of natural hazards on future development. Sections 5 through 19 include natural hazard risk assessments for cities, towns, and the unincorporated county. Section 20 documents local community planning and technical capability to implement mitigation strategies, and Section 21 discusses plan implementation, funding, and public involvement.

How The Plan Should Be Used

First, the plan should be used to help local elected and appointed officials plan, design, and implement programs and projects that will help reduce their community's vulnerability to natural hazards. Second, the plan should be used to facilitate inter-jurisdictional coordination and collaboration related to natural hazard mitigation planning and implementation. Third, the plan should be used to develop or provide guidance for local emergency planning. Finally, if adopted, the plan will bring communities in compliance with the Disaster Mitigation Act of 2000, qualifying jurisdictions to apply for funding for pre-disaster mitigation projects and for receiving federal aid in the event of a presidentially declared disaster.

What Is Hazard Mitigation?

Hazard mitigation is defined as any cost-effective action(s) that has the effect of reducing, limiting, or preventing vulnerability of people, property, and the environment, to potentially damaging, harmful, or costly hazards. Hazard mitigation measures, which can be used to eliminate or minimize the risk to life and property, fall into three categories. First, are those that keep the hazard away from people, property, and structures. Second, are those that keep people, property, and structures away from the hazard. Third, are those that do not address the hazard at all but rather reduce the impact of the hazard on the victims, such as insurance. This mitigation plan has strategies that fall into all three categories.

Hazard mitigation measures must be practical, cost effective, and environmentally and politically acceptable. Actions taken to limit the vulnerability

of society to hazards must not in themselves be more costly than the value of anticipated damages. However, some projects may require financial commitments from local jurisdictions without any measurable monetary reward or benefit, although it may save lives and priceless community assets. Some initial financial investments for projects which lessen risk to local residents and property, may also pay economic dividends later on if legal issues arise.

However, the primary focus of hazard mitigation actions must be on capital investment decisions, and based on vulnerability. Capital investments, whether for homes, roads, public utilities, pipelines, power plants, or public works greatly determine the nature and degree of hazard vulnerability for a community. Once a capital facility is in place, very few opportunities will present themselves over the useful life of the facility to correct any errors in location or construction with respect to hazard vulnerability. It is for these reasons that zoning and other ordinances - which manage development in high vulnerability areas along with building codes and guidelines, are often the most useful mitigation approaches a city can implement.

In general, mitigation measures are the most neglected programs within emergency management. Since the priority to implement mitigation activities is generally low in comparison to perceived threat, implementation may be a timely and highly involved process. Mitigation success may be achieved however, if accurate information is portrayed through complete hazard identification and impact studies, followed by effective mitigation management. Hazard mitigation is the key to eliminating long-term risks to people and property from hazards and their effects. Preparedness for all hazards includes response and recovery plans, training, development, management of resources, and the need to mitigate each jurisdictional hazard.

This multi-jurisdictional plan evaluates the potential impacts, risks and vulnerabilities associated with natural hazards for jurisdictions in Tooele County. The plan supports, identifies, describes, and documents potential mitigation projects for municipalities and the unincorporated

areas in each county. The suggested actions and plan implementation contained in this document for local governments may reduce the impact severity of future disasters. Only through coordinated partnerships with emergency managers, political entities, public works officials, community planners, the general public, and other individuals working to implement this program will the goals of the plan be accomplished.

For most of the State of Utah, the planning services of the Utah Association of Governments (AOG's) have been utilized to develop the mitigation plans for all jurisdictions in the state. However, some individual jurisdictions have recently completed the plan on their own. For this plan update, Tooele County emergency management requested assistance from Bear River Association of Governments to update the plan for the entire region.

Tooele County was the project manager for this plan update and provided oversight throughout the entire process. County staff also served as the main contact and liaison for elected and appointed officials, as well as staff from participating jurisdictions.

Plan Purpose

This Pre-Disaster Mitigation Plan is meant to provide information regarding threats to life and property associated with natural hazards to local and State governments as well as interested agencies and the general public. The intent of this document can be summarized into several overarching goals which:

- Fulfill Federal, State, and local hazard mitigation planning requirements
- Promote pre- and post-disaster mitigation measures, short and long-range strategies that minimize suffering, loss of life, and damage to property resulting from hazardous or potentially hazardous conditions to which citizens and institutions within the State are exposed.
- Eliminate or minimize conditions which would have an undesirable impact on our citizens, local infrastructure, economy,

environment, and the well-being of local, county, and state governments.

Plan Scope

Tooele County, with assistance from Bear River Association of Governments, will submit a current updated plan to the Utah Division of Emergency Services. Future monitoring, evaluating, updating and implementing will take place as new incidents occur and/or every five years. The hazard mitigation plans and strategies will also be included in local planning efforts and plans.

Overall Goals

Coordinate with participating local governments to develop a regional planning process that will meet the Local Mitigation Plan Review Tool provided by FEMA. Additional goals include planning to meet expectations set by the State and addressing the concerns of local jurisdictions.

Local Goals

The goals below form the basis for the development of the PDM Plan and are shown from highest to lowest priority. They are:

1. Protection of life before, during, and after the occurrence of a disaster.
2. Protection of emergency response capabilities (critical infrastructure).
3. Improved communication and warning systems.
4. Integration of appropriate emergency medical services and use medical facilities during a natural disaster event.
5. Identification of critical facilities and community infrastructure.
6. Government collaboration across jurisdictional boundaries during natural hazard events.
7. Protection of developed property, homes and businesses, industry, educational opportunities, and the cultural fabric of a community, by combining hazard loss reduction strategies with a community's

environmental, cultural/historical, social, and economic needs.

8. Protection of natural resources and the environment when considering mitigation measures.

Countywide Goals

1. Eliminate or reduce the long-term risk to human life and property by identifying natural hazards.
2. Aid both the private and public sectors in understanding the risks they may be exposed to from identified hazards, and work with local governments and partners to find mitigation strategies that reduce those risks.
3. Decrease liability for local governments by educating elected officials and staff on natural hazard mitigation and issues.
4. Minimize the impacts of natural hazard risks when they cannot be avoided.
5. Mitigate the impacts of damage as a result of identifying hazards.
6. Implement mitigation strategies in a way that minimizes negative environmental impacts.
7. Provide a basis for funding projects which are outlined as hazard mitigation strategies.
8. Maintain and improve a regional platform to enable communities to take advantage of shared goals, resources, and other available resources.

Prioritization of Mitigation Strategies

A guiding factor in prioritizing mitigation strategies was the principle that mitigation should provide the greatest amount of good to the greatest number of people, after considering funding, staffing, and other resource constraints.

Recurrence intervals, past events, and damage estimates compiled during the assessment of vulnerability in this plan were also considered for priority and time line values. While there was not a technical cost-benefit analysis for determining mitigation strategies during this planning process, the above criteria were considered for prioritization.

ADOPTION & UPDATING THE PLAN

Participating Jurisdictions

Table 1: Participating Jurisdictions in Tooele County

Tooele County
<u>Incorporated Communities</u>
Grantsville City
Ophir Town
Rush Valley Town
Stockton Town
Tooele City
Vernon Town
Wendover City
<u>Unincorporated Communities</u>
Dugway
Erda
Goshute Reservation
Lake Point
Pine Canyon
Skull Valley
Stansbury Park

Local Adoption of The Plan

On April 1, 2016, the DRAFT Pre-Disaster Mitigation Plan was placed on the Tooele County

Emergency Management website, located at www.tcem.org. A hard copy of the plan was also available at the Tooele County Emergency Management office for viewing. After a 30-day public comment period, comments from communities, the public, county working groups, as well as the Utah Division of Emergency Services were integrated into the plan. The draft plan was then sent to FEMA Region VIII for review.

After revisions to the draft plan were completed, each jurisdiction was notified regarding the benefits of adopting a FEMA-approved plan, encouraging all 15 incorporated and unincorporated communities, including the county, to adopt the plan. Blank promulgation forms were sent to chief elected officials asking the communities to adopt the plan and to send the completed promulgation forms to Tooele County Emergency Management staff for inclusion as an appendix in the plan. The final plan was also made available in its entirety and by section on the Tooele County Emergency Management website located at www.tcem.org.

Plan Updates & Changes - General

During the 2015-2016 planning process, it was determined that most of the 2008 plan was in need of some level of revision. However, background information, such as hazard definitions, the purpose for the plan, local adoption, and other information were all still relevant. The most substantial changes consisted of document layout revisions, updates on the planning process, economic and demographic information updates, completely new risk assessment methodology and analysis, mitigation strategy updates, and updated community capability assessments. Following are some of the specific changes made to these sections.

Document layout and organization has been completely updated to create a more user friendly and accessible document. Some charts, tables, data, and other information were moved to the appendix to accentuate the most critical elements in the body of the plan. Community risk assessments were organized by jurisdiction to provide more of a community emphasis. For example, the Grantsville section was named “Grantsville City –

Community Risk Assessment,” to give a sense of ownership for communities and to make the plan easier to navigate.

The planning process was altered slightly as well. Where the 2008 planning process consisted of a region-wide, collective approach, which included all five counties in the Wasatch Front Regional Council, this plan update was completed through a comprehensive, local, working group. Tooele County Emergency Management staff invited all jurisdictions in the region to send representatives to the meetings and to serve as members of a county working group. State and Federal Agencies with land management responsibilities in Tooele County were also invited and attended working group meetings. Unincorporated communities were also invited to participate in the planning process, and all natural hazards analysis was performed for those communities where data existed. Any other suggestions for members were integrated into the working group as needed.

The use of surveys was also employed for gathering data and soliciting input for local governments and others. Letters and e-mails were also sent regularly to those contacts from the county throughout the process inviting representatives to the meetings, and giving many opportunities for community involvement.

Economic and demographic data was also updated in the plan, as was historical and natural hazard events data. New sources were sought where data was limited in the 2008 version, such as historical landslide data, historical wildfire data, and earthquake epicentre data.

New risk assessment methodology and up-to-date GIS data was also used in this plan in an attempt to reflect current conditions (See **Appendix C** and **F**). New landslide susceptibility, geological faults, wildfire, dam failure, and floodplain data was also utilized. Steep slopes were added to address additional hazard areas. Natural Resource Conservation Service (NRCS) SSURGO GIS datasets were also utilized in this plan update to address additional hazards, including frequently flooded soils, high water table, and unsuitable soils for residences with and without basements. These soils datasets provide another layer of analysis

critical for determining risk to natural hazards, especially for communities in rural areas where other datasets do not exist.

The most significant change in the risk assessment methodology for this update included the use of county-wide parcel data for creating potential loss estimates. This data included for detailed information on building types, current market values, and other attributes. The data was more representative of potential losses for specific parcels since no comprehensive countywide building footprint data was available.

A new wildfire hazard data set was also used for this plan update. Data from the West Wide Wildfire Risk Assessment (WWWRA), completed in 2013 by the Oregon Department of Forestry, was utilized to provide a more accurate risk assessment region-wide.

Mitigation strategies were also updated through interaction with participating communities. Some strategies from 2008 were completed, those that were still applicable were carried over into this plan, and new strategies were created by local governments to better address natural hazard issues.

Some communities in the county have either grown and added new employees, and/or have more data and GIS capabilities. These capabilities were listed at the end of this document as well, with the realization that some communities will continue to have needs for hazard mitigation planning assistance from Tooele County and other State and Federal agencies in the future. Tooele County staff will continue to be a resource for these communities.

Other Plan Updates and Changes

Some of the most substantial changes to this updated plan are in regards to the document layout and organization. Unlike the 2008 plan, most of the data, including large charts and extraneous background information, was consolidated and put in the appendix. This created a much more interesting plan layout and made the body of the document much shorter.

Individual community sections were also

created to make the document more accessible to local community leaders, staff, and emergency managers/planners on the local, state, and federal levels.

A more robust risk analysis was also performed. Updated Geographic Information Systems (GIS) data was used, where available, for the analysis including updated data for wildfire, soils, steep slopes, dam failure, floodplain, and geologic hazards data. Soils data was introduced into the planning process to provide natural hazards data for additional flood areas, high water table, and unsuitable soils for buildings with and without basements. Potential loss data was also more comprehensive, and included new data for:

- Natural gas lines (Questar Gas)
- Other oil and gas facilities
- Updated electrical line, road and canal data
- Agricultural amenities
- Recreational amenities
- Natural amenities
- Updated list of Critical Facilities

Another focus of Tooele County emergency management staff was to make the meetings for the update process more interesting and appealing to elected officials and other stakeholders. Various natural hazards specialists from state and federal agencies were invited to give presentations at the mitigation strategies meeting as well as the pre-adoption and draft plan meeting. They presented realistic and feasible ideas for communities to help mitigate potential impacts from natural hazards. Elected officials and staff were invited to ask questions and learn from these specialists.

MITIGATION STRATEGIES IMPLEMENTED FROM 2008-2016

Drought

Action 3: Water reservoirs have insufficient storage capacity. Dredge reservoirs for increased capacity. *Settlement Canyon Reservoir has been dredged to increase storage capacity.*

Action 4: Store water when there is surplus. Increase storage capacity through expansion. *This has been an ongoing effort. Surplus water from storms is stored at the golf course ponds, and used for irrigation. However, they don't have a way to pump that back into the city.*

Action 5: Manage surface and subsurface supplies as one. Implement redistribution and/or interconnections between reservoir drainage areas and surface/subsurface storage or wells. *Tooele and Grantsville city have cross connections between water tanks to anywhere in their cities*

Action 6: Actively encourage water conservation through the development and distribution of outreach materials to each community. *Tooele City has passed numerous ordinances for water conservation.*

Action 8: Coordinate with irrigation companies to develop a secondary water system and water distribution plan for drought. *Reclamation facility is used for irrigation, as well as the golf course ponds.*

Earthquake

Action 3: Create and/or improve natural hazard ordinances including codes for liquefaction. Make these easily accessible and downloadable on the County website and linked to the Emergency Management website. *Building and zoning codes have been implemented to protect against earthquakes, have put ordinances in place for structural updates. Library, schools have been seismically updated. Police station is being designed to withstand earthquakes.*

Flood

Action 2: Request flood maps and/or updates for Grantsville City, Hickman Canyon and the South Rim development in Stockton. *Utah Department of Natural Resources and the US Forest Service has been involved in mapping floods in Grantsville.*

Action 4: Develop a drainage master plan; design and construct improved drainage channels, and detention ponds in appropriate areas of the County to include: Bates Canyon, Pine Canyon, Middle Canyon, Settlement Canyon, North and South Willow. ***Grantsville put in a control ditch on the west side of Grantsville, to direct flood waters through the county. Grantsville has also made an effort to preserve natural drainages and not allow building in that area.***

Action 5: Develop a Surface Water Management Plan, design/construct storm water routes or channels to direct flows, and storm drain spot improvements according to the recently conducted Stansbury Park Storm Drainage Study. ***An engineering study and a plan was developed to eliminate flood waters from coming into the city.***

Other Notes on Flooding:

Grantsville completed a mapping project, construction in some areas including facility upgrades, and is working with FEMA on drainage channel and corridor issues.

Severe Weather

Action 1: Increase Weather Spotter training.

Ongoing.

Action 2: Increase Amateur Radio Operator Involvement in weather observations.

Ongoing.

Action 3: Install more electronic sign boards for alerting public of severe weather condition, especially along the I-80 corridor.

Ongoing.

Wildland Fire

Action 1: Develop and distribute outreach documents specific to fire resistant vegetation. ***Fire resistant vegetation has been put in.***

Action 2: Take action through physical inspection to enforce codes currently in place. ***Have increased inspections and enforcement codes.***

Action 3: Explain wildfire risk to people seeking building permits and realtors showing homes in risk prone areas, discourage building above 5577 feet above sea level (WUI areas), and provide a copy of the code and outreach documents. ***Building permits and education has increased. Fire Warden has gone into communities with interface issues and talked about mitigation strategies.***

Action 4: Determine the specific areas where the Wildfire Protection Standards are in effect and make it available to the public in a graphic form. ***Ongoing.***

SECTION 2: REGIONAL SETTING, BACKGROUND INFORMATION, & DEMOGRAPHIC SUMMARY

PHYSIOGRAPHIC BACKGROUND

Tooele County is the second largest county in Utah, with 6,923 square miles of area. Salt Lake and Utah Counties bound it to the east. The southern border is Juab County, the northern border is Davis and Box Elder Counties and the western border is the State of Nevada. Most of the County's population lives in the eastern valleys where most of the irrigated and dry farmland is also located. Several hundred square miles in the western part of the county are arid desert, are largely owned by the federal government, and are sparsely populated. The County includes a portion

Climate

Utah's climate is variable, wet in some areas of the state and dry in others. This variability is a function of latitude, elevation, topography, and distance from moisture sources. The Wasatch Front region's climate borders a semi-arid, mid-latitude steppe climate that occurs along the perimeter of the Great Basin Desert, and a humid continental climate found at slightly higher elevations in the Rocky Mountain foothills (Critchfield, 1974).

Northern Utah has four seasons, low annual precipitation, convective and frontal storms, dry



of the Great Salt Lake desert, salt flats and is generally uncultivated. Altitudes range from 4,200 at the Great Salt Lake to 11,031 feet above sea level at the top of Deseret Peak in the Stansbury Mountains (Tooele County 2001).

Shared geographic, geological, natural, and social-cultural connections are important when considering natural hazards, pre-disaster mitigation, and emergency response and communications planning. Efforts should be coordinated between counties as much as possible to protect the public from natural hazard risks.

summers, low humidity, and large annual and diurnal temperature extremes. The Wasatch, Oquirrh and Stansbury Mountain Ranges bring most of the precipitation to the valley floor. The winter months bring heavy snow accumulation over the mountains that are favorable for winter sport activities. Spring runoff is at its peak from April through June and can cause flooding along the lower streams. Flash flooding from summer thunderstorms affects smaller more localized areas in this region from summer thunderstorms. Utah is the second driest state in the nation. The average annual precipitation in the Great Salt Lake desert

averages less than 5 inches annually.

During winter months, valley's experience fog and colder temperatures in low elevations and regular winds and increasing snow pack at higher elevations. During the summer months, temperatures can remain above 100° F for weeks, and drought can be problematic for farmers and ranchers.

The surrounding mountain ranges act as a barrier to the cold continental arctic masses. This also insulates the area during the day and cools the area rapidly at night. On clear nights, the colder air accumulates on the valley floor, while the foothills and benches remain relatively warm.

During the fall and winter months, smoke, haze, and fog can accumulate in the lower levels of stagnant air over the valley floor and can last for several weeks at a time. This is caused by areas of sinking air or high-pressure anticyclones settling over the Great Basin. Average wind speeds are usually light to moderate, usually below 20 miles per hour. Strong winds can occur in localized areas, mainly in canyon mouths along the western slopes of the Wasatch Mountains. Dust storms can occur in the western portions of the region. Tornadoes have occurred in this region but are uncommon. Severe hailstorms have also occurred in the region during the spring and summer months (some physiographic text and data taken from Tooele County's 2008 Pre-disaster Mitigation Plan).

Geology

The Oquirrh Mountain Range, running north-south, forms the border between Salt Lake, Tooele County, and the Stansbury Mountains. The western side of the Tooele valley forms the main physiographic features of the area.

The Salt Flats in the western portion of Tooele County are a remnant of Lake Bonneville's fine compressed sediment, comprised of salt that includes gypsum, potash, and calcium carbonate.

The region is characterized by numerous north-south oriented, fault tilted mountain ranges that are separated by intervening, broad, sediment-filled basins. Two additional landforms are typical of the Basin and Range region, including playas and

alluvial fans. Playas are undrained mud or salt flats that are composed of layers of sediments. Alluvial fans are erosional deposits of sand and gravel that typically occur at canyon mouths (Peterson, 1994). Many of the basins within the region were also modified by shorelines and sediments of inland lakes that intermittently covered the valley floors. The most notable of these was Lake Bonneville (Milligan, 2000).

The region is most commonly defined as an endorheic, or internally-drained, basin. As with the Basin and Range region, mountain ranges within the Great Basin were formed by faulting and subsequent erosion. In some areas, the mountain ranges have been so extensively reduced by erosion, and buried by the deposition of material, that only small remnants are visible above coalescing alluvial fans (Murphy, 1989).

The Bonneville Basin and associated Bonneville Salt Flats were formed through the recession and evaporation of the Pleistocene-era Lake Bonneville (Hallaran, 1994). The lowest elevation within the Great Basin occurs within the Bonneville Basin and is covered by the Great Salt Lake. The surface of the Great Salt Lake is approximately 4,200 feet (Fisher, 1994).

Environmental and Recreational Amenities

Tooele County has much to offer as far as environmental and recreational amenities. Some main attractions include numerous Pony Express stops, the Bonneville Salt Flats, Skull Valley and west desert area for motorsports, and numerous historical monuments.

In the county, there are many public and state parks that offer a variety of environmental and recreational amenities. There are various opportunities for recreation that are found in this region: reservoirs, fishing, hiking trails, camping and picnic areas, atv riding, wildlife watching, etc.

Modern society places increasing emphasis on the availability of good quality recreational amenities, which are seen as beneficial to the physical and mental health and quality of life of the population. The provision of recreational facilities has also been shown to reduce crime and vandalism, positively effect community economics,

and contribute to the development of stable communities.

Open Space is a large influence to residential and commercial development. The Wasatch Front Region is surrounded by relatively large amounts of open space. Currently, in Tooele County, large amounts of land are owned by the federal government. The urbanized area is fortunate to have exceptional access to the open space in the mountains to the east and to the west of the valleys. The Bureau of Land Management primarily administers the open space in the west desert area of Tooele County. Numerous nationally recognized winter and summer recreation areas for skiers, hikers and rock climbers are in close proximity. As a consequence, hundreds of thousands of people visit the public lands in the foothills and mountains of the Wasatch annually. Less notable and frequented, are the mountains to the west of the urbanized areas, such as the Oquirrh Mountains that divide Salt Lake and Tooele Counties. There are several natural streams emanating from these mountains as well as canyons that are mostly frequented by people living nearby. The majority of the Oquirrh Mountains is owned by Kennecott Copper Corporation, and is not generally available to the public for open space use.

Not only can open space resources be found in the mountains of the Wasatch, but private and public open space is also found in the valleys in the form of farms, developed and natural parks, golf courses, water features and vacant land. In many instances, these resources may receive more intensive use than those found in the adjacent mountains. Recently, because of the rapid growth in the area, citizens as well as state and local political leaders have become concerned about the relatively rapid loss of private open space resources, such as farmland and vacant land. Urban growth has put considerable pressure on the farmlands that can still be found in, or adjacent to, the urbanized areas.

REGIONAL DEMOGRAPHIC SUMMARY

Population Growth and Community Development

The total population for Tooele County is

approximately 61,598. The area population grew by 5.8% between 2010 to 2014, and 1.4% in the last year. (US Census Bureau, 2016). Grantsville had 10.5% increase in population growth adding 922 residents. Stansbury Park grew at a rate of 9.7% adding 316 new residents to the county.

Many of the jurisdictions in Tooele County may continue to experience high future growth rates, due to their proximity to Salt Lake County. As development from along the Wasatch Front continues to grow, Tooele County communities will most likely be utilized as an affordable bedroom community to Salt Lake to provide housing for those who work there.

Community and Economic Development Profile

In Tooele County, large amounts of land are owned by the federal government. Percent of land ownership is 78.5% Federal, 5.9% State, 0.3% Native American, 11.2% Private and Local Government and 4.1% water.

Employment in Tooele County is based on three main types of industry: government (23.8%), trade/transportation/utilities (14.9%), and professional and business services (14.0%). Other important sources of employment in the county are manufacturing (8.6%), education and health services (8.0%), leisure and hospitality (7.4%), and construction (6.3%). Some of the largest employers include Tooele County School District, Dugway Proving Grounds, EG&G Defense Materials, Detroit Diesel, U.S. Magnesium, Wal-Mart, Tooele County, and the Tooele Valley Regional Medical Center (UDWS 2007b).\

The employment rate in 2014 was approximately 62.6% with 31.3% of the population not in the labor force. The unemployment rate for the county in 2014 was 5.1% (Census, 2014).

Tooele County's per capita personal income in 2014 was \$22,423 and a median household income of approximately \$63,077. In 2014, 8.1% of the population was below the poverty line. The unemployment rate averaged only 5.1% for the year 2014 (Census, 2014). Tooele County School District is one of the largest employers.

Table 2: Major Employers in Tooele County**MAJOR EMPLOYERS – TOOELE COUNTY**

Company Name	Number of Employees
Department of Defense	1,000 to 1,999
Tooele County School District	1,000 to 1,999
Wal-Mart Distribution Center	1,000 to 1,999
EG&G Defense Materials, Inc.	500 to 999
Envirocare of Utah	250 to 499
Detroit Diesel Remanufacturing West	250 to 499
Tooele County	250 to 499
Tooele Valley Regional Medical Center	250 to 499
U.S. Magnesium	250 to 499

Source: Utah Department of Workforce Services

an opportunity to purchase flood insurance for their home. In order for individuals to be eligible to purchase flood insurance, their community needs to be a member of the National Flood Insurance Program (NFIP). It is fairly simple to join the NFIP with help from the State Floodplain Manager. There is also limited funding for flood mitigation projects for communities that are members of the NFIP. Currently 5 jurisdictions out of 14 in Tooele County participate in the NFIP (See Table 6 below).

Table 3: NFIP Participation

National Flood Insurance Program (NFIP) Participation and Flood Data/Status						
	Community Name	CID	Initial FIRM Identified	Current Effective Map Date	Online FIRM?	GIS Data Available**
TOOELE COUNTY	Confederate Tribe of the Goshute Reservation	NO INFORMATION AVAILABLE				
	Erda				Y	Limited
	Grantsville	490141#	11/18/2009	(NSFHA)	N	N
	Lake Point				N	N
	Ophir				N	N
	Pine Canyon				Y	N
	Rush Valley	NOT PARTICIPATING			Y	Y
	Skull Valley				N	N
	Stansbury Park				N	N
	Stockton	490144#	8/5/1980	11/18/09(M)	Y	Y
	Tooele	490145#	9/29/1989	11/18/2009	Y	Y
	Tooele County	490140#	11/16/1990	11/18/09(M)	Y	Y
	Vernon	NOT PARTICIPATING			Y	Y
	Wendover	490222#	8/19/1980	11/18/09(M)	Y	Y

Source: Federal Emergency Management Agency (FEMA) National Flood Insurance Program, 2015

* Unincorporated areas only

**(GIS) Geographic Information Systems (Mapping and geographic analysis software)

(E) Emergency Program or (R) Regular Program

(NSFHA) No Special Flood Hazard Area

NFIP PARTICIPATION & BUILDING CODE REPORTS

National Flood Insurance Program Participation

The National Flood Insurance Program was created in 1968 by the Federal Emergency Management Agency (FEMA) to provide homeowners living in the 100-year floodplain

Building Code Effectiveness Grading Reports (BCEGS)

The Building Code Effectiveness Grading Report was implemented in 1995 to evaluate current building codes in a particular community and to determine how well the community enforces its building codes. This program assigns each municipality a grade of one to ten, with one

showing excellent commitment to building code enforcement. The concept of the Building Code Effectiveness Grading Reports is that communities with effective, well-enforced building codes should sustain less damage in the event of a natural disaster, and insurance rates can be adjusted accordingly. More information on what determines a community's score can be found at: <http://www.isomitigation.com/bcegs/0000/bcegs0003.html>.

Table 4: Building Code Effectiveness Grading Report

Building Code Effectiveness Grading Report (BCEGS) Scores for the Tooele County Region (2008)			
Community	County	BCEGS Classification	Date
Grantsville City	Tooele County	BCEGS: RES 99 COM 06	1999
Stockton	Tooele County	BCEGS: RES 99 COM 99	1999
Tooele City	Tooele County	BCEGS: RES 03 COM 03	2003
Tooele County	Tooele County	BCEGS: RES 02 COM 02	2003
Wendover	Tooele County	BCEGS: RES 03 COM 03	1997

Source: ISO. 99 is used for jurisdictions which are either unclassified or do not meet the minimum criteria of the BCEGS program. This would include departments which do not do plan review, inspections, have legally adopted codes or have declined to participate in the ISO program.

SECTION 3: PLANNING PROCESS

TOOELE COUNTY PDMP PLANNING PROCESS

This mitigation plan is the result of a comprehensive and coordinated planning process. Beyond the involvement of the general public, a great deal of effort focused on coordinating and obtaining input from the 14 incorporated and non-incorporated communities in Tooele County. All 14 jurisdictions in the county were invited to participate in the planning process, as well as other interested parties including the general public. Representatives of local communities that were not able to attend working group meetings often participated in other ways including surveys or through personal communications via telephone or e-mail.

How The Plan Was Produced and Project Staff

Tooele County staff was primarily responsible for the management and oversight of the plan update process and provided guidance throughout the planning process. Staff acted as major points of contact and a liaison for major stakeholders, scheduled meetings, invited stakeholders to all of the meetings, helped to gather local data and natural hazards information, assisted with local promulgation of the plan, and additional administrative duties.

Bucky Whitehouse, Tooele County Emergency Services Director, was the project manager and served as the primary contact for local governments and other stakeholders. Beckie Boekweg, Tooele County Emergency Services staff, served as an additional contact for stakeholders, project administration, and provided assistance preparing for and holding stakeholder meetings.

Planning staff at Bear River Association of Governments was hired by Tooele County to update the plan, including, but not limited to, updating all necessary data, GIS analysis and mapping, potential losses, document natural hazards and events for each community (if available), and record mitigation strategies for each community. BRAG staff also presented at local meetings, recorded all community and public input, submitted the plan to the State of Utah and FEMA for review, and, following any necessary edits, submitted the plan for final approval by FEMA.

Zac Covington, Sr. Regional Planner with BRAG, served as the primary contact with the County and managed the plan update under the county's direction. He managed document updates, provided guidance on GIS and potential loss analyses, and all other elements of the update process under the direction of Tooele County Emergency Services personnel.

Table 5: Stakeholder Meetings

COUNTYWIDE MEETINGS - TOOELE COUNTY PDMP UPDATE			
Meeting	Date	Location	Invitees
Countywide Kick-off Mtg.	5/26/15	Tooele County Emergency Operations Center	Elected officials, staff, state and federal agencies, transit providers, emergency managers, planners, and other stakeholders
Countywide RiskAssessment Mtg.	8/18/16	Tooele County Emergency Operations Center	Elected officials, staff, state and federal agencies, transit providers, emergency managers, planners, and other stakeholders
Countywide Mitigation Strategies Mtg.	11/10/15	Tooele County Emergency Operations Center	Elected officials, staff, state and federal agencies, transit providers, emergency managers, planners, and other stakeholders
Countywide Pre-Adoption/DRAFT Plan Mtg.	3/15/16	Tooele County Emergency Operations Center	Elected officials, staff, state and federal agencies, transit providers, emergency managers, planners, and other stakeholders
OTHER MEETINGS WITH LOCAL COMMUNITIES (Attended by Tooele County EM Staff)			
Meeting		Date	
Stockton Town Council		4/9/15	
Vernon Town Council		8/11/15	
Stockton Town Council		8/13/15	
Wendover Town Council		8/20/15	
Rush Valley Town Council		8/26/15	
Ophir Town Council		9/1/15	
Stockton Town Council		3/25/16	

* Please see Appendix H for detailed agenda's and attendance lists for the countywide Tooele County PDMP update meetings.

Landon Profaizer, Regional Planner at BRAG, was responsible for GIS analyses and mapping, provided critical input on potential loss methodology, wrote several sections of the plan, helped formulate the planning process, and created the template for this document.

Planning Intern, Zach Maughan, managed initial GIS databases, performed preliminary potential loss analysis and natural hazards mapping, served as project contact for the county early in the process, and gave presentations at several stakeholder meetings.

Planning Interns Bryan Wilson and Joseph Nielson provided critical assistance with potential losses, spreadsheet management, data entry, and calculations, writing community potential loss and other document sections, processing survey data, and other project elements as needed.

A county working group was created to provide guidance, input, and technical assistance throughout the planning process. This working group was primarily composed of emergency management personnel, elected officials, public works staff, planners, federal and state agencies, citizens, and others representing jurisdictions in Tooele County.

Meetings Summary

Table 1 shows all of the countywide meetings for this plan update, including the kick-off, local risk assessment, mitigation, and pre-adoption meetings:

Planning Meetings and Public Outreach

A regional kick-off meeting was held on June 8, 2015. This meeting was intended to introduce stakeholders to the planning process, provide a project timetable, explain requirements for the plan, and to outline responsibilities for attendees, elected officials, emergency management staff, state and federal agencies, and others.

Those attending were chosen because of their past and present involvement in emergency and city/county emergency and general planning and/or management.

A newspaper article was published by the local Tooele Transcript, announcing completion of the draft plan, and soliciting comments from local residents and interested parties. See **Appendix E** for a copy of the newspaper announcement.

Letters and e-mails were also sent to each jurisdiction in the region, notifying them of the plan update process and inviting them to participate.

The county working group helped determine where current hazards were located and risks identified (in addition to current GIS data). They also gave input on existing critical facilities and infrastructure, explored mitigation strategies, and determined issues and needs to be addressed by this plan update (see attendance lists in **Appendix H** for dates, locations, and attendance for countywide meetings). Mayors, emergency managers, public works staff, state and federal government agencies, local Chambers of Commerce, planners, and other interested citizens were invited to be a member of the working group. The public, through public service announcements, were also invited to participate.

The county risk assessment meeting was held on August 18, 2015, and was intended to give attendees the opportunity to discuss known hazards in the county or their municipality, severity of the hazards, history of past hazard events, hazard mapping details, and resources of local knowledge regarding the hazards. In-house Geographic Information Systems (GIS) mapping was utilized by BRAG staff for creating maps of known natural hazards, critical facilities, and local infrastructure. Surveys were also passed out to attendees to fill out during the meeting. For those not able to attend, surveys were mailed to each jurisdiction. Included were questions regarding current known natural hazards, previous disaster events, National Flood Insurance Program participation, and other questions related to risk assessment.

It was important that jurisdictions were encouraged to help lead the process for writing the plan as much as possible, which they would be adopting and implementing in the future. The public and other organizations had ample

opportunity to be involved as desired through newspaper announcements, and word of mouth. As always, while word of mouth, letters, e-mails, and newspapers reach the vast majority of organizations and the general public in Tooele County, it may be advantageous to reach out more directly to different groups during the next plan update. Other organizations which could be invited to be involved in the next plan update process are special service districts (including school districts and conservation districts), canal and utility companies, the Utah Department of Transportation (UDOT), Utah Transit Authority, and others.

After hazard types and locations were determined for each jurisdiction and presented to the group, a countywide mitigation strategies meeting was held on November 10, 2015. Several natural hazards specialists gave presentations on the most probable future hazard events in the county, including earthquake, landslide, flood, and wildfire. These specialists shared local and regional examples of destructive natural hazard events, and gave recommendations on what types of mitigation strategies would be appropriate for those particular hazards. Attendees were also provided with FEMA's Mitigation Ideas booklet, lists of mitigation strategies from 2008 as a reference for strategy updates, and a mitigation strategies survey. This survey provided an opportunity for communities to document which strategies they wanted to include in the plan.

The final meeting was a countywide Draft Plan Presentation and Pre-Adoption Meeting held on March 15, 2016. At this meeting, the draft plan was presented, and adoption of the plan was

discussed. A public comment period began on April 1, 2016 ending on April 30, 2016, and was announced in local newspapers countywide.

Draft Review

After the draft plan was completed and presented at the countywide pre-adoption meeting, a link for the plan was placed on the Tooele County Emergency Services website at www.tcem.org. A digital copy was also sent to the Utah Division of Emergency Management (Utah DEM) with a completed crosswalk for a pre-draft review. At the same time, public notices were published in local newspapers announcing a 30-day public comment period and the plan's location on the Tooele County Emergency Services website. Communities and working group members were also notified of the comment period and location of the draft plan online.

After all the necessary changes were made to the draft plan, and after the public comment period, the plan was sent to FEMA for review. After FEMA revisions were made, those sections of the plan which were updated were sent back to FEMA for final approval. Copies of the plan were then sent to each community and County in the region, with an example promulgation form. Copies of signed promulgation forms from each participating jurisdiction in the region were then sent to Utah DEM, and, in turn, to FEMA.

Table 6: Natural Hazards in Tooele County

NATURAL HAZARDS IN TOOELE COUNTY	
Natural Hazards Analyzed Utilizing GIS (GIS Data Available)	Other Natural Hazards Included in the Plan
Dam Failure	Avalanche
Faults	Tornado
Wildfire	Tsunami
Flood (FEMA 100-yr)	Volcanic
Flood (NRCS Soils)	Radon
Liquefaction	Severe Weather
Landslide	Drought
Slope	Agricultural
High Water Table (NRCS Soils)	
Unsuitable Soils for Buildings (NRCS Soils)	

Hazard Identification

Hazards were identified and evaluated for inclusion in this plan based on historical review of past events, synthesis of existing reports, data and hazard mapping analysis, and input from local level emergency management personnel, planners, and other community officials. Consideration for inclusion was based on the likelihood of a hazard's occurrence, location of the occurrence and the potential impact of the event in terms of its effect on human life and property (See Table 6 above).

This list on the left side of the table includes those natural hazards that were analyzed utilizing Geographic Information Systems (GIS).

However, there are several other hazards that were discussed during the planning process in less detail due to a lack of data or a lack of historical evidence showing substantial risk to the jurisdictions in the region. Some hazards were also not discussed in detail in this plan because they are not natural hazards, which are what this plan mainly focuses on, with the understanding that those non-natural hazards should still be planned for by jurisdictions. This table includes a comprehensive list of all the hazards discussed with local stakeholders throughout this process, including those that were analyzed using GIS.

HAZARD LAYERS INCLUDED IN ANALYSIS	
Dam Failure	Faults (Fault Rupture zones and buffered Quaternary faults)
FEMA Flood Zone	Flood (NRCS Soils)
Liquefaction	Landslides
Steep Slopes	Wildfire
High Water Table (Soils)	Unsuitable Soils (Bldgs)

ASSESSMENT LAYER CATEGORIES	
Agriculture	Critical Facilities
Environment/Recreation	Infrastructure
Population	
See Appendix F for a complete list of risk assessment layers and data sources used in the analysis.	

Summary of Risk Assessment Methodology

(See **Appendix C** for more detailed information)

Assessing Hazard Impacts

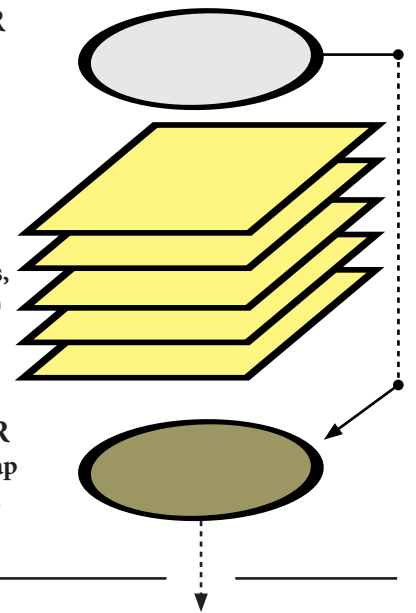
The risk assessment analysis for this plan was completed using Geographic Information Systems (GIS) software developed by Environmental System Research Institute (ESRI). Spatial layers were obtained from a number of sources throughout the planning process that include the Utah Automated Geographic Reference Center (AGRC), subject matter experts at workshops or meetings, and various local municipal or county planners or technical specialists. Once all the necessary hazard and assessment layers were obtained, ArcGIS Modelbuilder was used to organize and process the necessary spatial tools to identify resources that may be impacted by future hazard events.

SAMPLE MODEL FOR ASSESSING THE

HAZARD LAYER
(e.g. Flood, Fault, Wildfire, etc.)

ASSESSMENT LAYERS
(e.g. Critical Facilities, Roads, Housing, etc.)

OUTPUT LAYER
(shows areas of overlap between hazard and assessment layers)



Using the area (acres) or distance (miles) of impacted assessment layers, loss estimates were generated to identify the potential losses to life, property, or resources in the event of a natural hazard event.

The first step in the modelling process includes the acquisition and preparation of all available hazard layers. Once hazard layers are identified and organized by county, assessment layers are organized by category and added to the model to identify areas of overlap with each of the hazard layers. When the model is complete and processed, the resulting layers reveal all potential spatial or geographic threats to persons, property, or resources in the entire region that were included in the analysis.

After all the output layers are generated, and all layers and features affected by hazards are identified, everything is then clipped to each jurisdiction in the region, and loss estimate tables are generated using the area or distance measurements of affected features for each community.

Estimating Losses From Natural Hazards

With the output layers organized by community, the planning team uses layer information, along with other data sources to develop risk and value/loss tables for each of the five assessment layer categories that include:

- Population
- Critical Facilities
- Infrastructure
- Environmental/Recreational
- Agriculture

Population

The population table includes risk to people, as well as value and loss estimates for commercial and residential structures. In order to identify potentially impacted structures, Assessor/ GIS tables are filtered to extract Residential vs. Commercial parcels in the region. Structures are then assessed for their overlap or intersection with potential hazards through the modelling process previously described. Following this step, BRAG then used the land and structure Current Market Values associated with the Assessor file to assign loss estimates to structures threatened by hazards. BRAG also developed a Potential Revenue Loss

column to identify economic impacts to businesses in the event of a natural hazard. These figures are based on average sales, receipts, or value of shipments of firms with or without paid employees per firm (\$642,261 per firm). This information is derived from US Census Bureau and surveys of local/regional business owners.

With residential structures identified from the modelling process, BRAG then assigned population values to all threatened homes. These figures were derived from the 2013 American Community Survey using the average persons per household density estimate that varied slightly by county.

Critical Facilities

Critical facilities are identified from multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input. Hazard layers are overlaid onto all critical facilities layers in the modelling process to show spatial intersection or overlap, and are then summarized in the associated community risk assessment table. Features assessed for hazard risk in this category include:

- Emergency Services/Law Enforcement
- Schools/Public Facilities
- Health Care Facilities
- Places of Worship
- Infrastructure (Bridges, Broadband Anchors, Dams, Springs, Fuel Storage, Solid Waste Facilities, and others based on location)

Infrastructure

This category includes layers from a combination of local, state, and private entities. Infrastructure layers are first overlaid by hazard layers in the risk assessment model. The overlapping areas are then clipped out and a distance measurement is calculated for all the affected portions of linear infrastructure. Once the affected infrastructure sections are summarized, cost estimates for repair or replacement are then applied to assess the economic impact of each hazard type. Cost estimates are from a variety of

TOOELE COUNTY PDMP RISK ASSESSMENT LAYERS						
RESIDENTS AND PROPERTY	Residential Units at Risk			Commercial Units at Risk		
CRITICAL FACILITIES	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure (Oil/Gas Wells, Water System Facilities)	Hazardous Waste Facilities
INFRASTRUCTURE	Railroad Lines	Natural Gas Lines	Electrical Power lines	Roads	Canals	
AGRICULTURAL AMENITIES	Agriculturally Productive Lands		Grazing Allotments		Farm Land of Statewide Importance	
ENVIRONMENTAL AND RECREATIONAL AMENITIES	Wetland/ riparian	Lakes	Streams	Parks	Trails/Amenities	

Table 7: Tooele County PDMP Risk Assessment Layers

sources including prior planning documents or studies, utility providers, and county public works personnel.

Features assessed in the infrastructure category include:

- Railroad Lines
- Natural Gas Lines
- Electrical Power Lines
- Roads
- Canals

Environmental/Recreational

This category includes several environmental and recreational layers from multiple data sources including: Utah AGRC, US Fish and Wildlife Service, US Forest Service, US Geological Survey, Utah Division of Water Resources, and public and community leader input.

All layers were loaded in the risk assessment model and overlaid by hazards. With areas at risk identified, BRAG calculated the area or length of impacted features and summarized the results in the community risk assessment table. Features included in the Environmental/Recreational category are:

Environmental

- Wetlands

- Riparian Areas

- Lakes

- Streams

Recreational

- Parks

- Trails

- Outdoor Amenities

Agriculture

The final risk assessment category includes features associated with agricultural land and/or the historic and cultural resources associated with the history of farming in the region. Data sources for agricultural layers include: Utah Division of Water Resources, Utah AGRC, and BRAG.

All layers were loaded in the risk assessment model and overlaid by hazards. BRAG calculated the area and number of affected features and summarized the results in the community risk assessment table. Features included in the Agriculture category include:

- Agriculture Production (producing lands)
- Grazing Lands

Incorporation of Existing Plans, Studies, Reports, and Technical Information

While there have been many documents produced locally and regional in regards to hazards and reducing loss of life and property, most are emergency response and/or management, and do not specifically apply to pre-disaster mitigation. Federal, State, and local government documents have been written for many of the jurisdictions in the region. FEMA and the Utah Division of Emergency Management have both produced some excellent documents which can be used as a resource for natural hazards planning and pre-disaster mitigation. Many local governments address natural hazards on some level in their General Plan or in local land use ordinances. Some of the more recent documents incorporated as part of the planning process and used for general background information are as follows:

- Christenson, G.E., and Harty, K.M. (1988). Flood Hazard from Lakes and Failure of Dams in Utah. Utah Geological Survey. Map 111. Utah Department of Natural Resources.
- FEMA. G 318 Local Mitigation Planning Workshop Student Manual. 2014.
- FEMA. Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards, 2013.
- Floodplain Management in Utah; Quick Guide, 2003
- Public Safety Canada. All Hazards Risk Assessment Methodology Guidelines, 2012 - 2013.
- Southeastern Utah Association of Local Governments. Natural Hazards: Pre-Disaster Mitigation Plan for the Southeastern Region of Utah, 2013
- State of Utah Division of Emergency Management. State of Utah Hazard Mitigation Plan, 2014
- State of Utah, Division of Forestry, Fire and State Lands. Catastrophic Wildfire Reduction Strategy. 2012/2013
- Utah Floodplain and Stormwater Management Association. Floods: What You Should Know When Living in Utah, 2013.
- Utah Geological Survey, Guidelines for Evaluating Surface-Fault Rupture Hazards in Utah, 2003
- Utah Geological Survey. (1999). Geology and Geologic Hazards of Tooele Valley and the West Desert Hazardous Industry Area, Tooele County, Utah. Special Study 96. Utah Department of Natural Resources.
- Utah Governor's Office of Management and Budget. Utah 2012 Baseline Report
- Utah Natural Hazards Handbook, 2008
- Wasatch Front Regional Council. (2008). Natural Hazard Pre-Disaster Mitigation Plan.

SECTION 4: COUNTYWIDE RISK ASSESSMENT & MITIGATION STRATEGIES

HISTORY AND BACKGROUND OF NATURAL HAZARDS IN TOOELE COUNTY

Flooding

Areas in Tooele County have low-moderate risks for flooding. In recent recorded history there have only been a few occurrences. The most recent events were flash floods mostly due to excessive amounts of rainfall or snowmelt runoff. Most of these events happened in Tooele and Grantsville Cities. Several communities adjacent to these jurisdictions also reported flooding events. The Great Salt Lake, located on the northeast side of the county boundary, poses minimal threats for flooding. However, several studies suggest risk from dam failure or overtopping, due to higher than usual water levels. These same studies recommend a base flood elevation of between 4,216 and 4,218 feet above sea level. As observed during years with greater flood potential such as 1984, there is a possibility of areas south of the Great Salt Lake having flooding issues. However, streams, creeks, and smaller tributaries located in various jurisdictions within the county pose the highest overall flood risks.

In addition, a number of canals, streams, and creeks are located in the county that under certain conditions may fail or overflow. Also, flooding can 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.

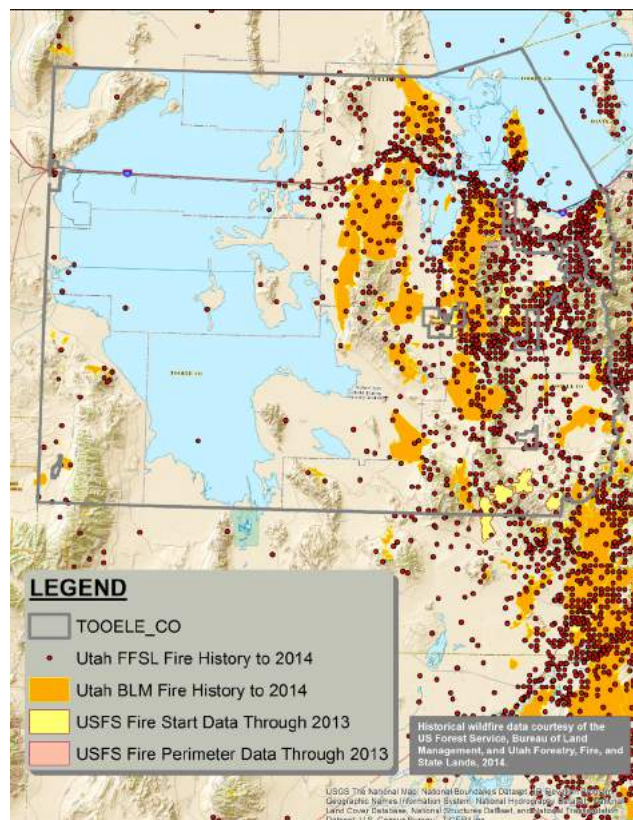
Some flooding events in Tooele County are attributed to snow melt rates in surrounding watersheds that are in excess of the capacity of the drainage systems or unusually heavy storm events that temporarily overwhelmed drainage capacity (or a combination of the both). Tooele County suffered flooding in 2005 and 2007 in Tooele City, Stansbury Park, Stockton, Grantsville and Hickman Canyon. This widespread Northern Utah flooding was due to a extremely fast mountain snowpack melt in early spring.

Wildfires

The vast majority of Tooele County and its

jurisdictions are at risk to wildfire. There is a historical trend of wildfires occurring in areas where populations and residential development are most dense. In the hot summer months when there are long periods of time with little to no rainfall, severe droughts continue to increase risk. More populated areas pose the highest risk for wildfire, located around developed areas and the unincorporated land outside municipal boundaries where there is dry, low, dense grass and brush. Steep slopes also increase the potential for wildfire. These sloped areas are typically dry and vulnerable to wildfire, which poses great risk to residents along the eastern benches. Most of eastern Tooele County consists of desert land and vegetation types which are also vulnerable. The central and western parts of the county have less vegetation due to a high salinity content in the soil. There is minimal risk for wildfire in the central and western portions of the county, and much smaller populations. This means there is little to no threats to life and property in these areas.

There have been several wildfires that have occurred in the last decade, many of which were caused by human activities, lightning, and some by unknown causes.



Landslides/Steep Slopes

Most of the landslide risk in Tooele County is found on the bench, mountainous areas, and mouths of canyons where debris flows are likely to occur. Agricultural lands and residential areas adjacent to steep slopes are also susceptible to landslide risk.

Wildfires play a large contributing factor in the occurrence of landslides. When a wildfire has occurred, it makes the soil structure weak and unstable. When there is heavy rain, a slight ground disturbance, or wind, the soil column may slide because there is no stable root system to hold the soil structure. As the saturated ground becomes heavier and less stable, it gives way, and a landslide can occur.

Landslide history

Between 1982-1986 there were periods of significant precipitation, and several landslides occurred in Tooele Valley. Much of the sediment found in the mountains around the area was weak and susceptible to landslide. (Geology and Geologic Hazards of Tooele Valley and the West Desert Hazardous Industry Area, 1999).

Earthquakes

There are two major primary fault zones located within Tooele County. The Oquirrh Marginal Fault on the east and the Six Mile Creek Fault between Marshall and Interstate 80 pose the two highest risks. There are also 16 quarternary faults within the county located near the mountain benches and valley regions. Earthquakes of small magnitude are common in the county, although no major earthquake resulting in significant property damage has occurred in recent recorded history. Geologic evidence establishes the possibility of a major earthquake in Tooele County (WFRC, 2008).

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.

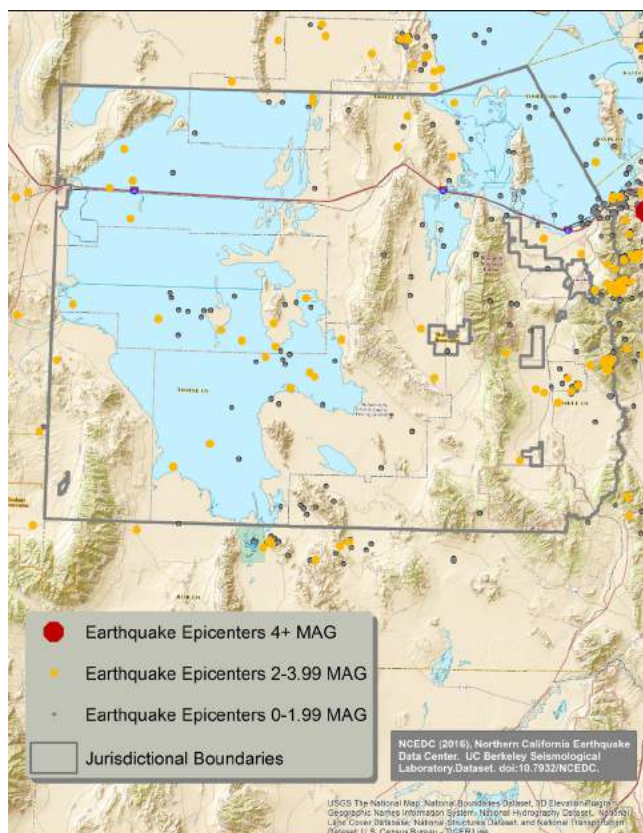
Portions of Tooele County are located atop an ancient Lake Bonneville, the bed of which is made up of generally unstable soils. The area is also subject to shallow ground water and a relatively high earthquake threat. Five of the neighboring jurisdictions located along the south rim of The Great Salt Lake pose moderate-high risks of earthquake and liquefaction susceptibility. The jurisdictions located further south of The Great Salt Lake have a significantly lower risk for liquefaction.

Much of the populated corridor in Tooele 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. The Wasatch Fault Zone is active and has the potential to produce a large 7.3-7.5 Richter magnitude earthquake on average every 300-400 years. (WRRC, 2008)

The Oquirrh Fault Zone also another threat for earthquakes affecting the County. The fault has an approximate recurrence interval of 20,000 years. Earthquakes up to Richter magnitude 7.0 are possible within the Oquirrh Fault Zone, but given its recurrence interval, earthquakes of this magnitude are not probable. Smaller earthquakes are more likely along this fault with Richter magnitudes around 6.0 (WFRC, 2008; Utah Geological Survey, 2015).

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

Below is a map of historical earthquake locations in Tooele County as of 2016:



No significant dam failures have been reported in Tooele County. However it is strongly suggested that municipalities with risks to flood and dam inundation should think highly about creating mitigation strategies for their individual communities in the event it does occur.

High Hazard Dams

1. Settlement Canyon Reservoir
2. Grantsville Reservoir
3. Bonneville Dike, GSL

Moderate Hazard Dams

1. Grantsville Regulating Pond
2. Vernon Reservoir
3. Last Chance Ski Pond

(Utah Division of Water Rights, 2016).

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 www.waterrights.utah.gov.

Problematic Soils

Problematic soils are prevalent in the region. Hazards can not be fully determined until a local engineering and/or geotechnical study has been performed on site. Most of the larger local communities require studies to determine risk and most, if not all, local communities require contractors to utilize the International Building Code (IBC) which helps mitigate most effects. While most city engineers and other staff are familiar with the hazards problematic soils can incur, more can be done to prevent structure damage and threats to life and property. Since problematic soils are so prevalent in the county, see countywide natural hazards section on page 4-35 for more details.

NATURAL HAZARD PROFILES**Table 8:** Tooele County Flood Hazard Profile

Frequency	Some flooding occurs nearly every year in Tooele 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 9: Tooele 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

Table 10: Tooele County Landslide/Steep Slopes Hazard Profile

Frequency	Annually to some extent
Severity	Potentially Severe
Location	Dispersed throughout the whole county, but mostly in the mountains on the east.
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	Moderate

Table 11: Tooele County Earthquake Hazard Profile

Frequency	Low magnitude events occur occasionally. Larger magnitude events are rare (although not necessarily on geologic time).
Severity	Potentially Catastrophic
Location	Entire County with highest frequency in the mountains on the east side of the county. Surface fault ruptures are likely to occur in fault zones and liquefaction would impact communities closest to the Great Salt Lake.
Seasonal Pattern	None
Duration	A few minutes with potential aftershocks
Speed of Onset	No warning
Probability of Future Occurrences	Based on 1962-2015 data, there is a 24% chance every year of an earthquake of 3.0 magnitude or greater.

Table 12: Tooele 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 Tooele County (FEMA, 2016).

COMMUNITY NATURAL HAZARD MAPS

(Please see sections 5 to 19 for natural hazard maps for each local community in Tooele County)

COUNTYWIDE NATURAL HAZARDS

- Drought
- Severe Weather
- Agricultural Hazards

- Radon
- Avalanche
- Tornado
- Tsunami
- Volcanic Activity
- Unsuitable Soils

Each of the hazards listed in Section 2 are addressed at some level in this plan. However, drought, severe weather, radon, avalanche, tornado, tsunami, and volcanic risks are very difficult to analyze due to lack of data or the inability to predict destructive events in particular locations. All potential hazards were discussed in county working group meetings. Although geographic data is lacking, the more prevalent county wide hazards, such as drought, severe weather, and radon were addressed in the mitigation strategies lists for the entire county. All 14 communities are susceptible on some level to those hazards and can mitigate effects from those in similar ways.

However, avalanches, tornados, tsunamis, and volcanic activity are limited to smaller geographic areas, physiographic or climatic variation, or have not produced predictable or, in some cases, significant damage. For example, while tornados have caused substantial damage in various parts of Utah, there has not been any reoccurrence of events which merit a reliable prediction on where future events could occur. Communities were allowed, and encouraged, to include mitigation strategies for any and all hazards they felt required mitigation on some level. Unsuitable soils are also so prevalent in the county, that local conditions need to be assessed by a licensed engineer in order to determine the true risk. These soils are often expansive in nature and through freeze-thaw processes, can shift or collapse, causing considerable damage to structures. Almost every community in Tooele County is at risk from unsuitable soils.

Risk Assessment and Mitigation Strategy Surveys were sent to each chief elected official for all jurisdictions in Tooele County. Among other questions, the surveys requested local input on the

following:

- NFIP status
- Existing natural hazards
- Natural hazard events since November 2008
- List of maps, documents, or plans related to natural hazards planning
- Current zoning and ordinances related to natural hazards
- Future developments that could be affected by natural hazards
- Mitigation strategies completed since 2008
- New mitigation strategies

(See **Appendix D** for survey responses and summaries).

HISTORY OF COUNTYWIDE NATURAL HAZARDS

Residents and communities in Tooele County have knowingly been effected by drought and severe weather since modern settlers came to the area in the mid-1800's. Native American's and early explorers were also well aware of the variation in the climate and temperature in the area and planned accordingly. One of the most famous sayings about the weather in the Rocky Mountains is, "If you don't like the weather, just wait 5-minutes!" Long-time residents of the area have experienced the variation which exists and plan accordingly (See **Appendix J** for regional historic severe weather events and losses to life and property).

However, for others, mitigating the effects of severe weather and drought can be difficult. Educational activities and public awareness campaigns seem to help, but can always be improved. Local communities and other organizations train for emergencies and events on a regular basis.

Other natural hazards, such as avalanche, tornado, tsunami, and volcanic activity are rare, but can be mitigated on some level. Local building codes and ordinances keep most residents

and structures safe, but events can be sporadic and variable.

Agricultural hazards, as addressed in this plan, relate mostly to insect infestation. The most prevalent of these is grasshopper and cricket infestation, but bark beetles, ticks, mosquitos, and termites have also been identified by the Utah Department of Agriculture and Food as threats (2015). See **Appendix I** for the statewide cricket and grasshopper infestation map and information.

The threats of Radon have not been very well known by residents and local governments until recent years. Thanks to educational activities promoted by the Utah Department of Health and others, knowledge of Radon has become more prevalent. However, while Radon levels can be relatively high in the region, they cannot be detected for each individual home or other structure unless individual tests are done following construction (See **Appendix K** for Radon risk maps and information).

Countywide Natural Hazard Profiles

Table 13: Drought Hazard Profile

Frequency	Frequent
Severity	Severe mostly for agricultural producers
Location	Un-irrigated areas are most impacted
Seasonal Pattern	Water supply dependent on winter snowfall. Summer is when impact is realized.
Duration	As many as 10 years
Speed of Onset	Incremental with impact increasing
Probability of Future Occurrences	High

Table 14: Agricultural Hazard Profile

Frequency	Sporadic
Severity	Severe mostly for agricultural producers and gardeners
Location	Everywhere
Seasonal Pattern	Spring & early summer
Duration	Months
Speed of Onset	Days
Probability of Future Occurrences	High

Table 15: Severe Weather Hazard Profile

Frequency	Frequent
Severity	Severe for communities, residents, and agricultural producers
Location	Everywhere (Some areas have more inherent risk due to geographic conditions)
Seasonal Pattern	Summer severe thunderstorms/hail & wind, late spring freezing, and heavy winter storms
Duration	Days/weeks
Speed of Onset	Immediate
Probability of Future Occurrences	High

Table 16: Radon Hazard Profile

Frequency	Persistent
Severity	Potentially Severe
Location	Everywhere
Seasonal Pattern	All, higher in winter months
Duration	Always
Speed of Onset	Years for detrimental effects
Probability of Future Occurrences	High

Table 17: Unsuitable Soils Hazard Profile

Frequency	Varies
Severity	Potentially Destructive to Structures
Location	Varies
Seasonal Pattern	Anytime. Highest risk for noticable damage in spring.
Duration	Long term
Speed of Onset	Varies
Probability of Future Occurrences	Moderate

Vulnerability and Potential Losses

People have been living with knowledge of current regional natural hazards since settlers first came to the area. Cold, snowy winters, hot dry summers, and other sporadic severe weather events are a part of life in the Rocky Mountains. Over the past decades, science has provided beneficial data related to soils and hazards from various soil types.

Radon and problematic soils data has helped local communities understand risks and studies

have provided critical information on how to mitigate their effects. While engineering and technical studies can provide information on what types of soils are evident in particular areas, it is difficult to give precise predictions. However, through education and updated local building and development regulations, most severe problems can be avoided.

Implications for Future Growth and Development

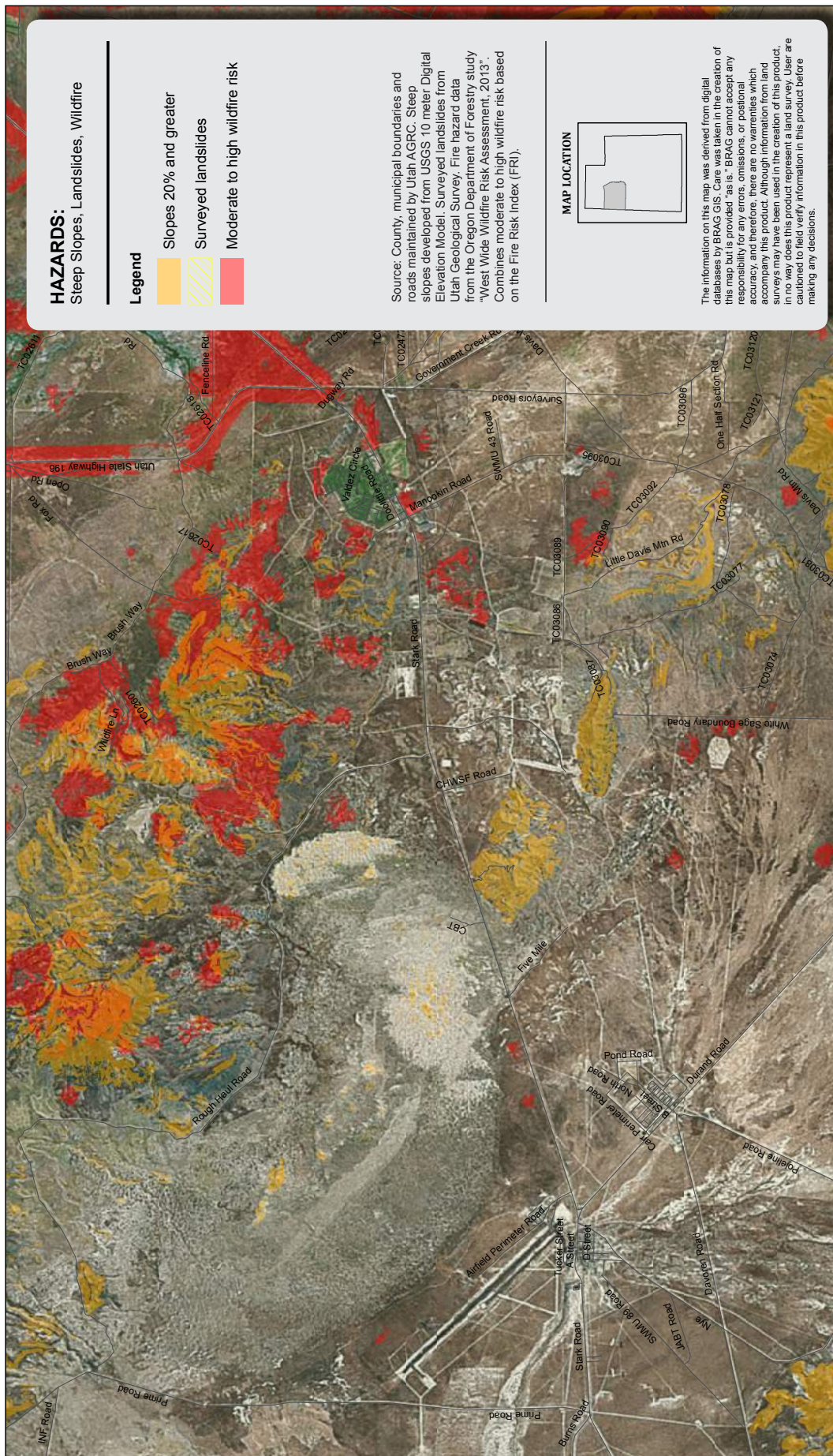
In general, as population increases in Tooele County, risk to residents, infrastructure, and property will likely increase for all regional hazards. The more people that live in an area, the more people will likely be exposed to potential hazards by utilizing more resources, and spreading out across the landscape. In short, as more people move into the area, more are likely to be affected by currently existing natural hazards.

COUNTYWIDE HAZARD MITIGATION STRATEGIES

(See following page)

COUNTY-WIDE 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
Tooele County Region	All	Protect current residents and property	Participate in the Weather Ready Nation Ambassador Initiative	N/A	Medium	Ongoing	Counties	Tooele County and BRAG	Minimal	National Weather Service, Tooele County
Tooele County Region	Severe Weather	Protect current residents and property	Public education/training including 3-5 day power outage survival, emergency response (CERT), emergency shelter locations, emergency kits, backup utilities, livestock issues, and interoperable emergency communications planning.	N/A	High	Annually	Counties, Utah ESHS, BRAG, Cities, FEMA	Tooele County and BRAG	\$50,000	Counties, Utah ESHS, BRAG, Cities, FEMA, NOAA
Tooele County Region	Agricultural	Protect current residents and property	Encourage crop diversity, weed and pest management, and coordination with local, State, and Federal agencies on agricultural land management and production.	N/A	Medium	2018	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM	Tooele County and BRAG	Minimal	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM,
Tooele County Region	Agricultural	Protect current residents and property	Educate residents on crop insurance program, alternative planting and CRP programs, value of agriculture, pest control, crop diversity, urban tree planting guidelines, etc	N/A	Medium	2017	State, Local, USDA	Tooele County and BRAG	Minimal	State, Local, USDA
Tooele County Region	Drought	Protect current residents and property	Set up a monthly schedule to monitor drought conditions. A monthly report sent to residents could inform them of mandatory water conservation measures in high drought susceptible months and emergencies.	N/A	High	Ongoing	Cities, County	All jurisdictions	Minimal	County, Cities
Tooele County Region	Drought	Protect current residents and property	Study feasibility of increasing current water storage capabilities. Encourage water conservation techniques for all land uses	N/A	Low	2017	Utah ESHS, BRAG	All jurisdictions	Minimal	Utah ESHS, BRAG
Tooele County Region	Radon	Protect current residents and property	Provide educational materials to owners of new homes and/or all residents in the local communities	N/A	High	Ongoing	Local	All jurisdictions	Minimal	Bear River Health Department
COUNTY-WIDE 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
Tooele County Region	All	Protect future residents and property	Participate in the Weather Ready Nation Ambassador Initiative	N/A	Medium	Ongoing	Counties	Tooele County and BRAG	Minimal	National Weather Service, Tooele County
Tooele County Region	Severe Weather	Protect future residents and property	Discuss planning needs on the county and city levels to coordinate land use regulations regarding Severe Weather events and response. This would be intended to prevent damages from extreme weather trigger events and incorporate severe weather into current response plans.	N/A	Medium	Annually	Counties, Municipalities, BRAG	All jurisdictions	Minimal	Counties, Municipalities, BRAG, Utah ESHS, Army Corp. Be Ready Utah, FSSL, LEPC, NOAA, NRCS
Tooele County Region	Agricultural	Protect future residents and property	Encourage crop diversity, weed and pest management, and coordination with local, State, and Federal agencies on agricultural land management and production.	N/A	Medium	2018	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM	Tooele County and BRAG	Minimal	Utah Department of Agriculture and Food, USDA, USU Extension, USFS, BLM,
Tooele County Region	Agricultural	Protect future residents and property	Educate residents on crop insurance program, alternative planting and CRP programs, value of agriculture, pest control, crop diversity, urban tree planting guidelines, etc	N/A	Medium	2017	State, Local, USDA	Tooele County and BRAG	Minimal	State, Local, USDA
Tooele County Region	Drought	Protect future residents and property	Set up a monthly schedule to monitor drought conditions. A monthly report sent to residents could inform them of mandatory water conservation measures in high drought susceptible months and emergencies	N/A	High	Ongoing	Cities, County	All jurisdictions	Minimal	County, Cities
Tooele County Region	Drought	Protect future residents and property	Study feasibility of increasing current water storage capabilities. Encourage water conservation techniques for all land uses	N/A	Low	2017	Utah ESHS, BRAG	All jurisdictions	Minimal	Utah ESHS, BRAG
Tooele County Region	Radon	Protect future residents and property	Provide educational materials to owners of new homes and/or all residents in the local communities	N/A	High	Ongoing	Local	All jurisdictions	Minimal	Bear River Health Department

SECTION 5: DUGWAY COMMUNITY RISK ASSESSMENT



DUGWAY, UTAH



DUGWAY, UTAH



DUGWAY NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

DUGWAY

Analysis of hazard risk involving the community of Dugway revealed that there is potential risk resulting mostly from **wildfire** and **unsuitable soils**. 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 Dugway. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

Natural Hazards

Wildfire. Moderate to high wildfire risk is minimal in the developed areas in and around Dugway communities. However, there are areas with higher risk in the foothills and areas with more vegetation.

Future Development

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

Table 18: Dugway Potential Loss Figures

Dugway, 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 (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	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
High Water Table	0	0	\$0	0	\$0	\$0
Unsuitable Soils for Buildings	0	0	\$0	0	\$0	\$0

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Dugway, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1 Fire Station, 1 Law Enforcement Building	1 Library	0	0	0	1 Airport
Flood (Soils)	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
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	1 Fire Station, 1 Army Airfield Bldg.	0	0	0	3 Water Tanks	1 Aviation Fuel Point
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.						

Dugway, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	\$ Value¹	# of Miles	\$ Value²	# of Miles	\$ Value³	# of Miles	\$ Value⁴	# of Miles	\$ Value⁵
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	7.65	\$4,016,250	0.21	\$315,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	0	\$0	0	\$0	0	\$0	0.08	\$42,000	1.48	\$2,220,000
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	0.69	\$362,250	0	\$0
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0		\$0
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	136.2	\$71,505,000	0	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Dugway, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00	0
Faults	0.00	0.00	0.00	0.00	0.00	0.00	0
Wildfire	10.30	0.00	0.00	0.00	0.00	0.00	0
Flood (FIRM)	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (Soils)	66.11	0.00	5.55	0.00	0.00	0.00	0
Liquefaction	0.00	0.00	0.00	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	0.19	0.00	0.02	0.00	0.00	0.00	0
High Water Table	0.00	0.00		0.00	0.00	0.00	0
Unsuitable Soils for Buildings	0.00	0.00	0.00	0.00	0.00	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Dugway, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0.00	0.00
Faults	0.00	0.00
Wildfire	108.26	592.80
Flood (FIRM)	0.00	0.00
Flood (Soils)	654.07	723.69
Liquefaction	0.00	0.00
Landslide	0.00	0.00
Slope	1.76	4.77
High Water Table	0.00	0.00
Unsuitable Soils for Buildings	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.

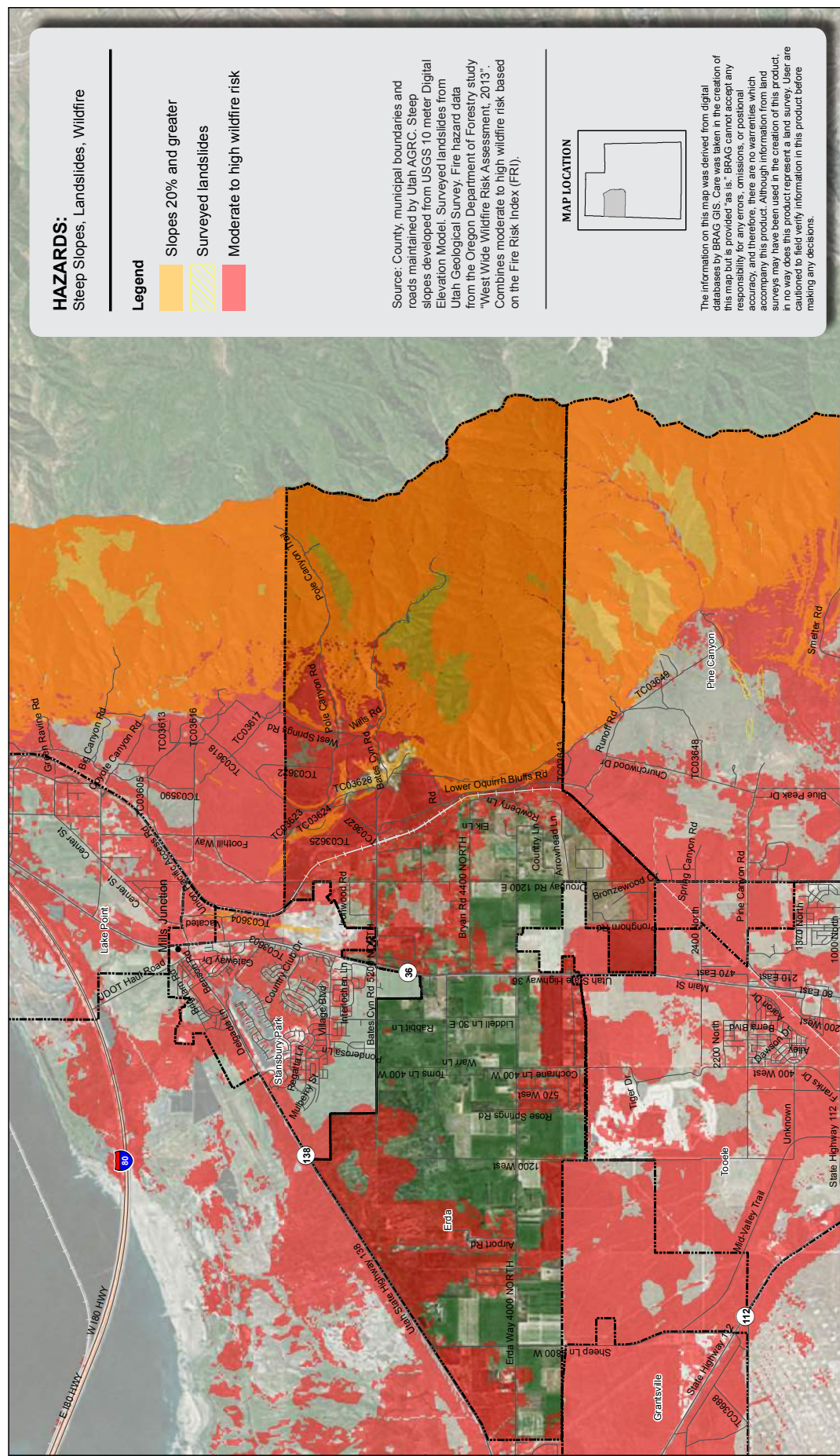
** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

Hazard Mitigation Strategies

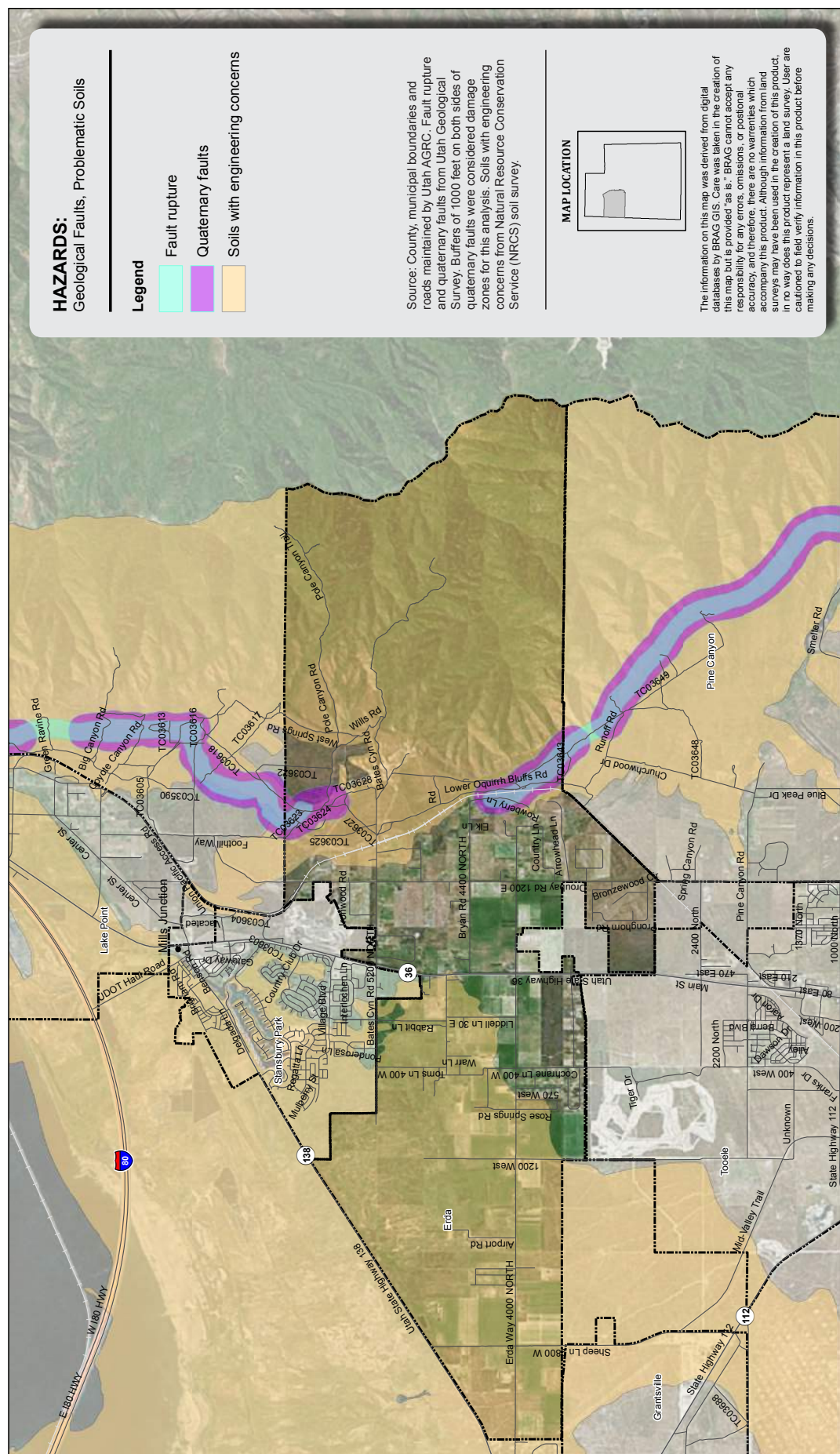
Table 19: Dugway Mitigation Strategies

DUGWAY - 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
Dugway	Flood	Protect current residents and property	Improve road and trail.	N/A	Low	Ongoing	Local, County	State, Local	N/A	FEMA, Utah DEM
Dugway	Wildfire	Protect current residents and property	Installation wildfire firebreaks.	N/A	Medium	N/A	EM budgets	Local	N/A	Utah FFSL
Dugway	Flooding	Protect current residents and property	Reseeding with natural grasses for soil retention.	N/A	Low	N/A	Local Property Tax	Local	N/A	FEMA, Utah DEM
Dugway	Earthquake	Protect current residents and property	Ready army program for workforce and residents awareness.	N/A	Medium	Ongoing	County, State	State, Local	N/A	UGS, USGS, Utah DEM
Dugway	Steep Slope	Protect current residents and property	Re-evaluate risk from steep slope to local amenities with local data.	N/A	Low	Ongoing	Local	Local	Minimal	UGS
Dugway	Unsuitable Soils	Protect current residents and property	Re-evaluate risk from unsuitable soils to local amenities with local data.	N/A	Low	Ongoing	Local	Local	Minimal	UGS, NRCS
DUGWAY - 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
Dugway	Flood	Protect future residents and property	Improve road and trail.	N/A	Low	Ongoing	Local, County	State, Local	N/A	FEMA, Utah DEM
Dugway	Wildfire	Protect future residents and property	Reseeding with natural grasses and removal of non-native grasses.	N/A	Medium	N/A	Local	Local	N/A	Utah FFSL
Dugway	Flooding	Protect future residents and property	Trail maintenance to improve drainage.	N/A	Medium	N/A	Local Property Tax	Local, County	N/A	FEMA, Utah DEM
Dugway	Earthquake	Protect future residents and property	Ready army program for workforce and residents awareness.	N/A	Medium	Ongoing	County, State	State, Local	N/A	UGS, USGS, Utah DEM
Dugway	Steep Slope	Protect future residents and property	Evaluate areas of potential future development and update planning processes.	N/A	Low	Ongoing	Local	Local	Minimal	UGS
Dugway	Unsuitable Soils	Protect future residents and property	Evaluate areas of potential future development and update planning processes.	N/A	Low	Ongoing	Local	Local	Minimal	UGS, NRCS

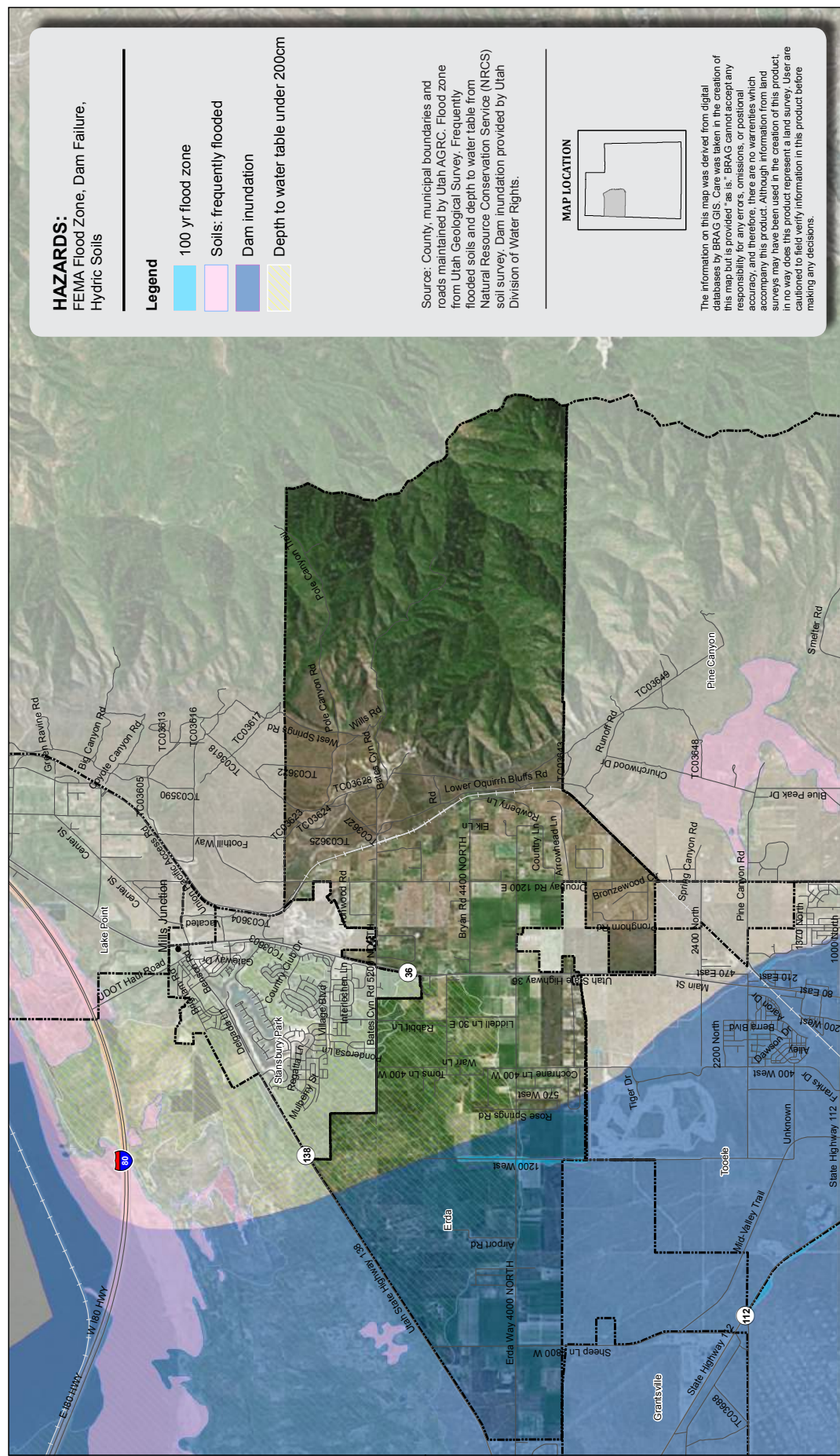
SECTION 6: ERDA COMMUNITY RISK ASSESSMENT



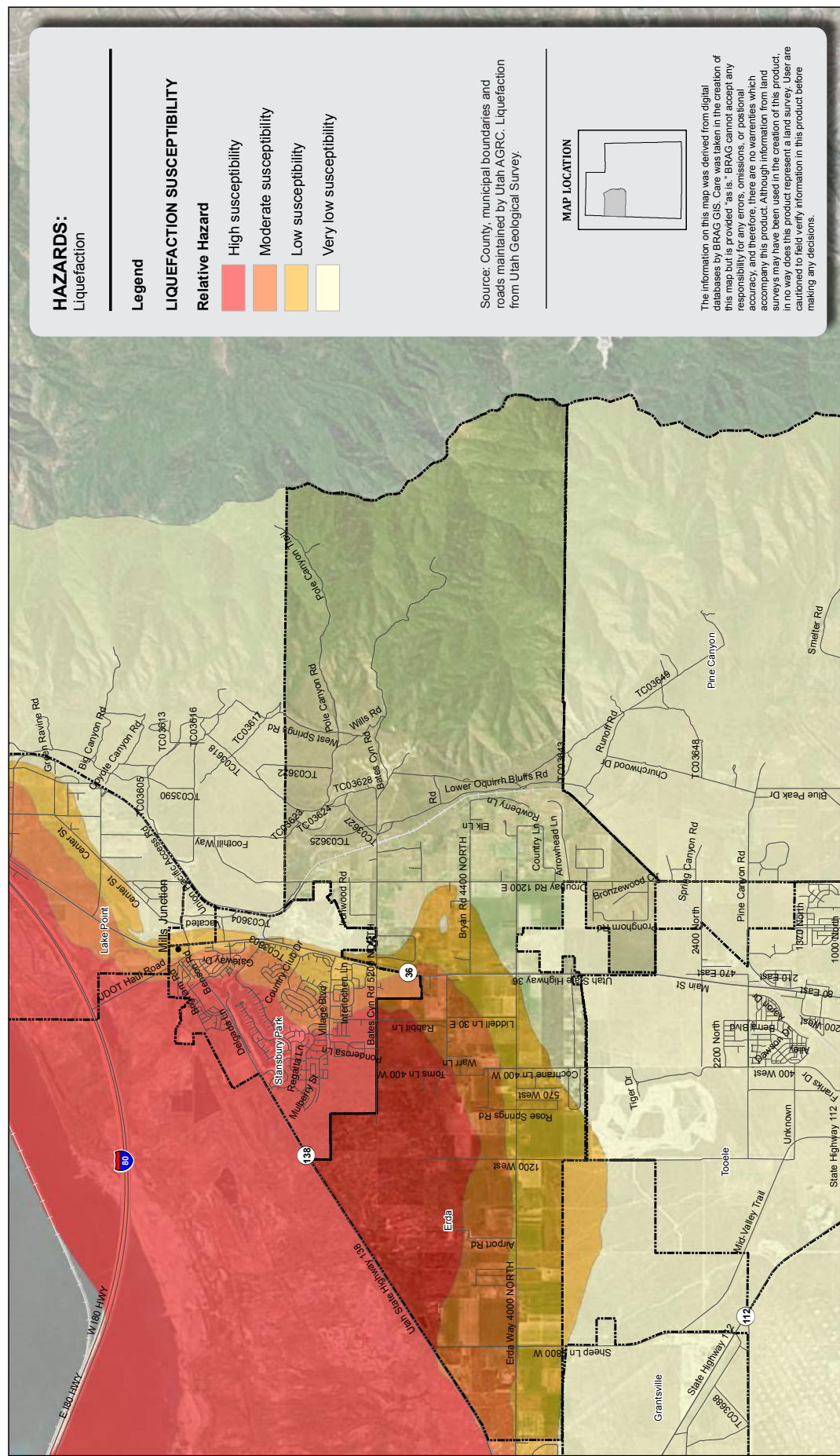
ERDA, UTAH



ERDA, UTAH



ERDA, UTAH



ERDA, UTAH

ERDA NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

ERDA

Analysis of hazard risk involving the community of Erda revealed that there is potential risk resulting from **dam failure, faults, wildfire, flood, liquefaction, high water table, and steep slopes**. These hazards have the potential to impact life, property, infrastructure, environmental, recreational, and agricultural features in the jurisdiction. Currently, dam failure, wildfires, and liquefaction hazards have the greatest potential to impact the community based on potential loss values. Steep slopes, flooding, and faults all have a great potential to impact but would only have moderate potential losses. Other natural hazard types not mentioned were found to have no potential impacts to the Erda area. See the following tables for more detailed descriptions of potential losses.

Table 20: Erda Potential Loss Figures

Natural Hazards

Dam failure. Erda's risk of dam failure involves the western portion of the community. Erda is situated just south of the the Great Salt Lake. Structures and amenities in these areas could experience damage if the Great Salt Lake dams or levees were to fail. Currently, no other areas in Erda appear to be at risk from dam failure. Dam failure has the potential to impact life, property, infrastructure, environmental, recreational and agricultural features in the jurisdiction.

Flood. The Great Salt Lake poses threats for flooding within the community. The areas on the west side within the jurisdiction have the greatest risk potential. The area around 1200 West and Erda Way have the greatest potential for floods. Erda does not participate in the NFIP program. Floods have the potential to impact life, property, environmental, and recreational features in the jurisdiction.

Liquefaction. The Erda community currently has a moderate-high risk for liquefaction. The

Erda, 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	237	74	\$14,833,033	3	\$8,467,149	\$1,926,783
Faults	42	13	\$2,820,576	0	\$0	\$0
Wildfire	1,632	510	\$161,007,031	22	\$33,041,498	\$14,129,742
Flood (FEMA)	16	5	\$1,102,562	1	\$288,171	\$642,261
Flood (Soils)	0	0	\$0	0	\$0	\$0
Liquefaction	1,127	346	\$84,101,306	4	\$16,844,844	\$2,569,044
Landslide	0	0	\$0	0	\$0	\$0
Slope	6	2	\$662,469	0	\$0	\$0
High Water Table	992	310	\$60,652,946	4	\$504,312	\$2,569,044
Unsuitable Soils for Buildings	1,542	482	\$90,857,623	8	\$14,031,330	\$5,138,088

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Erda, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	1 Fire Stations, 1 EMS Buildings	0	0	0	1 Broadband Anchor	3 Water Storage Facilities, 1 Solid Waste/Oil Facility, 1 Oil/Gas Well, 1 Airport
Faults	0	0	0	0	0	0
Wildfire	0	0	0	1 Churches	1 Broadband Anchor	9 Water Storage Facilities, 1 Airports
Flood (Soils)	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	2 Water Storage Facilities, 1 Airport
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	1 Broadband Anchor	0
High Water Table	0	0	0	0	0	
Unsuitable Soils for Buildings	0	0	0	0	0	Solid Hazardous Waste,

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

Erda, 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	5.44	\$7,616,000	0	\$0	9.21	\$4,835,250	4.19	\$6,285,000
Faults	1.4	\$2,100,000	0	\$0	1.6	\$203,200	7.61	\$3,995,250	0.36	\$540,000
Wildfire	5.13	\$7,695,000	2.75	\$3,850,000	2.5	\$317,500	29.3	\$15,382,500	0.31	\$465,000
Flood (FIRM)	0	\$0	0.49	\$686,000	0	\$0	2.78	\$1,459,500	0	\$0
Flood (Soils)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Liquefaction	12.54	\$18,810,000	2.26	\$3,164,000	0	\$0	12.54	\$6,583,500	4.79	\$7,185,000
Landslide	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Slope	0.05	\$75,000	0	\$0	0.88	\$111,760	6.1	\$3,202,500	0.27	\$405,000
High Water Table	0	\$0	1.38	\$1,932,000	0	\$0	10.29	\$5,402,250	8.8	\$13,200,000
Unsuitable Soils for Builings	4.3	\$6,450,000	5.77	\$8,078,000	2.45	\$311,150	35.61	\$18,695,250	17.84	\$26,760,000

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Erda, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	151.90	5.10	5.70	0.00	0.00	0.35	0
Faults	0.23	0.23	1.69	0.00	0.00	6.26	0
Wildfire	159.31	0.00	0.00	0.00	0.00	5.66	0
Flood (FIRM)	0.00	0.22	0.00	0.00	0.00	1.28	0
Flood (Soils)	0.00	0.00	0.00	0.00	0.00	0.00	0
Liquefaction	318.08	5.33	6.21	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	0.00	0.00	29.31	0.00	0.00	14.82	0
High Water Table	318.12	7.21	4.51	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	319.33	10.22	30.55	0.00	0.00	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Erda, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	2,847.50	329.70
Faults	17.75	575.35
Wildfire	2,885.52	6,835.18
Flood (FIRM)	34.26	0.08
Flood (Soils)	0.00	0.00
Liquefaction	3,331.35	0.00
Landslide	0.00	0.00
Slope	3.27	5,889.44
High Water Table	0.00	0.00
Unsuitable Soils for Buildings	0.00	7,504.43

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

entire community has a very well distributed risk of liquefaction throughout the area and has a relatively high risk. Liquefaction has the potential to impact life, property, infrastructure, environmental, recreational and agricultural features in the jurisdiction.

Wildfire. Erda is well known from the past to encounter wildfires and is at a high risk. These risks are associated with the community's agricultural land and dry fields. Wildfires especially threaten Erda during the most dry months of the year. They have the potential to impact life, property, infrastructure, environmental, recreational and agricultural features in the jurisdiction.

Faults. There are several fault damage zones in Erda with the potential to affect structures. Erda has four different levels of risk ranging from very low to a high risk. The risks grow exponentially greater from the southern part of the area to the north. The northern portion of Erda has the highest risk for structural damage. And earthquake could impact lives, infrastructure, environmental, recreational, and agricultural features in the jurisdiction.

High Water Table. Almost the entire west side of Erda has high water table issues. Fortunately, this is mostly located on current agricultural lands.

Steep Slopes. Erda has risks associated with steep slopes. Areas of greatest concern have slopes from 15% and higher. These risks are commonly found in areas directly adjacent to the mountains located to the east. Steep slopes have the potential to impact life, property, infrastructure, environmental, recreational, and agricultural features in the jurisdiction.

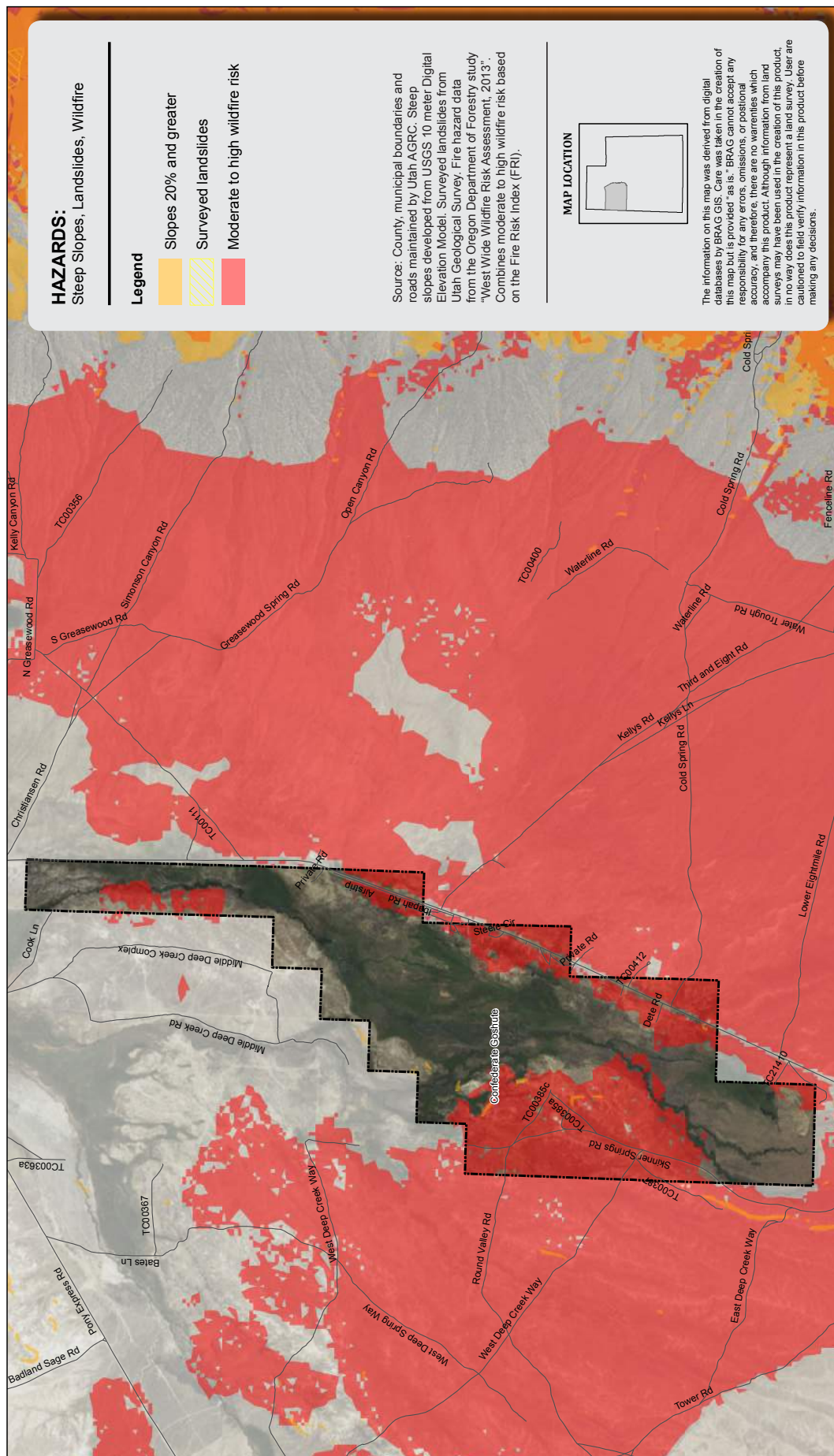
Future Development

Currently, there is a proposed development of around 1,000 homes on the east side of Erda between Lake Point and Pine Canyon. These homes could potentially be affected by wildfire, landslides, and geologic hazards.

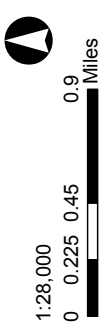
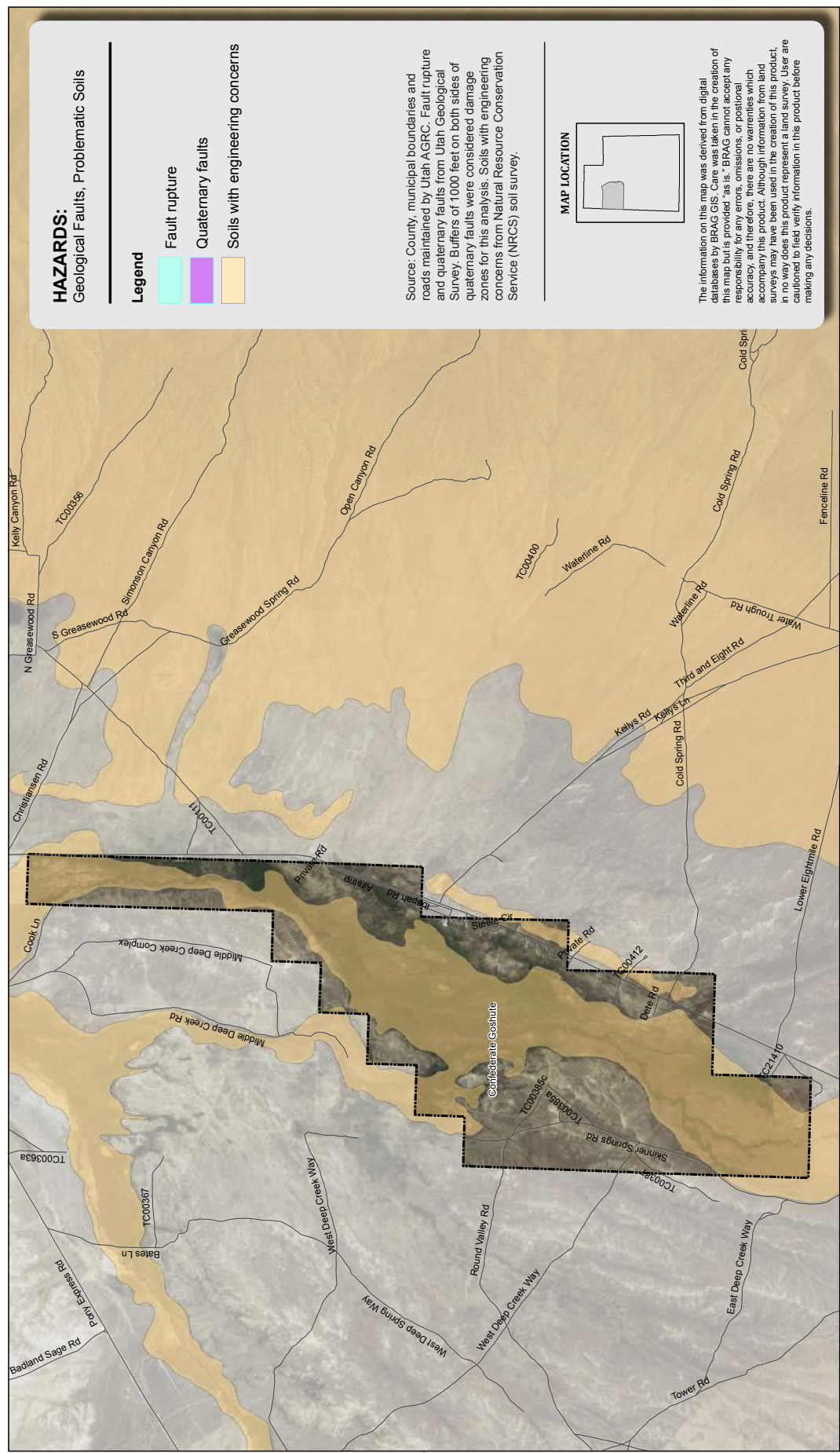
Hazard Mitigation Strategies

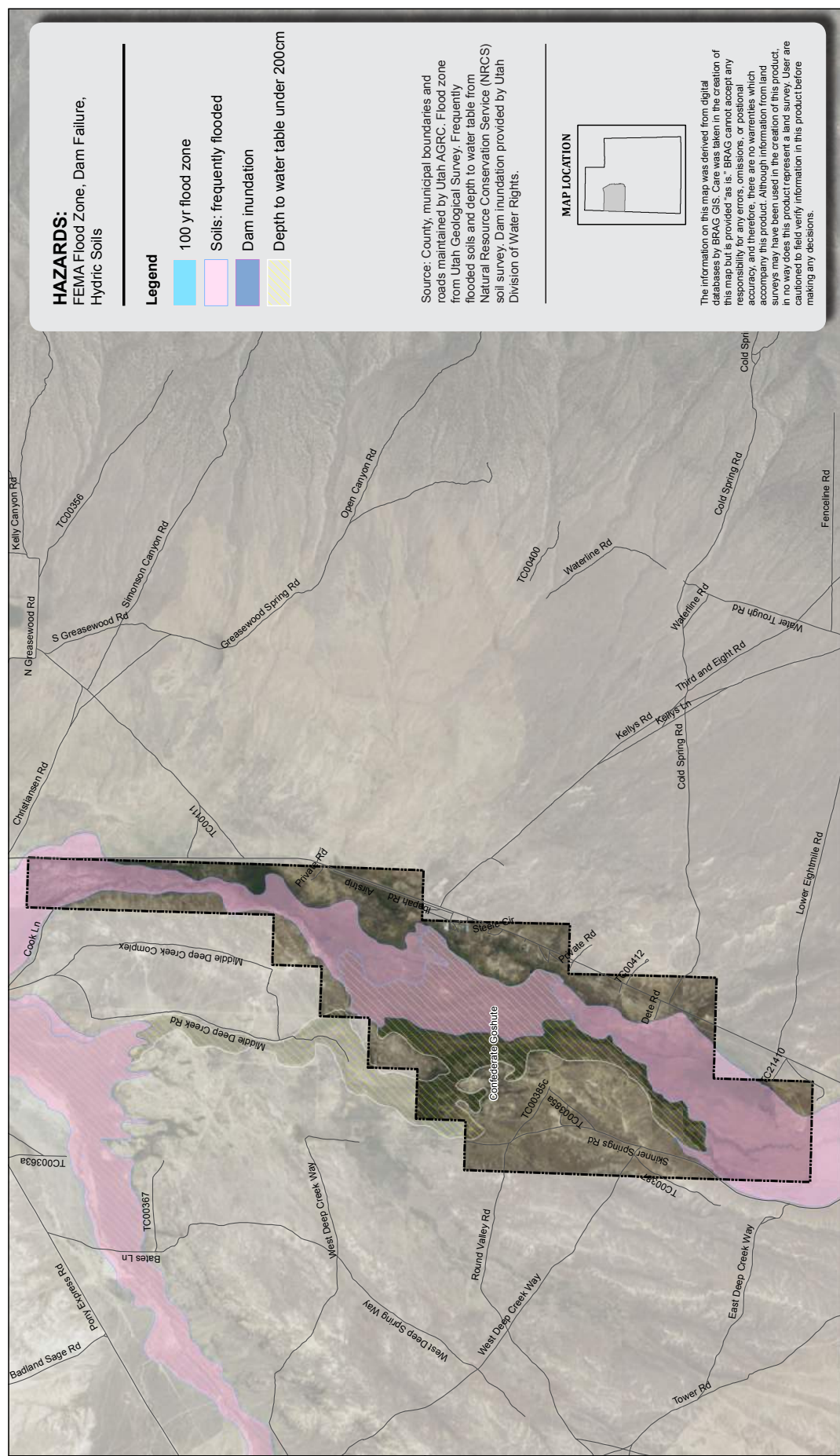
(See Section 17: Unincorporated Tooele County Community Risk Assessment)

SECTION 7: CONFEDERATED TRIBES OF THE GOSHUTE RESERVATION COMMUNITY RISK ASSESSMENT



GOSHUTE, UTAH





GOSHUTE RESERVATION NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

CONFEDERATED TRIBES OF THE GOSHUTE RESERVATION

Analysis of hazard risk involving the community of the Goshute Reservation in the unincorporated portions of Tooele County revealed that there is potential risk resulting mostly from **wildfire, floods, and steep slopes**. These hazards have varying potential to impact infrastructure, agriculture, and environmental features within the municipal boundary. Currently wildfire and flood hazards have the greatest potential to impact infrastructure, agriculture, and environmental amenities based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to the reservation. See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Table 21: Confederate Tribes of the Goshute Reservation Potential Loss Tables

Natural Hazards

Wildfire. The Goshute Reservation has a moderate risk of wildfire throughout the reservation and adjacent land parcels. Areas with the presence of grassy and shrubby vegetation types have the highest risk. Wildfires have the potential to impact infrastructure and agricultural features on the reservation.

Flood. The reservation has a moderate risk of flooded soils. Deep Creek runs through the middle of the reservation and is the main contributor to saturated soils. Flooded soils have the largest impact on agriculture production, grazing, and around a mile and a half of canals.

Steep Slopes. There are risks associated with steep slopes within the reservation. Areas of greatest concern have slopes of a 15-25% grade. The mountain range adjacent to the reservation on the east side also has the great risks. Steep slopes have the potential to impact infrastructure, environmental, and agricultural features.

Future Development

No concerns involving potential future development within the Goshute Reservation were reported by community representatives.

Goshute Tribe, 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 (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	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
High Water Table	0	0	\$0	0	\$0	\$0
Unsuitable Soils for Buildings	0	0	\$0	0	\$0	\$0

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Goshute Tribe, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1 Fire Station, 1 Law Enforcement Building	1 Library	0	0	0	1 Airport
Flood (Soils)	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
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	0	0	0	0	0	0

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

Goshute Tribe, 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	3.67	\$1,926,750	0.21	\$315,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	0	\$0	0	\$0	0	\$0	0.08	\$42,000	1.48	\$2,220,000
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
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0	0.04	\$60,000
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	0.19	\$99,750	1.52	\$2,280,000

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Goshute Tribe, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00	0
Faults	0.00	0.00	0.00	0.00	0.00	0.00	0
Wildfire	10.30	0.00	0.00	0.00	0.00	0.00	0
Flood (FIRM)	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (Soils)	66.11	0.00	5.55	0.00	0.00	0.00	0
Liquefaction	0.00	0.00	0.00	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	0.19	0.00	0.02	0.00	0.00	0.00	0
High Water Table	42.55	0.00	3.99	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	104.52	0.00	8.37	0.00	0.00	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Goshute Tribe, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0.00	0.00
Faults	0.00	0.00
Wildfire	108.26	592.80
Flood (FIRM)	0.00	0.00
Flood (Soils)	654.07	723.69
Liquefaction	0.00	0.00
Landslide	0.00	0.00
Slope	1.76	4.77
High Water Table	0.00	398.83
Unsuitable Soils for Buildings	0.00	948.74

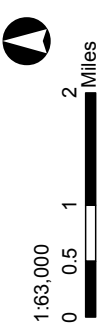
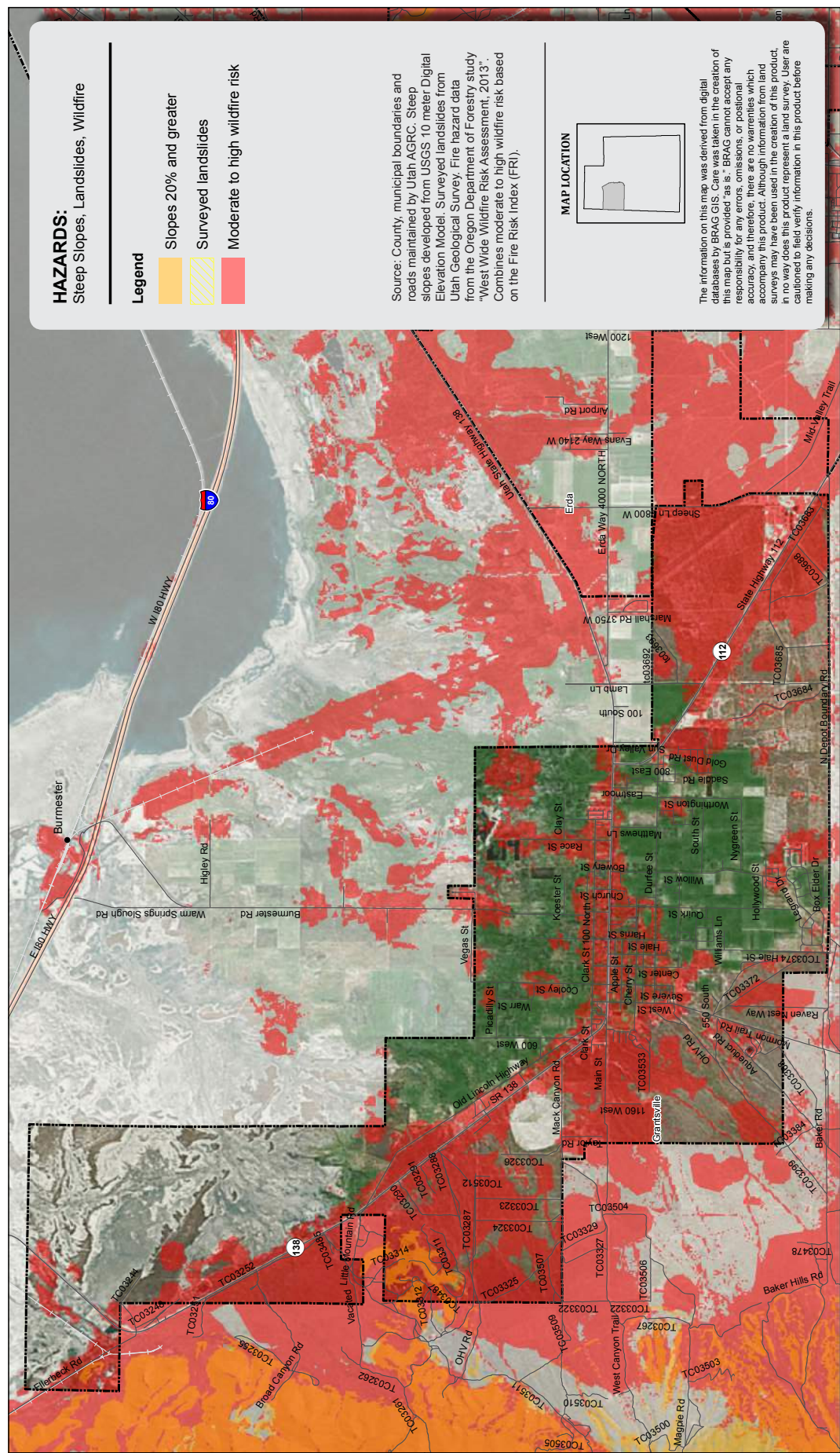
* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.

** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

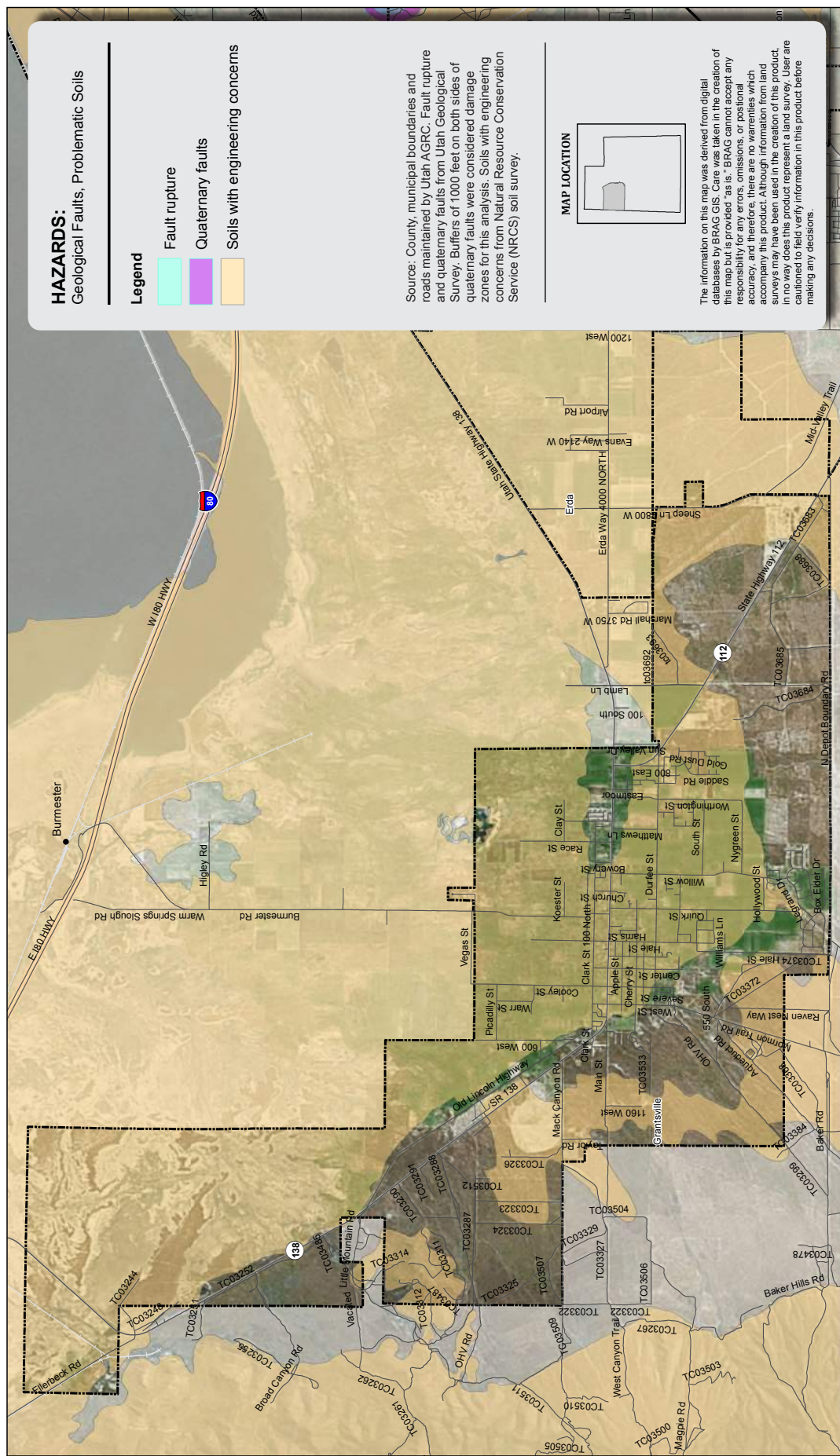
Hazard Mitigation Strategies

(See Section 17: Unincorporated Tooele
County Community Risk Assessment)

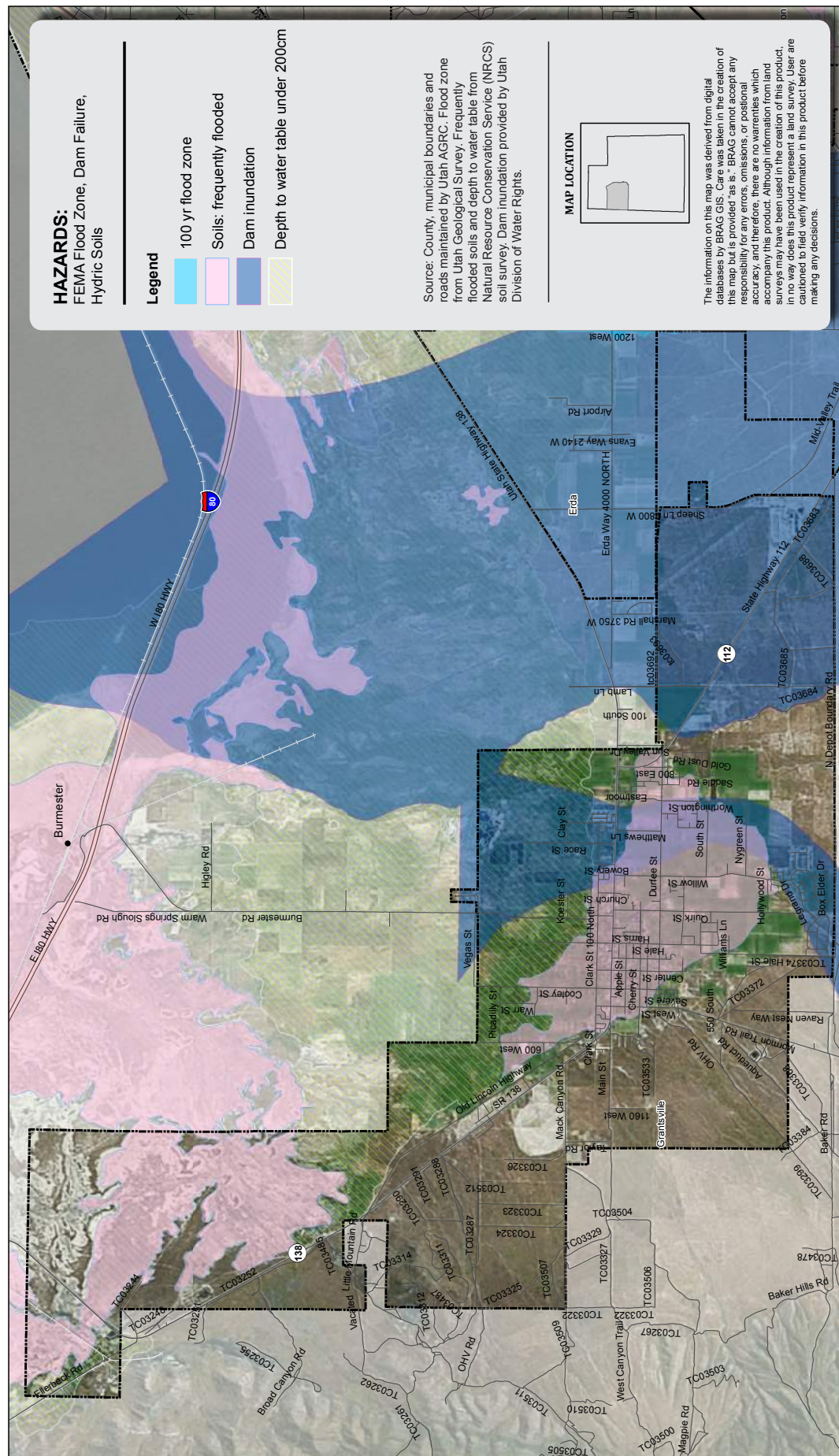
SECTION 8: GRANTSVILLE CITY COMMUNITY RISK ASSESSMENT



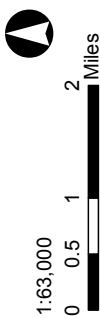
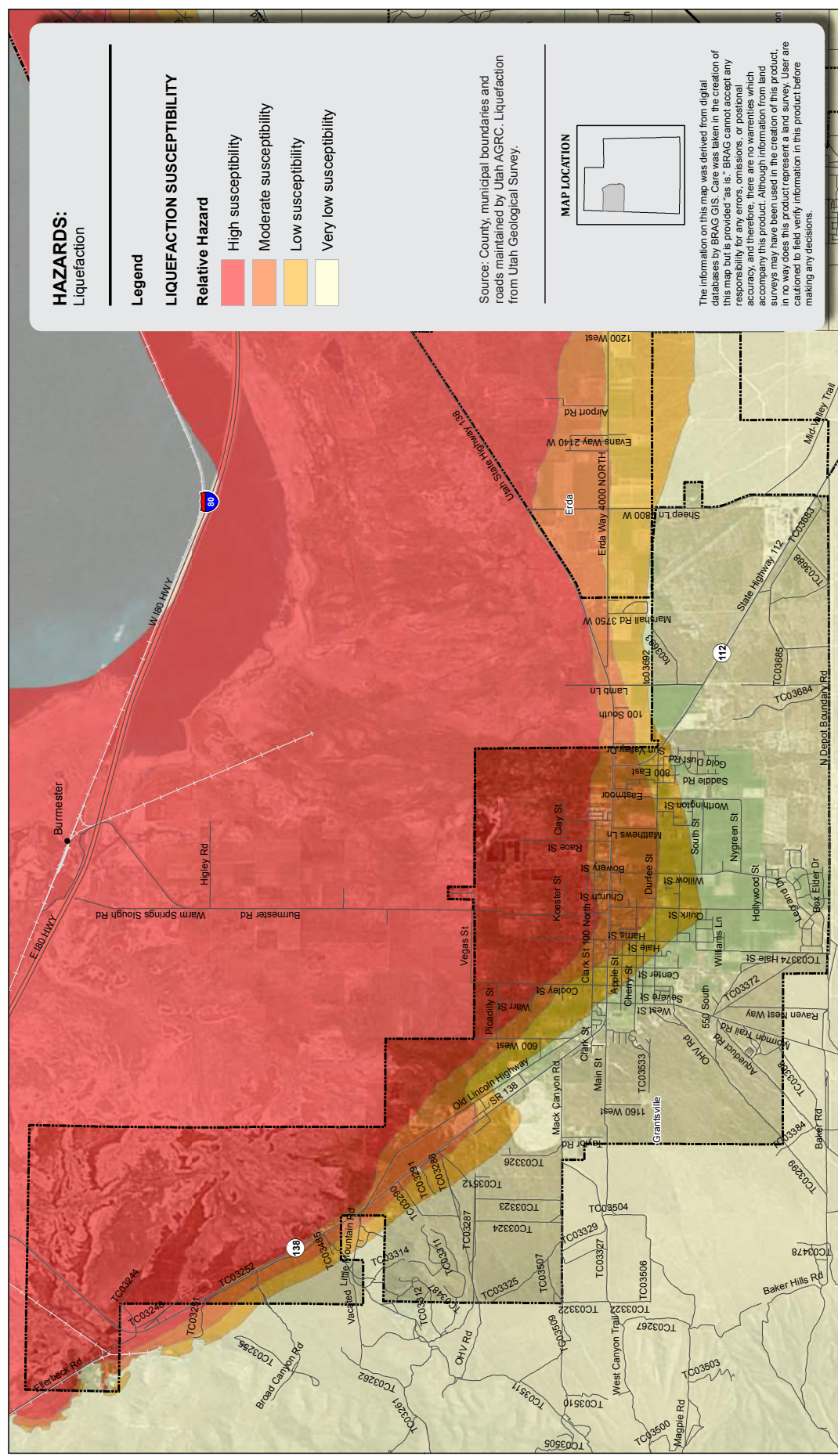
GRANTSVILLE, UTAH



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GRANTSVILLE, UTAH

GRANTSVILLE CITY NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

GRANTSVILLE CITY

Analysis of hazard risk involving the community of Grantsville revealed that there is potential risk resulting from **dam failure, flood (soils), liquefaction, steep slopes, high water table, and wildfire**. These hazards have varying potential to impact human life, property, infrastructure, agriculture, 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. Other natural hazard types not mentioned were found to have no potential impacts to Grantsville. See the following tables for more detailed descriptions of potential losses associated with each natural hazard in Grantsville City.

Table 22: Grantsville City Potential Loss Figures

Natural Hazards

Dam failure. Grantsville has risk to dam failure from Grantsville Reservoir. Areas at risk include all development south of Mountain Vista Park and northward along Worthington St, and eventually fanning out north-west all the way through town out to Burmester Rd. Life, structures and amenities in these areas could be effected in the case of a dam failure event. Failure of the Great Salt Lake levees also pose a risk to the northeastern portion of Grantsville.

Flood (Soils) Portions of Grantsville are at risk to flooding based on soils data. Although rare, the majority of the city is at risk, excluding some areas like the south and east ends of the city. Drainages in the city also pose risk to structures within jurisdictional boundaries. Flooded soils 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. During an earthquake, liquefaction poses the greatest risk to human life and property in Grantsville. All areas of Grantsville are at

Grantsville, 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	2,234	692	\$156,411,441	16	\$34,632,519	\$10,276,176
Faults	0	0	\$0	0	\$0	\$0
Wildfire	5,530	1,701	\$326,181,943	75	\$95,468,075	\$48,169,575
Flood (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	4,451	1,356	\$262,903,324	48	\$16,123,012	\$30,828,528
Liquefaction	2,933	885	\$157,092,400	58	\$60,786,683	\$37,251,138
Landslide	0	0	\$0	0	\$0	\$0
Slope	0	0	\$0	1	\$460,483	\$642,261
High Water Table	138	43	\$7,003,227	16	\$3,010,242	\$10,276,176
Unsuitable Soils for Buildings	5,136	1,605	\$242,340,246	61	\$73,487,727	\$39,177,921

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Grantsville, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	1 Police Department Building	1 Library	0	2 Churches	1 Broadband Anchor	1 Airport, 2 Solid Waste/Oil Facilities, 1 Water Storage Facility
Faults	0	0	0	0	0	0
Wildfire	1 EMS Building, 1 Fire Station	4 Schools	1 Assisted Living Center	4 Churches	10 Broadband Anchors	1 Airport, 1 Oil/Gas Well, 4 Solid Waste/Oil Facilities, 1 Police Department Building, 5 Water Storage Facility
Flood (FEMA)	0	0	0	0	0	0
Flood (Soils)	1 EMS Building, 1 Fire Station	5 Schools, 1 Post Office	1 Assisted Living Center	5 Churches	1 Dam	2 Water Storage Facilities, 1 Oil/Gas Well
Liquefaction	1 Police Department Building	2 Schools, 1 Library, 1 Post Office	1 Health Care Center	1 Church	2 Broadband Anchors,	1 Oil/Gas Well, 2 Water Storage Facilities, 2 Solid Waste/Oil Facilities
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
High Water Table	0	0	0	0	0	Tire Recycler, Environmental Services, 3 heavy equipment contractor
Unsuitable Soils for Buildings	0	0	0	0	0	3 Solid Waste/ Oil facilities, 12 heavy equipment
Poorly Drained Soils	0	0	0	0	0	0

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

Grantsville, 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	1.09	\$1,526,000	0	\$0	31.51	\$16,542,750	1.66	\$2,490,000
Faults	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Wildfire	1.51	\$2,265,000	4.6	\$6,440,000	1.27	\$161,290	52.24	\$27,426,000	1.59	\$2,385,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	0.56	\$840,000	3.79	\$5,306,000	0.1	\$12,700	34.39	\$18,054,750	1.65	\$2,475,000
Liquefaction	2.1	\$3,150,000	5.38	\$7,532,000	3.18	\$403,860	34.2	\$17,955,000	2.3	\$3,450,000
Landslide	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Slope	0.07	\$105,000	0	\$0	0	\$0	0.95	\$498,750	0.04	\$60,000
High Water Table	1.85	\$2,775,000	3.66	\$5,124,000	1.23	\$156,210	7.9	\$4,147,500	3.07	\$4,605,000
Unsuitable Soils for	2.22	\$3,330,000	7.78	\$10,892,000	3.18	\$403,860	69.98	\$36,739,500	8.56	\$12,840,000
¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi). 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, 2015). ³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi). ⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi). ⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).										

Grantsville, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	155.35	23.02	14.63	0.00	0.00	5.31	0
Faults	0.00	0.00	0.00	0.00	0.00	0.00	0
Wildfire	200.55	68.90	0.00	0.00	3.49	3.07	0
Flood (FIRM)	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (Soils)	512.35	2.02	10.67	0.00	0.00	2.68	0
Liquefaction	4,321.70	26.27	0.00	0.00	0.19	2.51	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	0.00	0.00	0.08	0.00	0.13	0.00	0
High Water Table	3,763.52	4.15	15.14	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	4,332.33	6.18	38.74	0.01	0.73	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Grantsville, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	1,964.88	3,656.43
Faults	0.00	0.00
Wildfire	1,188.16	3,845.82
Flood (FIRM)	0.00	0.00
Flood (Soils)	3,995.44	2,516.49
Liquefaction	8,222.65	4,095.91
Landslide	0.00	0.00
Slope	0.00	15.59
High Water Table	0.00	2,446.16
Unsuitable Soils for Buildings	0.00	6,990.15

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC 2012)

risk to some kind of liquefaction. Areas of Grantsville that have high risk of liquefaction in the event of an earthquake are those areas north of highway 138. The Areas of moderate risk exist along highway 138 ranging anywhere from a half mile to the north and south. The areas of low risk and very low risk exist south of that. 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.

Steep Slopes. Grantsville 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. 1 Structure and approximately 1 mile of infrastructure are estimated to be at risk from steep slopes.

High Water Table. High water table areas generally exist north of Highway 138 north of town.

Wildfire. Grantsville 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 areas of grassy and shrubby vegetation types found throughout the area. Additionally, some areas at lower elevations are also at risk due to their proximity to urban forests. There are areas of severe risk along the highways where gentle slopes and vulnerable vegetation are found. Wildfires have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Future Development

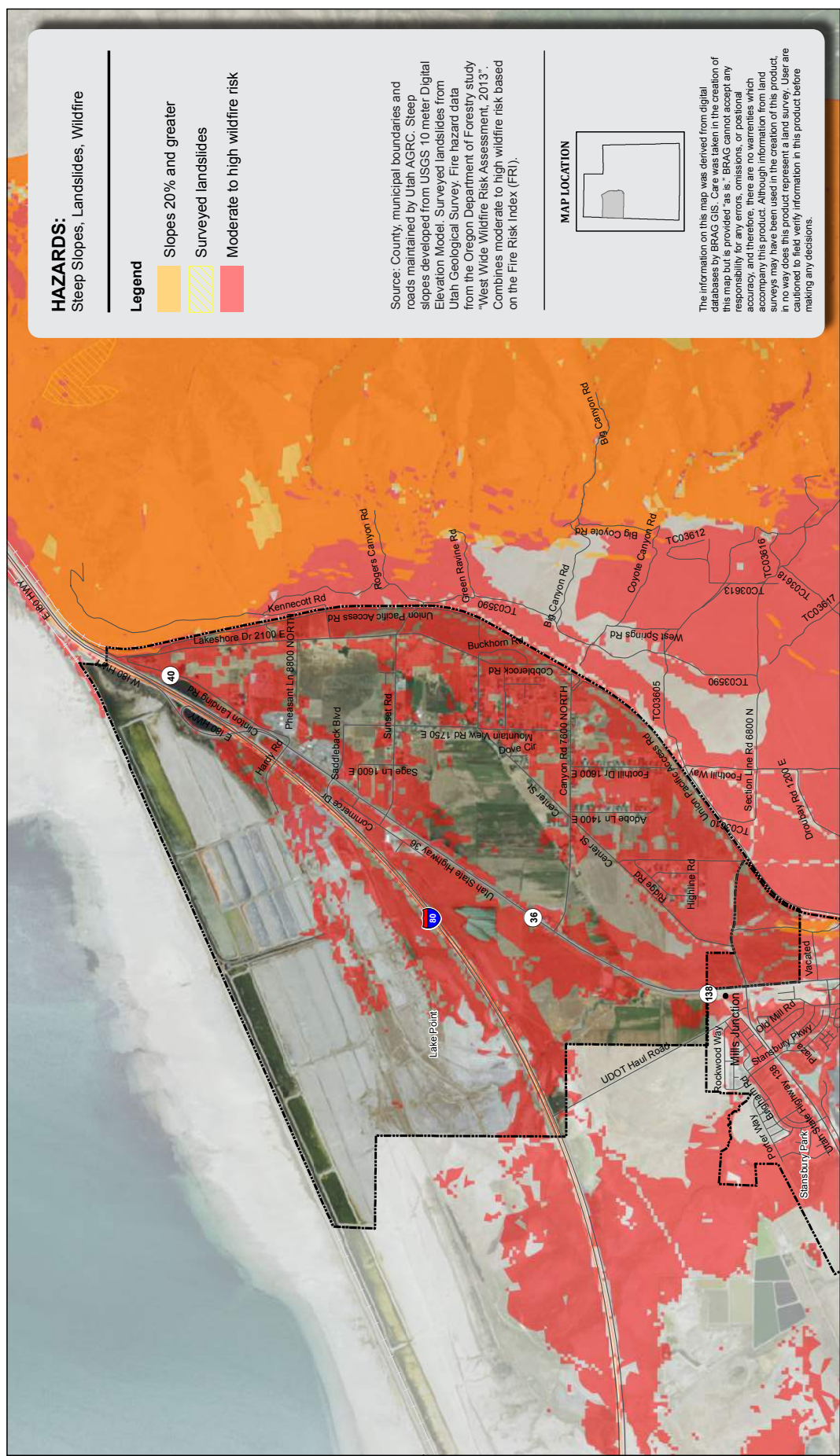
Future development is anticipated in the area just south of Durfee Street in Grantsville City. Potential natural hazards in this area include unsuitable soils for dwellings, dam inundation, liquefaction, and flooding.

Hazard Mitigation Strategies

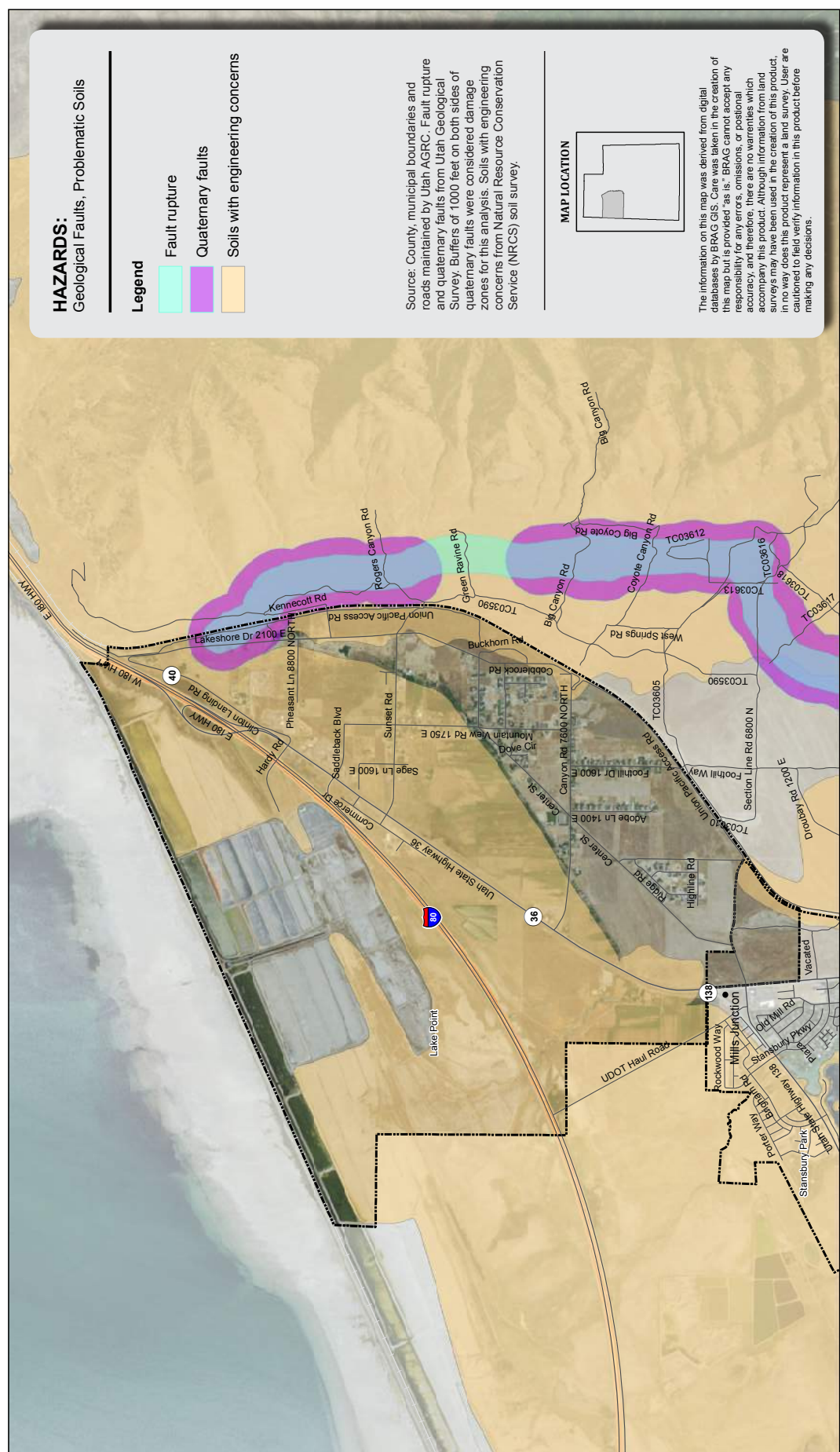
Table 23: Grantsville City Mitigation Strategies

GRANTSVILLE - 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
Grantsville City	Flood	Protect current residents and property	We maintain the flood control ditch with monitoring.	N/A	Medium	yearly	City Budget	Local	\$1,000	public works dept
Grantsville City	Earthquake	Protect current residents and property	Public buildings built to current earthquake standards	N/A	High	2016-Current	N/A	Developer, Builder	Varies	UGS
Grantsville City	Wildfire	Protect current residents and property	We require protective areas in the P&Z process	N/A	High	Ongoing	Development Agreements	City	Varies	Fire Dept., Public Works, P&Z
Grantsville City	Dam Failure	Protect current residents and property	Flood control ditch that would take the majority of the water and diversion plans.	N/A	Low	Ongoing	FEMA/ Utah Dept of public safety, DNR	City	N/A	Tooele County, Grantsville City, State of Utah
Grantsville City	Drought	Protect current residents and property	Water restrictions	N/A	Medium	Ongoing	City, State	City, County	Unknown	Dept. of water resources
Grantsville City	Severe Weather	Protect current residents and property	Building codes, emergency services	N/A	High	Ongoing	Unknown	City, County	Unknown	Emergency Services, Ham Radio
Grantsville City	Steep Slope	Protect current residents and property	Do evaluation of local sites which may be at danger from steep slope issues.	N/A	Medium	Ongoing	UGS, Local, Utah DEM	Local	Unknown	UGS, Local
Grantsville City	High Water Table	Protect current residents and property	Do evaluation of local sites which may be at danger from high water table issues. Education residents on resources for preventing water damage in homes	N/A	Medium	Ongoing	UGS, NRCS, Utah DEM	Local	Unknown	UGS, NRCS
Grantsville City	Unsuitable Soils	Protect current residents and property	Do evaluation of local sites which may be at danger from unsuitable soils.	N/A	Medium	Ongoing	UGS, NRCS, Utah DEM	Local	Unknown	UGS, NRCS
GRANTSVILLE - 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
Grantsville City	Flood	Protect future residents and property	Review concept plans through planning and zoning	N/A	High	2016-Current	City	City, County	N/A	FEMA
Grantsville City	Earthquake	Protect future residents and property	Providing places for residents to house/seek medical attention and food.	N/A	Low	Ongoing	FEMA	City	N/A	UGS
Grantsville City	Wildfire	Protect future residents and property	Requirements of protective areas through the planning and zoning process	N/A	High	Ongoing	Development Agreements	City, County	Varies	Fire Dept., Public Works, P&Z
Grantsville City	Dam Failure	Protect future residents and property	Same	N/A	Low	Ongoing	FEMA/ Utah Dept of public safety, DNR	City	N/A	Tooele County, Grantsville City, State of Utah
Grantsville City	Drought	Protect future residents and property	Ordinances require developers to provide adequate water for subdivisions	N/A	Medium	Ongoing	Developers, City, State	City, Developer	Unknown	NOAA
Grantsville City	Severe Weather	Protect future residents and property	Building codes, P&Z	N/A	High	Ongoing	FEMA, City, County, State, Fed	City, County	Unknown	Emergency Services, Ham Radio
Grantsville City	Steep Slope	Protect future residents and property	Re-evaluate future land use planning processes to include steep slope element.	N/A	Medium	Ongoing	Local	Local	Unknown	Utah APA, UGS
Grantsville City	High Water Table	Protect future residents and property	Re-evaluate future land use planning processes to include high water table element.	N/A	Medium	Ongoing	Local	Local	Unknown	Utah APA, UGS
Grantsville City	Unsuitable Soils	Protect future residents and property	Re-evaluate future land use planning processes to include unsuitable soil element.	N/A	Medium	Ongoing	Local	Local	Unknown	Utah APA, UGS

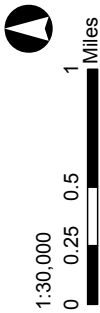
SECTION 9: LAKE POINT COMMUNITY RISK ASSESSMENT

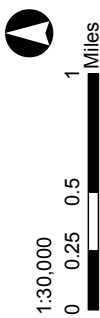
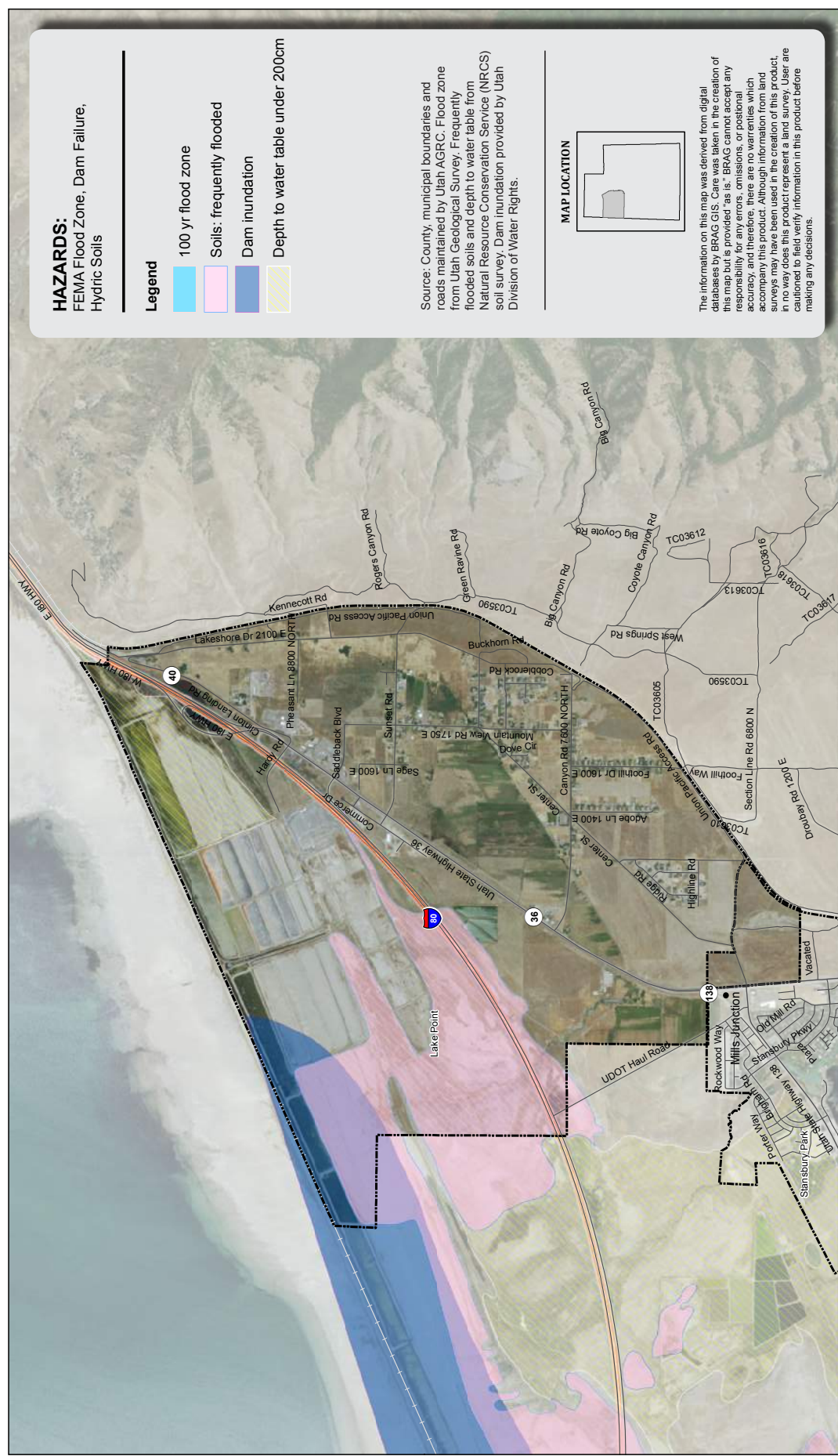


LAKE POINT, UTAH

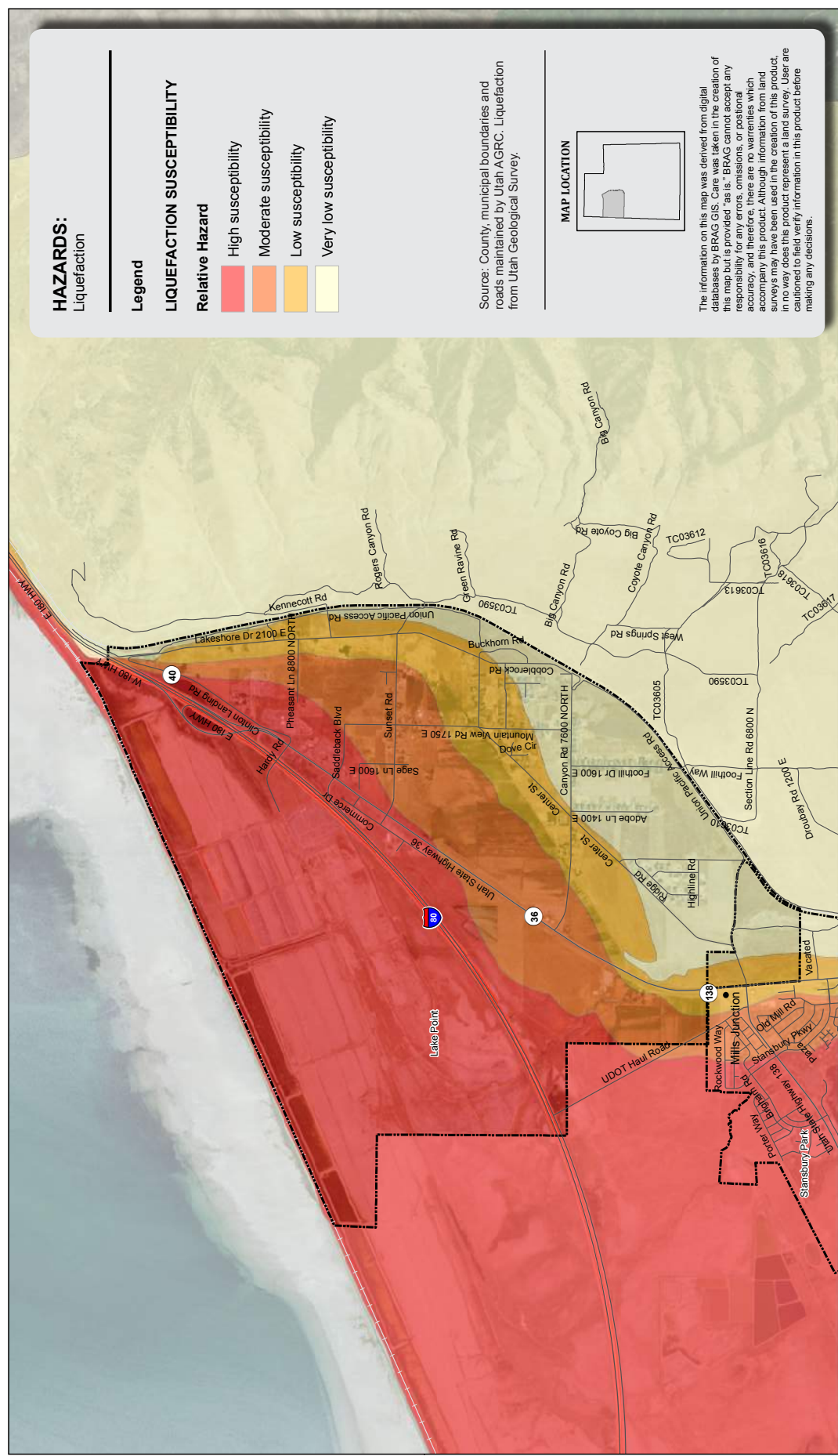


LAKE POINT, UTAH





LAKE POINT, UTAH



LAKE POINT, UTAH

LAKE POINT NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

See the following tables for more detailed descriptions of potential losses associated with each natural hazard in Lake Point.

LAKE POINT

Analysis of hazard risk involving the community of Lake Point revealed that there is potential risks resulting from **dam failure, geologic faults, wildfire, flooded soils, liquefaction, high water table and steep slopes**. These hazards have varying potential to impact human life, property, infrastructure, environmental, recreational, and agricultural features within the community boundaries. Lake Point is located directly adjacent to the southern rim of the Great Salt Lake. Currently, earthquakes resulting in liquefaction, as well as wildfires have the greatest potential to impact human life, property, infrastructure, and agricultural features based on potential loss values. Other natural hazard types not mentioned were found to have no potential impacts to Lake Point.

Natural Hazards

Dam failure. Lake Point has risk to dam failure involving The Great Salt Lake and would be heavily impacted in such an event. Features most at risk are infrastructure, which include the railroads and canals on the north west side of the community. There are associated risks to infrastructure and environmental amenities in the event of dam inundation.

Faults. Lake Point has high risk of fault damage. The community is situated along a quaternary fault as well as being located near faults on the eastern foothills. The eastern portions of the community, especially areas of the foothills and bench, lie along portions of this quaternary fault. Infrastructure, recreational, and agricultural amenities in the fault zone could suffer damage in the event of a large earthquake.

Wildfire. Lake Point has some wildfire risk

Table 24: Lake Point Potential Loss Figures

Lake Point, 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	48	15	\$2,286,504	2	\$157,660	\$1,284,522
Wildfire	1,223	368	\$99,045,372	48	\$54,238,062	\$30,828,528
Flood (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	0	0	\$0	1	\$1,220,246	\$642,261
Liquefaction	180	54	\$10,902,772	50	\$55,739,792	\$32,113,050
Landslide	0	0	\$0	0	\$0	\$0
Slope	3	1	\$245,557	0	\$0	\$0
High Water Table	0	0	\$0	2	\$785,410	\$1,284,522
Unsuitable Soils for Buildings	269	84	\$9,035,386	48	\$35,219,658	\$30,828,528

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Lake Point, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1 EMS Building, 1 Fire Station	0	0	2 Churches	2 Broadband Anchors	1 Water Storage Facility, 1 Solid Waste/Oil Facility, 1 Well
Flood (FEMA)						
Flood (Soils)	0	0	0	0	0	0
Liquefaction	1 EMS Building, 1 Fire Station	0	0	1 Church	1 Broadband Anchor	2 Water Storage Facilities, 1 Solid Waste/Oil Facility
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	0	0	0	0	0	1 Solid Waste Facility

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

Lake Point, 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	1.17	\$1,755,000	0	\$0	0	\$0	0	\$0	0.56	\$840,000
Faults	0	\$0	0	\$0	0	\$0	1.84	\$966,000	0.003	\$4,500
Wildfire	0.58	\$870,000	2.32	\$3,248,000	1.5	\$190,500	13.08	\$6,867,000	6.65	\$9,975,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	0	\$0	0	\$0	0.74	\$93,980	2.86	\$1,501,500	6.09	\$9,135,000
Liquefaction	3.34	\$5,010,000	0	\$0	1.72	\$218,440	0	\$0	0	\$0
Landslide	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Slope	0	\$0	0	\$0	0	\$0	0.23	\$120,750	0.01	\$15,000
High Water Table	0	\$0	0	\$0	0.74	\$93,980	3.29	\$1,727,250	13.7	\$20,550,000
Unsuitable Soils for Builings	0.51	\$765,000	1.8	\$2,520,000	1.8	\$228,600	22.9	\$12,022,500	27.27	\$40,905,000

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Lake Point, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.00	282.44	1.02	0.00	0.00	0.00	0
Faults	0.00	0.00	0.39	0.00	0.00	0.38	0
Wildfire	71.41	0.00	0.00	0.00	0.00	3.03	0
Flood (FIRM)	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (Soils)	3.49	545.60	6.55	0.00	0.00	0.00	0
Liquefaction	1,356.76	728.58	0.00	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	0.05	0.00	0.00	0.00	0.00	0.11	0
High Water Table	632.97	159.79	7.30	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	787.35	167.75	14.81	0.00	0.00	0.00	0
Note: Total acres of land and miles of streams and trails 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.							

Lake Point, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0.00	0.00
Faults	13.54	0.00
Wildfire	1,272.57	0.00
Flood (FIRM)	0.00	0.00
Flood (Soils)	238.49	0.00
Liquefaction	1,202.89	0.00
Landslide	0.00	0.00
Slope	5.42	0.00
High Water Table	0.00	0.00
Unsuitable Soils for Buildings	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, <i>Water Related Land Use</i> dataset.		
**Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)		

in the central and southern sections of town. Most of this risk is likely due to urban forest canopy density and proximity to the major population centers in town.

Flood. On the western and eastern side of Lake Points municipal area, there are frequently flooded soils and a high water table. However, most of these areas seem to be in agricultural areas, and generally do not seem to effect homes and businesses.

High Water Table. Most high water table areas are north of I-80 in agricultural lands and the Great Salt Lake floodplain.

Liquefaction. High liquefaction zones cover more than half of town, mostly north of I-80. Moderate susceptibility areas surround Highway 36, and low and very low susceptibility covers the southern edge of town. Overall, there is a substantial risk to Lake Point from liquefaction if there is an earthquake. Historical lakebed soils and potentially saturated conditions enhance liquefaction risk.

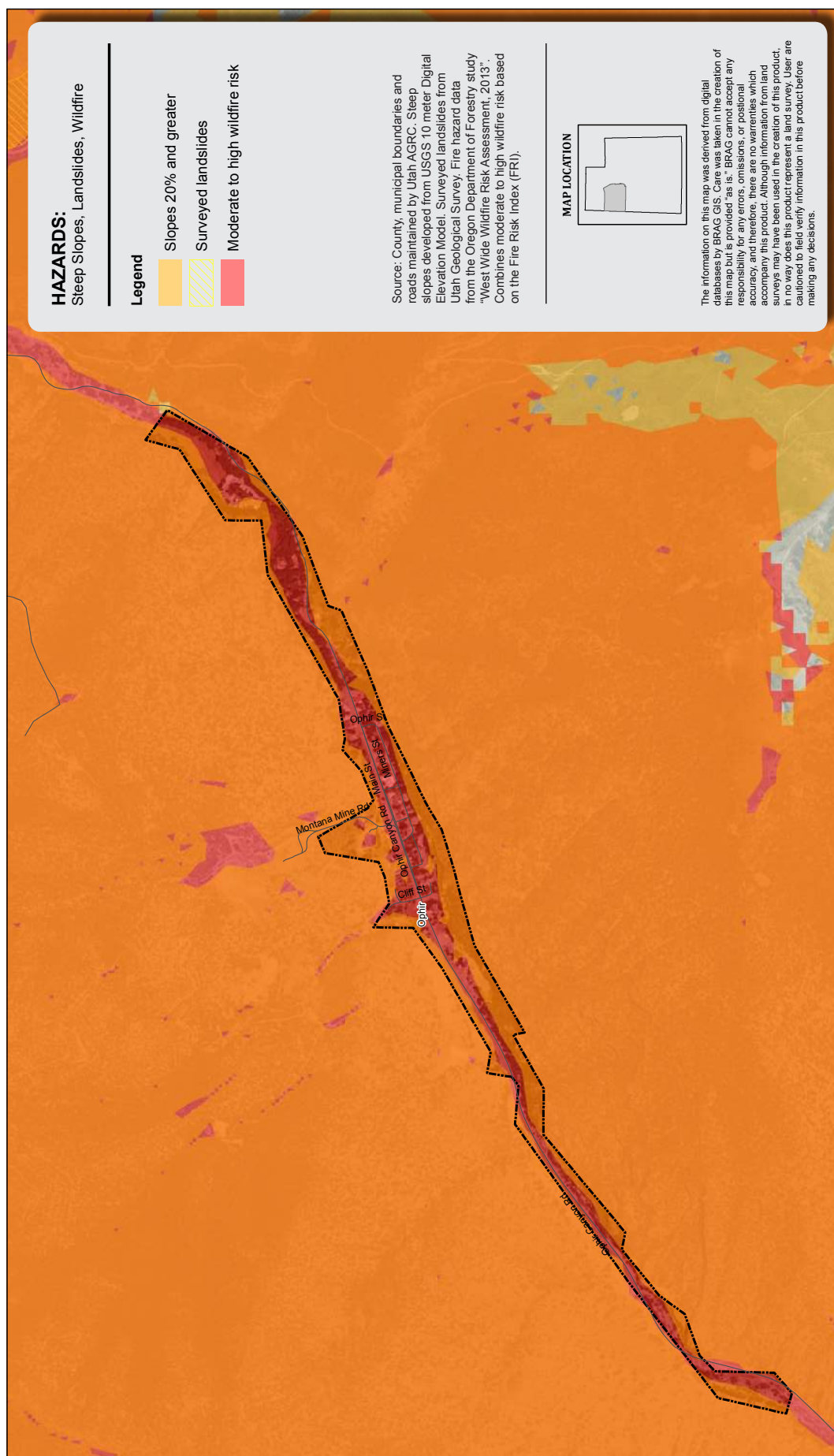
Future Development

Currently, there is a proposed development of around 1,000 homes on the east side of Erda between Lake Point and Pine Canyon. These homes could potentially be affected by wildfire, landslides, and geologic hazards.

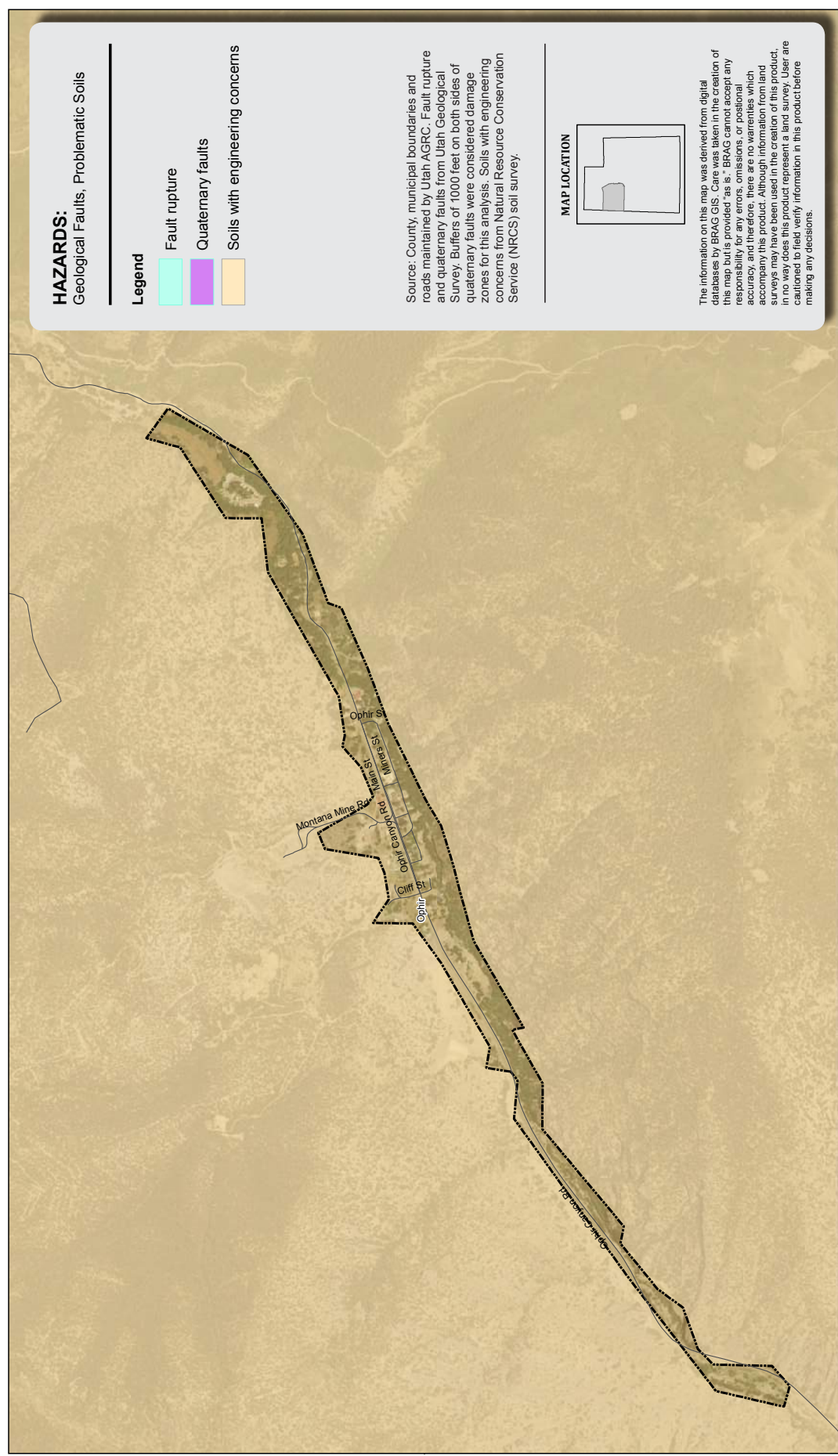
Hazard Mitigation Strategies

(See Section 17: Unincorporated Tooele County Community Risk Assessment)

SECTION 10: OPHIR TOWN COMMUNITY RISK ASSESSMENT



OPHIR, UTAH



OPHIR TOWN NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

OPHIR

Analysis of hazard risk involving the community of Ophir revealed that there is potential risk resulting from **steep slopes, and wildfire**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, 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 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 Ophir. See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Table 25: Ophir Potential Loss Figures

Natural Hazards

Slopes. Ophir 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 the Oquirrh Mountain Range. Areas bordering streams and rivers also appear to have an increased risk. Steep slopes have the potential to impact life, property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction. Nearly 20 people and 6 structures are estimated to be at risk within the jurisdiction from steep slopes.

Wildfire. Ophir is susceptible to high-severe risk of wildfire in portions of the city in which there are significant slopes in the Oquirrh mountains. Wildfires have the potential to impact over 35 people in the City, as well as nearly 12 structures.

Future Development

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

Ophir, 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	35	11	\$1,430,303	1	\$59,266	\$642,261
Flood (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	0	0	\$0	0	\$0	\$0
Liquefaction	0	0	\$0	0	\$0	\$0
Landslide	0	0	\$0	0	\$0	\$0
Slope	19	6	\$757,050	0	\$0	\$0
High Water Table	0	0	\$0	0	\$0	\$0
Unsuitable Soils for Buildings	35	11	\$1,172,903	1	\$8,252	\$642,261
* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.						
** Current Market Value per parcel, including building and land values. Data provided by Tooele County.						
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.						

Ophir, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1 Fire Station	0	0	0	0	0
Flood (FEMA)	0	0	0	0	0	0
Flood (Soils)	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
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	0	0	0	0	0	0

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

Ophir, 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	2.49	\$1,307,250	0.06	\$90,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	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	0.25	\$131,250	0.06	\$90,000
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	2.49	\$1,307,250	0.1	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Ophir, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00	0
Faults	0.00	0.00	0.00	0.00	0.00	0.00	0
Wildfire	8.28	0.00	0.00	0.00	0.00	1.68	0
Flood (FIRM)	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (Soils)	0.00	0.00	0.00	0.00	0.00	0.00	0
Liquefaction	0.00	0.00	0.00	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	4.82	0.00	0.82	0.00	0.00	0.16	0
High Water Table	0.00	0.00	0.00	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	0.00	0.08	2.56	0.00	0.00	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Ophir, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0.00	0.00
Faults	0.00	0.00
Wildfire	0.00	77.65
Flood (FIRM)	0.00	0.00
Flood (Soils)	0.00	0.00
Liquefaction	0.00	0.00
Landslide	0.00	0.00
Slope	0.00	38.29
High Water Table	0.00	0.00
Unsuitable Soils for Buildings	0.00	77.68

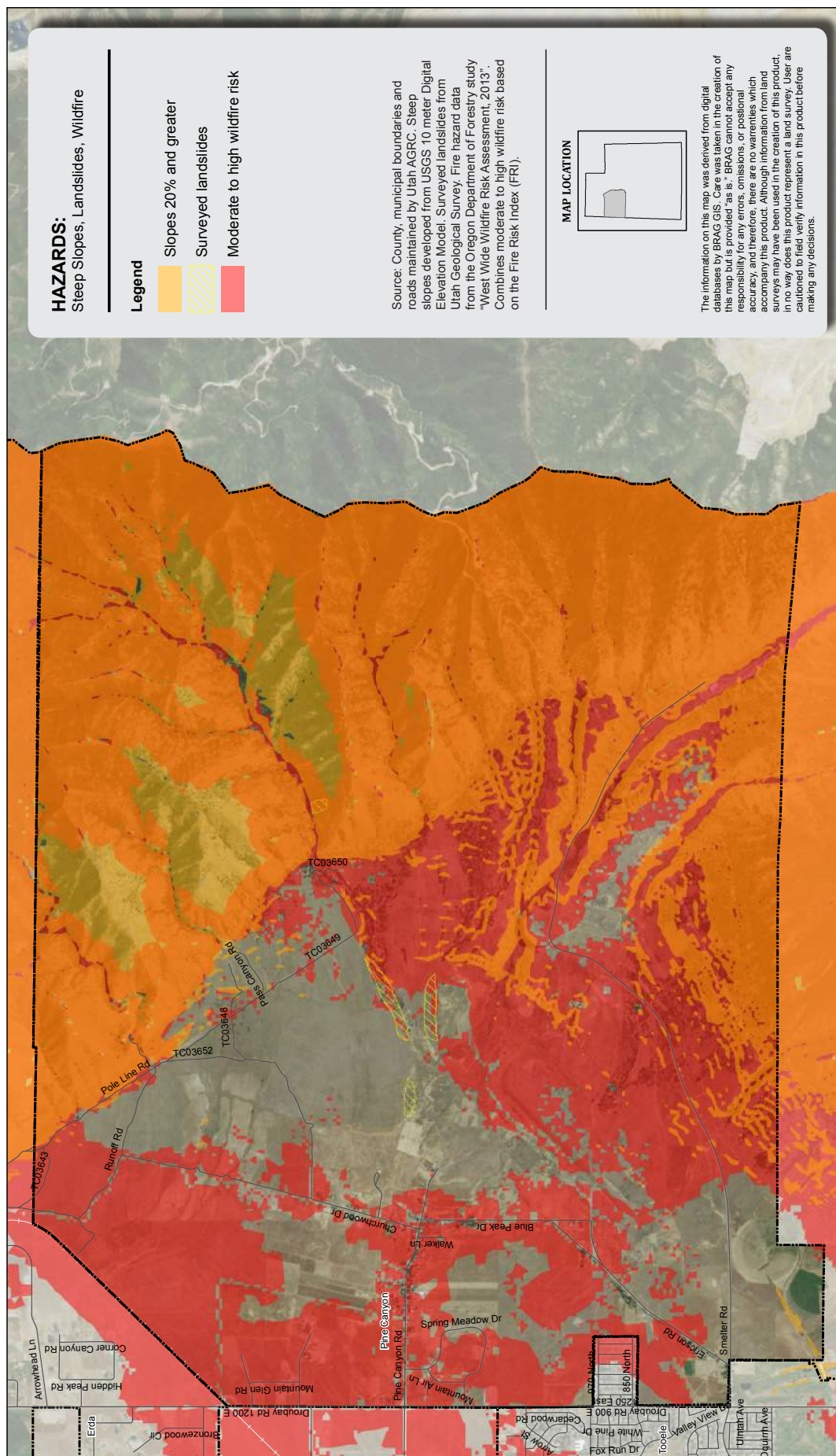
* Lands that are currently associated with agricultural activities involving water related land use, as described in the 2007 Utah Division of Water Resources, *Water Related Land Use* dataset.

** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

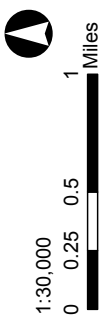
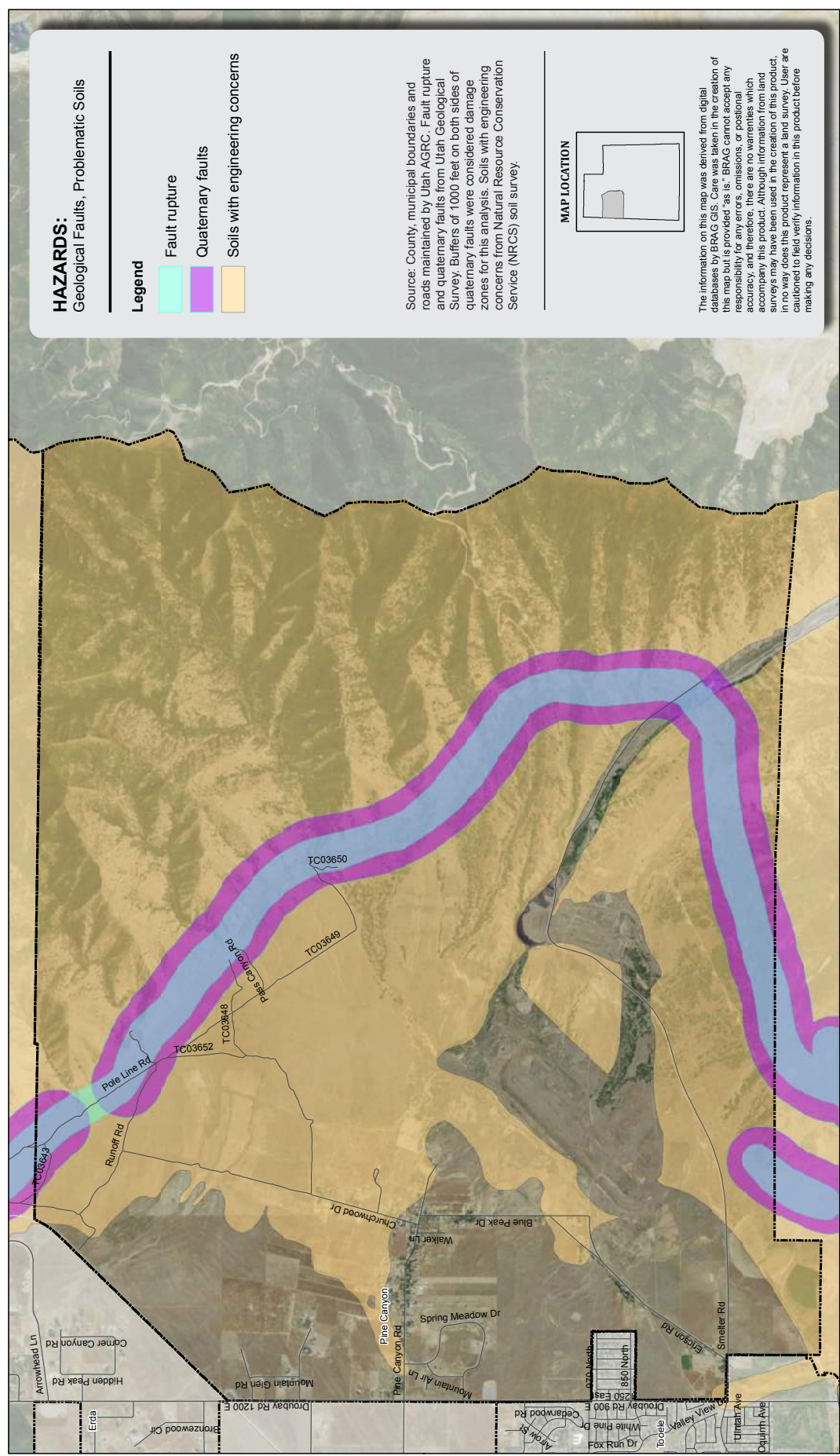
Hazard Mitigation Strategies

No mitigation strategies were reported for Ophir Town.

SECTION 11: PINE CANYON COMMUNITY RISK ASSESSMENT



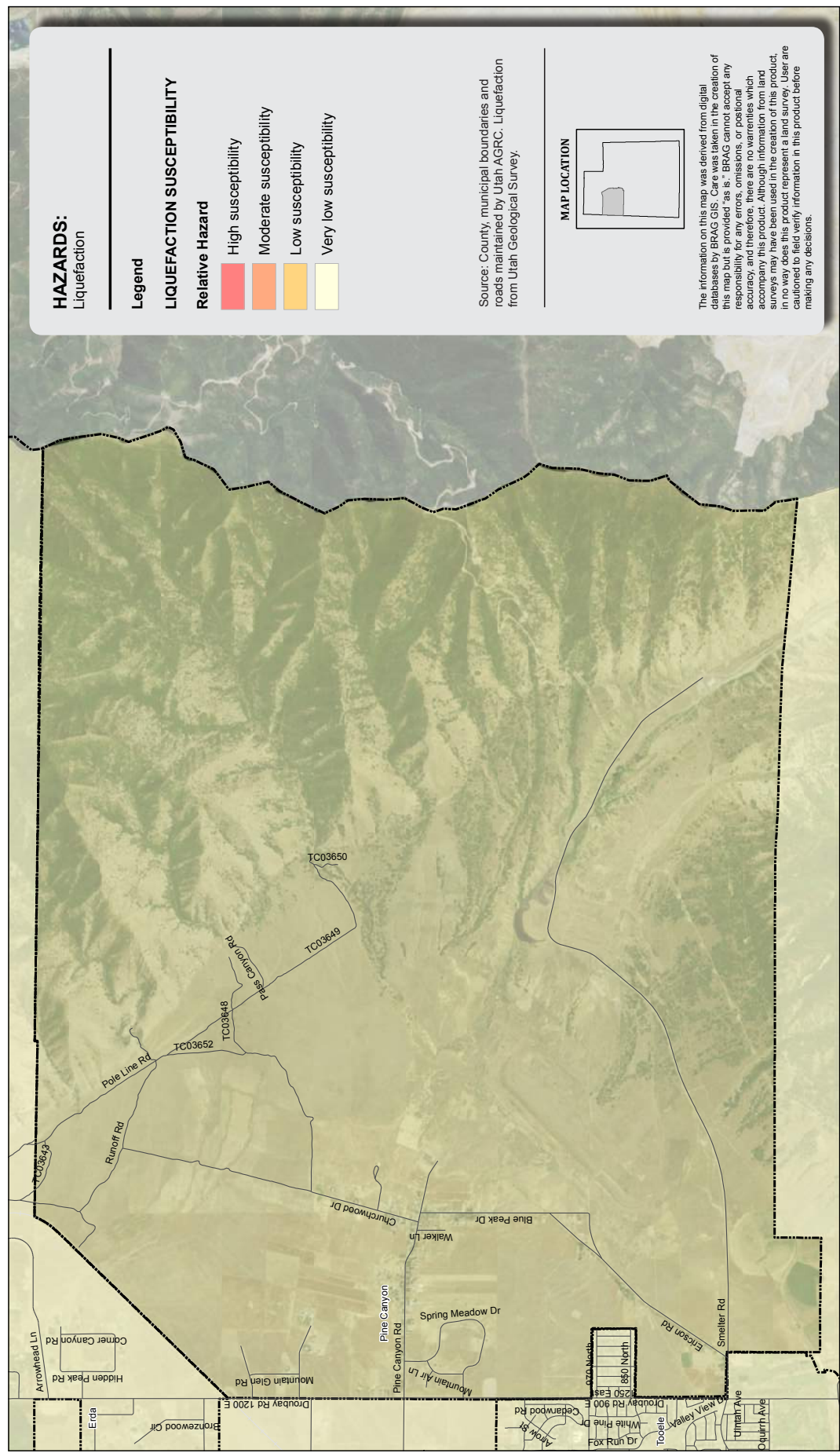
PINE CANYON, UTAH



PINE CANYON, UTAH



PINE CANYON, UTAH



PINE CANYON, UTAH

PINE CANYON NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

PINE CANYON

Analysis of hazard risk involving the community of Pine Canyon revealed that there is potential risk resulting from **faults, flood (soils), 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 has the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from faults, flooding soils, 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 Pine Canyon. See the following tables for more detailed descriptions of potential losses associated with each natural hazard

Table 26: Pine Canyon Potential Loss Figures

Flood (soils). Portions of Pine Canyon are at risk to flooding based on soils data. Although very rare, Pine Canyon's risk of flooding could affect several parts of town and its population. Areas most susceptible to flooding are portions of the community north of 2000 North, eastern portions of the town near the mouth of the canyon, and well as areas along Ericson Road. Flooding soils 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.

Faults. Pine Canyon has risk of fault damage. The community is situated next to a quaternary fault. The eastern portions of the community, especially areas of the foothills and bench, lie along portions of the that fault. Environmental, recreational, and agricultural amenities in the fault zone could suffer damage in the event of a large earthquake.

Wildfire. Pine Canyon is susceptible to moderate-high risk of wildfire in small portions of the town with steeper slopes and grassy and shrubby vegetation types. Areas are also at risk due to their proximity to urban forests. Wildfires have the potential to impact over 500 people in the town, as well as over 150 structures.

Pine Canyon, 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	506	156	\$42,163,402	0	\$0	\$0
Flood (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	93	29	\$7,133,169	0	\$0	\$0
Liquefaction	0	0	\$0	0	\$0	\$0
Landslide	0	0	\$0	0	\$0	\$0
Slope	0	0	\$0	0	\$0	\$0
High Water Table	0	0	\$0	0	\$0	\$0
Unsuitable Soils for Buildings	186	58	\$10,185,926	0	\$0	\$0
* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2. ** Current Market Value per parcel, including building and land values. Data provided by Tooele County. *** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.						

Pine Canyon, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	2 Dams	0
Wildfire	1 EMS, 1 Fire Station	0	0	0	1 Broadband Anchor, 3 Dams	1 Oil/Gas Well, 3 Water Storage Facility
Flood (FEMA)	0	0	0	0	0	0
Flood (Soils)	0	0	0	1 Church	1 Dam	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	3 Water Storage Facilities
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	0	0	0	0	0	0
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and						

Pine Canyon, 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	4.496306	\$2,360,561	0.11	\$165,000
Wildfire	1.05	\$1,575,000	0.16	\$224,000	2.89	\$367,030	10.92	\$5,733,000	2	\$3,000,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	0	\$0	0	\$0	0.06	\$7,620	2.44	\$1,281,000	1.82	\$2,730,000
Liquefaction	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Landslide	0	\$0	0	\$0	0	\$0	0	\$0	0.1	\$150,000
Slope	0	\$0	0	\$0	0	\$0	1.81	\$950,250	0.47	\$705,000
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Unsuitable Soils for Builings	0.04	\$60,000	0	\$0	0.46	\$58,420	11.82	\$6,205,500	5.97	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Pine Canyon, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00	0
Faults	0.20	0.00	9.18	0.00	0.00	2.50	0
Wildfire	17.48	0.00	0.00	0.00	0.00	20.86	0
Flood (FIRM)	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (Soils)	3.01	0.77	3.17	0.00	0.00	3.72	0
Liquefaction	0.00	0.00	0.00	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.73	0.00	0.00	0.00	0
Slope	3.20	0.06	17.57	0.00	0.00	21.09	0
High Water Table	0.00	0.00	0.00	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	9.58	1.32	32.17	0.00	0.00	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Pine Canyon, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0.00	0.00
Faults	7.19	3,059.73
Wildfire	1,258.61	6,714.22
Flood (FIRM)	0.00	0.00
Flood (Soils)	544.08	138.29
Liquefaction	0.00	0.00
Landslide	18.87	26.04
Slope	17.02	5,847.61
High Water Table	0.00	0.00
Unsuitable Soils for Buildings	0.00	8,008.75

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

Slopes. Pine Canyon has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 20%, which are commonly found adjacent to mountainous areas of the Oquirrh Mountain Range. Areas bordering streams also appear to have an increased exposure to risk. Steep slopes have the potential to impact property, infrastructure, and environmental, recreational and agricultural features in the jurisdiction.

Landslides. Isolated portions of Pine Canyon could suffer potential losses to landslides. Infrastructure, Environmental, and Agricultural lands that are most likely to be impacted include western portions of the town near the slopes of Anaconda Reservoir and areas near the mouth of the canyon. Landslides have the potential to impact infrastructure, and environmental, and agricultural features in the jurisdiction. .

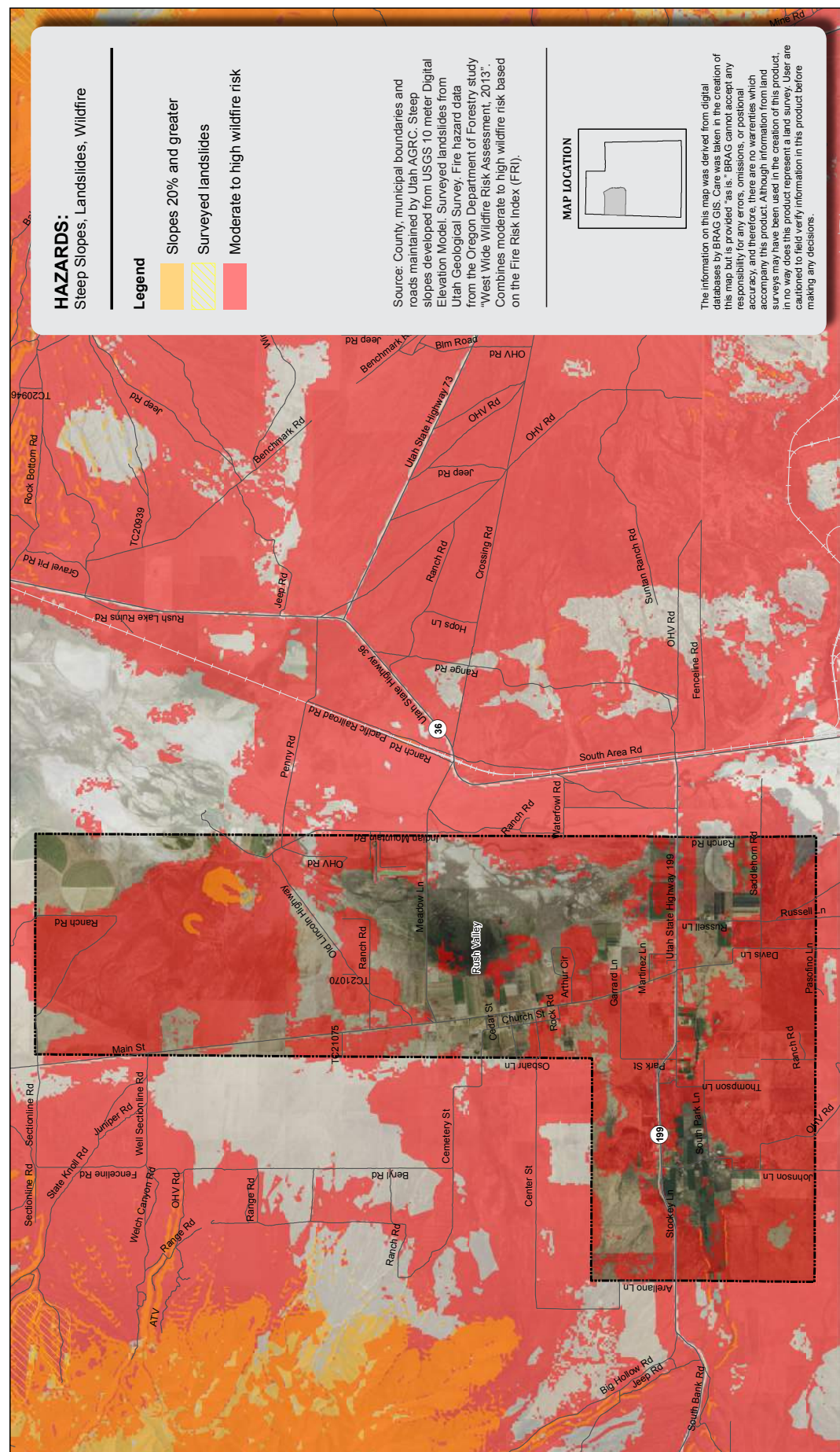
Future Development

Currently, there is a proposed development of around 1,000 homes on the east side of Erda between Lake Point and Pine Canyon. These homes could potentially be affected by wildfire, landslides, and geologic hazards.

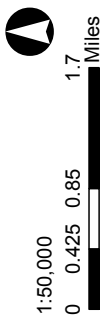
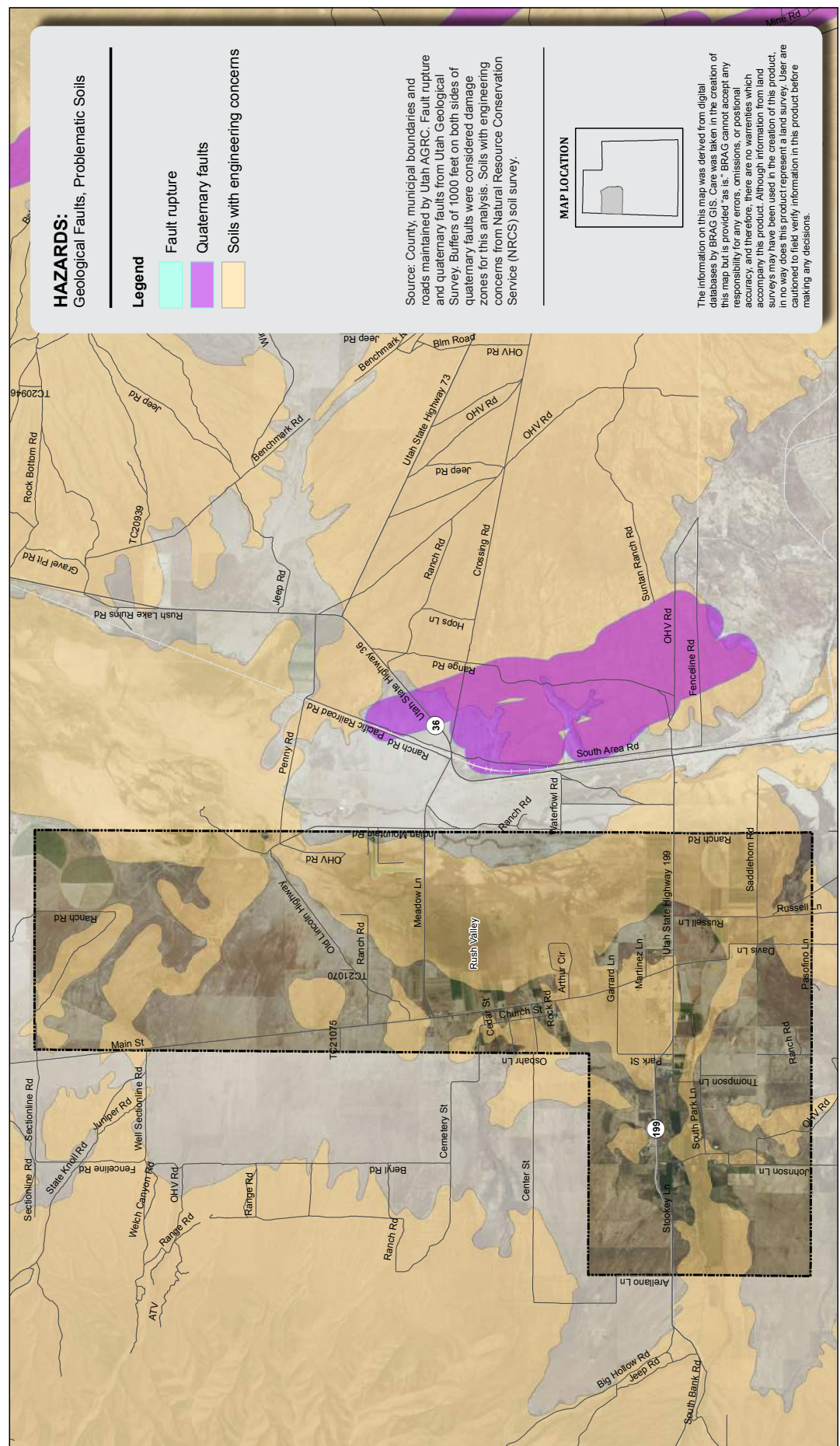
Hazard Mitigation Strategies

(See Section 17: Unincorporated Tooele County Community Risk Assessment)

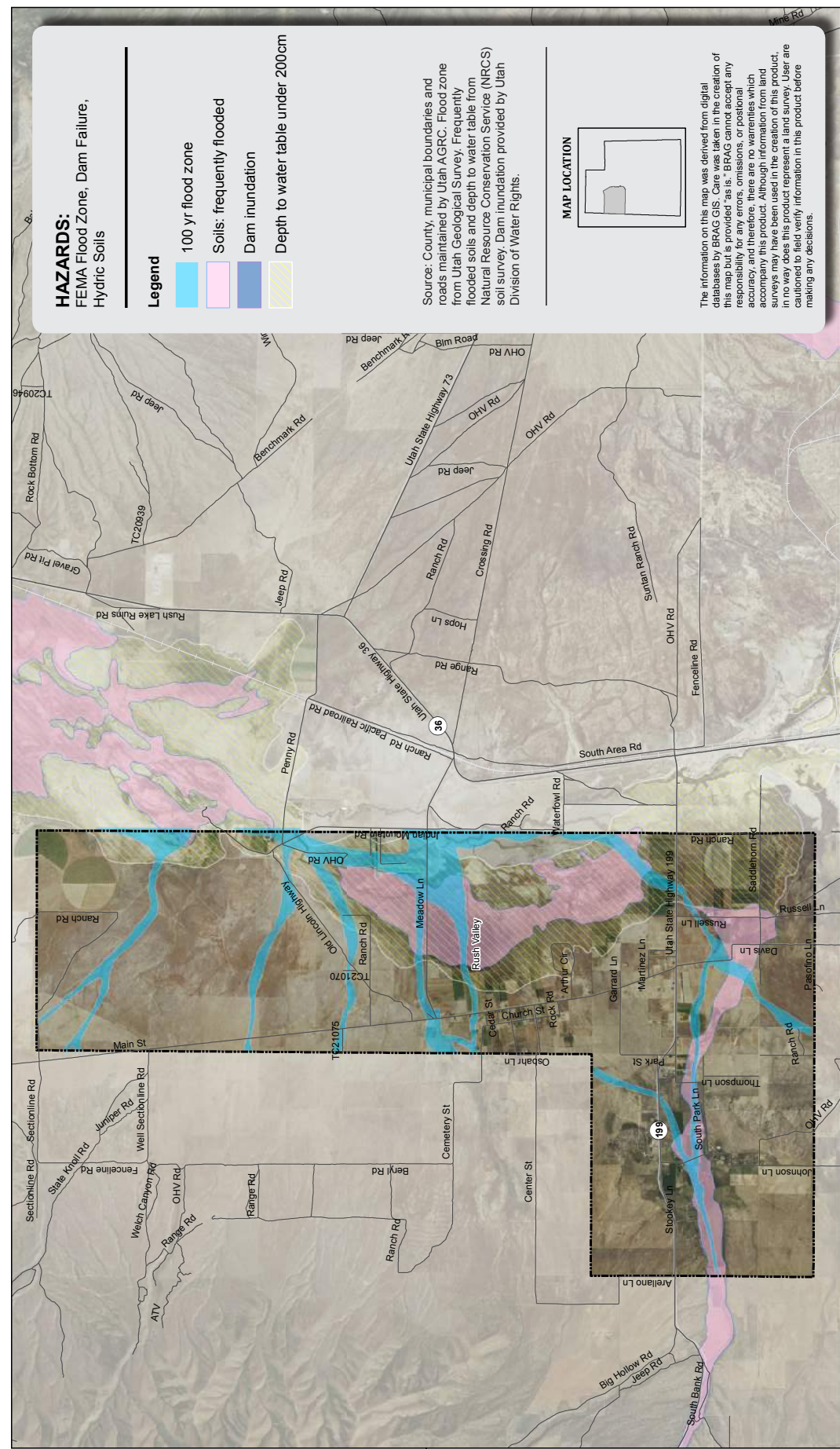
SECTION 12: RUSH VALLEY COMMUNITY RISK ASSESSMENT



RUSH VALLEY, UTAH



RUSH VALLEY, UTAH



RUSH VALLEY, UTAH

RUSH VALLEY NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

RUSH VALLEY

Analysis of hazard risk involving the town of Rush Valley revealed that there is potential risk resulting from **wildfire, flood, flooded soils, high water table, and steep slopes**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfires, and flooding have the greatest potential to impact human life, property, infrastructure, environmental, recreational, and agricultural features based on potential loss values. 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 Rush Valley. See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Table 27: Rush Valley Potential Loss Figures

Natural Hazards

Wildfire. Rush Valley is susceptible to a moderate-high risk of wildfire throughout the town. Wildfires threaten human life, infrastructure, community facilities, environmental, recreational, and agricultural features. Wildfires tend to occur most closely with development and amenities near areas with grassy and shrubby vegetation types. Wildfires have the potential to impact over 186 people in the town, as well as over 63 structures.

Flood. Portions of Rush Valley are at risk of flooding with a 1% chance of flooding annually. Areas susceptible to flooding are portions of the community bordering Rush Lake as well the central part of town. Floods in these areas pose a threat to human life, structures, infrastructure, environmental, recreational, and agricultural amenities and lands within town limits.

Steep Slopes. Rush Valley has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 25%, which are commonly found in hilly areas and areas bordering streams and rivers. Steep slopes have the potential to impact life, property, and agricultural features in the town. An estimated 6 people and 2 structures are at risk within the jurisdiction.

Rush Valley, 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	185.6	58	7,180,974	2	333,309	1,284,522
Flood (FEMA)	29	9	1,303,694	1	251,687	642,261
Flood (Soils)	16	5	879,264	1	251,687	642,261
Liquefaction	0	0	0.0	0	0.0	0.0
Landslide	0	0	0.0	0	0.0	0.0
Slope	6	2	301,255	0	0.0	0.0
High Water Table	13	4	\$704,080	1	\$115,007	\$642,261
Unsuitable Soils for Buildings	170	53	\$5,272,498	3	\$185,302	\$1,926,783

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Rush Valley, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure						
Faults						
Wildfire	Rush Valley Fire Department	1 Post Office		1 Church		1 Well
Flood (FEMA)						
Flood (Soils)						1 Dam
Liquefaction						
Landslide						
Slope						
High Water Table						
Unsuitable Soils for Buildings						
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.						

Rush Valley, 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	19.57	\$10,274,250	1.67	\$2,505,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	3.79	\$1,989,750	2.51	\$3,765,000
Flood (Soils)	0	\$0	0	\$0	0	\$0	2.35	\$1,233,750	1.50	\$2,250,000
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
High Water Table	0	\$0	0	\$0	0	\$0	6.08	\$3,192,000	3.34	\$0
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	18.22	\$9,565,500	3.78	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Rush Valley, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0
Wildfire	18.13	0	0	0	0	2.38	0
Flood (FIRM)	21.97	11.90	10.58	0	0	0.56	0
Flood (Soils)	74.13	21.20	5.24	0	0	0	0
Liquefaction	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0
High Water Table	110.3	30.76	4.5	0	0	0	0
Unsuitable Soils for Buildings	134.21	35.04	10.11	0	0	0	0

Note: Total acres of land and miles of streams and trails 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.

Rush Valley, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0	0
Faults	0	0
Wildfire	4,075.02	5,894.37
Flood (FIRM)	833.78	1,072.48
Flood (Soils)	1,260.69	1,323.42
Liquefaction	0	0
Landslide	0	0
Slope	1.39	77.01
High Water Table	0	2840.38
Unsuitable Soils for Buildings	0	4974.1

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

High Water Table. Most high water table areas in Rush Valley are east of Main Street in low lying areas.

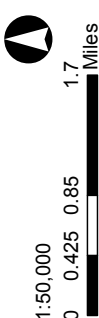
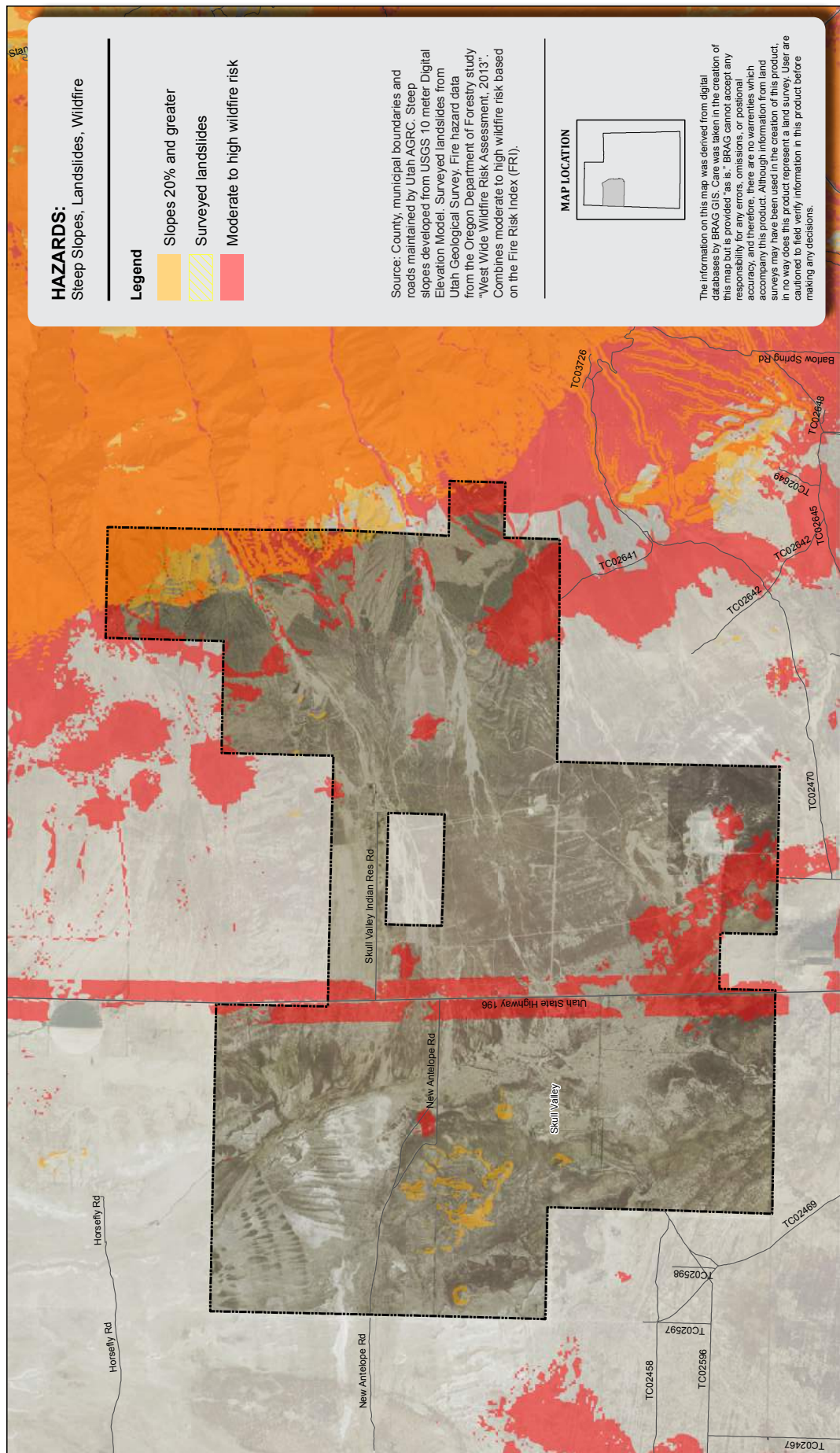
Future Development

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

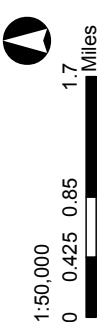
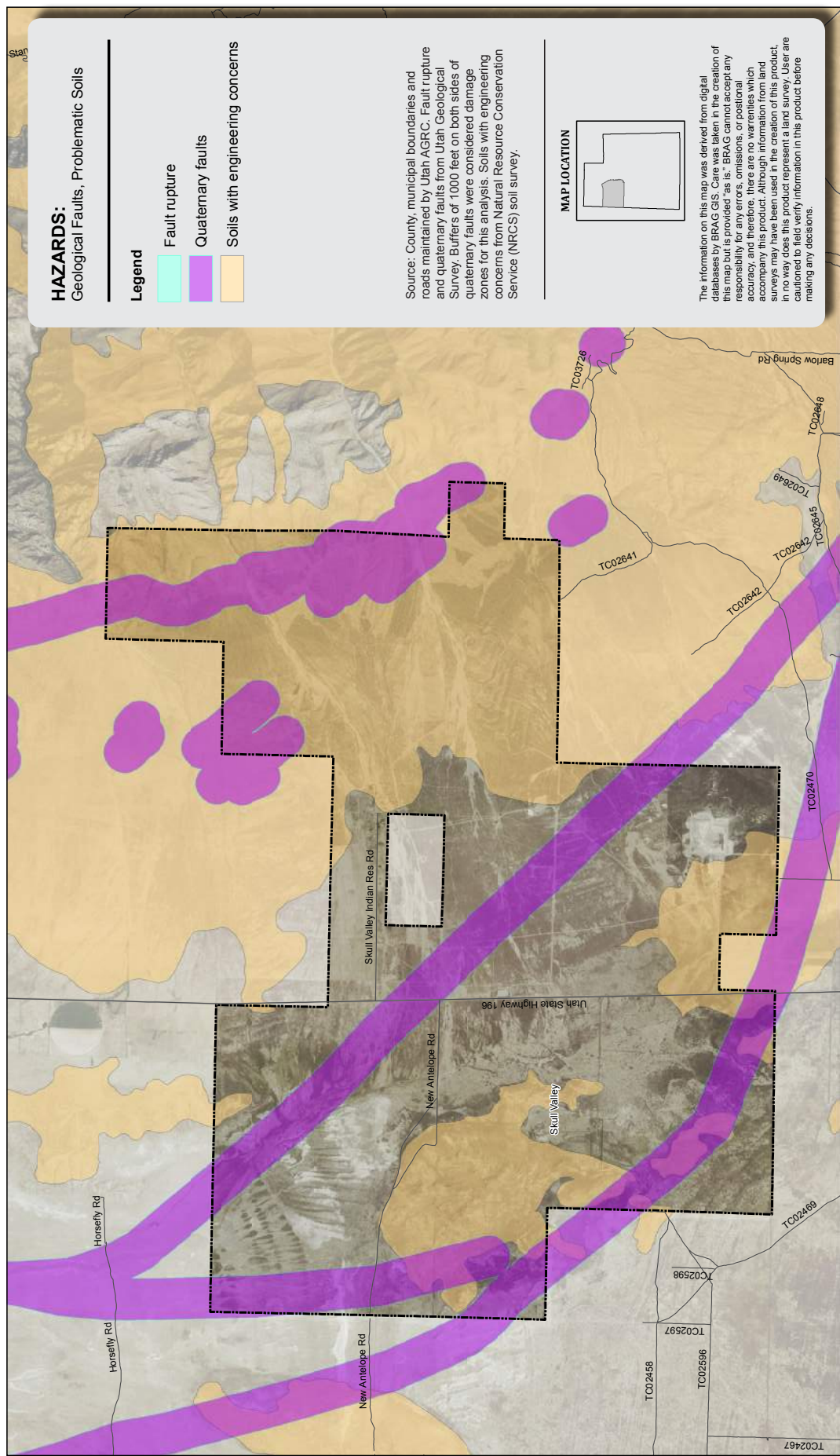
Hazard Mitigation Strategies

No mitigation strategies were reported for Rush Valley Town.

SECTION 13: SKULL VALLEY INDIAN RESERVATION COMMUNITY RISK ASSESSMENT



SKULL VALLEY, UTAH



SKULL VALLEY, UTAH

SKULL VALLEY NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

SKULL VALLEY

Analysis of hazard risk involving the unincorporated portions of Skull Valley revealed that there is potential risk resulting from **wildfire, faults and steep slopes**. These hazards have varying potential to impact infrastructure, agriculture, and environmental features. Currently wildfires have the greatest potential to impact infrastructure and agriculture amenities based on potential loss values. Steep slopes have minimal impact on streams. Other natural hazard types not mentioned were found to have no potential impacts to the reservation. See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Table 28: Skull Valley Potential Loss Figures.

Natural Hazards

Wildfire. The Skull Valley Reservation has a moderate- very high risk of wildfire throughout the reservation and adjacent land parcels. Areas with the presence of grassy and shrubby vegetation types have the highest risk. Wildfires have the potential to impact infrastructure and agricultural features on the reservation.

Faults. Minor risk to roads from an earthquake exist for the reservation.

Steep Slopes. There are low risks associated with steep slopes within the reservation. Areas of greatest concern have slopes of 15-25%. Steep slopes have the potential to impact 2 miles of streams in Skull Valley.

Future Development

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

Skull Valley, 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 (FEMA)	0	0	\$0	0	\$0	\$0
Flood (Soils)	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
High Water Table	0	0	\$0	0	\$0	\$0
Unsuitable Soils for Buildings	0	0	\$0	0	\$0	\$0

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Skull Valley, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure						
Faults						
Wildfire						
Flood (FEMA)						
Flood (Soils)						
Liquefaction						
Landslide						
Slope						
High Water Table						
Unsuitable Soils for Buildings						
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.						

Skull Valley, 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	1.27	\$666,750	0	\$0
Wildfire	0	\$0	0	\$0	0	\$0	1.37	\$719,250	0	\$0
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Flood (Soils)	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
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	2.23	\$1,170,750	1.33	\$0
¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).										
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, 2015).										
³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).										
⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).										
⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).										

Skull Valley, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0	0
Faults	1.09	0.32	14.64	0	0.52	0	0
Wildfire	0	0	0	0	0	0	0
Flood (FIRM)	0	0	0	0	0	0	0
Flood (Soils)	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0
Slope	0	0	2.19	0	0	0	0
High Water Table	0	0	0	0	0	0	0
Unsuitable Soils for Buildings	2.37	0	29.62	0	6.61	0	0

Note: Total acres of land and miles of streams and trails 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.

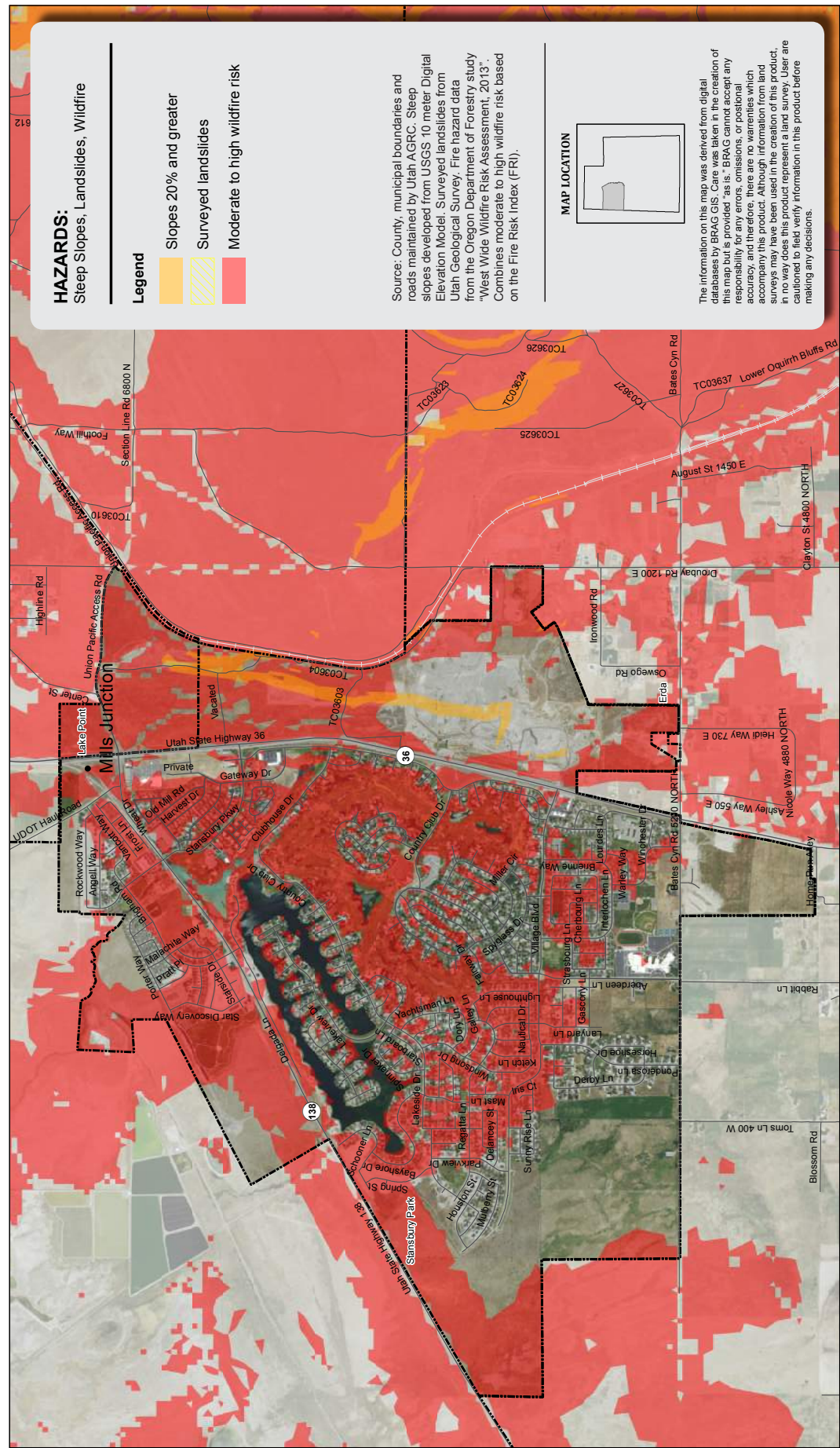
Skull Valley, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0	0
Faults	0	0
Wildfire	98.09	0.02
Flood (FIRM)	0	0
Flood (Soils)	0	0
Liquefaction	0	0
Landslide	0	0
Slope	0	0
High Water Table	0	0
Unsuitable Soils for Buildings	0	8.93

* 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.

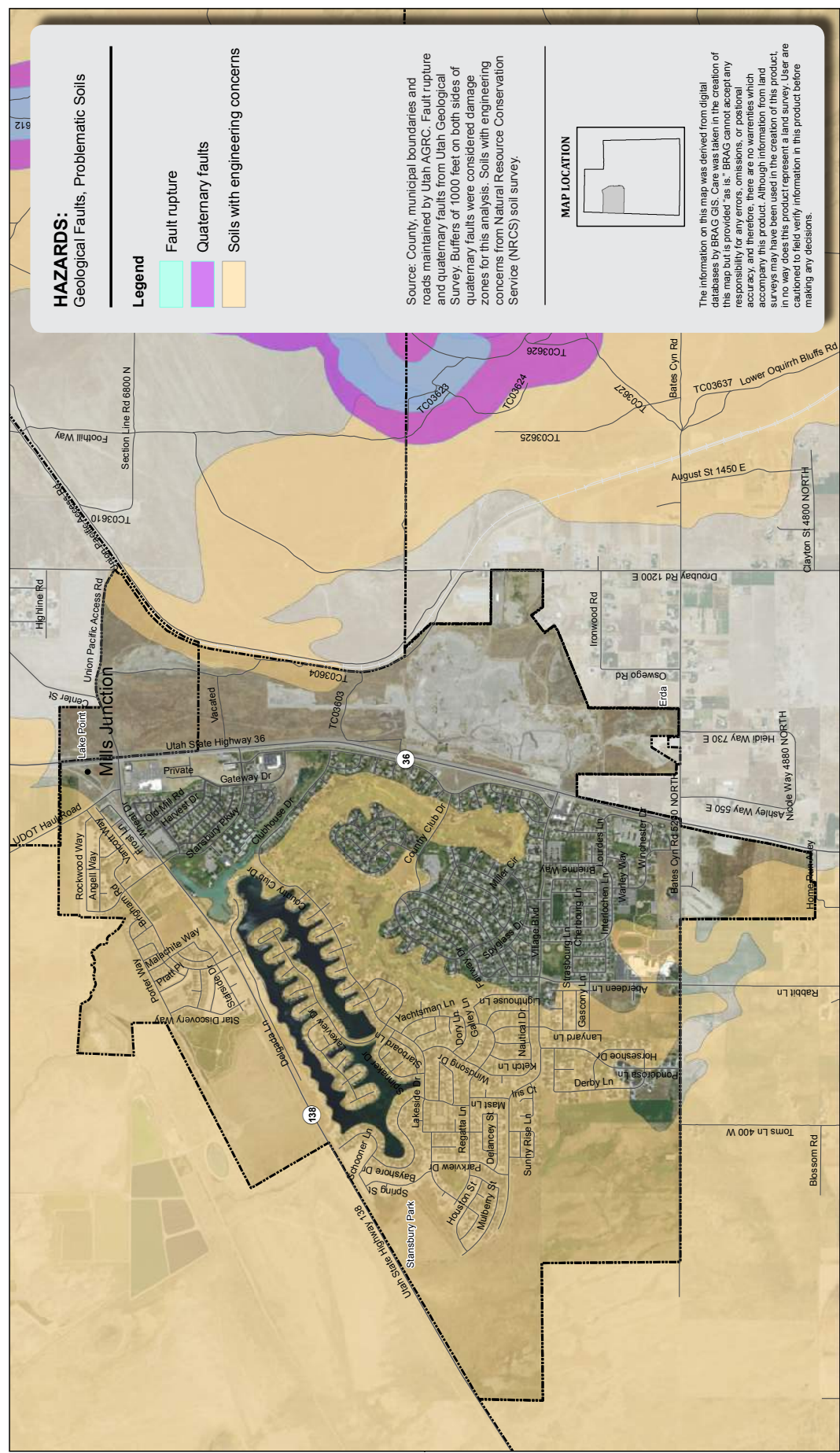
** Lands currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

(See Section 17: Unincorporated Tooele
County Community Risk Assessment)

SECTION 14: STANSBURY PARK COMMUNITY RISK ASSESSMENT



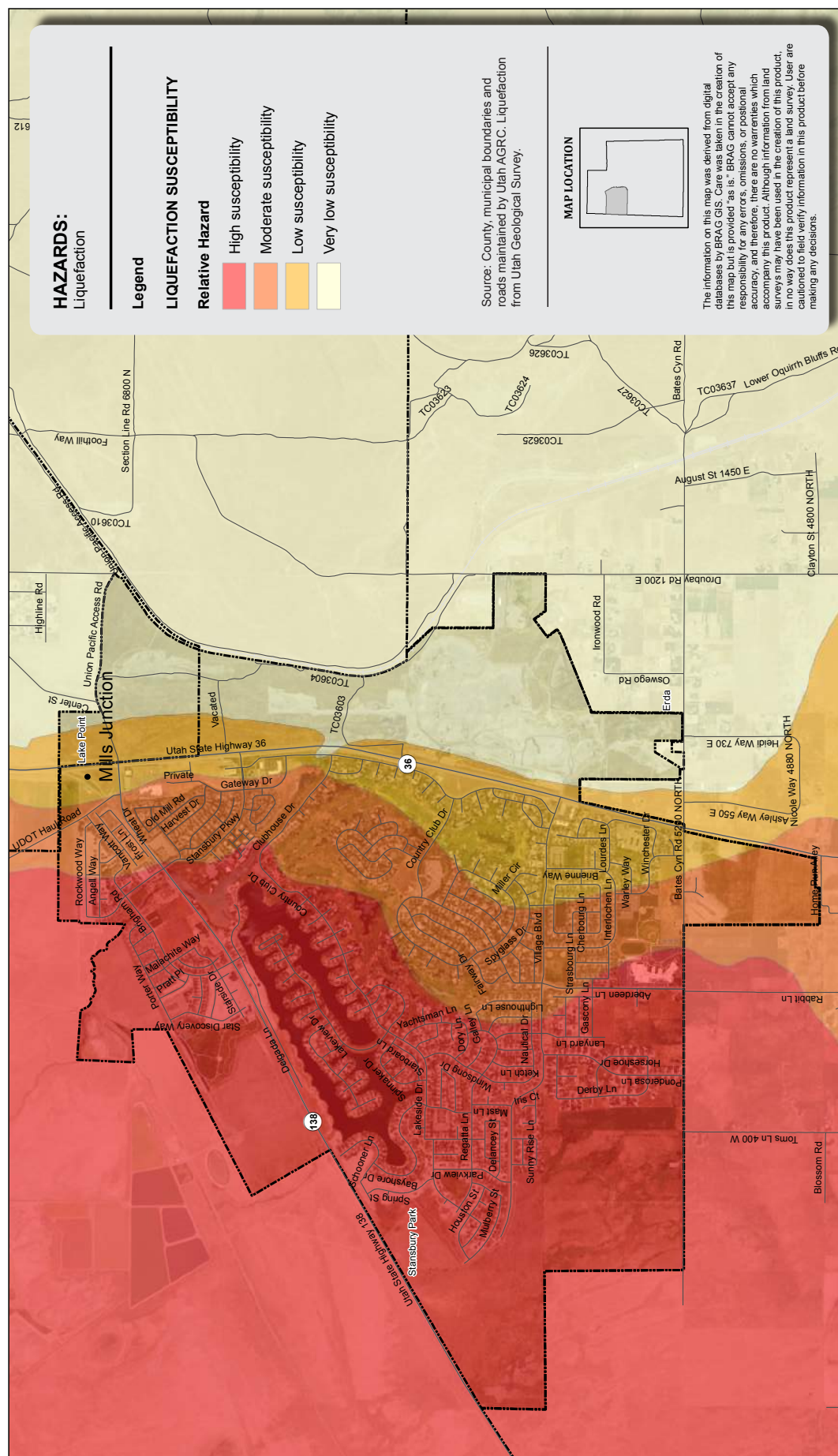
STANSBURY PARK, UTAH



STANSBURY PARK, UTAH



STANSBURY PARK, UTAH



STANSBURY PARK, UTAH

STANSBURY PARK NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

impacts to Stansbury Park. See the following tables for more detailed descriptions of potential losses associated with each natural hazard associated with jurisdictional elements.

STANSBURY PARK

Analysis of hazard risk involving the community of Stansbury Park revealed that there is potential risk resulting from **wildfire, flood, liquefaction, high water table and steep slopes**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within the community. Currently, wildfire, high water table, earthquakes resulting in liquefaction, as well as steep slopes 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 based on potential loss values. Other natural hazard types not mentioned were found to have no potential

Natural Hazards

Wildfire. Stansbury Park is susceptible to a moderate-high risk of wildfire. They tend to occur in areas near development and amenities with grassy and shrubby vegetation types. The development on the south side of Stansbury Lake and the low lying grassy parcels of land adjacent to Mills Junction have the greatest risk for wildfire. Wildfires have the potential to impact around 13,000 people and 4,164 structures with commercial units included.

Flood. Portions of Stansbury Park are at risk to flooding. Stansbury Park does participate in NFIP. Areas most susceptible to flooding are found in development bordering Stansbury Lake, and the parcels of land in the south west corner of the community with more wetlands. Floods resulting in these areas pose a threat to road infrastructure, and agricultural features

Table 29: Stansbury Park Potential Loss Figures

Stansbury Park, 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	13,190.4	4,122	883,540,504	42	55,901,178	0
Flood (FEMA)	0	0	0	0	0	0
Flood (Soils)	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	2	1,848,186	\$1,284,522
High Water Table	4,262	1,332	\$265,714,566	4	\$1,086,686	2569044
Unsuitable Soils for Buildings	9,760	3,050	\$581,450,162	4	\$1,086,686	\$2,569,044

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Stansbury Park, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	1 EMS, 1 Fire Station		0	0	1 Dam, 1 Well	0
Flood (FEMA)	0	0	0	0	0	0
Flood (Soils)	0	0	0	0	0	0
Liquefaction	0	3 Schools	0	0	1 Broadband Anchor, 1 Dam, 1 Well	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	0	0	0	0	0	0

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

Stansbury Park, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	\$ Value¹	# of Miles	\$ Value²	# of Miles	\$ Value³	# of Miles	\$ Value⁴	# of Miles	\$ Value⁵
Dam Failure	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Faults	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Wildfire	0.07	\$105,000	0.55	\$770,000	0	\$0	20.33	\$10,673,250	0	\$0
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0.37	\$194,250	0	\$0
Flood (Soils)	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Liquefaction	0	\$0	0	\$0	0	\$0	0.98	\$514,500	0	\$0
Landslide	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Slope	0	\$0	0	\$0	0	\$0	0.60	\$315,000	0.07	\$105,000
High Water Table	0	\$0	0	\$0	0	\$0	10.08	\$5,292,000	5.29	\$7,935,000
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	24.07	\$12,636,750	7.67	\$11,505,000

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Stansbury Park, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0	0
Faults	0	0	0	0	0	0	0
Wildfire	183.43	0	0	0	0	0.20	0
Flood (FIRM)	0	0	0	0	0	0	0
Flood (Soils)	0	0	0	0	0	0	0
Liquefaction	368.06	155.27	0.39	0	0	0	0
Landslide	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0
High Water Table	238.25	36.16	3.24	0	0	0	0
Unsuitable Soils for Buildings	274.59	50.84	4.82	0	0	0	0

Note: Total acres of land and miles of streams and trails 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.

Stansbury Park, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0	0
Faults	0	0
Wildfire	588.48	0
Flood (FIRM)	2.36	0
Flood (Soils)	0	0
Liquefaction	785.98	0
Landslide	0	0
Slope	31.07	0
High Water Table	0	0
Unsuitable Soils for Buildings	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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

within the community boundary

Liquefaction. Areas of Stansbury Park have a low to high risk of liquefaction in the event of an earthquake. Earthquakes resulting in liquefaction have the potential to impact critical facilities, infrastructure, environmental, and agricultural amenities. The majority of areas susceptible to high risk liquefaction exist within the community around Stansbury Lake. The risks fade as you gradually move away from the lake. Liquefaction has the potential to threaten 3 schools and other important facilities in the community.

High Water Table. A good portion of Stansbury Park is located where there is a high water table. Many homes on both the south ends of the lake, and much of the land to the southwest of the lake. Homes with basements are particularly susceptible.

Steep Slopes. Stansbury Park has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 15%. Areas bordering streams, rivers, and drainages appear to have an increased exposure to risk. Steep slopes have the potential to impact property, infrastructure, and agricultural features in the community. Two commercial structures are at risk as well as a little over a half mile of street infrastructure due to steep slopes.

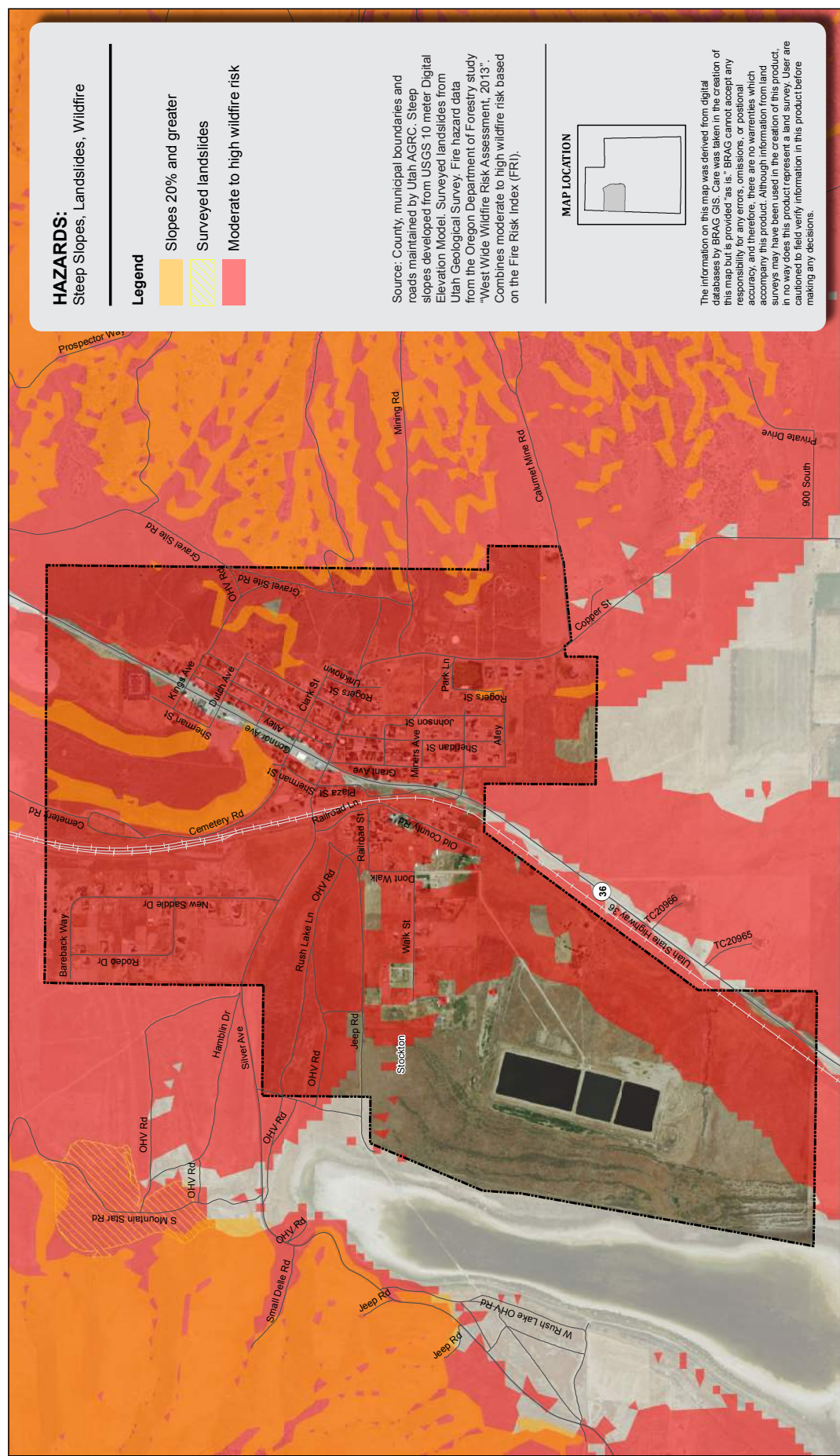
Future Development

There is a new development planned south of Bates Canyon and west of SR 36 in the Stansbury Park area. This new development could potentially be susceptible to wildfire hazards, soil liquefaction during an earthquake, and a high water table.

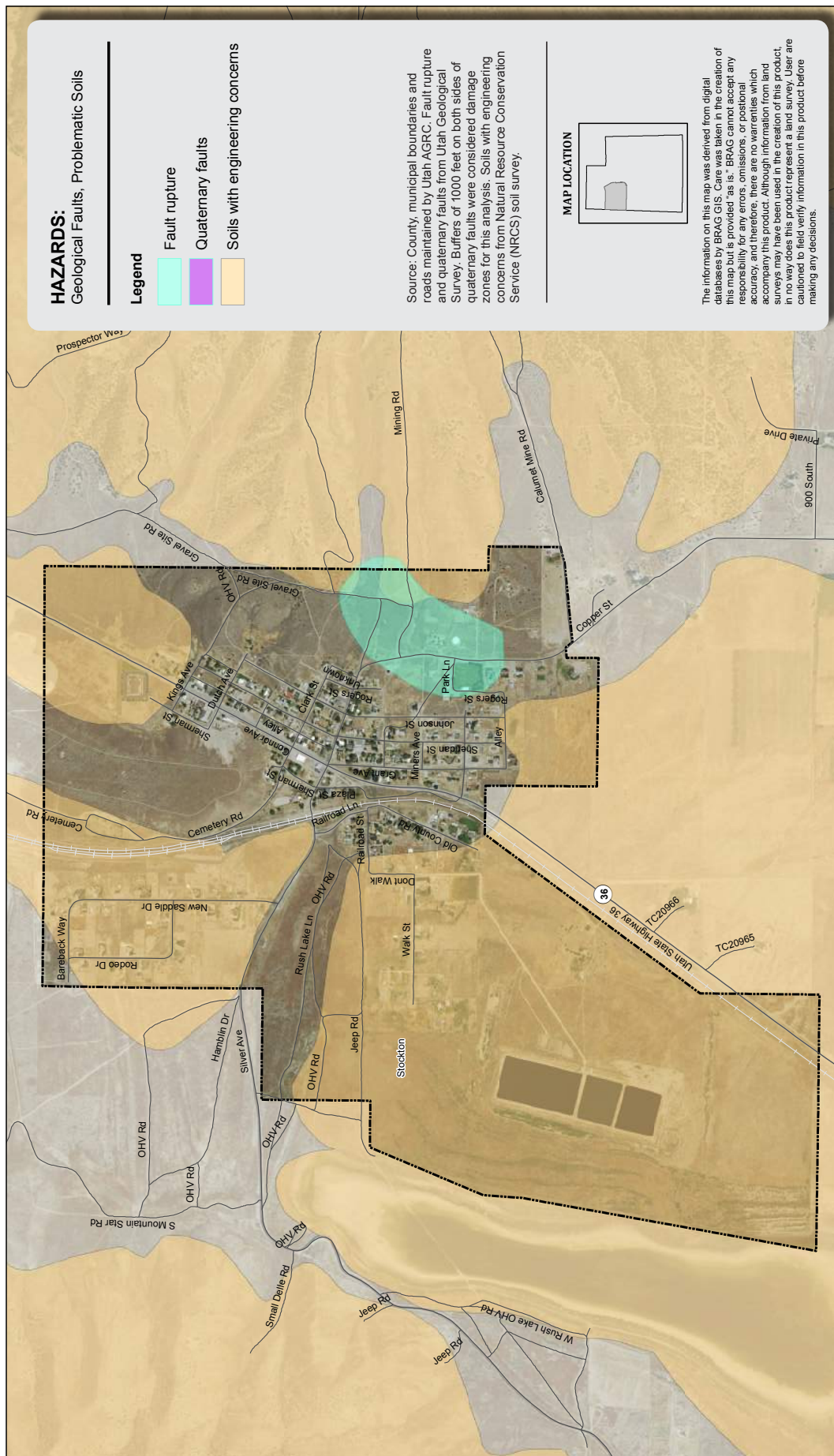
Hazard Mitigation Strategies

(See Section 17: Unincorporated Tooele County Community Risk Assessment)

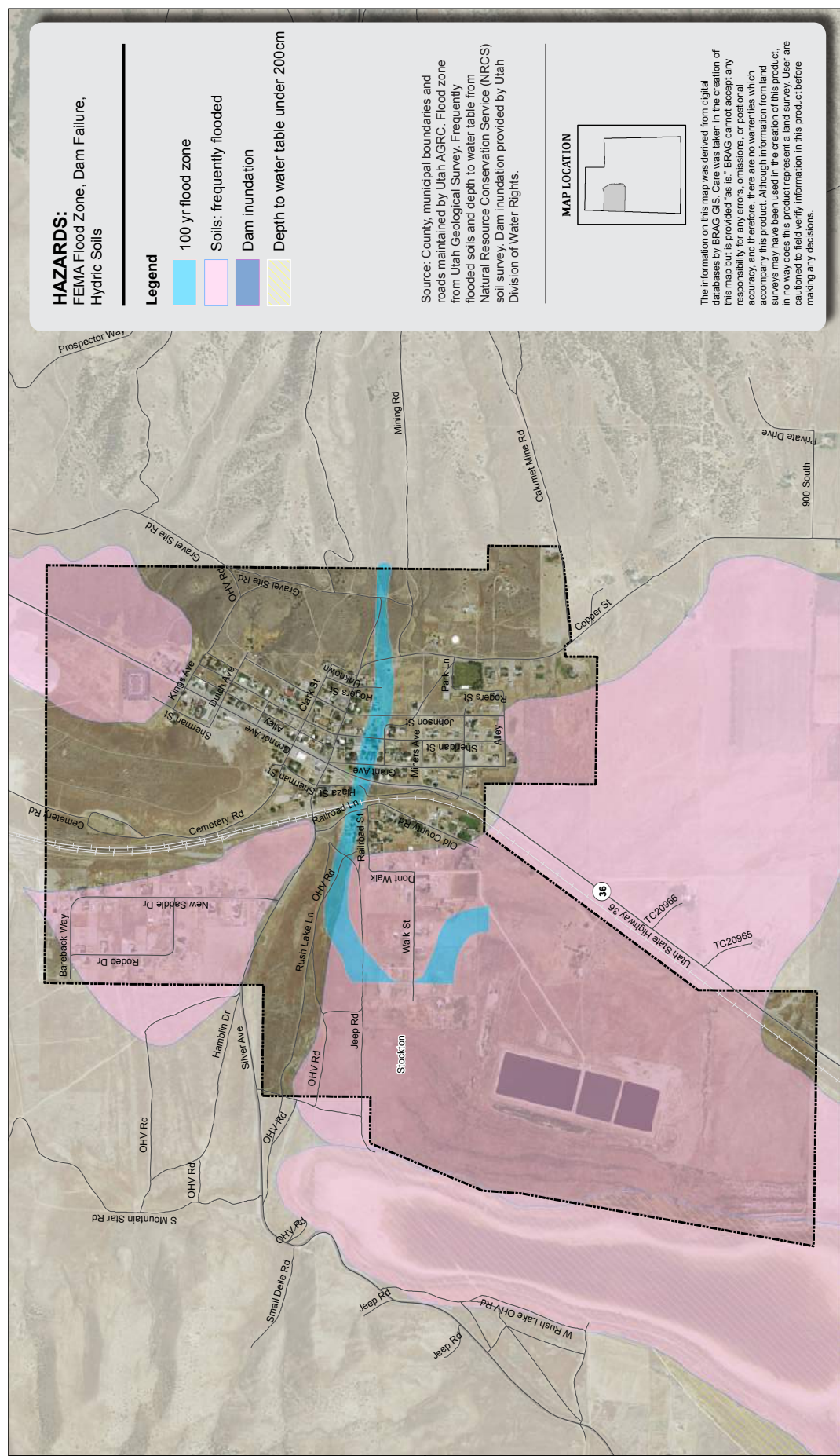
SECTION 15: STOCKTON COMMUNITY RISK ASSESSMENT



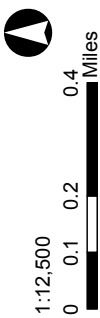
STOCKTON, UTAH

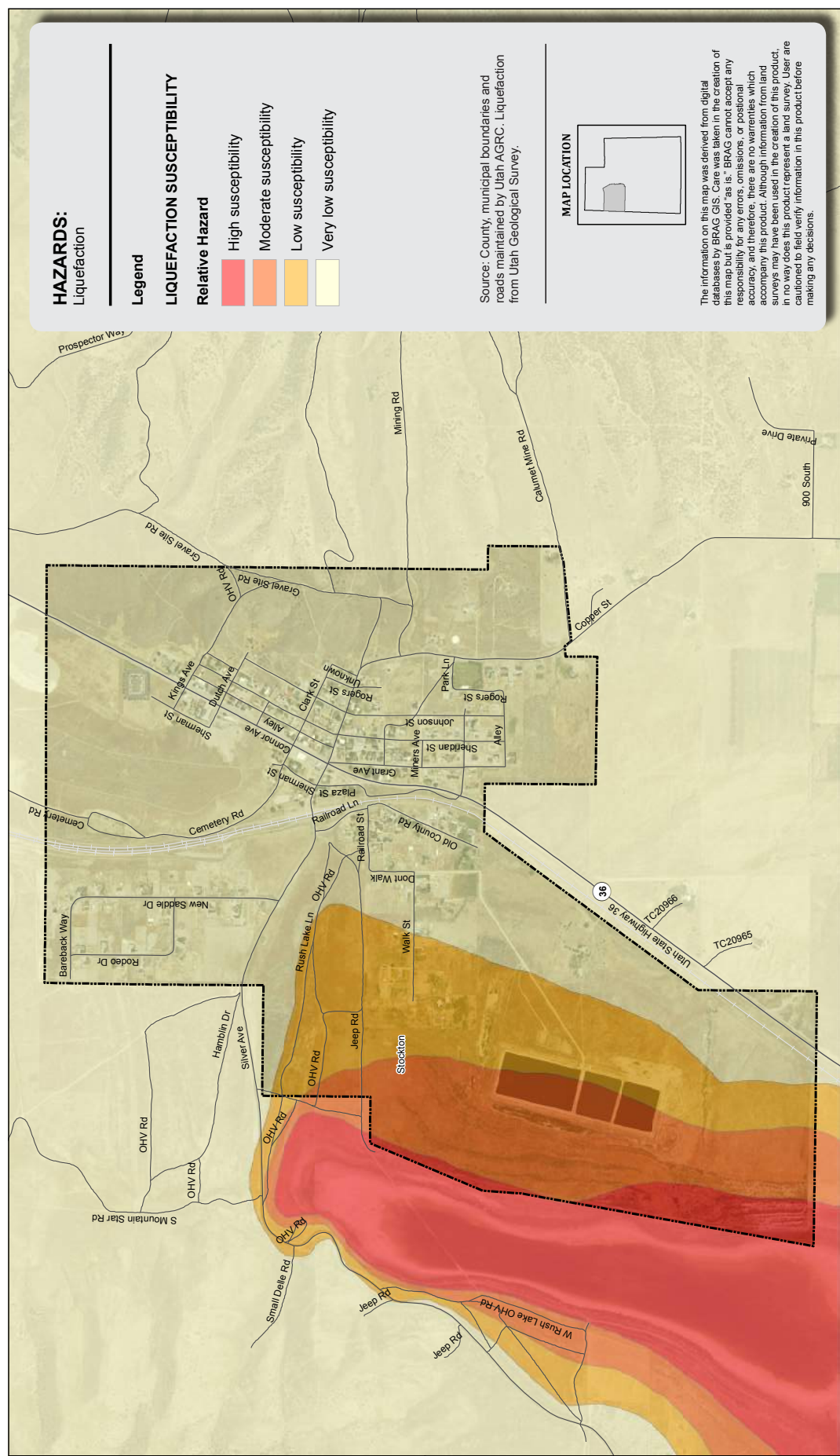


STOCKTON, UTAH



STOCKTON, UTAH





STOCKTON, UTAH

STOCKTON NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

STOCKTON

Analysis of hazard risk involving the town of Stockton revealed that there is potential risk resulting mostly from **faults, wildfire, flood, and steep slopes**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within municipal boundaries. Currently, wildfires and floods have the greatest potential to impact human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features based on potential loss values. Potential impacts from faults 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 Stockton.

Table 30: Stockton Town Potential Loss Figures

Stockton, 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	9.6	3	558,713	0	0	0
Wildfire	524.8	164	18,596,905	7	696,706	4495827
Flood (FEMA)	57.6	18	1,779,097	0	0	0
Flood (Soils)	57.6	18	3,750,666	0	0	0
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	35.2	11	1,324,166	0	0	0
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	61	19	\$2,904,296	0	0	0

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Natural Hazards

Faults. Stockton has risk of fault damage being located close to localized faults. There are two fault surface rupture areas along the foothills of the Bald Mountain. Human life, structures, infrastructure, environmental, recreational, and agricultural amenities in the fault zone could suffer damage in the event of a large earthquake. Damage in the fault zone could threaten human life with over 10 people at risk. Additionally, 3 structures are at risk and one mile of road infrastructure.

Wildfire. Stockton is susceptible to a very high risk of wildfire in the majority of the town. Wildfires tend to occur in areas near development and amenities with grassy and shrubby vegetation types. Benches and hilly areas adjacent to the mountainous areas, and areas with steeper slopes or grassy and shrubby vegetation also pose high risks. Wildfires have the potential to impact an estimated 525 people in the town, as well

Stockton, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure						
Faults						
Wildfire	Stockton Police Department			1 Church	1 Dam	
Flood (FEMA)						
Flood (Soils)				1 Church	1 Dam	Stockton Industrial Landfill
Liquefaction						
Landslide						
Slope						
High Water Table						
Unsuitable Soils for Buildings						1 solid hazardous waste

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

Stockton, 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	1.01	\$530,250	0	\$0
Wildfire	2.38	\$3,570,000	1	\$1,400,000	0	\$0	11.46	\$6,016,500	1.8	\$2,700,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0.69	\$362,250	0.02	\$30,000
Flood (Soils)	0.13	\$195,000	0	\$0	0	\$0	2.86	\$1,501,500	1.96	\$2,940,000
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	0.13	\$68,250	0.48	\$720,000
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Unsuitable Soils for Builings	1.41	\$2,115,000	0.5	\$700,000	0	\$0	3.69	\$1,937,250	2.28	\$3,420,000

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Stockton, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0	0	0	0	0	0	0
Faults	0	0	0.41	0	0	0.58	0
Wildfire	10.27	0	0	0	0	2.70	0
Flood (FIRM)	0	0	0.36	0	0	0.08	0
Flood (Soils)	0	141.50	2.40	0	0	0.80	0
Liquefaction	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0
Slope	0	0	0.48	0	0	0	0
High Water Table	14.51	5.34	0	0	0	0	0
Unsuitable Soils for Buildings	136.22	5.34	2.86	0	0	0	0

Note: Total acres of land and miles of streams and trails 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.

Stockton, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0	0
Faults	0	4.24
Wildfire	207.81	205.63
Flood (FIRM)	17.64	380.90
Flood (Soils)	356.40	0
Liquefaction	0	0
Landslide	0	0
Slope	0.82	2.34
High Water Table	0	14.5
Unsuitable Soils for Buildings	0	394.21

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

as nearly 164 residential units and 7 commercial structures.

Flood. Portions of Stockton are at risk to flooding. Stockton does participate in NFIP. Areas most susceptible to flooding are found in the lower elevated wetland areas near and around Rush Lake. Flood risk areas have the potential to threaten 58 people, and 18 residential structures. Floods resulting in these areas pose a threat to human life, property, critical facilities, infrastructure, agriculture, environmental, and recreational features within the town boundary.

Slopes. Stockton has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 25%, 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, and agricultural features. Around 35 residents and 11 structures are at risk within the jurisdiction for steep slopes.

Future Development

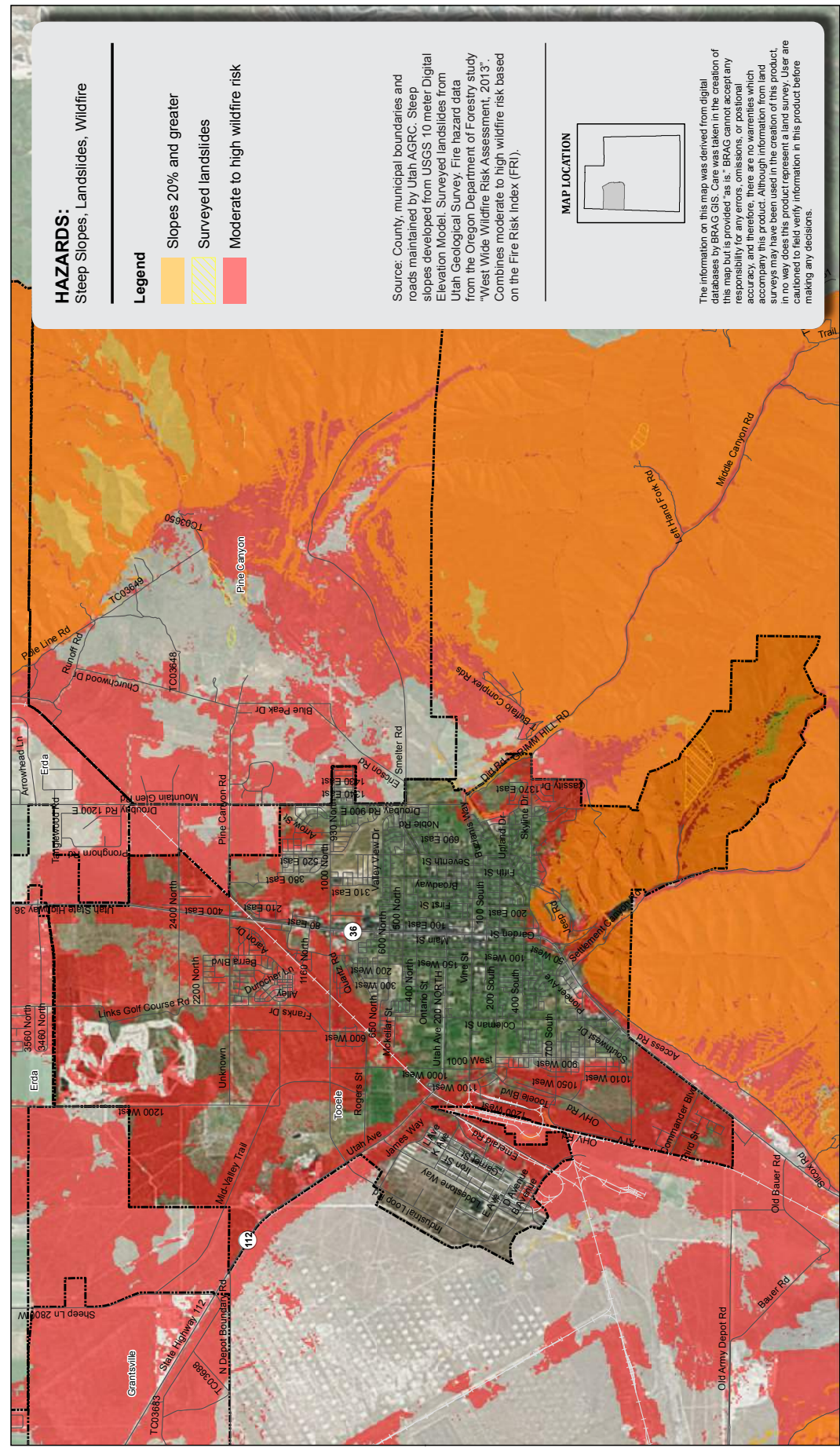
No concerns involving potential future development within Stockton were reported by community representatives.

Hazard Mitigation Strategies

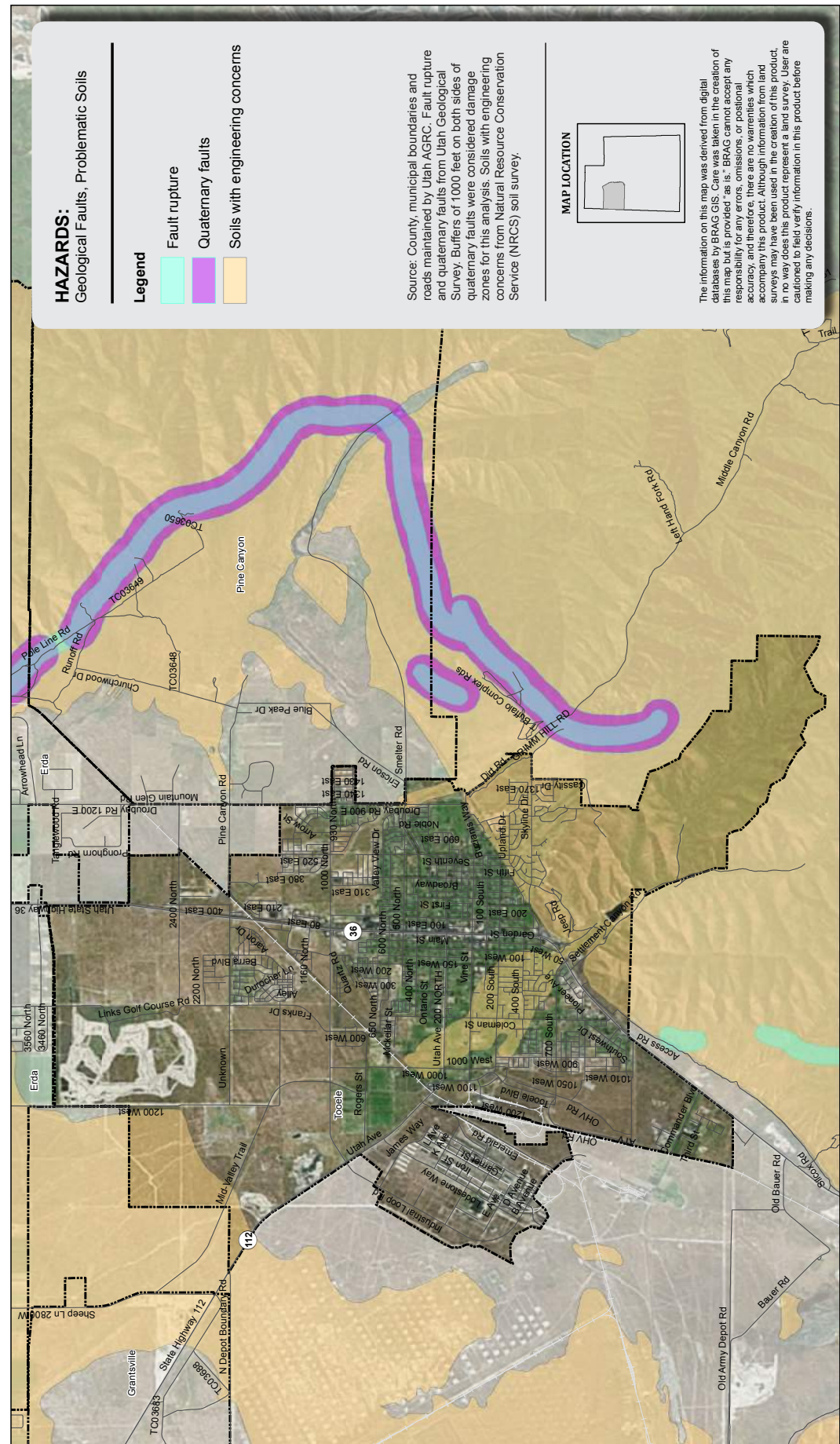
Table 31: Stockton Mitigation Strategies

STOCKTON - 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
Stockton	Wildfire	Protect current residents and property	Raise fire hydrants that have sunk into the ground below usable levels.	N/A	High	2016	Utah FFSL	Town, County	\$4,000 materials; \$2,000 labor	Utah FFSL, County
Stockton	Flood	Protect current residents and property	Remove post debris from 1983-84 flood.	N/A	High	2016-2017	FEMA, Utah DEM	Town	TBD	FEMA, Utah DEM
Stockton	Earthquake	Protect current residents and property	Education for local residents on earthquake safety.	N/A	High	2017	Local	Town, County	Minimal	UGS, USGS
Stockton	Steep Slope	Protect current residents and property	Evaluate specific sites with steep slope issues and work with residents to come up with a plan to resolve	N/A	High	2017	Local	Town	Minimal	UGS, NRCS
Stockton	High Water Table	Protect current residents and property	Evaluate specific sites with high water table issues and work with residents to come up with a plan to resolve	N/A	High	2017	Local	Town	Minimal	UGS, NRCS
Stockton	Unsuitable Soils	Protect current residents and property	Evaluate specific sites with unsuitable soil issues and work with residents to come up with a plan to resolve	N/A	High	2017	Local	Town	Minimal	UGS, NRCS
STOCKTON - 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
Stockton	Wildfire	Protect future residents and property	Increase firebreaks around town property called "sod farm" (300+ acres southwesterly) - currently 125' for a 3/4 mile section; want to clean up intake at water source; put down concrete barrier. Begin with engineering study.	N/A	High	2016	Utah FFSL	Town, County	\$4,000 materials; \$2,000 labor	Utah FFSL, County
Stockton	Flood	Protect future residents and property	Clean up intake at water source; put down concrete barrier. Begin with engineering study.	N/A	High	2016-2017	FEMA, Utah DEM	Town	TBD	FEMA, Utah DEM
Stockton	Earthquake	Protect future residents and property	Update ordinances to include fault damage zones, and require geotechnical studies to address	N/A	High	2017	Local	Town, County	Minimal	UGS, USGS
Stockton	Steep Slope	Protect future residents and property	Update ordinances to include fault damage zones, and require geotechnical studies to address	N/A	High	2017	Local	Town	Minimal	UGS, NRCS
Stockton	High Water Table	Protect future residents and property	Update ordinances to require either not basements in high water table areas, or sump pumps.	N/A	High	2017	Local	Town	Minimal	UGS, NRCS
Stockton	Unsuitable Soils	Protect future residents and property	Require geotechnical studies on properties with unsuitable soils.	N/A	High	2017	Local	Town	Minimal	UGS, NRCS

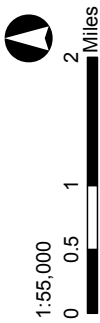
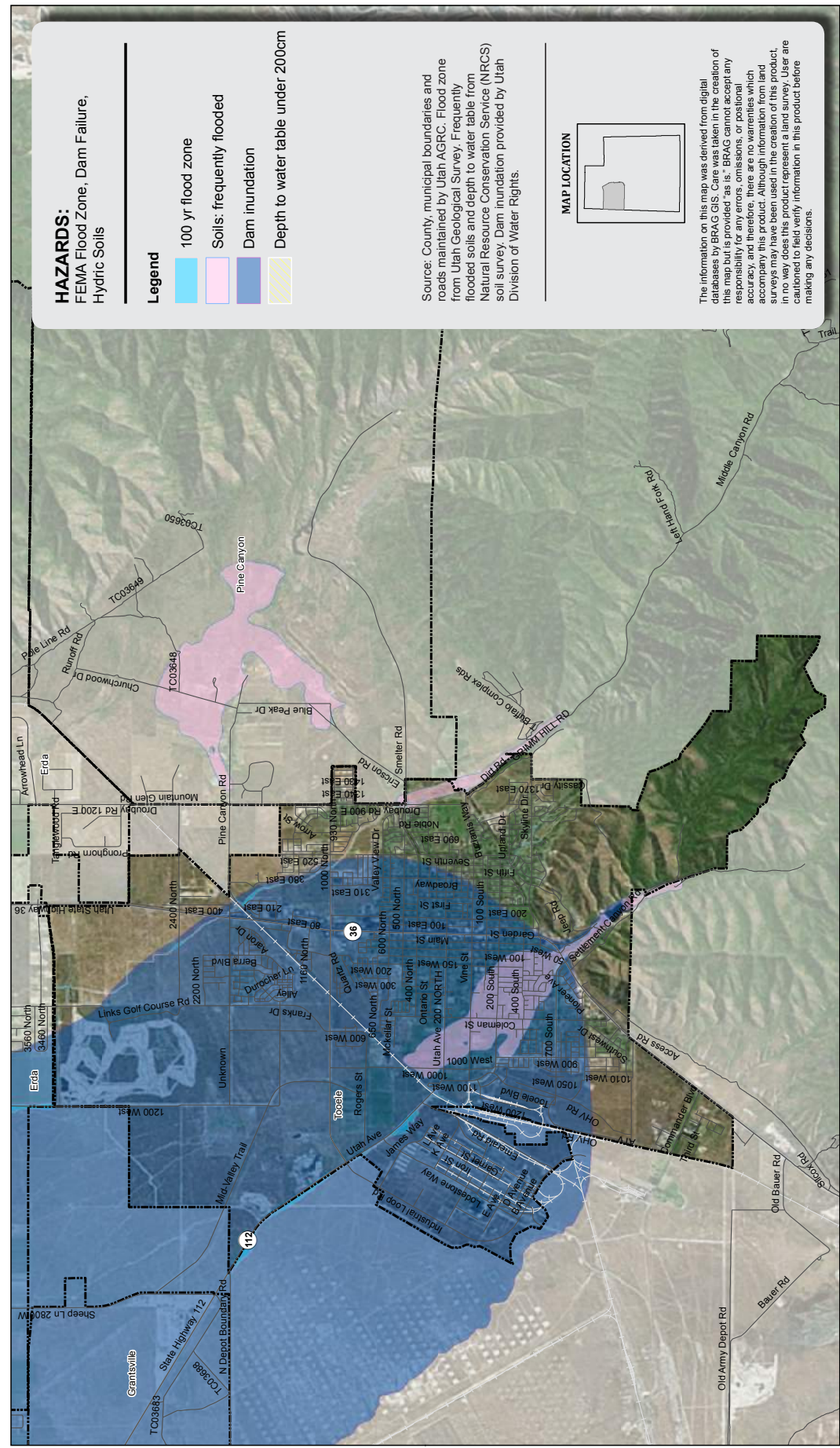
SECTION 16: TOOELE CITY COMMUNITY RISK ASSESSMENT



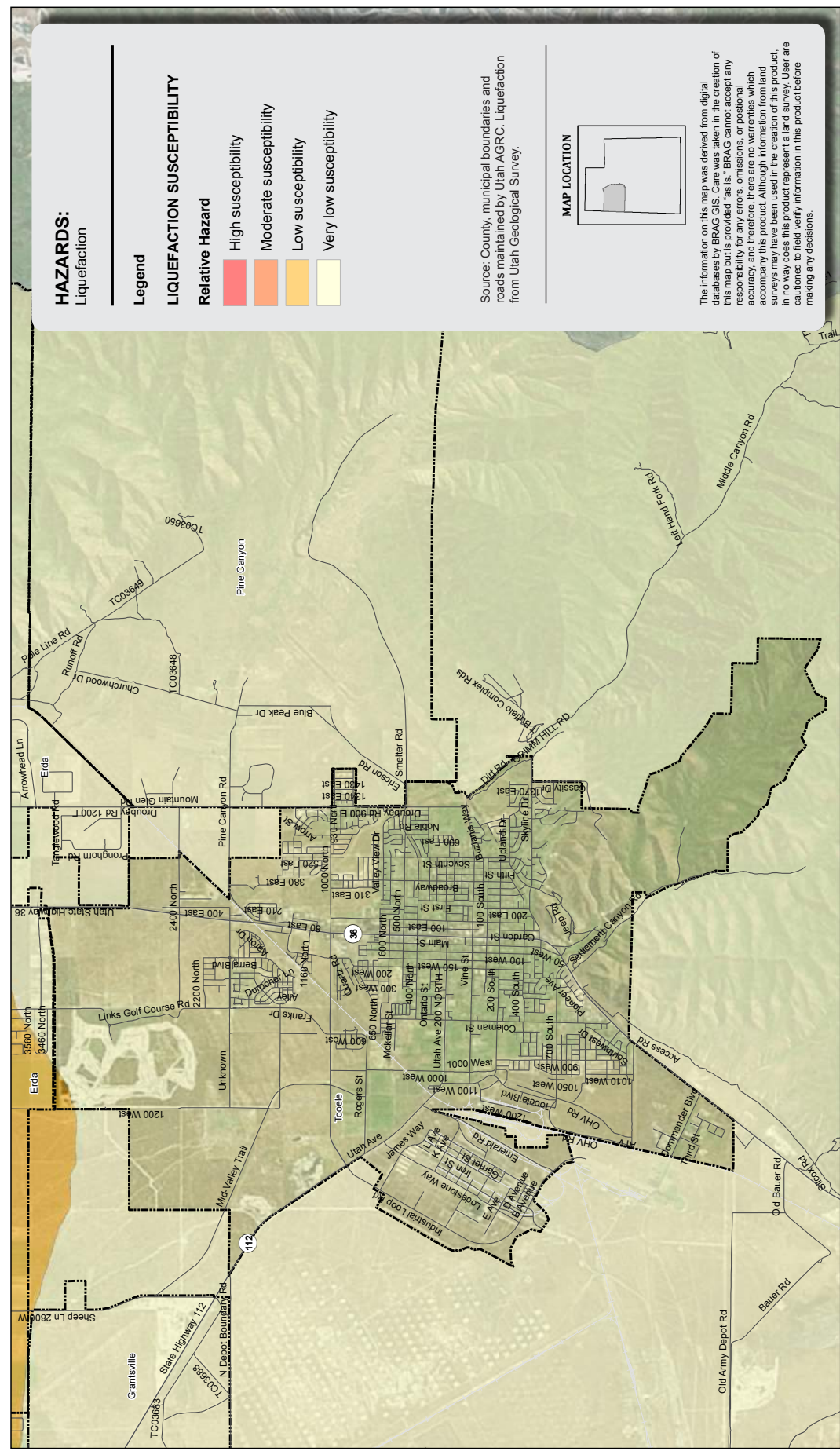
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TOOELE, UTAH

TOOELE CITY NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

potential impacts to Tooele City. See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Natural Hazards

TOOELE CITY

Analysis of hazard risk involving the community of Tooele City revealed that there is potential risk resulting from **dam failure, floods, flood (soils), 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 wildfire create the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from steep slopes, floods, flooded soils, and landslides appear to have less potential for impacts, yet still pose risks to human life. Other natural hazard types not mentioned were found to have no

Dam failure. Tooele's risk of dam failure involves the portions of the jurisdiction located below the Great Salt Lake from the north and Settlement Canyon Reservoir from the south. If these dams 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 16,000 residents and nearly 5,000 structures.

Flood. Portions of Tooele City are at risk to flooding. Tooele city does participate in NFIP as areas within the jurisdiction have risk to impacts. Areas most susceptible to flooding are portions of the community west of Main Street, south of 400 South, and areas west of Coleman St, as well as portions of the Settlement Canyon drainage below the reservoir.

Table 32: Tooele City Potential Loss Figures

Tooele 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	16,352	4,954	681,586,316	363	341,213,071	233140743
Faults	0	0	0	0	0	0
Wildfire	6,339.2	1,973	375,439,790	148	253,686,690	95054628
Flood (FEMA)	524.8	164	36,686,235	12	36,541,522	7707132
Flood (Soils)	2620.8	781	104,789,785	1	134,546	642261
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	297.6	93	\$23,511,432	2	\$689,664	\$1,284,522
High Water Table	0	0	0	0	0	0
Unsuitable Soils for Buildings	5,181	1,619	\$221,764,427	2	\$257,483	\$1,284,522

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Tooele 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	Other
Dam Failure	Tooele City Police and Fire Departments, Tooele County Jail, Tooele County Sheriffs Office, Utah Highway Patrol Tooele Office, Mountain View Ambulance, Tooele Army Department	11 Schools, Tooele City Public Library	Mountain West Medical Center, Rocky Mountain Care, Beehive Homes, Cottage Glen, Tooele County in Home Services, Tooele County Health Department, Tooele Valley Dialysis Center, Mountain West Hospice, Valley Mental Health	24 places of worship	1 dam, 9 wells	Detroit Diesel MTU, Russell Welding Fabricators, Tooele County Illegal Disposal, Tooele County Health and Human Services, Bolinder Resources, 2 Tooele County Health Department Services
Faults						
Wildfire	6 Health Care Facilities, 1 Law Enforcement Building	4 Schools		3 Churches	2 Dam	1 Solid Waste Facility, 1 Spring, 7 Wells
Flood (FEMA)						
Flood (Soils)		2 Schools		2 places of worship	2 dams, 2 wells	
Liquefaction						
Landslide						
Slope					2 dams, 1 well	
High Water Table						
Unsuitable Soils for Buildings						3 contractor heavy equipment
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.						

Tooele 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	13.15	\$19,725,000	2.91	\$4,074,000	0.12	\$15,240	125.22	\$65,740,500	6.21	\$9,315,000
Faults	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Wildfire	8.11	\$12,165,000	4.13	\$5,782,000	1.84	\$233,680	52.48	\$27,552,000	3.19	\$4,785,000
Flood (FIRM)	0	\$0	0.17	\$238,000	0.08	\$10,160	2.72	\$1,428,000	0.06	\$90,000
Flood (Soils)	0	\$0	0.33	\$462,000	0.53	\$67,310	11.61	\$6,095,250	1.70	\$2,550,000
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	0.24	\$336,000	0.54	\$68,580	2.67	\$1,401,750	0.11	\$165,000
High Water Table	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Unsuitable Soils for Buildings	0	\$0	2.28	\$3,192,000	2.63	\$334,010	30.06	\$15,781,500	2.1	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Tooele City, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	26.46	12.57	16.52	65.38	0	10.32	0
Faults	0	0	0	0	0	0	0
Wildfire	13.64	0	0	0	0	16.03	0
Flood (FIRM)	0.05	0	5.31	0	0	0.33	0
Flood (Soils)	8.30	0.44	4.62	0	0	0	0
Liquefaction	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	2.46	0
Slope	6.47	0.22	4.11	0	0	7.54	0
High Water Table	0	0	0	0	0	0	0
Unsuitable Soils for Buildings	14.48	0.81	16.55	0	0	0	0

Note: Total acres of land and miles of streams and trails 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.

Tooele City, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	3,657.30	559.16
Faults	0	0
Wildfire	3,155.00	2,835.93
Flood (FIRM)	44.17	20.24
Flood (Soils)	133.46	62.04
Liquefaction	0	0
Landslide	0	83.17
Slope	6.63	2,194.61
High Water Table	0	0
Unsuitable Soils for Buildings	0	3,158.56

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

Other areas at risk of flood include Middle Canyon drainage through the northeast portions of the city. 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.

Flood (Soils). Portions of Tooele City are at risk to flooding based on soils data. Although rare, areas most of these soils are located where drainage below Settlement Canyon Reservoir occurs and out through the west portion of the city. Other areas at risk of flood include Middle Canyon drainage through the northeast portions of the city. Flooded soils 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.

Steep Slopes. Tooele City has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 25%, 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, and agricultural features. Nearly 300 residents and 100 structures are at risk within the jurisdiction for steep slopes.

Landslides. Isolated portions of Tooele City could suffer potential losses to landslides. Populations, structures, infrastructure, amenities and lands that are most likely to be impacted include eastern and southern portions of the city. Landslides have the potential to impact environmental, and agricultural features in the jurisdiction.

Wildfire. Tooele City is susceptible to moderate-high risk of wildfire in isolated portions of the city, such as the benches and hilly areas adjacent to the mountainous areas and areas with steeper slopes or grassy and shrubby vegetation. Areas at risk in the city are those in proximity to urban forests and development. Wildfires have the potential to impact over 6,000 people in the city, as well as 2,121 residential and commercial structures.

Future Development

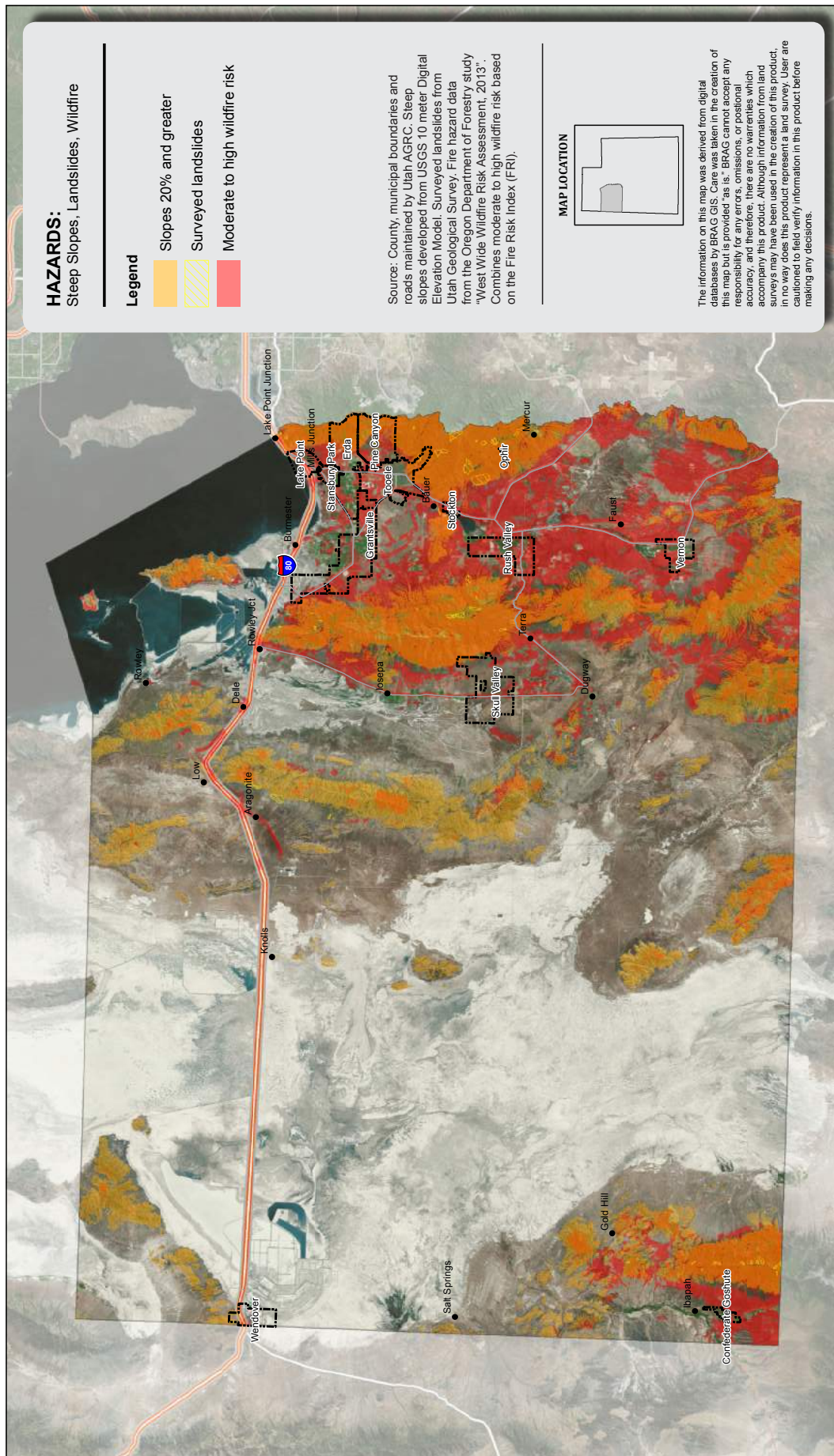
New development is expected in Tooele City north of State Road 112 (1000 N.), near 400 West. Potential natural hazards which could put residents and property/infrastructure at risk include dam inundation areas and wildfire.

Hazard Mitigation Strategies

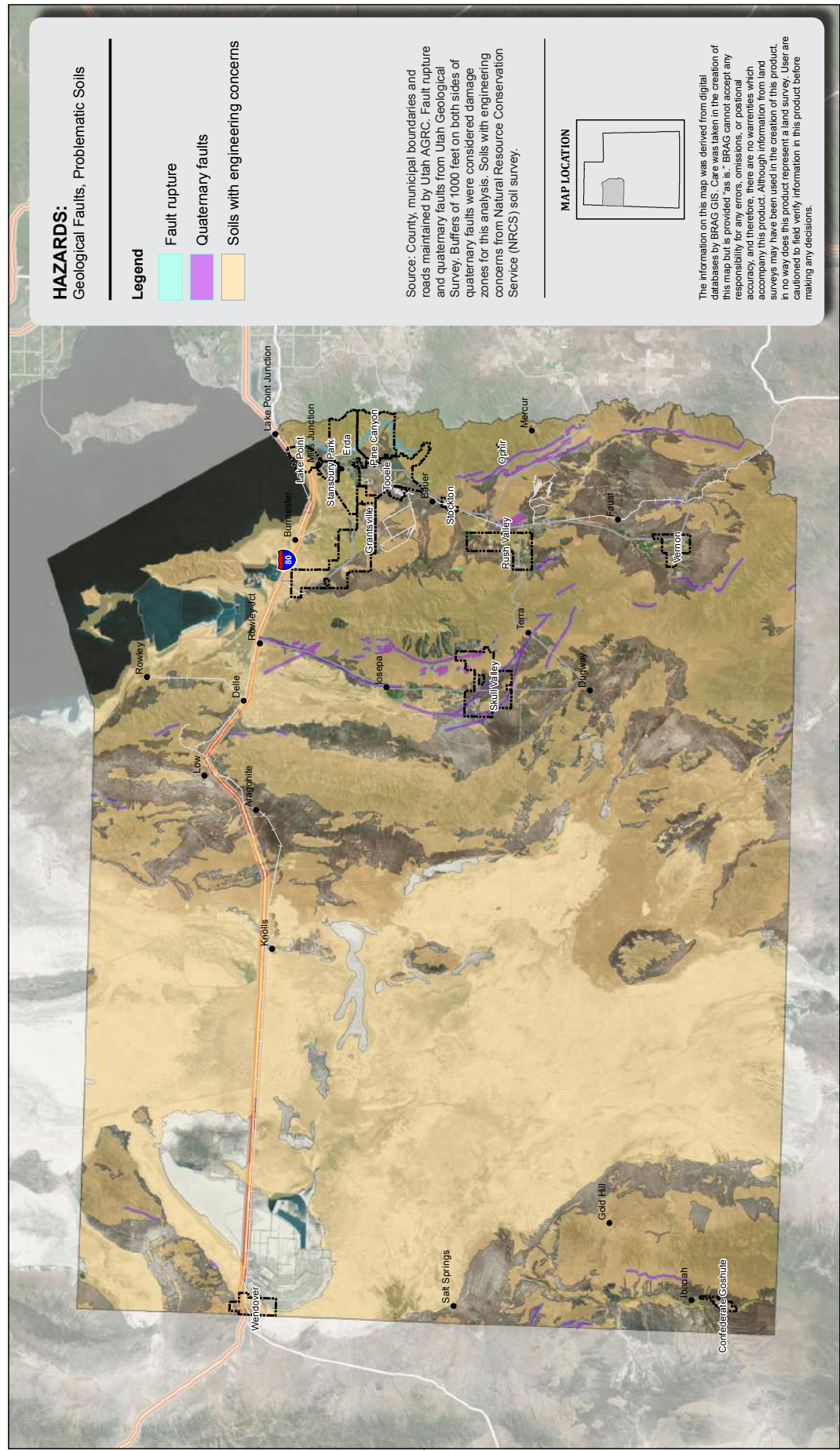
Table 33: Tooele City Mitigation Strategies

TOOELE 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
Tooele City	Flood Channels	Protect current residents and property	Require channels to be stabilized and adequate prior to development	N/A	High	Ongoing	Developer	City	N/A	Ordinances and plans currently in place
Tooele City	Earthquake	Protect current residents and property	Enforce international building code for all new construction and remodels	N/A	Low	Ongoing	Builder	City, County, Builder	N/A	UGS, USGS, Utah DEM
Tooele City	Landslide	Protect current residents and property	Monitor flood plains for possible areas of failure	N/A	Medium	Ongoing	Grants, State, County	City	N/A	UGS, USGS, Utah DEM
Tooele City	Dam Failure	Protect current residents and property	Dam is under state jurisdiction	N/A	Low	Ongoing	State	State	N/A	Utah Water Resources
Tooele City	Problem Soils	Protect current residents and property	Require geo-technical studies in areas where soils may be a concern	N/A	High	Ongoing	Developer	City	N/A	UGS, USGS, NRCS
Tooele City	Drought	Protect current residents and property	Water conservation schedule in place	N/A	High	Ongoing	N/A	City, County	N/A	NOAA
Tooele City	Severe Weather	Protect current residents and property	Monitor drainage areas	N/A	Low	Ongoing	City, County	City	N/A	NOAA
Tooele City	Wildfire	Protect current residents and property	Review local wildland-urban interface and/or other plans to determine local level risk	N/A	High	Ongoing	City	City	Minimal	Utah FFSL, County
Tooele City	Steep Slope	Protect current residents and property	Review slope maps to help determine more local risks and plan accordingly	N/A	Medium	Ongoing	City	City	Minimal	UGS
TOOELE 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
Tooele City	Flood Channels	Protect future residents and property	Require channels to be stabilized and adequate prior to development	N/A	High	Ongoing	builder	City	N/A	Ordinances and plans currently in place
Tooele City	Earthquake	Protect future residents and property	Enforce International building code for all new development	N/A	High	Ongoing	Builder	City, County, Builder	N/A	UGS, USGS, Utah DEM
Tooele City	Landslide	Protect future residents and property	Ordinance in place to restrict building on steep slopes	N/A	High	Ongoing	City, County	City	N/A	UGS, USGS, Utah DEM
Tooele City	Dam Failure	Protect future residents and property	Dam is under state jurisdiction	N/A	Low	Ongoing	State	State	N/A	Utah Water Resources
Tooele City	Problem Soils	Protect future residents and property	Require geo-technical studies in areas where soils may be a concern	N/A	High	Ongoing	Developer	City	N/A	UGS, USGS, NRCS
Tooele City	Drought	Protect future residents and property	Enforce water conservation schedule possibly amend if the need arises	N/A	High	Ongoing	N/A	City, County	N/A	NOAA
Tooele City	Severe Weather	Protect future residents and property	Monitor drainage areas enforce building code and design criteria for snow load, etc.	N/A	Low	Ongoing	City, County	City	N/A	NOAA
Tooele City	Wildfire	Protect future residents and property	Review local wildfire ordinances and wildland-urban interface policies and plans	N/A	High	2017	City, County	City/District	Minimal	Utah FFSL, County
Tooele City	Steep Slope	Protect future residents and property	Review local slope ordinances and work with UGS to determine dangerous slope percentages for structures	N/A	Medium	2017	City	City	Minimal	Utah DEM

SECTION 17: UNINCORPORATED TOOELE COUNTY COMMUNITY RISK ASSESSMENT

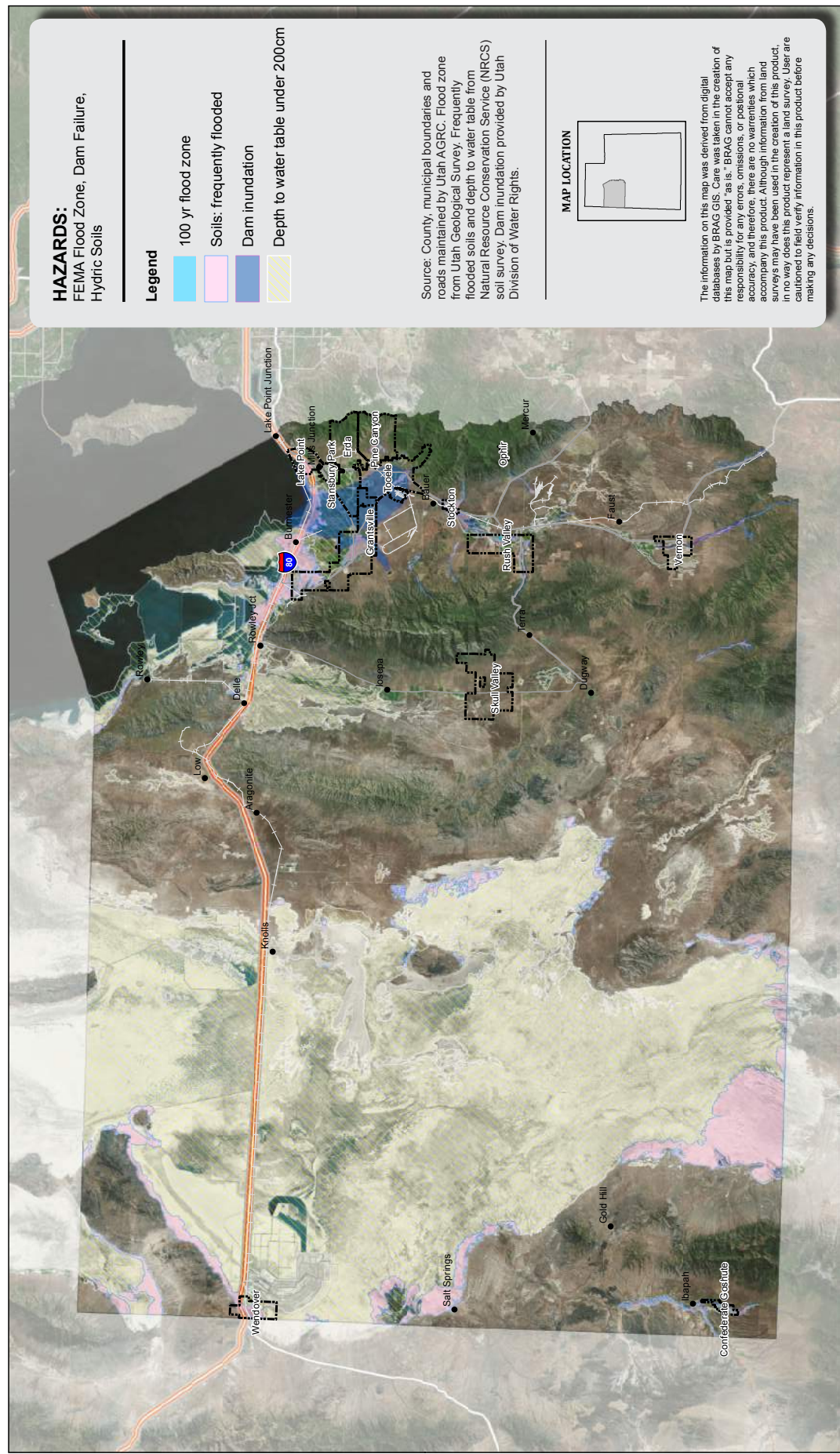


TOOELE COUNTY, UTAH

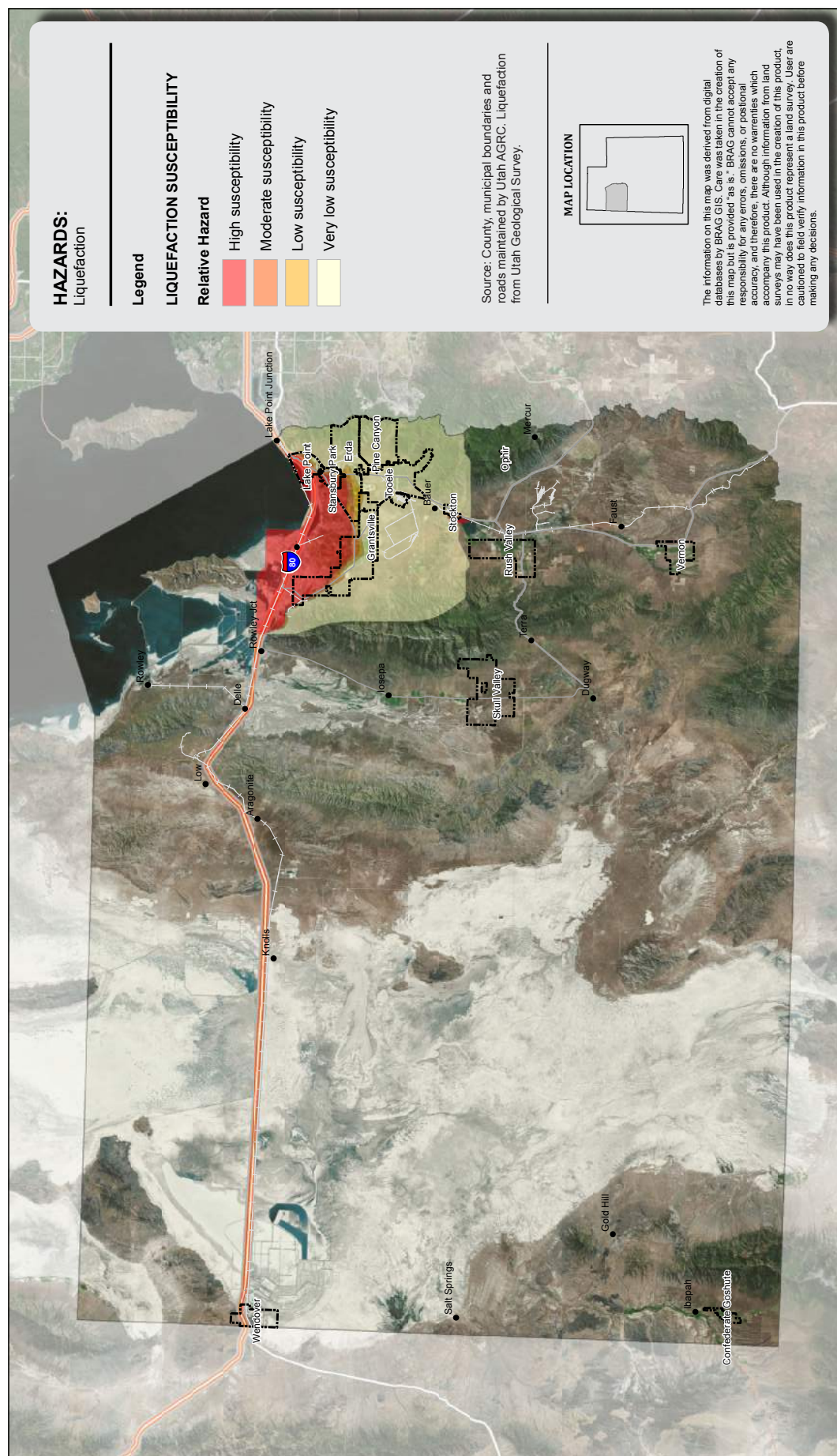


TOOELE COUNTY, UTAH





TOOELE COUNTY, UTAH



TOOELE COUNTY, UTAH

UNINCORPORATED TOOELE COUNTY NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

UNINCORPORATED TOOELE COUNTY

Analysis of hazard risk involving the community of Tooele County revealed that there is potential risk resulting from **dam failure, faults, flood, flood (soils), liquefaction, landslide, steep slopes, high water table, 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, dam failure, earthquakes resulting in liquefaction, and flooded soils have the greatest potential to impact human life, property, and various community amenities based on potential loss values. Potential impacts from floods, landslides, faults, and steep slopes appear to have

Table 34: Unincorporated Tooele County Potential Loss Figures

less potential for impacts, yet still pose risks. Other natural hazard types not mentioned were found to have no potential impacts to Tooele County. See the following tables for more detailed descriptions of potential losses associated with each natural hazard.

Natural Hazards

Dam failure. Hazard mapping identifies dam failure risk of the Great Salt Lake for almost all of the low elevation areas near Grantsville, around Tooele City, the drainage of Grantsville reservoir, the Settlement Canyon reservoir drainage into south western Tooele City, and Vernon reservoir drainage effecting the western portions of Vernon.

Faults. Hazard mapping identifies several structures at risk from fault rupture. Areas of concern are generally the following: The foothills of the Oquirrh Mountains throughout the western county, the eastern foothills of the Stansbury Mountains and throughout Skull Valley, east of Vernon, Rush Valley, and Dugway. Faults have potential to impact 2 structures and 6 people.

Tooele 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	333	102	\$21,223,939	6	\$8,995,068	\$3,853,566
Faults	6	2	\$2,427,714	0	\$0	\$0
Wildfire	17,306	5,386	\$1,240,824,809	136	\$392,591,499	\$87,347,496
Flood (FEMA)	16	5	\$1,102,562	1	\$288,171	\$642,261
Flood (Soils)	141	44	\$10,394,936	2	\$1,405,191	\$1,284,522
Liquefaction	213	65	\$15,734,963	9	\$2,850,459	\$5,780,349
Landslide	0	0	\$0	0	\$0	\$0
Slope	93	29	\$7,755,763	6	\$8,196,134	\$3,853,566
High Water Table	112	35	\$5,450,821	13	\$1,934,739	\$8,349,393
Unsuitable Soils for Buildings	397	124	\$19,996,282	27	\$241,068,962	\$17,341,047
* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.						
** Current Market Value per parcel, including building and land values. Data provided by Tooele County.						
*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.						

Tooele 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	Other
Dam Failure	2 Fire Stations, 2 EMS Buildings				4 Dams, 4 Broadband Anchors, 8 Wells/Facilities	2 Airports, 6 Oil/gas Wells, 3 Solid Waste/Oil Facilities
Faults					2 Dams	4 Springs, 1 Well
Wildfire	1 Heliport, 1 Fire Station				23 Dams, 4 Broadband Anchors	15 Springs, 23 Wells, 3 Trailheads, 6 Solid Waste Facilities, 8 Oil/Gas Wells, 2 Forest Service Station, 1 Airport
Flood (FEMA)						
Flood (Soils)				2 Churches	4 Dams	6 Wells, 2 Springs, 1 Landfill, 1 Oil/gas Well
Liquefaction					2 Dams	6 Oil/Gas Well, 3 Solid Waste Facilities
Landslide						1 Spring
Slope	1 Heliport				4 Broadband Anchors, 7 Dams,	7 Solid Waste Facilities, 17 Springs, 4 Wells, 3 Culinary Water Facilities
High Water Table					1 Landfill	Private facility, Dugway DPG, Land spreading operation, Incinerator, 5 oil gas wells, oil facility
Unsuitable Soils for Buildings						17 solid waste, 16 oil facilities, 3 heavy equipment facilities, 1 power plant, 2 radio towers, 7 campgrounds, 1 picnic site, 9 trailheads

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

Tooele 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	16.3	\$24,450,000	11.67	\$16,338,000	4.58	\$581,660	41.06	\$21,556,500	20.37	\$30,555,000
Faults	5.03	\$7,545,000	0.59	\$826,000	8.47	\$1,075,690	183.83	\$96,510,750	1.16	\$1,740,000
Wildfire	164	\$246,000,000	30.10	\$42,140,000	30	\$3,810,000	1,749.96	\$918,729,000	19.76	\$29,640,000
Flood (FIRM)	0	\$0	0.49	\$686,000	0	\$0	3.3	\$1,732,500	0.08	\$120,000
Flood (Soils)	20.15	\$30,225,000	3.18	\$4,452,000	7.13	\$905,510	113.57	\$59,624,250	50.41	\$75,615,000
Liquefaction	0	\$0	14.34	\$20,076,000	0	\$0	0.21	\$110,250	0.35	\$525,000
Landslide	0.13	\$195,000	0.14	\$196,000	0.11	\$13,970	10.9	\$5,722,500	0.5	\$750,000
Slope	0	\$0	3.72	\$5,208,000	0	\$0	316.95	\$166,398,750	17.8	\$26,700,000
High Water Table	78.11	\$117,165,000	20.66	\$28,924,000	31.26	\$3,970,020	356.2	\$187,005,000	242.83	\$364,245,000
Unsuitable Soils for Buildings	155.03	\$232,545,000	49.42	\$69,188,000	60.39	\$7,669,530	3,370.79	#####	389.96	\$584,940,000

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Tooele County, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	6,206.94	2,103.96	90.98	7.19	2.03	8.06	1 Campground
Faults	960.96	71.7	288.25	0	38.48	8.73	
Wildfire	4,188.17	0	0	0	481.17	272	0
Flood (FIRM)	0	5.16	0.22	0	0	3.03	
Flood (Soils)	78,293.99	985.36	502.72	32.74	9.11	26.75	1 Campground, 1 Picnic Site
Liquefaction	39,014.26	2,933.48	0.35	0	0	2.63	0
Landslide	18.15	14.11	31.34	0	3.63	10.78	
Slope	58.69	4.63	1,410.52	68.18	97.39	158.01	7 Campgrounds, 1 Picnic Site, 5 Trailheads
High Water Table	1,581,697.93	65,016.52	1,695.36		7.19		
Unsuitable Soils for Buildings	1,504,687.16	33,992.65	7,108.39	138.56	549.35	55.14	

Note: Total acres of land and miles of streams and trails were identified using multiple data sources including: Utah AGRC, U.S. Fish and

Tooele County, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	14,805.89	1,811.20
Faults	195.89	50,707.26
Wildfire	41,310.19	601,606.17
Flood (FIRM)	69.37	42.95
Flood (Soils)	44,813.32	45,534.41
Liquefaction	38,972.63	6,426.79
Landslide	30.76	4,684.75
Slope	11,772.91	174,777.14
High Water Table		217,289.02
Unsuitable Soils for Buildings		1,519,639.38

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

Flood. The unincorporated areas of Tooele County have structures located in the 100-year floodplain. Generally, as can be expected, these structures are located in drainage areas along Settlement Canyon, Middle Canyon, Soldier Creek, Vernon Reservoir and low-lying areas along Indian Mountain Rd. in Rush Valley.

Flood (Soils) Hazard mapping identifies risk from flooding in unincorporated areas of Tooele County in the following areas: Along I-80 through north Lake Point, north Granstville, through Burmester, and all the way to the northern tip of the Stansbury Mountains. Risk is also identified south of Stockton, north of Rush Valley, South of Wendover, throughout Ibapah, and in the edges of the Skull Valley.

Liquefaction. Hazard mapping identifies moderate-to-high and high liquefaction risk to low elevation areas from the Great Salt Lake to Granstville, Erda, Stansbury Park, and Lake Point, as well as everything in between. There is a low risk of liquefaction in the areas directly to the south of those stated above, all the way to Rush Valley, affecting Pine Canyon, Tooele, Stockton and everything in between.

Landslides. Hazard mapping identifies risk from landslides in unincorporated Tooele County in the following areas: Various high altitude portions in the Oquirrh Mountain range, various areas along Soldier Creek, areas west of Stockton, out towards Terra in the mountain pass and some areas east of Pine Canyon. It appears that no life or structures are at risk, only risk to infrastructure, recreational, and agricultural lands.

High Water Table. High water table occurs south of the Great Salt Lake, and north of Tooele City. There are also affected areas near and around Rush Valley. Lastly, the entire Great Salt Lake Desert in the western portion of the county has a high water table, but does not affect anything but roads and environmental and/or agricultural areas.

Steep Slopes. hazard mapping identifies risk from steep slopes in the unincorporated area. Due to the characteristic north to south trending mountain ranges, much of the county's eastern boundaries slope upwards beyond 20%. Areas most at risk are those near Ophir, Stockton, Tooele, and Pine Canyon.

Wildfire. Hazard mapping identifies moderate-to-high wildfire risk to the nearly the entire area between the Stansbury, and Oquirrh mountain ranges. There is high risk to areas along the eastern bench of the county, where many of the homes are

located. There are nearly 5,500 structures at risk of wildfire in these areas which is the most significant hazard risk of all in Tooele County.

Future Development

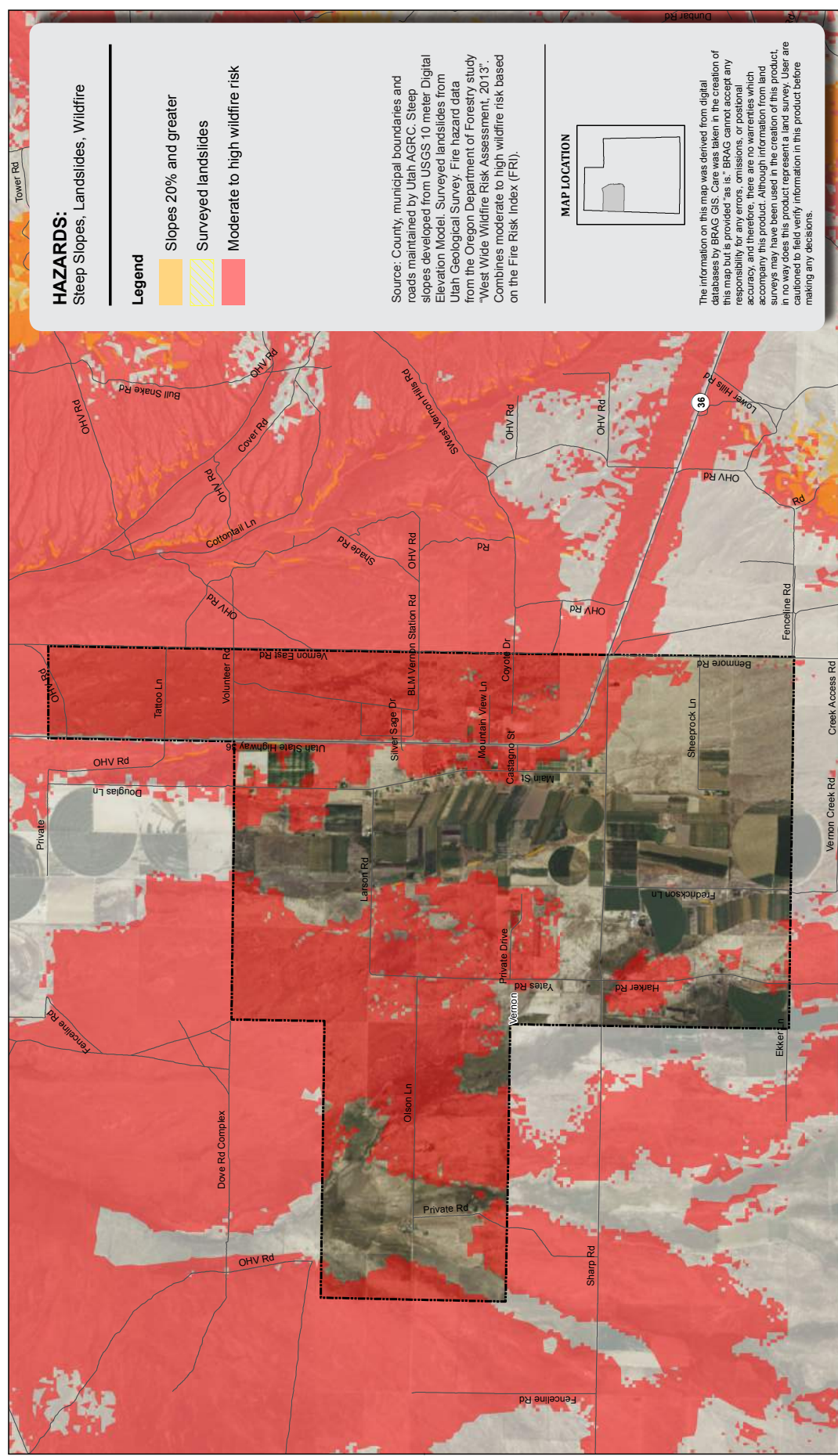
No specific information on potential growth and development was provided by Tooele County.

Hazard Mitigation Strategies

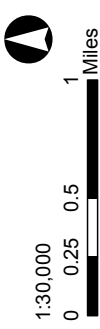
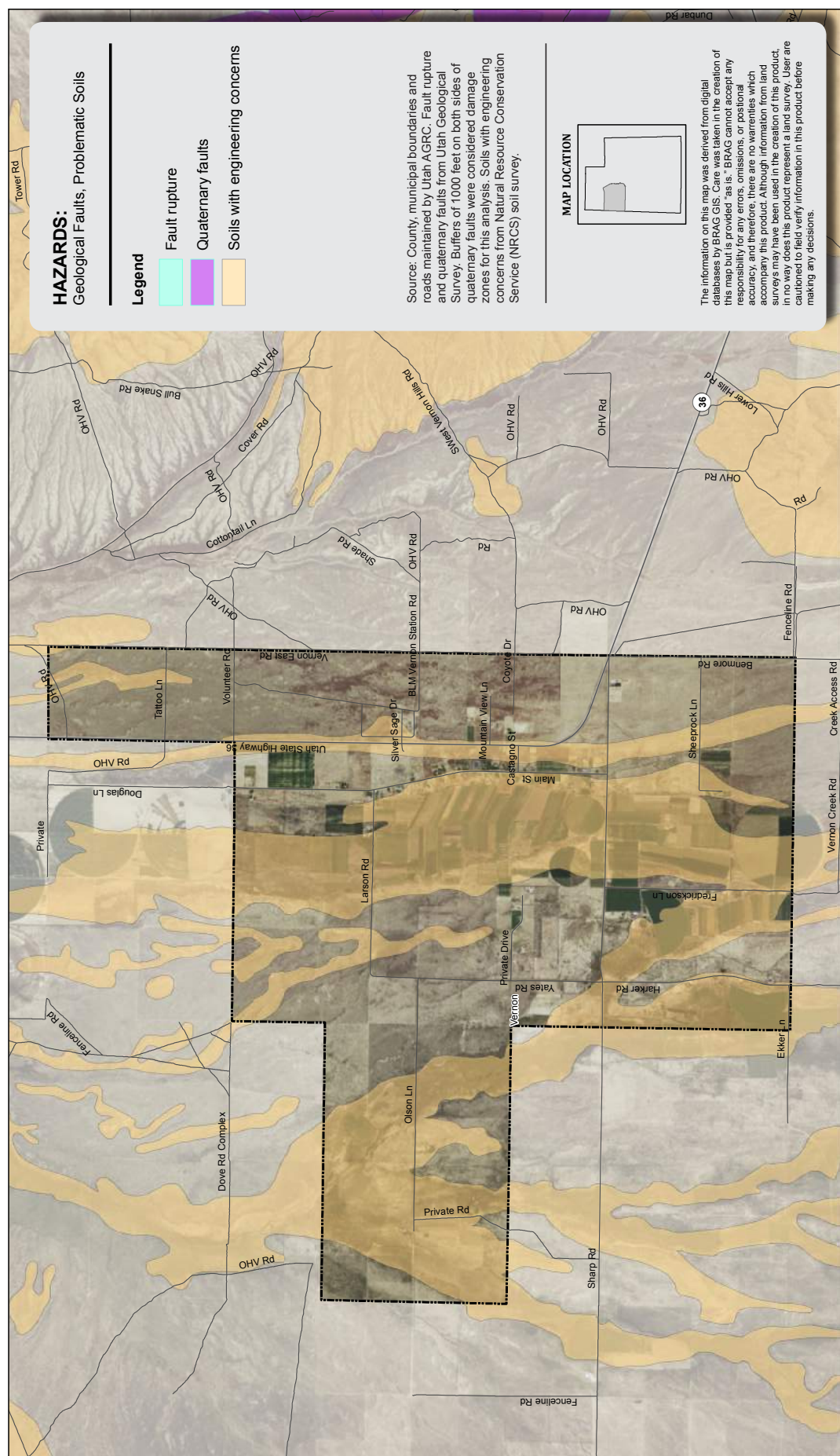
Table 35: Unincorporated Tooele County Mitigation Strategies

TOOELE COUNTY - COMMUNITY MITIGATION STRATEGIES									
Protecting Current Residents and Property									
Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if)	Priority (High)	Time-frame	Potential Funding Sources	Responsible Entity	Resources
Tooele County	Flood	Protect current residents and property	With all of the construction on the hillsides, action should be taken to reduce the impact of run-off flooding in these areas. Zoning, ordinances, etc.	N/A	High	2017	Grants, Development agreements, etc.	Builder, Local	USGS, County Planners, Soil Engineers
Tooele County	Flood	Protect current residents and property	Prepare by identification on map of hazard areas. Mitigate by altering water course to prevent damage to homes.	N/A	Medium	2017	County, State, Govt.	County	FEMA, Utah DEM
Tooele County	Earthquake	Protect current residents and property	Develop Earthquake preparedness programs	N/A	Medium	2017	FEMA Grant, CERT Grants	Local	County, Communities, State DEM
Tooele County	Earthquake	Protect current residents and property	Update ordinances to earthquake standards	N/A	Medium	2017	City, County	County	County, City
Tooele County	Severe Weather	Protect current residents and property	Prepare by training operations/equipment for severe weather. Make equipment available.	N/A	High	2017	County, State, City	County, All Jurisdictions	City, County, State
Tooele County	Wildfire	Protect current residents and property	Update city ordinances to require defensible space and fire resistant vegetation surrounding homes located in wildland/urban interface.	N/A	High	2017	City, Utah Dept. of Public Safety/ FEMA	Local	Utah FFSL, County
Tooele County	Wildfire	Protect current residents and property	Enforce WUI building requirements, require defensible space to be developed, other recognized WUI programs, plants, spaces, etc.	N/A	High	2016	DES/DPS, FEMA, County	Local, County	Utah FFSL, county fire warden
Tooele County	Landslides	Protect current residents and property	Require reseeded of natural plants after land development takes place.	N/A	Medium	2016	Developers, builders, county, USGS	Local, Developer	USGS, County Planners, Soil Engineers
Tooele County	Problem Soils	Protect current residents and property	Same as Landslides listed above	N/A	Medium	2016	Developers, builders, county, USGS	Local, Developer	USGS, County Planners, Soil Engineers
Tooele County	Dam Failure	Protect current residents and property	Education of residents, update emergency response plans as necessary.	N/A	Medium	2017	County	County	Utah Div. of Water Resources/Dam Safety, FEMA
Tooele County	Steep Slopes	Protect current residents and property	Review local slope ordinances and work with UGS to determine dangerous slope percentages for structures	N/A	Medium	2017	County	County	UGS
Tooele County	High Water Table	Protect current residents and property	Education of local residents on preventative measures for reducing damage from flooding due to high water table.	N/A	Medium	2017	County	County	UGS, NRCS
TOOELE COUNTY - COMMUNITY MITIGATION STRATEGIES									
Protecting Future Residents and Property									
Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if)	Priority (High)	Time-frame	Potential Funding Sources	Responsible Entity	Resources
Tooele County	Flood	Protect future residents and property	Ordinance and zoning to limit the encroachment into the foothills and to require soils testing before construction is allowed.	Unknown	High	2016	Developers, Builders, County general fund.	Local	Other communities that have dealt with this issue
Tooele County	Flood	Protect future residents and property	Check ordinances to prevent housing in flood plain area.	N/A	Medium	2017	City, County, State, Govt.	County	City, County, USU Extension
Tooele County	Earthquake	Protect future residents and property	Same as above	N/A	Medium	2017	FEMA Grant, CERT Grants	Local, County	County, Communities, State DEM
Tooele County	Earthquake	Protect future residents and property	Education of residents, update ordinances if necessary	N/A	Medium	2018	County, City	County, All Jurisdictions	USU, FEMA
Tooele County	Severe Weather	Protect future residents and property	Extra operators for equipment during emergencies. Utilize HAM and radio operators for emergency communication	N/A	High	2017	County, City	County, All Jurisdictions	County
Tooele County	Wildfire	Protect future residents and property	Update city ordinances to require sprinklers in all new homes located in the wildland/urban interface.	N/A	High	2018	City, Utah Dept. of Public Safety/ FEMA	Local	Utah FFSL, County
Tooele County	Wildfire	Protect future residents and property	Residential sprinkler requirements, defensible space	N/A	High	2016	Residential sprinkler coalition, developers	Local	Utah State fire marshal's office
Tooele County	Landslides	Protect future residents and property	Require more soil studies on soils of property up high on the hillsides	N/A	Medium	2017	Developers, County, USGS	Local	USGS, Engineers
Tooele County	Problem Soils	Protect future residents and property	Same as Landslides listed above	N/A	Medium	2016	Developers, builders, county, USGS	Local, Developer	USGS, County Planners, Soil Engineers
Tooele County	Dam Failure	Protect future residents and property	Review local ordinances and determine if they need to be updated to better prevent development in dam inundation areas.	N/A	Medium	2017	County	County	Utah Div. of Water Resources/Dam Safety, FEMA
Tooele County	Steep Slopes	Protect future residents and property	Review local ordinances and determine if they need to be updated to better prevent development in high slope areas.	N/A	Medium	2017	County	County	UGS
Tooele County	High Water Table	Protect future residents and property	Review local ordinances and update to only allow structures with proper mitigation measures in high water table areas.	N/A	Medium	2017	County	County	UGS, NRCS

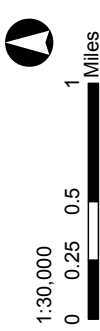
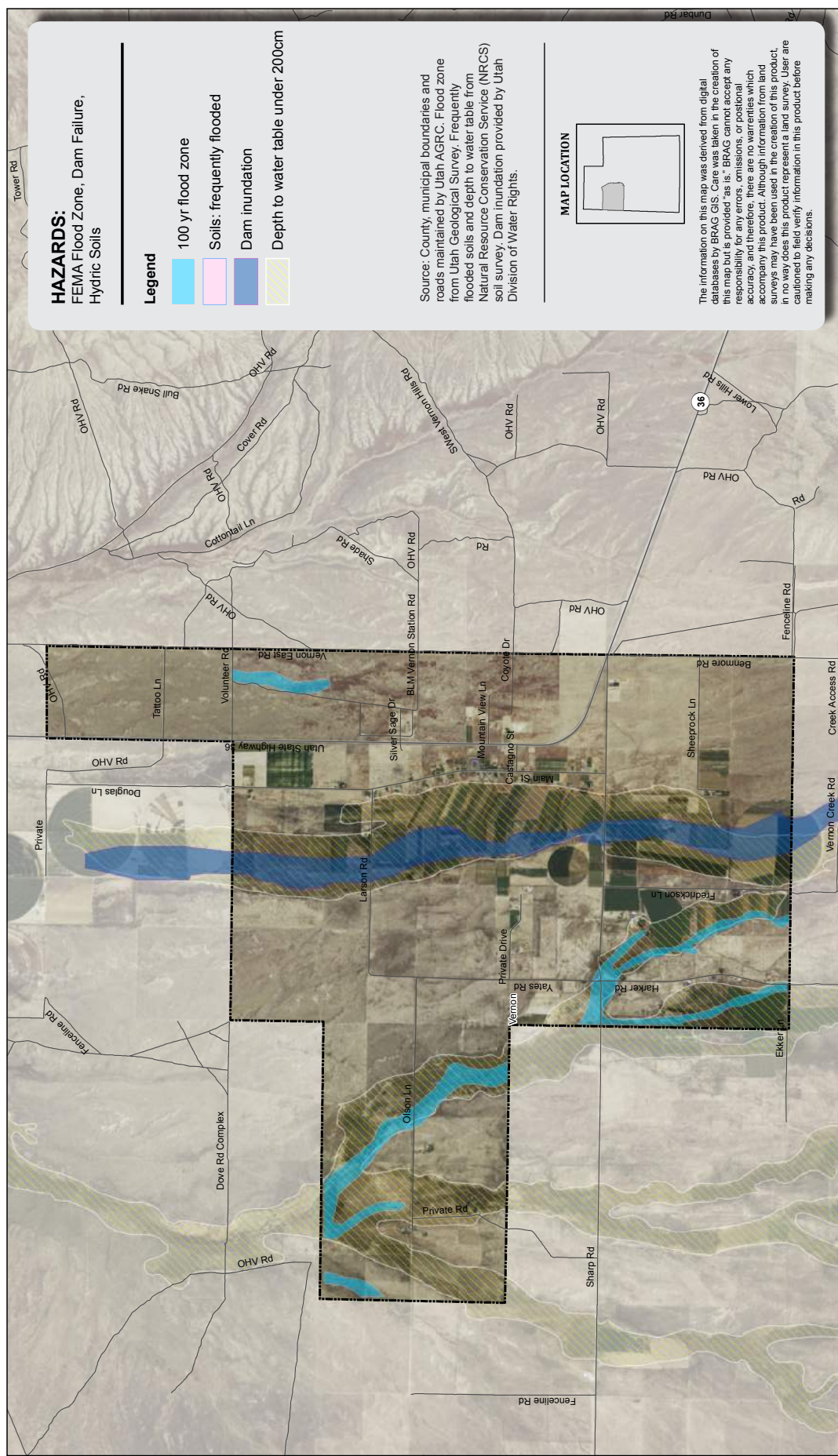
SECTION 18: VERNON COMMUNITY RISK ASSESSMENT



VERNON, UTAH



VERNON, UTAH



VERNON, UTAH

VERNON NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

VERNON

Analysis of hazard risk involving the community of Vernon revealed that there is potential risk resulting from **flood, dam failure, steep slopes, high water table, 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, dam failure and steep slopes pose risks to human life, and other features and amenities in the community. Other natural hazard types not mentioned were found to have no potential impacts to Vernon. See the following tables for more detailed descriptions of potential losses associated

with each natural hazard.

Natural Hazards

Flood. Portions of Vernon are at risk to flooding. Vernon does not participate in NFIP. Areas within the jurisdiction do not appear to have substantial risk, except for 3 structures and some agricultural production land. Areas most susceptible to flooding appear to be the those of lower elevation farmlands, in the eastern portions of the town, and those areas in the path of drainage into the Atherly Reservoir.

Dam Failure. Vernon has risk to dam failure involving Vernon Reservoir. Areas at risk are those low elevations in between Vernon Reservoir and Atherny Reservoir, which affect the eastern portions of the town. 4 structures, and approximately 13 residents, as well as various farmland in these areas could be affected in the case of a dam failure event.

Steep Slopes. Vernon has a low risk associated with steep slopes in its boundaries. Areas of greatest concern have slopes of over 15%, which are commonly

Table 36: Vernon Potential Loss Figures

Vernon, 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	\$433,145	0	\$0	\$0
Faults	0	0	\$0	0	\$0	\$0
Wildfire	115	36	\$3,759,597	3	\$220,962	\$1,926,783
Flood (FEMA)	10	3	\$393,261	0	\$0	\$0
Flood (Soils)	0	0	\$0	0	\$0	\$0
Liquefaction	0	0	\$0	0	\$0	\$0
Landslide	0	0	\$0	0	\$0	\$0
Slope	10	3	\$418,435	0	\$0	\$0
High Water Table	67.2	21	\$1,545,060	2	\$187,747	\$1,284,522
Unsuitable Soils for Buildings	160	50	\$4,001,264	2	\$67,694	\$1,284,522

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Vernon, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure					1 Well	
Faults						
Wildfire		1 Post Office, 1 School		1 Church		
Flood (FEMA)						
Flood (Soils)						
Liquefaction						
Landslide						
Slope						
High Water Table						
Unsuitable Soils for Buildings						
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and						

Vernon, UT, Infrastructure at Risk										
Hazard Type	Infrastructure at Risk									
	Railroad Lines		Natural Gas Lines		Electrical Power lines		Roads		Canals	
	# of Miles	\$ Value¹	# of Miles	\$ Value²	# of Miles	\$ Value³	# of Miles	\$ Value⁴	# of Miles	\$ Value⁵
Dam Failure	0	\$0	0	\$0	0	\$0	0.27	\$141,750	0.78	\$1,170,000
Faults	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Wildfire	0	\$0	0	\$0	0	\$0	8.82	\$4,630,500	0.14	\$210,000
Flood (FIRM)	0	\$0	0	\$0	0	\$0	0.89	\$467,250	0.7	\$1,050,000
Flood (Soils)	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
High Water Table	0	\$0	0	\$0	0	\$0	2.42	\$1,270,500	2	\$0
Unsuitable Soils for Builings	0	\$0	0	\$0	0	\$0	7.42	\$3,895,500	2.7	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Vernon, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.11	0	3.61	0	0	0.13	0
Faults	0	0	0	0	0	0	0
Wildfire	4.53	0	0	0	0.43	0.44	0
Flood (FIRM)	5.96	0	6.53	0	0	0.3	0
Flood (Soils)	0	0	0	0	0	0	0
Liquefaction	0	0	0	0	0	0	0
Landslide	0	0	0	0	0	0	0
Slope	0	0	0	0	0	0	0
High Water Table	24.53	0	7.38	0	0.01	0	0
Unsuitable Soils for Buildings	25.92	0	8.57	0	0.12	0	0

Note: Total acres of land and miles of streams and trails 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.

Vernon, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	259.42	0
Faults	0	0
Wildfire	1,266.89	1,373.00
Flood (FIRM)	188.25	53.42
Flood (Soils)	0	0
Liquefaction	0	0
Landslide	0	0
Slope	3.74	0
High Water Table	0	74.7
Unsuitable Soils for Buildings	0	267.67

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the potential to impact 10 people, 3 residential units, and nearly 4 acres of agricultural land. Other community amenities and features did not have noticeable risks.

High Water Table. Most of areas in Vernon that have a high water table are irrigated croplands and low lying drainages west of Main Street.

Wildfire. Vernon 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 115 people and 36 structures at risk.

Future Development

No information on future development in Vernon was provided by local officials.

Hazard Mitigation Strategies

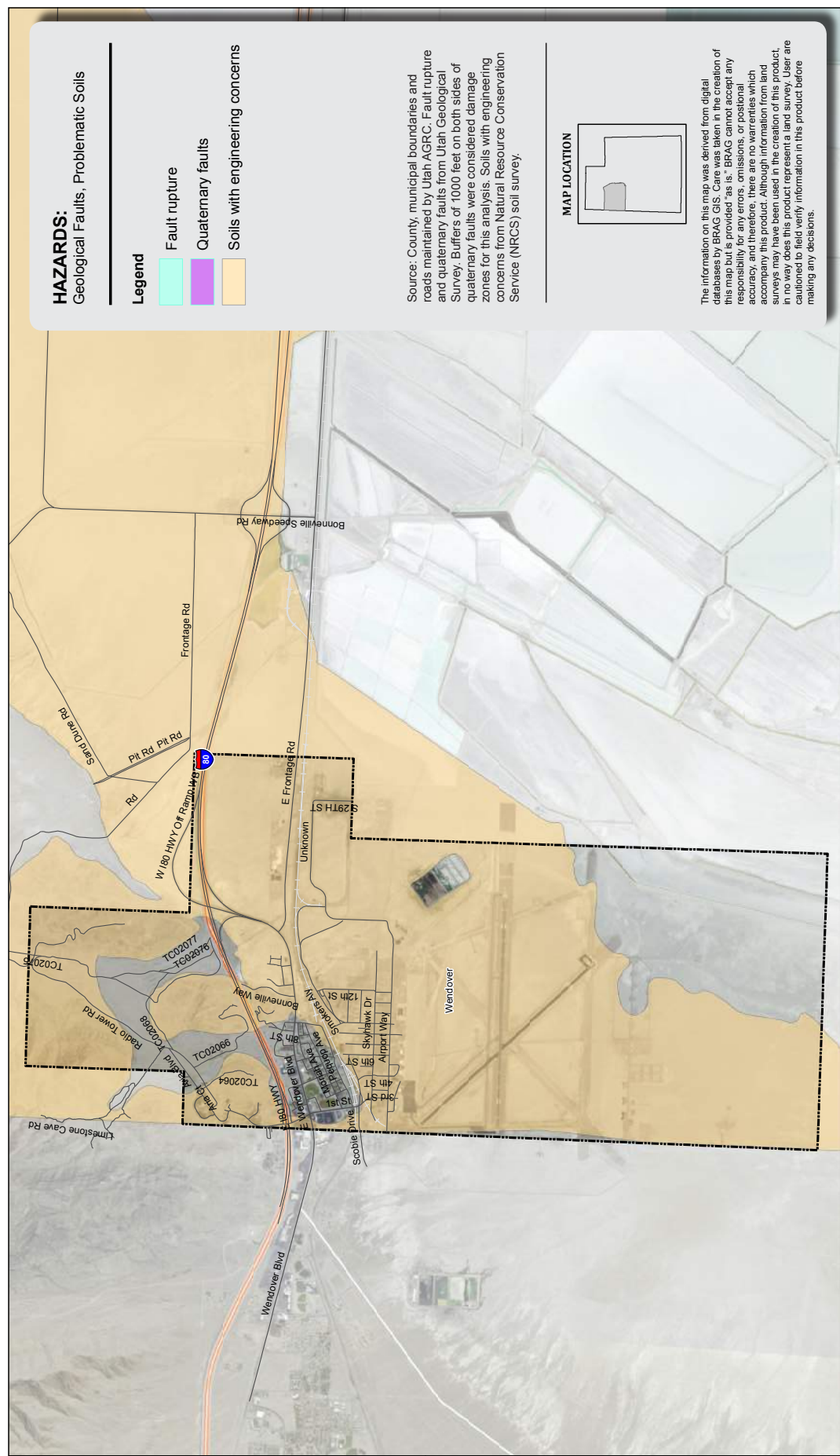
Table 37: Vernon Mitigation Strategies

VERNON - 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
Vernon	All	Protect current residents and property	County-wide emergency preparedness fair	N/A	Medium	2017	County/ Town	County	N/A	FEMA, State of Utah, County Planners
Vernon	Wildfire	Protect current residents and property	Town Code and Ordinance requirements for defensible space and fuel control.	N/A	Medium- High	2016-2017	Town/ FEMA/HDPS	Town	\$1,500	TC EOC/ DHS
Vernon	Severe Weather	Protect current residents and property	Provide adequate funding and rainy day for emergency snow removal.	N/A	Medium- High	2017	Town	Town	\$5,000	GF/ TC for major emergency
Vernon	Earthquakes	Protect current residents and property	Review current code insp. Old school work with district groups	TCSD- Town- FEMA	Medium	2017	TCSD- Town- FEMA	Town	\$250,000	Taxes- Grants- FEMA- Utah State Gov.
Vernon	Drought	Protect current residents and property	Steps to protect water develop plan for emergency. Protect VIC Irrigation water.	N/A	Medium	2018	Grant	Town, County	\$10,000	NOAA
Vernon	Dam Failure	Protect current residents and property	Assure flood plain residents above detention. Zoning	Assure flood plan residents above detention. Zoning	Low- Medium	2017	Town, NFIP	Town	\$10,000	FEMA State of Utah, Tooele County
Vernon	Problem Soils	Protect current residents and property	Identify residents/ property at risk for problem soils	Building Code review by T.C. rework planning maps	Medium	2018	G.F. Town	Town	\$1,000	Tooele County Mapping
Vernon	Landslides	Protect current residents and property	Check to see if FEMA and county maps are correct and potential for landslide.	N/A Review maps with planning commission	Low	2020	Unknown	Town, County	Unknown	FEMA- Tooele County
Vernon	Radon	Protect current residents and property	Community education, potential risk	Notice in newsletter of radon risk	Low	2018	G.F. Town	Town	\$500	State of Utah, FEMA, OSHA
Vernon	Flood	Protect current residents and property	Talk with the State of Utah Floodplain Manager about the benefits of joining NFIP and update accordingly.	Talk with the State of Utah Floodplain Manager about the benefits of joining NFIP and update accordingly.	Medium	2017	Town	Town	Minimal	State DEM, FEMA
Vernon	Sleep Slopes	Protect current residents and property	Review local slope ordinances and work with UGS to determine dangerous slope percentages for structures.	N/A	Medium	2017	Town	Town	Minimal	UGS
Vernon	High Water Table	Protect current residents and property	Review local slope ordinances and work with UGS to determine dangerous slope percentages for structures.	N/A	Medium	2017	Town	Town	Minimal	UGS, NRCS
VERNON - COMMUNITY MITIGATION STRATEGIES										
Protecting Future Residents and Property										
Jurisdiction	Hazard	Goal	Action	Action (For NFIP Compliance, if Applicable)	Priority (High, Medium, Low)	Time-frame	Potential Funding Sources	Responsible Entity	Estimated Cost	Resources
Vernon	All	Protect future residents and property	County-wide emergency preparedness fair	N/A	Medium	2017	County/ Town	County	N/A	FEMA, State of Utah, County Planners
Vernon	Wildfire	Protect future residents and property	Require defensible set backs in ordinance, EMT communications	N/A	Medium	2017	Same	Town, County	\$1,500	Same
Vernon	Severe Weather	Protect future residents and property	None, emergency power emergency communications	N/A	Medium	2017	Town/ DHS	Town, County	\$5,000	NOAA
Vernon	Earthquakes	Protect future residents and property	Enforce county code building requirements. Emergency power and water.	N/A	Medium	2017	Town	Town	\$12,000	Surplus Property
Vernon	Drought	Protect future residents and property	Assure that Rush Valley water remains in Rush Valley	N/A	Medium	2018	Grant- Town- FEMA- State Water Board	Town, Rush Valley	\$10,000	State of Utah
Vernon	Dam Failure	Protect future residents and property	Assure code and zoning limit new construction	Maybe	Low- Medium	2018	Federal, State, Tooele County	Town	\$1,000	State of Utah, Tooele County
Vernon	Problem Soils	Protect future residents and property	Advise potential building of location with questionable soils. Update maps.	Update Maps	Medium	2018	Town	Town	\$1,000	Mapping resources Tooele County
Vernon	Landslides	Protect future residents and property	See Above Current Plan	N/A Review maps with planning commission	Low	2020	Unknown	Town, County	Unknown	FEMA- Tooele County
Vernon	Radon	Protect future residents and property	Construction codes/ advise new home builders	notice by planning commission to for new construction	Low	2020	G.F. Town, Vernon Town	TOWN	\$500	State of Utah, FEMA, OSHA
Vernon	Flood	Protect future residents and property	Talk with the State of Utah Floodplain Manager about the benefits of joining NFIP and update accordingly.	Talk with the State of Utah Floodplain Manager about the benefits of joining NFIP and update accordingly.	Medium	2017	Town	Town	Minimal	State DEM, FEMA
Vernon	Sleep Slopes	Protect future residents and property	Review local ordinances and determine if they need to be updated to better prevent development in high slope areas.	N/A	Medium	2017	Town	Town	Minimal	UGS
Vernon	High Water Table	Protect future residents and property	Review local ordinances and update to only allow structures with proper mitigation measures in high water table areas.	N/A	Medium	2017	Town	Town	Minimal	UGS, NRCS

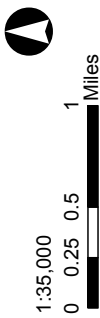
SECTION 19: WENDOVER COMMUNITY RISK ASSESSMENT

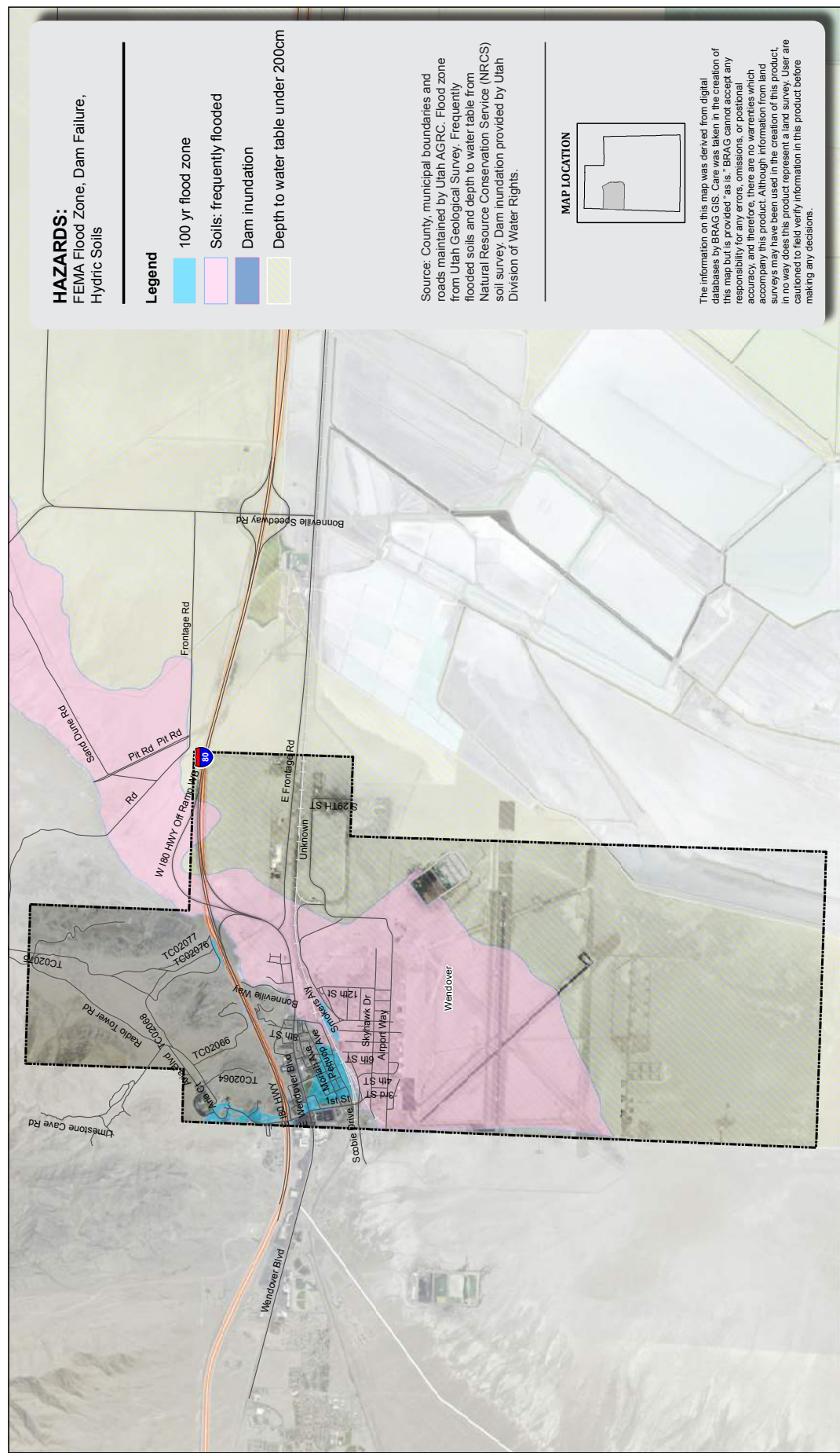


WENDOVER, UTAH



WENDOVER, UTAH





WENDOVER, UTAH

WENDOVER NATURAL HAZARDS, POTENTIAL LOSSES, AND MITIGATION STRATEGIES

WENDOVER

Analysis of hazard risk involving the city of Wendover revealed that there is potential risk resulting from **wildfire, flood, high water table, and steep slopes**. These hazards have varying potential to impact human life, property, critical facilities, infrastructure, agriculture, and environmental features within municipal boundaries. Currently, wildfire and flood have the greatest potential to impact human life, property, critical facilities, infrastructure, and agricultural features based on potential loss values. Potential impacts from liquefaction, dam failure, earthquakes, and landslides appear to pose no risks in the community. Other natural hazard types not mentioned were found to have no potential impacts to Wendover. See the following tables for more

detailed descriptions of potential losses associated with each natural hazard.

Natural Hazards

Wildfire. Wendover is susceptible to low-moderate risk of wildfire in north and 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 city. Wildfires have the potential to impact 54 homes, 237 people, and 29 commercial structures. Also a school, grazing land, and some infrastructure would be threatened.

Flood. Portions of Wendover are at risk to flooding. Wendover does participate in NFIP. Areas within the jurisdiction do appear to have a low to moderate risk to impacts within the city center. Areas most susceptible to flooding appear to be in between the state line and 9th street on the east of the city. Floods have the greatest potential to impact human life, property, critical facilities, and infrastructure. Locations with minimal risks are environmental and agriculture features within the jurisdiction.

Table 38: Wendover Potential Loss Figures

Wendover, 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	237	54	\$13,375,286	29	\$18,256,449	\$18,625,569
Flood (FEMA)	336	74	\$12,229,551	14	\$8,088,930	\$8,991,654
Flood (Soils)	38	9	\$1,650,988	16	\$1,838,593	\$10,276,176
Liquefaction	0	0	\$0	0	\$0	\$0
Landslide	0	0	\$0	0	\$0	\$0
Slope	22	4	\$2,206,644	6	\$7,091,901	\$3,853,566
High Water Table	35	11	\$510,756	19	\$2,225,794	\$12,202,959
Unsuitable Soils for Buildings	224	70	\$9,986,077	28	\$7,604,389	\$17,983,308

* Based on average persons per owner household for Tooele County from 2013 American Community Survey, which is 3.2.

** Current Market Value per parcel, including building and land values. Data provided by Tooele County.

*** Based on average sales, receipts, or value of shipments of firms with or without paid employees, per firm (\$642,261 per firm). Derived from 2007 Survey of Business Owners for Tooele County, US Census Bureau.

Wendover, UT, Critical Facilities at Risk						
Hazard Type	Critical Facilities Types					
	Emergency Services/Law Enforcement	Schools/Public Facilities	Health Care Facilities	Places of Worship	Infrastructure	Other
Dam Failure	0	0	0	0	0	0
Faults	0	0	0	0	0	0
Wildfire	0	1 School	0	0	0	0
Flood (FEMA)				1 Church		
Flood (Soils)	1 Fire Station	0	0	1 Church	3 Broadband Anchors	1 Airport
Liquefaction	0	0	0	0	0	0
Landslide	0	0	0	0	0	0
Slope	0	0	0	0	0	0
High Water Table	0	0	0	0	0	Bulk Transportation, 3 heavy equipment
Unsuitable Soils for Buildings	0	0	0	0	0	1 bulk transportation, 3 contractor heavy equipment
Note: Critical facilities were identified using multiple data sources including: Utah AGRC, UDOT, Utah Division of Water Resources, and public and community leader input.						

Wendover, 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	1.19	\$1,785,000	0	\$0	0	\$0	3.90	\$2,047,500	0	\$0
Flood (FIRM)	0	\$0	0	\$0	0	\$0	3.42	\$1,795,500	0.02	\$30,000
Flood (Soils)	1.95	\$2,925,000	0	\$0	0	\$0	12.15	\$6,378,750	1.21	\$1,815,000
Liquefaction	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Landslide	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0
Slope	0.02	\$30,000	0	\$0	0	\$0	1.21	\$635,250	0	\$0
High Water Table	3.66	\$5,490,000	0	\$0	0	\$0	15.75	\$8,268,750	2.49	\$0
Unsuitable Soils for Builings	3.77	\$5,655,000	0	\$0	0	\$0	22.86	\$12,001,500	2.58	\$0

¹ Based on figures from 2009 Pre-Disaster Mitigation Plan for Bear River Region, Utah (\$1,500,000/mi).

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, 2015).

³ Based on estimates from Logan Light and Power, 2015 (\$127,000/mi).

⁴ Based on estimates derived from an average 28' wide, 4" thick asphalt county road with gravel subgrade replacement. Cache County, 2015 (\$525,000/mi).

⁵ Based recent Cache County and regional project cost estimates, 2015 (\$1,500,000/mi).

Wendover, UT, Environmental & Recreational Features at Risk							
Hazard Type	Environmental Features at Risk			Recreational Features at Risk			
	Wetland/ riparian	Lakes	Streams	Parks	Trails	Trails (Master)	Amenities
	# of Acres		# of Miles	# of Acres	# of Miles	# of Miles	# of Amenities
Dam Failure	0.00	0.00	0.00	0.00	0.00	0.00	0
Faults	0.00	0.00	0.00	0.00	0.00	0.00	0
Wildfire	0.00	0.00	0.00	0.00	0.00	0.00	0
Flood (FIRM)	0.00	0.00	0.12	0.00	0.00	0.00	0
Flood (Soils)	0.00	0.31	1.80	0.00	0.00	0.00	0
Liquefaction	0.00	0.00	0.00	0.00	0.00	0.00	0
Landslide	0.00	0.00	0.00	0.00	0.00	0.00	0
Slope	0.00	0.00	0.33	0.00	0.00	0.00	0
High Water Table	1,092.53	0.45	5.00	0.00	0.00	0.00	0
Unsuitable Soils for Buildings	652.40	0.45	6.33	0.00	0.00	0.00	0

Note: Total acres of land and miles of streams and trails 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.

Wendover, UT, Agricultural Features at Risk		
Hazard Type	Lands at Risk	
	Agriculture Production*	Grazing**
	# of Acres	
Dam Failure	0.00	0.00
Faults	0.00	0.00
Wildfire	0.00	113.75
Flood (FIRM)	0.00	24.10
Flood (Soils)	0.00	173.69
Liquefaction	0.00	0.00
Landslide	0.00	0.00
Slope	0.00	432.20
High Water Table	0.00	397.27
Unsuitable Soils for Buildings	0.00	1,111.26

* 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 currently associated with grazing allotments identified as part of the Grazing Improvement Program (Utah AGRC, 2012)

High Water Table. Areas with high water table in Wendover are located in the eastern and southern areas of town near the historic Great Salt Lake floodplain.

Steep Slopes. Wendover has risk associated with steep slopes within its boundaries. Areas of greatest concern have slopes of over 25%, which are commonly found in hilly and mountainous areas, and areas bordering drainages, streams and rivers. Steep slopes have the greatest potential to impact human life, property, and infrastructure. Areas with minimal damage cost according to the potential loss charts are environmental and agricultural features.

Future Development

No information on potential future development in Wendover was provided by local officials.

Hazard Mitigation Strategies

No mitigation strategies were reported for Wendover City.

SECTION 20: COMMUNITY CAPABILITY ASSESSMENT

INTRODUCTION

The following section is a description of the organizational, technical and political capacity of Tooele County communities to implement hazard mitigation strategies and goals. A plan will do nothing to improve hazard mitigation efforts in the area without sufficient implementation capacity and capability; particularly local level capacity (town, city and county government). The purpose of this section is to identify where capacity to implement this plan is lacking for local governments.

LOCAL ORGANIZATIONAL AND TECHNICAL CAPABILITY

Only a handful of communities in Tooele County have full or part-time professional staff of any kind. In many cases a limited tax base means that hiring professional staff in the smaller cities and towns is financially unobtainable. Often these smaller communities rely on local volunteers or elected and appointed officials to perform many of the tasks normally handled by professional staff.

Table 39: State and County Hazard Mitigation Resources

State and Regional Hazard Mitigation Resources - Tooele County	
Agency/Group	Description
Utah Division of Emergency Services and Homeland Security	Training, technical assistance and funding.
Utah League of Cities and Towns	Training, technical assistance and planning assistance
Utah Chapter American Planning Association	Local land use planning resource.
Utah Geological Survey	Technical assistance, plan review
Tooele County	Technical assistance, GIS, and emergency planning/response information.
Wasatch Front Regional Council	Community Development Block Grant assistance.
Tooele County Health Department	Emergency preparedness and response.
American Red Cross	Training, emergency preparedness and response.
Utah Association of Conservation Districts	Technical assistance and planning assistance.
Utah Division of Forestry, Fire, and State Lands	Technical assistance and funding resources. Community Wildfire Protection Plan writing assistance.
US Forest Service	Wildfire response and coordination
Bureau of Land Management	Wildfire response and coordination

It's not uncommon to have volunteer city council members or planning commissioners assigned the task of emergency management, grant writing, or long-range planning. Professional staff with Tooele County Emergency Management

help provide some technical and natural hazards planning assistance to some of the smaller communities. This assistance is often limited by staffing capacity and funding. As funding allows, some communities are able to contract for professional services from private consultants.

Only Tooele County, Tooele City, Dugway Proving Grounds, and Grantsville have staff that is, for the most part, dedicated full-time to emergency management, planning, public works, or related tasks.

POLICY AND PROGRAM CAPABILITY

Most incorporated jurisdictions in Tooele County have an adopted General Plan as required by state code. Although some communities have recently updated their General Plan, some are very outdated and have not been revised in years. Generally speaking, if these plans address natural hazards at all, they are addressed generally.

All of the seven municipalities have an adopted zoning ordinance, including Tooele County. For the smaller communities these ordinances can be outdated and may not be as consistent with the jurisdiction's General Plan as would be ideal.

LOCAL COMMUNITY CAPABILITIES - TOOELE COUNTY				
Jurisdiction		Professional Staffing (e.g. Emergency Manager, City Manager, Engineer, Planner)	Emergency Response Capacity	Technical Capacity (In House)
Incorporated Communities	TOOELE COUNTY	County Emergency Management, Building and Development Services, Roads Department	Fire, EMS, and Law	Planning and Development, GIS, Engineering
	Grantsville City	Public Works, Planning and Zoning Administrator, Building Official	Local Fire, EMS, and Law	Planning and Development
	Ophir Town	Volunteer/County consultant	County Fire, County Law and Contracted EMS	None
	Rush Valley Town	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Stockton Town	Volunteer/County consultant	Local Fire and Law and Contracted EMS	None
	Tooele City	Community Development, Public Works, Engineering	Local Fire, EMS, and Law	Planning and Development, GIS, Engineering
	Vernon Town	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Wendover City	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
Unincorporated Communities	Dugway	Military Oversight, Emergency Management, GIS support	Local Fire, EMS, and Law	Planning, Engineering, GIS
	Erda	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Goshute Reservation	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Lake Point	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Pine Canyon	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Skull Valley	Volunteer/County consultant	Local Fire, County Law and Contracted EMS	None
	Stansbury Park	Stansbury Park Service Agency	Local Fire, County Law and Contracted EMS	None

Table 40: Local Community Capability

Most zoning ordinances do not address natural hazards even if they are mentioned in the General Plan. A few communities have a “sensitive area” or “hazard area” overlay zone, but they are very basic, often mentioning a brief requirement for geotechnical reports or other studies. All incorporated communities issue building permits and enforce local building codes. This service is usually contracted out to the county.

Many of the smaller communities lack emergency response plans.

JURISDICTIONAL CAPABILITY TO EXPAND POLICIES AND PROGRAMS

Each incorporated community in Tooele County is authorized by state law to regulate land use activities and plan for future growth in their respective community. By law, cities, towns, and counties are required to address land use, transportation, and affordable housing (for larger communities) in their community General Plan. Especially in recent years, communities have been much more proactive with updating their plans to

include more detail and more fully comply with state codes and ordinances, and to protect them from liability should a natural hazard event occur.

However, many of the smaller cities and towns do not have adequate funding, staffing, or financial resources to update their local General Plan every 3-5 years per state and other recommendations. In fact, some communities have not updated their General Plans since they were first created in the late 1970’s and early 1980’s. These smaller jurisdictions often do not have the resources to expand on or improve existing policies and programs as professionally, extensively, or as timely, as the larger jurisdictions do. There are some resources which can help, although they are limited. Tooele County, Utah League of Cities and Towns, The State of Utah, and other resources are available, but each has limited funding, staffing, or resources to provide assistance.

Those communities with full-time staff are much more likely to have adequate capacity to apply for funding or update the General Plan and other plans/documents in house (See Table 109).

Authority

Act that grants authority to counties. Utah Code, Title 10 Chapter 9 grants similar authority to municipalities.

Federal: Public Law 93-288 as amended, established the basis for federal hazard mitigation activity in 1974. A section of this Act requires the identification, evaluation, and mitigation of hazards as a prerequisite for state receipt of future disaster assistance outlays. Since 1974, many additional programs, regulations, and laws have expanded on the original legislation to establish hazard mitigation as a priority at all levels of government. When PL 93-288 was amended by the Stafford Act, several additional provisions were also added that provide for the availability of significant mitigation measures in the aftermath of a Presidentially declared disaster. Civil Preparedness Guide 1-3, Chapter 6- Hazard Mitigation Assistance Programs places emphasis on hazard mitigation planning directed toward hazards with a high impact and threat potential.

The Disaster Mitigation Act of 2000 was signed into Law on October 30, 2000. Section 322 defines mitigation planning requirements for state, local, and tribal governments. Under Section 322 States are eligible for an increase in the Federal share of hazard mitigation (HMGP), if they submit for approval a mitigation plan, which is a summary of local and/or regional mitigation plans, that identifies natural hazards, risks, vulnerabilities, and describes actions to mitigate the hazards, risks and vulnerabilities in that plan.

State: The State of Utah derives its authority under the Emergency Management Act of 1981 (Utah Code 53-2, 63-5) as well as the Governor's Emergency Operations Directive and Executive Order of the Governor 11.

Associations of Governments: The Associations of Governments have been duly constituted under the authority of Title XI, Chapter 13, Utah Code Annotated, 1953, as amended (The Inter-local Cooperation Act) and pursuant to Section 3 of the Executive Order of the Governor of the State of Utah, dated May 27, 1970, with the authority to conduct planning studies and to provide services to its constituent jurisdictions.

Local: Utah Code, Title 17, Chapter 27 is the County Land Use Development and Management

**SECTION 21 - PLAN MAINTENANCE,
IMPLEMENTATION, FUNDING & PUBLIC
INVOLVEMENT**

PLAN MAINTANENCE PROCEDURE

Monitoring, Evaluating and Updating the Plan

Periodic monitoring and reporting of the Plan is required to ensure that the goals and objectives for Tooele County communities are kept current and that local mitigation efforts are being carried out. The following are procedures for plan maintenance. Due to varoius circumstances, the annual reporting procedures from the 2008 plan were not carried out, and there was no need to revise or update the plan before this five-year update process. However, we feel that these procedures, with a few minor modifications from the 2008 plan, are the most efficient way to maintain the plan. Tooele County Emergency Management staff is committed to follow the procedures outlined below in order to help community's better implement the plan on a local level. Reporting bi-annually on the plan is also a great reminder of the need to implement community mitigation strategies over the next five years.

Annual Reporting Procedures

The Plan shall be reviewed bi-annually, as required by the Tooele County Commission, or as situations dictate such as following a disaster declaration as follows.

1. The County Commission will receive an bi-annual report and/or presentation on the implementation status of the Plan from Emergency Management staff.
2. The report will include an evaluation of the effectiveness and appropriateness of the mitigation actions proposed in the Plan.
3. The report will recommend, as appropriate, any required changes or amendments to the Plan.

If the Commission determines that a modification of the Plan is warranted, they may initiate a plan amendment.

Revisions and Updates

Periodic revisions and updates of the Plan are required to ensure that the goals and objectives

for Tooele County are current. More importantly, revisions may be necessary to ensure the Plan is in full compliance with Federal regulations and State statutes. This portion of the Plan outlines the procedures for completing such revisions and updates.

Five (5) Year Plan Review

Contingent on funding, every five years the plan will be reviewed and a complete update will be initiated. All information in the plan will be evaluated for completeness and accuracy based on new information, methods, or data sources. New property development activities will be added to the plan and evaluated for impacts. New or improved sources of hazard related data will also be included.

The goals, objectives, and mitigation strategies will be readdressed and amended as necessary based on new information, additional experience, and the implementation progress of the plan. The approach to this plan update effort will be essentially the same as used for the original plan development.

Plan Amendments

Plan amendments will be considered by each participating jurisdiction on an as-needed basis. All affected local jurisdictions (Cities, Towns and the County) will be required to hold a public hearing and adopt the recommended amendment or updated community section by resolution.

IMPLEMENTATION THROUGH EXISTING PROGRAMS

Integration with Local Planning

This plan is only useful to the extent its recommendations and mitigation strategies are integrated into local level decision making, programs, regulations, and resource allocation priorities. In the preparation of this plan it soon became very evident that for most elected and appointed officials in Tooele County, there is a strong desire to improve the jurisdiction's handling of natural hazard related issues. For many cities and towns, particularly the smaller ones, lack of motivation is not the issue. Finding the personnel,

time, and financial resources is always a concern for smaller communities.

There are many different avenues for the local implementation of this plan by local jurisdictions. The most direct application for local jurisdictions is to create or update a natural hazards zone or overlay in the local General Plans, zoning, and land use ordinances. Regulating land uses in natural hazard areas can effectively reduce losses of life and property. Updating these documents can be time consuming, but communities should be updating their General Plan about every five years at a minimum anyway. This regular update process is a great opportunity for communities to review their sections of the Tooele County Pre-Disaster Mitigation Plan (PDMP), identify risks documented in the plan, and to update their local General Plan, zoning, and ordinances accordingly.

According to Utah law, there are only three elements that jurisdictions are required to address in their General Plan; transportation, affordable housing (only for incorporated cities with over 1,000 people), and land use. While these three elements are the only required sections for the plan, jurisdictions are given authority to do much more in protecting the public's health, safety, and welfare. This is also true regarding development and geologic hazards.

In 2008, the Utah Land Use Development and Management Act was amended to more specifically grant jurisdictions authority to regulate development in floodplains and geologic hazard areas. It reads, "A municipality may enact an ordinance regulating land use and development in a flood plain or potential geologic hazard area to protect life and prevent the substantial loss of real property or substantial damage to real property (LUDMA, 10-9a-505. Zoning districts, Amended by Chapter 326, 2008 General Session)." The same is true for counties.

The responsibility and authority to regulate development in natural hazard areas lies with the County, City, or Town. The State of Utah does not regulate most development, and while the Utah Geological Survey and others offer assistance to Counties/communities, they do not have authority to regulate. Public health, safety,

and welfare can be protected most effectively as communities exercise the authority given them and use the resources available to them to plan development responsibly near hazard areas.

Many local emergency response plans are written in a national response framework, which is an all hazards approach to emergency response. These plans are outlined in a way that simplifies emergency response based on NIMS (National Incident Management System) principles. It focuses on partnerships, preparedness, tiered response, etc., but does not particularly focus on specific natural hazards. As such, it's difficult to implement natural hazards planning directly into these documents. However, local emergency management officials train for emergency response to all types of natural hazards. This plan can serve as a reference to them providing historical hazard events, points of contact, general geographic locations of hazards, and potential losses per jurisdiction per hazard. Also, continued involvement in several follow-up Pre-Disaster Mitigation planning meetings will provide useful forums for discussion and collaboration among various organizations and levels of government.

Public works departments can also implement the information from this plan. As communities view the natural hazards data and mapping in this plan, they can accordingly identify where infrastructure could be damaged in the event of a natural disaster or where weak sections are in the various systems. Data sets for the various hazards identified in this plan are continually being updated and refined. The Utah Geological Survey and others can provide zoning and ordinance assistance for geological hazard areas, and can provide the most up-to-date data and mapping.

As far as Flood Mitigation Plans, those communities that do have a plan can update it referencing the data and statistics in this plan. Potential losses and the general number of structures in FEMA floodplains can be very beneficial in those plan updates. However, the best resource for updating floodplain planning efforts is the Utah Division of Homeland Security and Emergency Services. The State Floodplain Manager has the necessary training and resources to assist communities in this respect. Likewise, for

wildfire protection, the Utah Division of Forestry, Fire, and State Lands can provide assistance to communities which can help them become eligible for funding. For general pre-disaster mitigation funding and project assistance, the Utah Division of Homeland Security and Emergency Services hazard mitigation planning staff can provide the most up-to-date knowledge and experience.

Another local application of the PDMP is the community Capital Improvements List. As communities realize which hazards exist in their area, they can plan accordingly to apply for funding for emergency response equipment or new infrastructure and buildings that help protect the health and safety of residents. This list can include building retrofits, new structures, machinery or equipment, vehicles, utility lines, and other projects in the community. The US Department of Housing and Urban Development (HUD) administers Community Development Block Grants (CDBG). These funds are administered for Tooele County by the Wasatch Front Regional Council. One other funding source for these types of projects is the USDA Rural Development low interest loans.

Perhaps the most direct way communities in Tooele County can implement this plan into current planning mechanisms is by completing the mitigation strategies for their respective community found in this plan. These strategies were written by communities and a County working group to find ways to decrease potential losses to life and property. As communities strive to improve natural hazards planning within their jurisdictional boundaries, they will more effectively protect the public's health, safety, and welfare by implementing these mitigation strategies.

Tooele County does not have the legal standing or the regulatory authority to require Cities or Towns to make plan, ordinance, or policy changes. At best, the County can encourage, educate, and suggest changes to local codes, plans, regulations, and policies. Given this, it is suggested in this plan that Tooele County's ongoing implementation effort would be most useful if focused on building local capacity, educating local officials on what is at stake (both in terms of funding eligibility and concern for citizenry), and providing the

sustained technical assistance that is so crucial for the successful implementation of any long-term mitigation strategies.

Specifically, Tooele County proposes to help move the implementation phase forward by (contingent on funding):

1. Establishing, coordinating, and hosting follow-up hazard mitigation meetings bi-annually.
2. Presenting to local governments on the benefits of natural hazards planning, hazard mitigation project options, and funding opportunities.
3. Providing on-going technical assistance to Cities, and Towns by request.

POTENTIAL FUNDING SOURCES

Although all mitigation techniques will likely save money by avoiding losses, many projects are costly to implement. Tooele County jurisdictions will continue to seek outside funding assistance for mitigation projects for both the pre- and post-disaster environment. This portion of the Plan identifies the primary Federal and State grant programs for local jurisdictions to consider, and also briefly discusses local and non-governmental funding sources.

Federal

There are several federal grant programs that have been identified as funding sources, specifically targeting hazard mitigation projects:

Below are some federal pre-disaster mitigation funding sources:

Title: Pre-Disaster Mitigation Program

Agency: Federal Emergency Management Agency

Through the Disaster Mitigation Act of 2000, Congress approved the creation of a national program to provide a funding mechanism that is not dependent on a Presidential Disaster Declaration. The Pre-Disaster Mitigation (PDM) program provides funding to states and communities for cost-effective hazard mitigation activities that complement a comprehensive mitigation program and reduce injuries, loss of life, and damage and destruction of property.

The funding is based upon a 75% Federal share and 25% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination. Special accommodations will be made for “small and impoverished communities”, who will be eligible for 90% Federal share/10% non-Federal.

FEMA provides PDM grants to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities: State and local hazard mitigation planning, technical assistance (e.g. risk assessments, project development), mitigation projects, acquisition or relocation of vulnerable properties, hazard retrofits, minor structural hazard control or protection projects, community outreach, and education (up to 10% of State allocation).

Title: Hazard Mitigation Grant Program

Agency: Federal Emergency Management Agency

The Hazard Mitigation Grant Program (HMGP) was created in November 1988 through Section 404 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act. The HMGP assists states and local communities in implementing long-term mitigation measures following a Presidential disaster declaration.

To meet these objectives, FEMA can fund up to 75% of the eligible costs of each project. The state or local cost-share match does not need to be cash; in-kind services or materials may also be used. With the passage of the Hazard Mitigation and Relocation Assistance Act of 1993, federal funding under the HMGP is now based on 15% of the federal funds spent on the Public and Individual Assistance programs (minus administrative expenses) for each disaster.

The HMGP can be used to fund projects to protect either public or private property, so long as the projects in question fit within the state and local governments overall mitigation strategy for the disaster area, and comply with program guidelines. Examples of projects that may be funded include the acquisition or relocation of structures from hazard-prone areas, the retrofitting of existing structures to protect them from future damages; and the development of state or local standards designed to protect buildings from future damages.

Eligibility for funding under the HMGP is limited to state and local governments, certain private nonprofit organizations or institutions that serve a public function, Indian tribes and authorized tribal organizations. These organizations must apply for HMPG project funding on behalf of their citizens. In turn, applicants must work through their state, since the state is responsible for setting priorities for funding and administering the program.

Title: Flood Mitigation Assistance Program

Agency: Federal Emergency Management Agency

FEMA's Flood Mitigation Assistance program (FMA) provides funding to assist states and communities in implementing measures to reduce or eliminate the long-term risk of flood damage to buildings, manufactured homes and other structures insurable under the National Flood Insurance Program (NFIP). FMA was created as part of the National Flood Insurance Reform Act of 1994 (42 USC 4101) with the goal of reducing or eliminating claims under the NFIP.

FMA is a pre-disaster grant program, and is available to states on an annual basis. This funding is available for mitigation planning and implementation of mitigation measures only, and is based upon a 75% Federal share/25% non-Federal share. States administer the FMA program and are responsible for selecting projects for funding from the applications submitted by all communities within the state. The state then forwards selected applications to FEMA for an eligibility determination. Although individuals cannot apply directly for FMA funds, their local government may submit an application on their behalf.

Title: Public Assistance (Infrastructure) Program, Section 406

Agency: Federal Emergency Management Agency

FEMA's Public Assistance Program, through Section 406 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, provides funding to local governments following a Presidential Disaster Declaration for mitigation measures in conjunction with the repair of damaged public facilities and infrastructure. The mitigation measures must be related to eligible disaster related damages and must directly reduce the potential for future, similar disaster damages to the eligible facility. These opportunities usually present themselves during the repair/replacement efforts.

Proposed projects must be approved by FEMA prior to funding. They will be evaluated for cost effectiveness, technical feasibility and compliance with statutory, regulatory and executive order requirements. In addition, the evaluation must ensure that the mitigation measures do not negatively impact a facility's operation or risk from another hazard.

Public facilities are operated by state and local governments, Indian tribes or authorized tribal organizations and include:

- *Roads, bridges & culverts
- *Draining & irrigation channels
- *Schools, city halls & other buildings
- *Water, power & sanitary systems
- *Airports & parks

Private nonprofit organizations are groups that own or operate facilities that provide services otherwise performed by a government agency and include, but are not limited to the following:

- *Universities and other schools
- *Hospitals & clinics
- *Volunteer fire & ambulance
- *Power cooperatives & other utilities
- *Custodial care & retirement facilities
- *Museums & community centers

Title: Emergency Management Performance Grant

Agency: Federal Emergency Management Agency

By authorizing the Robert T. Stafford Disaster Relief and Emergency Assistance Act and Section 662 of the Post Katrina Emergency Management Reform Act of 2006, Congress approved the creation of a national program to provide a funding mechanism. Title VI of the Stafford Act authorizes FEMA to make grants for the purpose of providing a system of emergency preparedness for the protection of life and property in the United States from hazards and to vest responsibility for emergency preparedness jointly in the federal government and the states and their political subdivisions. The Federal Government, through the EMPG Program, provides necessary direction, coordination, and guidance, and provides necessary assistance, as authorized in this title, to support a comprehensive all hazards emergency preparedness system.

The funding is administered through the state based upon a 50% Federal share and 50% non-Federal share. The non-Federal match can be fully in-kind or cash, or a combination.

FEMA provides EMPG assistance to states that, in turn, can provide sub-grants to local governments for accomplishing the following eligible mitigation activities: management and administration, planning, organization costs, equipment, training, conducting exercises, construction and renovation projects, and maintenance and sustainment activities and projects.

Title: SBA Disaster Assistance Program

Agency: US Small Business Administration

The SBA Disaster Assistance Program provides low-interest loans to businesses following a Presidential disaster declaration. The loans target businesses to repair or replace uninsured disaster damages to property owned by the business, including real estate, machinery and equipment, inventory and supplies. Businesses of any size are eligible, along with non-profit organizations.

SBA loans can be utilized by their recipients to incorporate mitigation techniques into the repair and restoration of their business.

Title: Community Development Block Grants

Agency: US Department of Housing and Urban Development

The Community Development Block Grant (CDBG) program provides grants to local governments for community and economic development projects that primarily benefit low- and moderate-income households. The CDBG program also provides grants for post-disaster hazard mitigation and recovery following a Presidential disaster declaration. Funds can be used for activities such as acquisition, rehabilitation, or reconstruction of damaged properties and facilities and for the redevelopment of disaster areas.

Title: Community Assistance

Agency: US Bureau of Land Management

This funding can be used on private land adjacent to BLM lands. In addition, through the CWPP process the community can recommend fuels treatment project to the BLM on their jurisdictional area.

Title: State Fire Assistance-Healthy Forests Restoration Act (HFRA)

Agency: US Forest Service

The Healthy Forests Restoration Act allows communities to identify/recommend fuel mitigation projects on public lands. This in turn allows federal agencies to plan, process, and implement projects on these lands in an expedited manner.

Title: Stevens

Agency: US Forest Service

The Stevens grant is funding for projects that include a portion of Forest Service land and there must be a prescribed fire component.

Title: Secure Rural Schools and Community Self Determination Act

Agency: US Forest Service (money is funneled through the State Department of Treasury then to the Counties).

This act was amended and reauthorized for fiscal year 2008-2011, and was signed by the President on October 3, 2008. This authorizes the use of Title III monies for the development of Community Wildfire Protection Plans. The Utah Division of Forestry, Fire, and State Lands has technical experts who can assist with the development of these plans.

Title: Disaster Assistance and Relief Act

Agency: (no agency other than Congress)

This funding can be used to implement “shovel or chainsaw” ready projects. These project areas must be adjacent to Forest Service lands. A community must have an approved Community Wildfire Protection Plan to be eligible for these funds.

Local

Local governments depend upon local property taxes as one of their primary sources of revenue. These taxes are typically used to finance services that must be available and delivered on a routine and regular basis to the general public. If local budgets allow, these funds are used to match Federal or State grant programs when required for large-scale projects.

Non-Governmental

Another potential source of revenue for implementing local mitigation projects are monetary contributions from non-governmental organizations, such as private sector companies, churches, charities, community relief funds, the Red Cross, hospitals, Land Trusts, and other non-profit organizations.

In addition to the public comment period for the draft version of the plan, including the proper public notices in local newspapers, a press release of the final plan will help to educate the public. This should involve education on the need for preparing for and mitigating against the effects of natural hazards and the purpose and usefulness of the final adopted plan.

As implementation of the mitigation strategies continues in each local jurisdiction, the primary means of public involvement will be the jurisdiction's own public comment and hearing process. State law as it applies to municipalities and counties requires this as a minimum for many of the proposed implementation measures. Tooele County encourages Cities and Towns to go beyond the minimal requirements of receiving public input, and to engage stakeholders.

CONTINUED PUBLIC INVOLVEMENT

During interim periods between the five year re-write, efforts will be continued to encourage and facilitate public involvement and input. The plan will be available for the public electronically on the Tooele County Emergency Management website (www.tcem.org). A hardcopy will also be available at the Tooele County Emergency Management office in Tooele, Utah. Comments will always be received whether orally, written, or by e-mail.

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APPENDIX A - REGIONAL DEMOGRAPHICS AND POPULATION DATA

Annual Estimates of the Population for Communities in Tooele County, Utah July 1, 2010 to July 1, 2014							
Population Estimates							
Geographic Area	2010	2011	2012	2013	2014	10-'14 Population Growth	10-'14 Percent Growth
Confederate Tribe of the Goshute Reservation	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Erda	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Grantsville	8,960	9,113	9,395	9,615	9,838	878	9.79%
Lake Point	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ophir	44	45	46	48	48	4	9.09%
Pine Canyon	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rush Valley	444	451	459	470	468	24	5.40%
Skull Valley	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stansbury Park	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Stockton	634	632	630	630	638	4	0.63%
Tooele	31,725	32,055	32,088	32,339	32,573	848	2.67%
Vernon	249	252	255	262	264	15	6.02%
Wendover	1,402	1,398	1,395	1,401	1,397	-5	-0.35%
Unincorporated County	58,517	59,272	59,864	60,750	61,625	3,108	5.04%
Data Source: Annual Estimates of the Resident Population: April 1, 2010 to July 1, 2014, 2014 Population Estimates (U.S. Census Bureau). N/A = Not Available							

TOOELE COUNTY - DEMOGRAPHIC AND HOUSING ESTIMATES
2010-2014 American Community Survey 5-Year Estimates

Subject	Estimate	Percent
SEX AND AGE		
Total population	59,973	59,973
Male	30,220	50.4%
Female	29,753	49.6%
Under 5 years	5,432	9.1%
5 to 9 years	6,310	10.5%
10 to 14 years	6,118	10.2%
15 to 19 years	4,930	8.2%
20 to 24 years	3,324	5.5%
25 to 34 years	8,266	13.8%
35 to 44 years	8,749	14.6%
45 to 54 years	6,837	11.4%
55 to 59 years	2,644	4.4%
60 to 64 years	2,802	4.7%
65 to 74 years	2,788	4.6%
75 to 84 years	1,390	2.3%
85 years and over	383	0.6%
Median age (years)	30.3	(X)
18 years and over	38,753	64.6%
21 years and over	36,294	60.5%
62 years and over	6,164	10.3%
65 years and over	4,561	7.6%
18 years and over	38,753	38,753
Male	19,382	50.0%
Female	19,371	50.0%
65 years and over	4,561	4,561
Male	2,141	46.9%
Female	2,420	53.1%
RACE		
Total population	59,973	59,973
One race	59,022	98.4%
Two or more races	951	1.6%
One race	59,022	98.4%
White	55,483	92.5%
Black or African American	499	0.8%
American Indian and Alaska Native	677	1.1%
Cherokee tribal grouping	7	0.0%
Chippewa tribal grouping	0	0.0%
Navajo tribal grouping	350	0.6%
Sioux tribal grouping	12	0.0%
Asian	522	0.9%

Asian Indian	0	0.0%
Chinese	165	0.3%
Filipino	142	0.2%
Japanese	65	0.1%
Korean	31	0.1%
Vietnamese	0	0.0%
Other Asian	119	0.2%
Native Hawaiian and Other Pacific Islander	217	0.4%
Native Hawaiian	84	0.1%
Guamanian or Chamorro	0	0.0%
Samoan	106	0.2%
Other Pacific Islander	27	0.0%
Some other race	1,624	2.7%
Two or more races	951	1.6%
White and Black or African American	152	0.3%
White and American Indian and Alaska Native	275	0.5%
White and Asian	208	0.3%
Black or African American and American Indian and Alaska	0	0.0%
Race alone or in combination with one or more other races		
Total population	59,973	59,973
White	56,377	94.0%
Black or African American	670	1.1%
American Indian and Alaska Native	994	1.7%
Asian	760	1.3%
Native Hawaiian and Other Pacific Islander	371	0.6%
Some other race	1,767	2.9%
HISPANIC OR LATINO AND RACE		
Total population	59,973	59,973
Hispanic or Latino (of any race)	7,052	11.8%
Mexican	5,571	9.3%
Puerto Rican	121	0.2%
Cuban	26	0.0%
Other Hispanic or Latino	1,334	2.2%
Not Hispanic or Latino	52,921	88.2%
White alone	50,294	83.9%
Black or African American alone	498	0.8%
American Indian and Alaska Native alone	655	1.1%
Asian alone	513	0.9%
Native Hawaiian and Other Pacific Islander alone	217	0.4%
Some other race alone	88	0.1%
Two or more races	656	1.1%
Two races including Some other race	13	0.0%
Two races excluding Some other race, and Three or more	643	1.1%
Total housing units	19,925	(X)

'N' - Data for this geographic area cannot be displayed because the number of sample cases is too small.

(X) - The value is not applicable or not available.

APPENDIX B - NATURAL HAZARDS DEFINITIONS AND INFORMATION

HAZARD DEFINITIONS

The following is a description of each of the hazards evaluated in Tooele County's Pre-disaster Mitigation Plan. These definitions, with minor modifications and additions, were developed by DESHS and used by permission in this plan.

Flooding

Flooding is a temporary overflow of water onto lands not normally inundated by water producing measurable property damage or forcing evacuation of people and vital resources. Floods frequently cause loss of life; property damage and destruction; damage and disruption of communications, transportation, electric service, and community services; crop and livestock damage and loss, and interruption of business. Floods also increase the likelihood of hazard such as transportation accidents, contamination of water supplies, and health risk increase after a flooding event.

Another important consideration to make regarding flooding is the variety of flood types and other hazards that often happen at the same time flooding occurs. For example, rarely are flood waters clear and free from debris. Often, mud/sediment/debris flows happen concurrently with flooding, causing damages sometimes more severe than what flooding alone may have caused. Also, when defining and analyzing flood hazards in the Bear River Region, irrigation canals should be included. Canals are not designed to handle storm water during high rain events. By the nature of canal design, the further downstream on the canal, the less water that canal can handle. As water is extracted from the system, less water is available. This design is opposite to how a storm water system is designed, which should be able to handle higher flows further downstream (Scott Stoddard, personal communication, 8/13/09). Canals located on steep or unstable hillsides can also exacerbate problems when a landslide occurs, increasing risk and adding an element of flooding to an already dangerous situation.

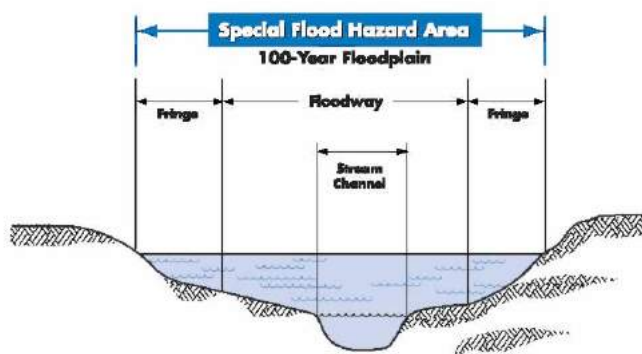
As development near floodplains occurs, cut and fill of hillsides can change the hydrology of the land-

scape. In some circumstances, the floodplain levels can actually raise much like putting marbles one at a time in a bathtub filled with water. One by one, projects can slowly alter the floodplain until more residents and structures are at risk. Homes built earlier that were never in the FEMA floodplain to begin with could then be at risk.

Several factors determine the severity of floods including rainfall intensity, duration and rapid snowmelt. A large amount of rainfall over a short time span can result in flash flood conditions. Small amounts of rain can also result in flooding at locations where the soil has been previously saturated or if rain concentrates in an area having impermeable surfaces such as large parking lots, paved roadways, or post-burned areas with hydrophobic soils. Topography and ground cover are also contributing factors for floods. Water runoff is greater in areas with steep slopes and little or no vegetative ground cover.

Frequency of inundation depends on the climate, soil, and channel slope. In regions where substantial precipitation occurs during a particular season or in regions where annual flooding is due to spring melting of winter snow pack, areas at risk may be inundated nearly every year.

Conditions which may exacerbate floods include: steeply sloped watersheds, constrictions, obstructions, debris contamination, soil saturation and velocity.



Explanation of Common Flood Terms

FIRM: Flood Insurance Rate Map

100-year flood: Applies to an area that has a 1 percent chance, on average, of flooding in any given year. However, a 100-year flood could occur two years in a row, or once every 10 years. The 100 year-flood is also referred to as the base flood.

Base Flood: Is the standard that has been adopted for the NFIP. It is a national standard that represents a compromise between minor floods and the greatest flood likely to occur in a given area and provides a useful benchmark.

Base Flood Elevation (BFE): As shown on the FIRM, is the elevation of the water surface resulting from a flood that has a 1% chance of occurring in any given year. The BFE is the height of the base flood, usually in feet, in relation to the National Geodetic Vertical Datum (NGVD) or 1929, the North American Vertical Datum (NAVD) of 1988, or other datum referenced in the FIS report.

Special Flood Hazard Area (SFHA): Is the shaded area on a FIRM that identifies an area that has a 1% chance of being flooded in any given year (100-year floodplain).

Floodway: Is the stream channel and that portion of the adjacent floodplain that must remain open to permit passage of the base flood without raising that water surface elevation by more than one foot.

Earthquakes

An earthquake is the abrupt shaking of the earth caused by the sudden breaking of rocks when they can no longer withstand the stresses, which build up deep beneath the earth's surface. The rocks tend to rupture along weak zones referred to as faults. When rocks break they produce seismic waves that are transmitted through the rock outward producing ground shaking. Earthquakes are unique multi-hazard events, with the potential to cause huge amounts of damage and loss. Secondary effects of a sudden release of seismic energy (earthquake) include: ground shaking, surface fault rupture, liquefaction,

tectonic subsidence, slope failure, and various types of flooding.

The Intermountain Seismic Belt

The Intermountain Seismic Belt (ISB), which the Bear River Region is part of, is a zone of pronounced earthquake activity up to 120 miles wide extending in a north south direction 800 miles from Montana to northern Arizona. The Utah portion of the ISB trends from the eastern Box Elder and Cache County area south through the center of the State, along the Wasatch Front, and then southwest through Richfield and Cedar City, concluding in St. George. "The zone generally coincides with the boundary between the Basin and Range physiographic province to the west and the Middle Rocky Mountains and Colorado Plateau physiographic provinces to the east" (Eldredge 6).

Secondary Earthquake Threats

The major secondary effects of earthquakes include: ground shaking, surface fault rupture, liquefaction, tectonic subsidence, avalanches, rock fall, slope failure, and various types of flooding. Other sections discuss landslides, and flooding therefore they will not be discussed under secondary effects of earthquakes yet importance needs to be given to the fact that earthquakes can increase the likelihood of flooding and landslides.

Ground Shaking

Ground shaking causes the most impact during an earthquake because it affects large areas and is the origin of many secondary effects associated with earthquakes. Ground shaking, which generally lasts 10 to 30 seconds in large earthquakes, is caused by the passage of seismic waves generated by earthquakes. Earthquake waves vary in both frequency and amplitude. High frequency low amplitude waves cause more damage to short stiff structures, where as low frequency high amplitude waves have a greater effect on tall (high-rise) structures. Ground shaking is measured using Peak Ground Acceleration (PGA). The PGA measures the rate in change of motion relative to the established rate of accelera-

tion do to gravity.

Local geologic conditions such as depth of sediment and sediment make up, affect earthquake waves. Deep valley sediments increase the frequency of seismic waves relative to bedrock. In general, ground shaking increases with increased thickness of sediments” (Eldredge 8).

Surface Fault Rupture

During a large earthquake fault movement may propagate along a fault plain to the surface, resulting in surface rupture along the fault plain. Most faults in the Bear River Region are normal (mountain building) faults with regards to movement, meaning the footwall of the fault moves upward and the hanging wall moves in a down direction. Thus faulting is on a vertical plain, which results in the formation of large fault scarps. In historic time surface fault rupture has only occurred once in Utah; the 1934 Hansel Valley earthquake in Box Elder County with a magnitude 6.6 produced 1.6 feet of vertical offset.

Surface fault rupture presents several hazards, anything built on top of the fault or crossing the fault has a high potential of being destroyed in the event of displacement. Foundations will be cracked, buildings torn apart, damage to roads, utility lines, pipelines, or any other utility line crossing the fault. It is almost impossible to design anything within reasonable cost parameters to with stand an estimated displacement of 16 to 20 feet.

Surface fault rupture doesn't occur on a single distinct plain; instead it occurs over a zone often several hundred feet wide known as the zone of deformation. This zone of deformation occurs mainly on the down thrown side of the main fault trace. Tectonic subsidence, caused by antithetic faults moving in the opposite direction of the main fault, slide down hill on the main fault scarp creating grabens (down dropped blocks) within the zone of deformation.

Hintze described an “enigma” of Utah in that seismicity does not always coincide with surface fault scarps or faults (Geologic History of Utah, 1988). The epicenter of the earthquake may be miles away

from the surface faulting.

Liquefaction

Soil liquefaction occurs when water-saturated cohesionless sandy soils are subject to ground shaking. When liquefaction occurs, soils behave more like a viscous liquid (quicksand) and lose their bearing capacity and shear strength. Two conditions must be met in order for soils to liquefy: (1) the soils must be susceptible to liquefaction (sandy, loose, water-saturated, soils typically between 0 and 30 feet below the ground surface) (2) ground shaking must be strong enough to cause susceptible soils to liquefy (lips). The loss of shear strength and bearing capacity due to liquefaction causes buildings to settle or tip and light buoyant structures such as buried storage tanks and empty swimming pools to float upward. Liquefaction can occur during earthquakes of magnitude 5.0 or greater.

Lateral Spread

Soils, once liquefied, can flow on slopes with angles of .5 to 5 percent this movement of liquefied soils is known as lateral spread. “The surficial soil layers break up and sections move independently, and are displaced laterally over a liquefied layer” (Eldredge 10). Liquefaction can cause damage in several ways, with lateral spreading being one of the most common. Displacement of three (3) or more feet may occur and be accompanied by ground cracking and vertical displacement. Lateral spreading causes roads, buildings, buried utilities, and any other buried or surface structure to be pulled apart.

Various Flooding Issues Related to Earthquakes

Earthquakes could cause flooding due to the tilting of the valley floor, dam failure and seiches in lakes and reservoirs. Flooding can also result from the disruption of rivers and streams. Water tanks, pipelines, and aqueducts may be ruptured, or canals and streams altered by ground shaking, surface faulting, ground tilting, and landsliding.

Seiches

Standing bodies of water are susceptible to earthquake ground motion. Water in lakes and reservoirs may be set in motion and slosh from one end to the other, much like in a bathtub. This motion is called a seiche (pronounced “saysh”). A seiche may lead to dam failure or damage along shorelines.

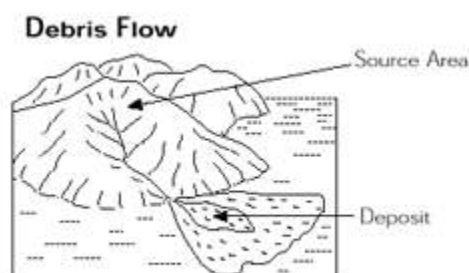
Landslides

Landslides are defined as, “...the movement of a mass of rock, debris, or earth down a slope (Cruden, 1991).” Landslides, often referred to as mass wasting or slope failure, are one of the most common natural disasters. Slope failures can vary considerably in shape, rate of movement, extent, and effect on surrounding areas. Slope failures are classified by their type of movement, and type of material. The types of movement are classified as falls, slides, topples, and flows. “The types of material include rock, debris (coarse grained soil) and earth (fine grained soil)” (Eldredge 17). “Types of slope failures then are identified as rock falls, rock slides, debris flows, debris slides, and so on” (Eldredge 17). Slope failures occur because of either an increase in the driving forces (weight of slope and slope gradient) or a decrease in the resisting forces (friction, or the strength of the material making up a slope). “Geology (rock type and structure), topography (slope gradient), water content, vegetative cover, and slope aspect are important factors of slope stability” (Eldredge 18).

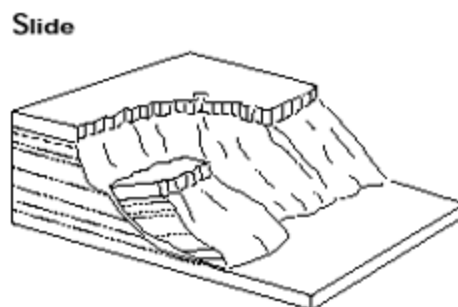
Certain landslides, such as debris flows can be exacerbated by flooding and water saturation. Landslides alone can be dangerous, but adding flooding to the situation can increase risk.

Three Common Types of Landslides in Utah

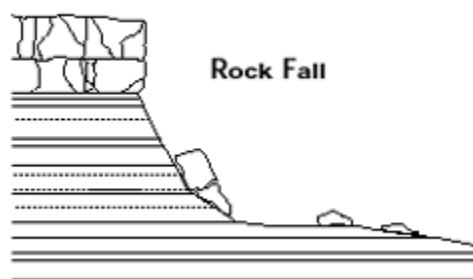
Debris flows consist of sediment-water mixtures that flow down a streambed or hillside, commonly depositing sediment at canyon mouths in fan like deposits known as alluvial fans.



Slides are down slope movements of soil or rock on slopes.



Rock falls consist of rock(s) falling from a cliff or cut slope and are very common in the canyon country of southern Utah.



Conditions That Make Slopes More Susceptible to Landslides

- Discontinuities: faults, joints, bedding surfaces.
- Massive Materials over soft materials.
- Orientations of dip slope: bedding plans that dip out of slope.

- Loose structure and roundness.
- Adding weight to the head of a slide area: rain, snow, landslides, mine waste piles, buildings, leaks from pipes, sewers, and canals, construction materials fill materials.
- Ground shaking: earthquakes or vibrations.
- Increase in lateral spread caused by mechanical weathering.
- Removal of lateral support.
- Human activities: cut and fill practices, quarries, mine pits, road cuts, lowering of reservoirs.
- Removing underlying support: under cutting of banks in a river.
- Increase in pore water pressure: snow melt, rain, and irrigation.
- Loss of cohesion.

Steep Slopes

According to the Utah Governor's Office of Planning and Budget (UGOPB), steep slopes are considered areas with a slope angle of 20% or greater over a minimum horizontal distance of 30 feet (UGOPB, n.d.). Areas with steep slopes put development and lands are risk for a variety of reasons. Steeper slopes can fail, leading to damaged property and resources. Risk to avalanche increases in areas with high angle slopes. Erosion is often associated with steep slopes as well, as displacement of soils and debris is more likely to occur with severe weather events. Steeper terrain is also increases wildfire risk in dry areas with adequate fuel loads. Complicating the risk associated with steep slopes is that mitigation can be more expensive, as construction and engineering solution cost more to implement.

Utah Governor's Office of Planning and Budget. (n.d.) *Steep Slopes*. Retrieved from <http://www.planning.utah.gov/CriticalLands/Critical%20Lands%20PDFs/steepslopes.pdf>

Wildfire

A wildfire is an uncontrolled fire spreading through vegetative fuel often exposing or consuming structures. Wildfires often begin unnoticed and spread quickly and are usually sighted by dense smoke.

Wildfires are placed into two classifications Wildland and Urban-Wildland Interface.

Wildland fires are those occurring in an area where development is essentially nonexistent, except for roads, railroads, or power lines. Urban-Wildland Interface fire is a wildfire in a geographical area where structures and other human development meet or intermingle with wildland or vegetative fuels.

When discussing wildfires it is important to remember that fires are part of a natural process and are needed to maintain a healthy ecosystem. Three basic elements are needed for a fire to occur (1) a heat source (2) oxygen and (3) fuel. Major ignition sources for wildfire are lightning and human causes such as arson, recreational activities, burning debris, and carelessness with fireworks. On average, 65 percent of all wild fires started in Utah can be attributed to human activities. Once a wildfire has started, vegetation, topography and weather are all conditions having an affect wildfire behavior.

Severe Weather

For the purpose of this mitigation plan the term severe weather is used to represent downbursts, lightening, heavy snowstorms, blizzards, avalanches, hail, and tornados.

Downbursts

A downburst is a severe localized wind, blasting from a thunderstorm. Depending on the size and location of these events, the destruction to property may be devastating. Downbursts fall into two categories by size. Microbursts cover an area less than 2.5 miles in diameter. Macrobusts cover an area with a diameter larger than 2.5 miles.

Lightening

During the development of a thunderstorm, the

rapidly rising air within the cloud, combined with the movement of the precipitation within the cloud, causes electrical charges to build. Generally, positive charges build up near the top of the cloud, while negative charges build up near the bottom. Normally, the earth's surface has a slight negative charge. However, as the negative charges build up near the base of the cloud, the ground beneath the cloud and the area surrounding the cloud becomes positively charged. As the cloud moves, these induced positive charges on the ground follow the cloud like a shadow. Lightning is a giant spark of electricity that occurs between the positive and negative charges within the atmosphere or between the atmosphere and the ground. In the initial stages of development, air acts as an insulator between the positive and negative charges. When the potential between the positive and negative charges becomes too great, there is a discharge of electricity that we know as lightning.

Heavy Snowstorms

A severe winter storm deposits four or more inches of snow during a 12-hour period or six inches of snow during a 24-hour period. According to the official definition given by the U.S. Weather Service, the winds must exceed 35 miles per hour and the temperature must drop to 20° F or lower. All winter storms make driving extremely dangerous.

Blizzards

A blizzard is a snowstorm with sustained winds of 40 miles per hour (mph) or more or gusting winds up to at least 50 mph with heavy falling or blowing snow, persisting for one hour or more, temperatures of ten degrees Fahrenheit or colder and potentially life-threatening travel conditions. The definition includes the conditions under which dry snow, which has previously fallen, is whipped into the air and creates a diminution of visual range.

Hail Storms

Hailstones are large pieces of ice that fall from powerful thunderstorms. Hail forms when strong updrafts within, the convection cell of a cumulo-

nimbus cloud carries water droplets upward causing them to freeze. Once the droplet freezes, it collides with other liquid droplets that freeze on contact. These rise and fall cycles continue until the hailstone becomes too heavy and falls from the cloud.

Drought

Drought is a normal recurrent feature of climate, although many, in Utah, erroneously consider it a rare and random event. It occurs in virtually all climatic zones, while its characteristics vary significantly from one region to another. Droughts, simple put, are cumulative hazards, which result from long periods of below normal precipitation. Drought is a temporary aberration and differs from aridity since the latter is restricted to low rainfall regions and is a permanent feature of climate.

The State of Utah uses the Palmer Drought Severity Index or (PDSI) to quantify the existence of a drought. Using the PDSI, drought is expressed as a negative number. Much of the basis, used by the State, to determine drought years, or drought periods, comes from the PDSI. In addition, the PDSI is used by the State Climatologist, the National Geophysical Data Center of NOAA, and the National Drought Mitigation Center.

For the most part droughts no longer affect the availability of drinking water, thus no longer place people's lives at risk, the same cannot be said for a person's livelihood. Numerous water projects throughout the state have placed enough water in storage to insure drinking water. Prolonged droughts have a significant effect on agricultural and agribusinesses, within the state dependent on irrigation water. Droughts also stress wildlife, and heighten the risk of wildfire.

Tornados and High Winds

According to the National Oceanic and Atmospheric Administration, a tornado is defined as a violently rotating column of air extending from a thunderstorm to the ground. While there have not been many destructive tornados in Utah's history, several have caused damages and casualties. The most

destructive of these was the Salt Lake City tornado on August 11, 1999. This F2 tornado caused \$170 million in damages, injured 80 people, and caused one casualty (Alder et al., 2005).

In the Bear River Region, many of the tornados on record have been in mostly unpopulated areas, and have not caused any substantial damages or threats to life. However, history has shown the potential for tornados in the region, and communities should be aware of that potential, and the possible risk of a tornado touching down in their community.

Dam Failure

Dam failures result from the failure of a man made water impoundment structure, which often results in catastrophic down grade flooding. Dam failures are caused by one or a combination of the following: “breach from flooding or overtopping, ground shaking from earthquakes, settlement from liquefaction, slope failure, internal erosion from piping, failure of foundations and abutments, outlet leaks or failures, vegetation and rodents, poor construction, lack of maintenance and repair, misuse, improper operation, terrorism, or a combination of any of these” (Eldredge, 46). The Utah State Engineer has been charged with regulating non-federal dams in the State dams since 1919. “In the late 1970’s Utah started its own Dam Safety Section within the State of Utah Engineers Office to administer all non-federal dams in response to the Federal Dam Safety Act (PL-92-367)” (Eldredge, 46).

The State Dam Safety Section has developed a hazard rating system for all non-federal dams in Utah. Downstream uses, the size, height, volume, and incremental risk/damage assessments or dams are all variables used to assign dam hazard ratings in Dam Safety’s classification system. Using the hazard ratings systems developed by the Dam Safety Section, dams are placed into one of three classifications high, moderate, and low. Dams receiving a low rating would have insignificant property loss due to dam failure. Moderate hazard dams would cause significant property loss in the event of a breach. High hazard dams would cause a possible loss of life in the event of a rupture. The frequency of dam

inspection is designated based on hazard rating with the Division of Water Rights inspecting high-hazard dams annually, moderate hazard dams biannually and low-hazard dams every five years.

Agricultural (Infestation, Disease, Livestock/Crop Loss)

Agricultural losses can be detrimental to residents and local economies in the Bear River Region. Insect infestation and other types of crop loss can not only affect a farmer’s livelihood, but can lessen the amount of feed available for livestock, and lead to increased feed prices. Disease can also have extremely negative effects for the agricultural economy and residents livelihoods, where animals and crop populations can quickly be decimated. Where the Bear River Region relies quite substantially on agricultural incomes, these threats should be taken seriously and planned for accordingly.

Avalanche

An avalanche is a flow of snow down a steep slope. Generally, the snow is released due to a mechanical failure in structure of the snow, which often occurs after the deposit of multiple layers of snowfall (snowpack). There are three different types of avalanches, slab, powder snow, and wet snow, with slab avalanches being the most common in backcountry recreation accidents. Gravity can trigger avalanches, however they may also be triggers by other forces such as human use, such as skiing or snowmobiling. Large-scale avalanches often coincide with severe winter weather events.

Volcanic

According to the Natural Disasters Association, volcanoes are a “landform created by magma by the earth’s interior.” Volcanic eruptions have the potential to have a wide variety of impacts ranging from loss of life, to destruction of property, lands, and agricultural production. The closest active volcano to the region is Yellowstone, which could have a catastrophic effect on the region. Volcanic activity also creates several other hazards such as landslides,

tsunamis and debris flows. Another aspect of volcanic activity that poses a risk is geothermal activity. Geothermal activity has the potential to heat bodies of water used for recreation, as well as release dangerous gasses into the atmosphere.

Radon

According to the Environmental Protection Agency (EPA), radon “is an odorless, tasteless and invisible gas produced by the decay of naturally occurring uranium in soil and water” (EPA, 2014). Radon’s only known risk is its ability to cause lung cancer in humans. Radon can exist in both indoor and outdoor areas. If an indoor space is found to have high levels of radon, the EPA recommends have the space repaired immediately to reduce levels to a safer level.

Source:

Environmental Protection Agency. (2014). *Radon*. Retrieved from <http://www.epa.gov/radon/aboutus.html>

Tsunami

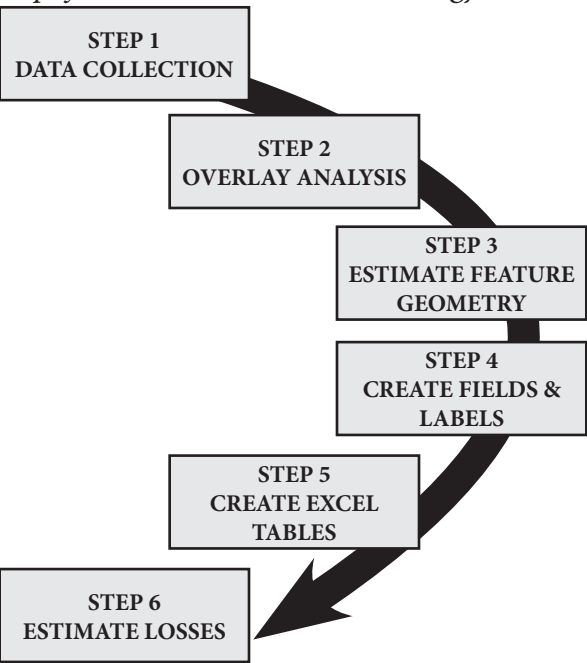
A tsunami is a set of waves, most commonly associated with the ocean that cause impacts to bodies of water and their surrounding shorelines. Tsunamis can also be associated with lakes in landlocked environments. Generally, three events trigger tsunamis, volcanoes, earthquakes and landslides. When faulting occurs near the surface during an earthquake, the resulting uplift or slippage creates a wave of water that grows as it reaches shore. Deposits of a landslide in a body of water can have a similar impacts, displacing water in an area and creating waves. Damage associated with tsunamis is a result of flooding from the corresponding waves.

APPENDIX C - DETAILED RISK ASSESSMENT METHODOLOGY

The risk assessment methodology for this plan includes several steps to gather, prepare, input, analyze, and export data to provide detailed information of the potential impacts of natural hazards in Tooele County. The planning team primarily utilized Geographic Information Systems (GIS) software, developed by Environmental System Research Institute (ESRI). This software enables the creation of large data set models in ArcGIS Modelbuilder to input and analyze spatial information. This feature of the software was relied on heavily for processing all spatial layers, and ultimately for generating the spatial information provided in the Community Risk Assessment tables.

GIS analysis also included the use of Python scripting features of ArcGIS to automate the creation of fields and labeling each file with the necessary hazard, input, and jurisdiction information for many output files generated from this hazard overlay process. To help illustrate the methodology for this analysis, the process steps for generating the risk assessment findings of this report are shown below.

Steps for Risk Assessment Methodology



STEP 1 - DATA COLLECTION

Step one is used to identify all available spatial data to be included in the model. This includes all hazard types, jurisdictional boundaries, and input layers that were organized into the following five categories: Agriculture, Critical Facilities, Environmental/Recreational, Infrastructure, and Population. The list below identifies all the hazard and input layers that were identified and grouped by their respective category. See Appendix G for a complete list of layers and data sources/ descriptions.

HAZARD LAYERS

- Dam Failure
- Geologic Faults
- Wildfire (moderate to high risk)
- Flood (FEMA FIRM)
- Flood (Soils)
- Liquefaction (moderate-high to high risk)
- Landslides
- Steep Slopes (20% slope or higher)
- High Water Table (Soils)
- Unsuitable Soils for Buildings (Soils)

INPUT LAYERS

Agriculture

- Agricultural Land (producing)
- Grazing Lands (permits)

Critical Facilities

- Airports
- Bridges
- Broadband Anchors
- Jail/Correctional Facilities
- Dams
- EMS/Fire Stations
- Health Care/Mental Health Facilities
- Law Enforcement Offices
- Places of Worship
- Public Facilities
- Schools
- Water Storage
- Solid Waste/Oil Facility
- Oil/Gas Well
- Senior Care Centers

Environmental/Recreational

- Lakes
- Local Parks
- Outdoor Amenities
- Riparian Areas
- Streams
- Trails
- Wetlands

Infrastructure

- Canals
- Electrical Lines
- Natural Gas Lines
- Railroads
- Roads

Population

- Commercial Parcels
- Population Density
- Residential Parcels

After identifying all available spatial data, the planning team worked to prepare all the hazard layers for analysis. This was based on meetings with technical experts in their respective fields to ensure data accuracy, and also to utilize any categories or ranking of the hazard data that is relevant and most beneficial to assessing risks to people and resources in the region.

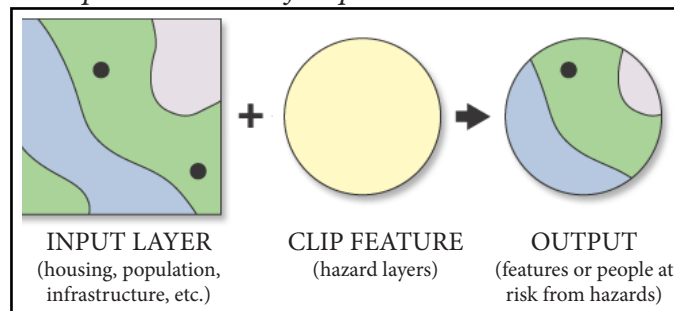
Once all available data was identified and processed, the planning team created the remaining infrastructure layers through digitization in ArcGIS. This included the geocoding of pdf maps for all Questar Natural Gas lines in the region. Ruby Pipeline was also digitized by observing ground disturbance through the use of aerial imagery provided by the National Agriculture Imagery Program (NAIP).

STEP 2 - OVERLAY ANALYSIS

After preparing and organizing spatial layers by category, models were developed to overlay all of the hazard layers with each of the input layers. This was done first at the county level, then at the municipal level.

This process is accomplished with the Clip (Data Management) tool in ArcGIS. The tool extracts all features of a layer that are within the features of another layer - similar to a cookie cutter. Using this tool, each input layer was clipped by individual hazard layer, then clipped by county, and lastly by jurisdictional boundary.

Example Illustration of Clip Tool



The use of ArcGIS Modelbuilder greatly reduced the amount of time necessary to process such a large number of hazard and input layers.

STEP 3 - ESTIMATE FEATURE GEOMETRIES

Once all the overlay models are complete, the resulting output files contain one of three types of geometric features that are either point, line, or polygon. Point features for example include mostly structures or facilities such as airports, bridges, or schools. Line features include things like roads, railroad, or utility lines. And lastly, polygon features include areas such as agricultural land, housing or commercial parcels, wetlands, or parks.

Using the feature geometry of each line or polygon output file, distance or area calculations can be estimated within ArcGIS. This information is added to the attribute table of each layer in order to identify the total linear miles or acres of input

features impacted by hazards. This information is then used later to assign dollar values to each feature impacted by natural hazards.

STEP 4 - CREATE OUTPUT FILE FIELDS & LABELS

With the large number of output files created through the modelling process, the ability to easily sort feature information is critical to estimating losses and organizing data by jurisdiction. This required the addition of four fields in the attribute table that help identify:

1. Input Layer - critical facility, road, parcel, etc.
2. Hazard Layer - flood, slope, etc.
3. Jurisdiction - location of hazard impacts
4. Feature Geometry - miles or acres of features impacted by hazards

Due to the large number of files requiring additional attribute fields and labels, Python programming scripts were written in the Pythonwin application to process all remaining files quickly and uniformly. This scripting feature allowed for the labeling of the final output files, and also for deleting any empty shapefiles created as a result of the modelling process where no overlap occurred between hazard and input layers.

STEP 5 - CREATE EXCEL TABLES

With all the models and scripts complete, files were merged according to geometry (point, line, or polygon) and then converted from shapefiles to Excel spreadsheets using the Merge and Table to Excel tools in ArcGIS Toolbox. This was done to minimize the number of ArcGIS licenses needed to complete the value and loss estimates by BRAG staff, and also for the sort and summarize functions available in Excel.

With all the modelling results in spreadsheet format, the planning team could easily assign dollar values to infrastructure input layer losses and quickly summarize those losses by hazard, input layer, and jurisdiction.

STEP 6 - ESTIMATE LOSSES

Dollar values for infrastructure losses were estimated using the following data sources (listed by layer):

Linear Infrastructure Cost Estimates

CANALS	
Cost Estimate	\$1.5 million/mile
Source	Bob Fotheringham, Cache County and regional project cost estimates, 2015.
ELECTRICAL LINES	
Cost Estimate	\$127,000/mile
Source	Logan Light & Power, 2015.
NATURAL GAS LINES	
Cost Estimate	\$1.4 million/mile. Derived by averaging linear foot replacement costs estimated for gas lines ranging from 2"-20", then multiplying the average by 5280 feet.
Source	Questar Gas, 2015.
RAILROADS	
Cost Estimate	\$1.5 million/mile
Source	BRAG Pre-Disaster Hazard Mitigation Plan, 2009.
ROADS	
Cost Estimate	\$525,000/mile. Derived with base replacement cost of \$350,000/mile with 50% added for unknowns and engineering/inspection.
Source	Bill Gilson, Box Elder County Road Supervisor & Josh Runhaar, Cache County Director of Development Services, 2015.

LETTER FROM QUESTAR GAS REGARDING NATURAL GAS LINE REPLACEMENT COSTS (Same cost estimates used for Tooele County Pre-Disaster Mitigation Plan)


Questar Gas

1140 West 200 South
P.O. Box 45360
Salt Lake City, UT 84145-0360
Tel 801-324-3539

Dan MacDonald

Operations Engineering

May 27, 2015

Zach Maughan
Bear River Association of Governments
170 N Main
Logan, Utah 84321

To whom it may concern,

In an email dated April 27, 2015, Bear River Association of Governments requested the replacement costs of Questar Gas pipeline facilities in Box Elder, Cache and Rich Counties. Below you will find tables containing the approximate replacement costs per linear foot for both distribution main (IHP) and high pressure main (HP). Any costs for repair or replacement will depend upon the nature of the required repairs or replacement. The estimated costs provided here are based upon the cost of material and labor in May of 2015. Moreover, the scope, timing and nature of an actual project would govern the actual costs and, without additional information, Questar Gas cannot provide more accurate estimates. Accordingly, Questar Gas does not warrant the reliability of this information for any particular purpose and offers it solely for informational purposes.

IHP	
Diameter	\$/linear foot
<=3"	\$ 60
4"	\$ 85
6"	\$ 130
8"	\$ 160
10"	\$ 185
12"	\$ 210

HP	
Diameter	\$/linear foot
2"	\$ 150
3"	\$ 165
4"	\$ 175
6"	\$ 205
8"	\$ 240
10"	\$ 275
12"	\$ 320
20"	\$ 590

Sincerely,
Dan MacDonald

APPENDIX D - LOCAL MITIGATION STRATEGY SURVEY AND COMMUNITY SUMMARIES

PRE-DISASTER MITIGATION PLAN UPDATE RISK ASSESSMENT

Page 1

PLEASE COMPLETE AND RETURN TO TOOELE COUNTY

**(Mail: 15 East 100 South, Tooele, Utah 84074, Email: bucky@tcm.org,
or FAX: (435) 882-9947 - Attention: Bucky Whitehouse)**

Jurisdiction Name: _____ Completed by: _____
Address: _____ Phone: _____ Email: _____

1. Does your community participate in the National Flood Insurance Program (NFIP)?
Yes _____ No _____ Don't Know _____

2. What existing or potential Natural Hazards threaten your community? (ex. drought, earthquake, flooding, landslide, wildfire, dam failure, soil subsidence etc):

3. Have there been Natural Hazard events in your community since December 2008? If so, please describe the event(s), the severity of the event(s) (damage or intensity), and the date, if known:

4. Do you have any maps, documents, or plans related to natural hazards for your community? Please describe:

5. Please list any "critical facilities" that exist in your city/town. These critical facilities could include hospitals, schools, fire stations, water treatment plants, or other facilities that help to protect citizens.

6. Does your city/town currently have zoning or ordinances that address natural hazards and/or regulate construction in potentially hazardous areas?
Yes _____ No _____ Don't Know _____

PRE-DISASTER MITIGATION PLAN UPDATE

RISK ASSESSMENT

Page 2

7. Please check (or circle) all the hazards below that you would like to have more extensive/robust analysis to help develop future mitigation strategies.

☐ Agricultural

☐ Problem Soils and Rock

☐ Avalanche

☐ Radon

☐ Dam Failure

☐ Severe Weather

☐ Drought

☐ Subsidence

☐ Earthquake

☐ Tornado

☐ Erosion

☐ Tsunami

☐ Flood

☐ Volcanic

☐ Hail

☐ Wildfire

☐ Landslide

☐ Others: _____

8. Please check (or circle) all the hazards below where you have experience or expertise that you or someone in your agency can contribute to the risk assessment analysis.

☐ Agricultural

☐ Problem Soils and Rock

☐ Avalanche

☐ Radon

☐ Dam Failure

☐ Severe Weather

☐ Drought

☐ Subsidence

☐ Earthquake

☐ Tornado

☐ Erosion

☐ Tsunami

☐ Flood

☐ Volcanic

☐ Hail

☐ Wildfire

☐ Landslide

☐ Other _____

Risk Assessment Survey: Tooele PDMP Update 2015-16											
Respondent Information		Survey Questions									
Jurisdiction Name	Completed By	1	2	3	4	5	6	7		8	
Grantsville City	Kevin Turner	Don't Know	Drought	Flooding-Homes, roads, fields (5yrs ago)	City Emergency Plan book w/maps & plans	UDOT Station	Yes	Agricultural	Problem Soils	Agricultural	Problem Soils
			Earthquake	Wildfires		City Hall		Avalanche	Radon	Avalanche	Radon
			Flooding			Schools		Dam Failure	Severe Weather-Winter Storms	Dam Failure	Severe Weather
			Soil Subsidence			Fire Station		Drought	Subsidence	Drought	Subsidence
			Wildfire			Water Treatment Plant		Earthquake	Tornado	Earthquake	Tornado
			Wind			Water Sources		Erosion	Tsunami	Erosion	Tsunami
			Lightening			Water Storage Tanks & Wells		Flood	Volcanic	Flood	Volcanic
						Senior Center		Hail	Wildfire	Hail	Wildfire
						Medical Office		Landslide	Other: Wind, Lightening(fires)	Landslide	Other:
						Retirement Home					
						Day Care Centers					
						Police Station					
Ophir	Scott Degelbeck	No	Flooding, wildfire, landslide	High water runoff 5 years ago. Controlled with sandbags and cleaning debris from creekbed	Have map showing hazard zones and land use codes.	Fire Station	Yes	Agricultural	Problem Soils	Agricultural	Problem Soils
						Need training		Avalanche	Radon	Avalanche	Radon
						Need water storage		Dam Failure	Severe Weather	Dam Failure	Severe Weather
						Need evacuation plan		Drought	Subsidence	Drought	Subsidence
								Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:	Landslide	Other:
Stockton	David Durtschi	don't know	Drought, earthquake, landslide, wildfire, soil subsidence, interruption of water supply	water flow stopped by mudslide...very severe	no	Fire station, town hall	yes	Agricultural	Problem Soils	Agricultural	Problem Soils

Risk Assessment Survey: Tooele PDMP Update 2015-16											
Respondent Information		Survey Questions									
Jurisdiction Name	Completed By	1	2	3	4	5	6	7		8	
	M Whitney	Don't Know	drought, earthquake, flooding, wildfire	flood, fire, low water/drought	no	water intake, water treatment, deep water well, fire dept.	no	Avalanche	Radon	Avalanche	Radon
	Mary Edwards	don't know	Wildfires, earthquakes, drought	Fire-extensive	no	water plant, town hall, fire station	don't know	Dam Failure	Severe Weather	Dam Failure	Severe Weather
	George B. Carter	Don't know	wildfire	not known	not at this time	fire station, water treatment plant	don't know	Drought	Subsidence	Drought	Subsidence
	Kendall Thomas	yes	drought, earthquake, flooding, wildfire	wild fire	don't know	fire station, water treatment plant	don't know	Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:	Landslide	Other: Water Quality
Tooele City	Rachelle Custer	Yes	All of the listed	none	FEMA floodplain maps, state geologic maps, City storm drain plan, Settlement Canyon Map, Tooele County Middle Canyon Flood Plain, Flood Plan	hospitals, schools	yes: sensitive area/hillside development; Flood Plain Development	Agricultural	Problem Soils	Agricultural	Problem Soils
	Dave McCall					City Hall, Health Dept.		Avalanche	Radon	Avalanche	Radon
						Stansbury Medical Care Facility		Dam Failure	Severe Weather	Dam Failure	Severe Weather-wind
						2 medical care facilities		Drought	Subsidence	Drought-water data	Subsidence
						County Jail, EOC		Earthquake	Tornado	Earthquake	Tornado
						water reclamation plant, Culinary water facilities		Erosion-Drainage Channels	Tsunami	Erosion	Tsunami
						churches, fire stations		Flood	Volcanic	Flood-Master Plan	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other: Industrial Depot	Landslide	Other:

Risk Assessment Survey: Tooele PDMP Update 2015-16											
Respondent Information		Survey Questions									
Jurisdiction Name	Completed By	1	2	3	4	5	6	7		8	
Vernon	Rodney R. Manzione	Don't Know	Drought, earthquake, Flood, wildfire, dam failure, landslide	drought, weather, fire	unknown	fire station, water storage, church, school	yes, flood zone	Agricultural	Problem Soils	Agricultural	Problem Soils
	Bruce Thomas (Mayor)	No	Wildfire, Dam Failure, Earthquake	no	no	water company	yes	Avalanche	Radon	Avalanche	Radon
	John Olson	no	Drought, Earthquake, Wildfires, Highway spill of harmful substance	drought	none	church	yes	Dam Failure	Severe Weather	Dam Failure	Severe Weather
								Drought	Subsidence	Drought	Subsidence
								Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:HWY Hazmat	Landslide	Other:
Wendover	Mike Crawford	yes	flooding, drought, rail, highway	aug. 2014- flash flooding	Emergency rescue plan, flood maps	community center, schools	yes	Agricultural	Problem Soils	Agricultural	Problem Soils
	Karen Shepherd	yes	earthquakes, landslide	Severe weather- washed out roads	Currently working on updating master plan	lds church, 2 schools, community building	don't know	Avalanche	Radon	Avalanche	Radon
	D.B. Sweat	yes	drought, earthquake, flooding, wildfire, technological, soil	floods- damage to roads and personal property	no	Elementary School, high school, fire station, sewer treatment	yes	Dam Failure	Severe Weather	Dam Failure	Severe Weather
	Steve Wallace	don't know	?	?				Drought	Subsidence	Drought	Subsidence
								Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other: Hazmat along interstate/rail road pollution, and distant water sources	Landslide	Other: nuclear, chemical, and biological incidence
Tooele County	Jerry Houghton	yes	Drought	2011- Floods, south Willow	don't know	hospitals, schools,	no	Agricultural	Problem Soils	Agricultural-Grass Hopper/Cricket	Problem Soils
	Wade Bitner		earthquake	2014- Anaconda Fire	working towards C.W.P.P. in surrounding communities	fire stations, water treatment plants	don't know	Avalanche	Radon	Avalanche	Radon
	Tom Wilson (FFSL)		Wildfire	Wildfire		army depot north & South		Dam Failure	Severe Weather	Dam Failure	Severe Weather
			Flooding	Hail storm (2-3")		Aragonite	yes, WUI Code	Drought	Subsidence	Drought	Subsidence

Risk Assessment Survey: Tooele PDMP Update 2015-16											
Respondent Information		Survey Questions									
Jurisdiction Name	Completed By	1	2	3	4	5	6	7		8	
			soils	patch Springs fire 2013,		Clean Harbours,	for any new building in	Earthquake	Tornado	Earthquake	Tornado
			water table	Stockton Fire 2014		Magnesium Corp	unincorporated county area	Erosion	Tsunami	Erosion	Tsunami
			landslide			Walmart Distribution		Flood	Volcanic	Flood	Volcanic
			dam failure					Hail	Wildfire	Hail	Wildfire
	Gordon Stewart	Don't know	drought			hospitals, clinics	yes	Landslide	Other: water storage	Landslide	Other: Pipeline Upgrade
Stansbury Park	Brett Palmer	no	Drought	no	Yes, infrastructure water, sewer, storm drainage	1 high school,	no	Agricultural	Problem Soils	Agricultural	Problem Soils
			Flooding			2 elementary schools,		Avalanche	Radon	Avalanche	Radon
			earthquake			1 Fire Station,		Dam Failure	Severe Weather	Dam Failure	Severe Weather
						3 Community Buildings,		Drought	Subsidence	Drought	Subsidence
						2 water storage tanks,		Earthquake	Tornado	Earthquake	Tornado
						6 wells & buildings,		Erosion	Tsunami	Erosion	Tsunami
						Sewer treatment plant		Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:	Landslide	Other:
Tooele County Health Dept.	J. Coombs	Don't Know	Drought	Flooding	no	hospitals, schools,	N/A	Agricultural	Problem Soils	Agricultural	Problem Soils
			Earthquake	Wind Damage		fire stations		Avalanche	Radon	Avalanche	Radon
			Winds			water treatment plant		Dam Failure	Severe Weather	Dam Failure	Severe Weather
			Wildfire					Drought	Subsidence	Drought	Subsidence
			Flooding					Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:	Landslide	Other:
National Weather Service	Kevin Barjenbra ch	N/A	N/A	N/A	N/A	N/A	N/A	Agricultural	Problem Soils	Agricultural	Problem Soils
Weather Forecast Office								Avalanche	Radon	Avalanche	Radon
Salt Lake City, Utah								Dam Failure	Severe Weather	Dam Failure	Severe Weather
								Drought	Subsidence	Drought	Subsidence
								Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire

Risk Assessment Survey: Tooele PDMP Update 2015-16

Respondent Information		Survey Questions									
Jurisdiction Name	Completed By	1	2	3	4	5	6	7		8	
									Other: Winter Storms, Debris Flows, Winds, Thunderstorm		Other: Winter Storms, Debris Flows, Winds, Thunderstorm
								Landslide		Landslide	
North Tooele County Fire	Randy Willden	yes	drought, Earthquake	Flood Canyon Fire 2 yrs 2012-2013	minimal	Fire Stations, schools, churches, can provide lists	Tooele County	Agricultural	Problem Soils	Agricultural	Problem Soils
			flooding	anaconda fire 2014				Avalanche	Radon	Avalanche	Radon
			Landslide					Dam Failure	Severe Weather	Dam Failure	Severe Weather
			wildfire					Drought	Subsidence	Drought	Subsidence
			dam failure					Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:	Landslide	Other:
USU Tooele	Donna Dillinaham-Evans	don't know	Drought, Flood,		no	USU Campus	don't know	Agricultural	Problem Soils	Agricultural	Problem Soils
			Dam Failure			Tooele BLVD		Avalanche	Radon	Avalanche	Radon
						TATC-		Dam Failure	Severe Weather	Dam Failure	Severe Weather
						Health DEPT.		Drought	Subsidence	Drought	Subsidence
						Fire Dept.		Earthquake	Tornado	Earthquake	Tornado
						CCC building		Erosion	Tsunami	Erosion	Tsunami
						School District		Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other: Bio Hazards-Prevailing Winds	Landslide	Other: School Lab info
Terra	Gerry Neil	don't know	drought	wildland fire	none	fire stations	don't know	Agricultural	Problem Soils	Agricultural	Problem Soils
			flooding	floods				Avalanche	Radon	Avalanche	Radon
			landslide	erosion from burns				Dam Failure	Severe Weather	Dam Failure	Severe Weather
			wildfire					Drought	Subsidence	Drought	Subsidence
								Earthquake	Tornado	Earthquake	Tornado
								Erosion	Tsunami	Erosion	Tsunami
								Flood	Volcanic	Flood	Volcanic
								Hail	Wildfire	Hail	Wildfire
								Landslide	Other:	Landslide	Other:

2016 Tooele County Pre-Disaster Mitigation Plan – Community Survey

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***PLEASE COMPLETE AND RETURN TO BUCKY WHITEHOUSE BY FRIDAY, FEB. 19, 2016 @ 5:00 P.M.**

Mail: Attn: Bucky Whitehouse, Tooele County EM, 15 East 100 South, Tooele, UT 84074

Email: bucky@tcem.org **Fax:** (435)333-3333

(PLEASE CONTACT BUCKY FOR HELP OR WITH QUESTIONS - OFFICE PHONE: 435.833.8121, CELL: 435.241.0220)

Jurisdiction Name: _____ Completed by: _____

Address: _____ Phone: _____

Email: _____

MITIGATION STRATEGIES SECTION

1. Tooele County staff, with the assistance of County working groups, has been analyzing potential risks from natural hazards in your community. **THE FOLLOWING NATURAL HAZARDS HAVE BEEN IDENTIFIED AS A POTENTIAL RISK TO YOUR COMMUNITY (SEE CHECKED HAZARDS).** Please check any other hazards you are aware of in your community.

Natural Hazards identified:

- | | |
|---|---|
| ☐ ■ FLOOD | ☐ ■ SEVERE WEATHER (all jurisdictions, optional) |
| ☐ ■ EARTHQUAKE | ☐ ■ AVALANCHE |
| ☐ ○ FAULTS | ☐ ■ TORNADO |
| ☐ ○ LIQUEFACTION | ☐ ■ TSUNAMI |
| ☐ ■ WILDFIRE | ☐ ■ VOLCANIC |
| ☐ ■ LANDSLIDES | ☐ ■ RADON |
| ☐ ■ DAM FAILURE | ☐ ■ STEEP SLOPES |
| ☐ ■ PROBLEM SOILS | |
| ☐ ■ DROUGHT(all jurisdictions, optional) | |

2. *Enclosed in this packet is a chart showing mitigation strategies for jurisdictions in your county from the 2008 Pre-Disaster Mitigation Plan. Please provide comments below regarding which strategies were implemented, those that were not implemented, and a brief explanation if they were not. You may also write comments/notes on the chart and mail it to Bucky with this survey.

2016 Tooele County Pre-Disaster Mitigation Plan – Community Survey

Page 2

3. Below are blank mitigation strategy charts for you to fill in for each of the hazards highlighted above. Please enter the hazard in the first column, and fill in each of the following columns related to that hazard. **Each community must include a goal for protecting existing residents and property, and a goal for protecting future residents and property from each hazard.** If your community participates in the National Flood Insurance Program (NFIP), you must also include a separate action related to NFIP compliance for flood hazards. Also included in this packet is a copy of the document, “Mitigation Ideas,” written by the Federal Emergency Management Agency (FEMA) to assist you in creating mitigation strategies. Below is an example for your reference:

HAZARD: <u>Wildfire</u>	
GOAL 1: PROTECT <u>CURRENT</u> RESIDENTS AND PROPERTY	
Action	<i>Update city ordinances to require defensive space and fire resistant vegetation surrounding homes located in wildland/urban interface.</i>
Action (For NFIP Compliance, if Applicable)	<i>N/A</i>
Priority (High, Medium, or Low)	<i>High</i>
Timeframe (Year)	<i>2017</i>
Potential Funding Sources	<i>City, Utah Dept. of Public Safety/FEMA</i>
Estimated Cost	<i>\$2,000</i>
Resources	<i>Utah FFSL, County</i>
GOAL 2: PROTECT <u>FUTURE</u> RESIDENTS AND PROPERTY	
Action	<i>Update city ordinances to require sprinklers in all new homes located in the wildland/urban interface.</i>
Action (For NFIP Compliance, if Applicable)	<i>N/A</i>
Priority (High, Medium, or Low)	<i>High</i>
Timeframe (Year)	<i>2018</i>
Potential Funding Sources	<i>City, Utah Dept. of Public Safety/FEMA</i>
Estimated Cost	<i>\$1,500</i>
Resources	<i>Utah FFSL, County</i>

HAZARD: _____	
GOAL 1: PROTECT <u>CURRENT</u> RESIDENTS AND PROPERTY	
Action	
Action (For NFIP Compliance, if Applicable)	
Priority (High, Medium, or Low)	

MITIGATION STRATEGIES SURVEYS COMPLETED

- Dugway
- Grantsville City
- Stockton
- Tooele City
- Tooele County
- Vernon Town

*To see a list of mitigation strategies from each of the completed surveys, see each individual community risk assessment section.

APPENDIX E - PUBLIC OUTREACH

PROOF OF PUBLICATION

STATE OF UTAH }
County of Tooele } SS.

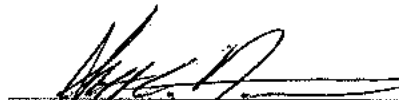
DRAFT PRE-DISASTER MITIGATION PLAN FOR TOOELE COUNTY, UTAH

In accordance with the Disaster Mitigation Act of 2000, the countywide Pre-Disaster Mitigation Plan for Tooele County, Utah has been updated. The DRAFT plan will be available on April 7, 2016 for a 30-day public comment period ending May 7, 2016. The plan identifies potential natural hazards, estimates vulnerability to those hazards, and documents mitigation strategies for all jurisdictions located within Tooele County in northern Utah. The plan will be available on the Tooele County Emergency Management website at www.tcem.org and a hard copy will be available at the Tooele County Emergency Management office in Tooele City, located at 15 East 100 South, on March 15th. Please send comments and questions to Bucky Whitehouse, Tooele County Emergency Management Director at ucky@tcecm.org or call at 435.833.8121. (Published in the Transcript Bulletin April 26 & May 3, 2016)

I, Scott C. Dunn, being first duly sworn, depose and say that I am the Publisher of the Tooele Transcript-Bulletin, a twice-weekly newspaper of general circulation published each Tuesday and Thursday at Tooele City, Tooele County, Utah; that the notice attached hereto and which is a part of the proof of publication of

Draft Pre-Disaster Mitigation Plan Tooele County Emergency Management

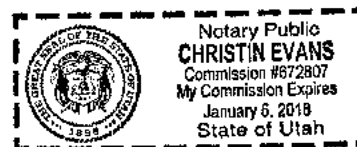
was published in said newspaper for two issue(s), the first publication having been made on the 26th day of April, 2016, and the last on the 3rd day of May, 2016; that said notice was published in the regular and entire issue of every Tuesday/Thursday edition of the newspaper during the period and time of publication, and the same was published in a newspaper proper and not in a supplement. Said notice was also placed online at www.utahlegals.com.


Scott C. Dunn

Subscribed and sworn to me this 19th day of May, 2016.


Notary Public

TOOELE **TRANSCRIPT
BULLETIN**



APPENDIX F - GEOGRAPHIC INFORMATION SYSTEMS (GIS) DATA SOURCES

GIS LAYERS AND DATA SOURCES

LAYERS	SOURCES	DATE
Hazards		
Dam Failure	Utah Division of Water Rights	2004
Faults	Utah Geological Survey	2015
Flood (FEMA)	FEMA FIRM Maps	2009
Flood (Soils)	Natural Resource Conservation Service, SSURGO	2014
High Water Table	Natural Resource Conservation Service, SSURGO	2014
Landslide	Utah Geological Survey	2007
Liquefaction	Utah Geological Survey	2008
Poorly Drained Soils	Natural Resource Conservation Service, SSURGO	2014
Slope	Natural Resource Conservation Service, SSURGO	2014
Wildfire	Oregon Department of Forestry, Utah FFSL	2013
Infrastructure		
Canals	USGS, National Hydrography Dataset (NHD)	2015
Electrical Lines	Utah Automated Geographic Reference Center (AGRC)	1990
Natural Gas	Questar Gas	2015
Railroads	Utah Automated Geographic Reference Center (AGRC)	2009
Roads	Tooele County	2015
Critical Facilities		
Airports	Utah Automated Geographic Reference Center (AGRC)	2003
Bridges	Utah Department of Transportation (UDOT)	2015
Broadband	Utah Automated Geographic Reference Center (AGRC)	2014
Dams	Utah Division of Water Resources	2000
EMS/Fire	Utah Automated Geographic Reference Center (AGRC), Local	2013
Health Care Facilities	Utah Automated Geographic Reference Center (AGRC), Local	2013
Law Enforcement	Utah Automated Geographic Reference Center (AGRC), Local	2014
Places of Worship	Utah Automated Geographic Reference Center (AGRC)	2010
Public Facilities	Public Input, Stakeholder Meetings	2014
Libraries	Utah Automated Geographic Reference Center (AGRC)	2013
Correctional Facilities	Utah Automated Geographic Reference Center (AGRC)	2013
Solid Waste, Hazardous Waste, Used		
Oil Facilities	Utah Department of Environmental Quality, Local	2015
Oil and Gas wells	Utah Department of Environmental Quality	2015
Surface Water Assessment Zones	Utah Department of Environmental Quality	2015
Water System Facilities	Utah Department of Environmental Quality	2015
Surface Water Protection Zones	Utah Department of Environmental Quality	2015
Ground Water Protection Zones	Utah Department of Environmental Quality	2015
Schools	Utah Automated Geographic Reference Center (AGRC)	2013
Other Critical Facilities	County and Local	2015
Environmental/Recreational		
Amenities	U.S. Forest Service, Wasatch Cache National Forest & AGRC	2011/2014
Lakes	USGS, National Hydrography Dataset (NHD)	2015
Local Parks	Utah Automated Geographic Reference Center (AGRC)	2010
Wetland/Riparian Areas	USFWS, Utah Div. of Water Res., AGRC Water Related Land Use	2007
Streams	USGS, National Hydrography Dataset (NHD)	2015
Trails	Utah Automated Geographic Reference Center (AGRC)/USFS	2014
Trails (Master)	Tooele County	2015
Wetlands	U.S. Fish & Wildlife Service, National Wetlands Inventory	2015
Population		
Parcels	County Assessor, County GIS, County IT Personnel	2014
Population	U.S. Census Bureau, American Community Survey	2010
Agriculture		
Agricultural Land	Utah Division of Water Resources, Water Related Land Use	2007
Grazing	Utah Automated Geographic Reference Center (AGRC)	2009

APPENDIX G - PLAN PROMOLGATION/ LOCAL ADOPTION RESOLUTIONS

text

APPENDIX H - MEETING ATTENDANCE AND AGENDAS

TOOELE COUNTY PDMP KICK-OFF MTG ATTENDANCE - 6/8/15

Name	Organization
Scott McKenzie	TCEM
Eric Martineau	DEM
Anna Boynton	DPS-DEM
Jim Bolser	Tooele City- Director of Community Development/Public Works
Rachelle Custer	Tooele City- City Planning & Zoning Administrator
Dave McCall	Tooele City Council
Randy Willden	North Tooele Fire
Brett Palmer	Stansbury Park Imp. Dist.
Kevin Barjenbruch	National Weather Service
Donna Dillingham-Evan	Utah State University-Tooele
Wade Bitner	Tooele County Commission
Dennis Clark	Vernon Town
Tina Worcester	DPG-EOC
Paul Easterly	DPG-EOC/AT
Tom Wilson	FFSL/DNR
Gerry Neil	Terra Fire Dept.
Jeff Coombs	TCHD
Zach Maughan	BRAG
Zac Covington	BRAG
Jerry Houghton	Tooele Co. Recorder/Surveyor
Troy Heroud	SITLA
Kevin Turner	Grantsville City- Police Chief
Bucky Whitehouse	Tooele County EM
Becky Boekweg	Tooele County EM

TOOELE COUNTY PDMP RISK ASSESSMENT MTG ATTENDANCE - 8/18/16

Name	Address/Organization
Jim Pavelka	Dugway
Tina Worcester	Dugway
Jim Bolser	Tooele City- Director of Community Development/Public Works
Joel Linares	Grantsville City
Brent Marshall	Grantsville City
Myron Bateman	Tooele County Commission
Wade Bitner	Tooele County Commission
SharLynn Mueller	USU Tooele Campus
Zac Covington	BRAG
Zach Maughan	BRAG
Bucky Whitehouse	Tooele County EM
Beckie Boekweg	Tooele County EM

TOOELE COUNTY PDMP MIT. STRAT. MTG ATTENDANCE LIST 11/10/15

Name	Address/Organization
Tom Wilson	FFSL
Dace Vickers	State DNR
Tracy Schaffor	Mountain West Medical Center
Joel Linares	Grantsville City
Brent Marshall	Grantsville City
Cassandra Ray	North Tooele County Fire District
Kathy Holder	Utah Division of Emergency Management
Janna Wilkinson	Utah Division of Emergency Management
Eric Martineau	Utah Division of Emergency Management
Josh Groeneveld	Utah Division of Emergency Management
Robin Frederickson	Tooele County EM
Tina Worcester	Dugway
Jim Pavelka	Dugway
Jeff Coombs	Tooele County Health Department
Nathan Morreale	Utah Health Science Center
Scott Mckenzie	Tooele County EM
Joseph S. Paulick	Tooele County Engineering
Rich Giraud	Utah Geological Survey
Shawn Milne	Tooele County Commission
Paul Wimmer	Tooele County Sheriff
Bucky Whitehouse	Tooele County EM
Joseph Nielson	BRAG
Zac Covington	BRAG

TOOELE COUNTY PDMP PRE-ADOPTION MTG ATTENDANCE - 3/15/16

Name	Address/Organization
Brett palmer	Stansbury Park Inp. Dist.
Bruce Thomas	Vernon Town
Kevin Barjenbruch	National Weather Service
Joel Linares	Grantsville City
Brent Marshall	Grantsville City
Randy Willden	North Tooele Fire District
Jim Bolser	Tooele City
Sharlynn Mueller	USU-Tooele
Wade Bitner	Tooele County Commission
Myron Bateman	Tooele County Commission
Robin Frederickson	TCEM
Scott Mckenzie	TCEM
Shawn Milne	Tooele County Commission
Bucky Whitehouse	TCEM
Joseph Nielson	BRAG
Zac Covington	BRAG

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE TOOELE COUNTY KICK-OFF MEETING

Monday June 8, 2015 - 11:00 A.M. to 1:30 P.M.

**Tooele County Emergency Operations Center
Training Room
15 East 100 South
Tooele, Utah 84074**

11:00 A.M.	Welcome and Introductions	Bucky Whitehouse Tooele County Emergency Services
11:15 A.M.	Process Timeline & Roles	Bucky Whitehouse
11:30 A.M.	PDMP Planning in Tooele County and the plan update process	Zac Covington & Zach Maughan BRAG Staff
12:00 P.M.	<i>Lunch (Provided)</i>	
12:30 P.M.	Pre-Disaster Mitigation Planning	Eric Martineau Utah Department of Emergency Mgmt.
1:15 P.M.	Questions Scheduling	Bucky Whitehouse
1:30 P.M.	Adjourn	

AGENDA

TOOELE COUNTY RISK ASSESSMENT MEETING PRE-DISASTER MITIGATION PLAN UPDATE

Tuesday August 18, 2015 - 11:00 A.M. to 1:30 P.M.

Tooele County Emergency Operations Center
Training Room
15 East 100 South
Tooele, Utah 84074

11:00 A.M.	Welcome and Introductions	Bucky Whitehouse Tooele County Emergency Services
11:10 A.M.	Risk Assessment Update	Bucky Whitehouse
11:25 A.M.	Critical Facilities & Infrastructure	Bucky Whitehouse
12:00 P.M.	<i>Lunch (Provided)</i>	
12:30 P.M.	Hazard Maps & Potential Losses Methodology	Zach Maughan Bear River Association of Governments
1:15 P.M.	Questions Scheduling	Bucky Whitehouse
1:30 P.M.	Adjourn	

AGENDA

TOOELE COUNTY MITIGATION STRATEGIES MEETING PRE-DISASTER MITIGATION PLAN UPDATE

Tuesday November 10, 2015 - 11:00 A.M. to 1:30 P.M.

Tooele County Emergency Operations Center
Training Room
15 East 100 South
Tooele, Utah 84074

11:00 A.M.	Welcome and Introductions	Bucky Whitehouse Tooele County Emergency Services
11:10 A.M.	Risk Assessment Update	Zac Covington Bear River Association of Governments
11:25 A.M.	Tooele County Earthquake Modeling – HAZUS	Josh Groeneveld Utah Department of Emergency Management
11:40 A.M.	Mitigation Strategies for Severe Weather	Brian McInerney, National Weather Service
12:00 P.M.	<i>Lunch (Provided)</i>	
12:20 P.M.	Mitigation Strategies for Wildfire Hazards	Tom Wilson, Tooele County Fire Warden Dave Vickers, Area Fire Management Officer
12:40 P.M.	Mitigation Strategies for Geologic Hazards	Richard Giraud Utah Geological Survey
1:00 P.M.	Mitigation Strategies for Flood Hazards	Kathy Holder State Floodplain Manager, Utah DEM
1:20 P.M.	Questions - Schedule Next Mtg.	Bucky Whitehouse
1:30 P.M.	Adjourn	

AGENDA

PRE-DISASTER MITIGATION PLAN UPDATE – TOOELE COUNTY

DRAFT PDMP FINDINGS AND PRE-ADOPTION MEETING

Tuesday March 15, 2016 - 11:00 A.M. to 1:00 P.M.

**Tooele County Emergency Operations Center
Training Room
15 East 100 South
Tooele, Utah 84074**

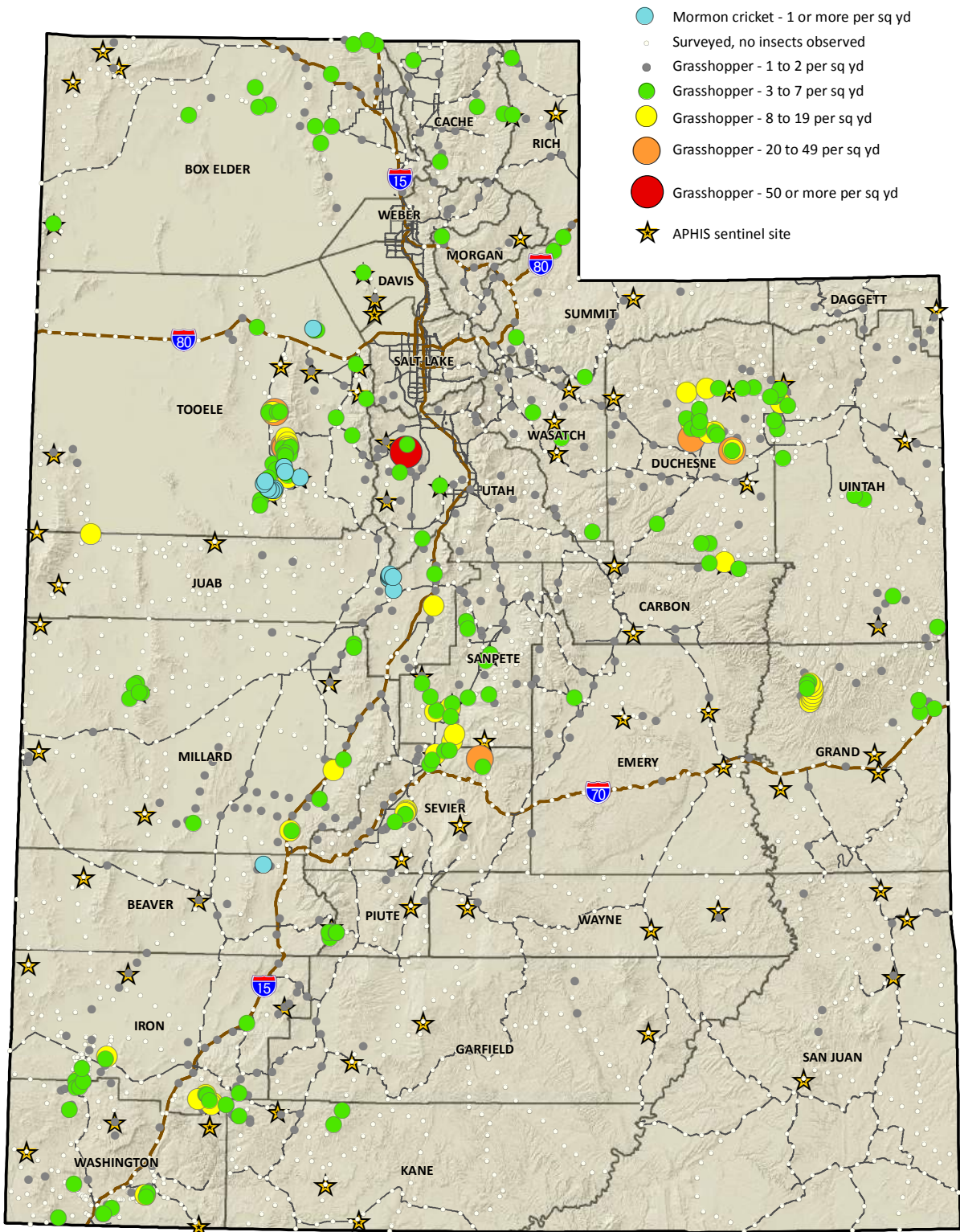
11:00 A.M.	Welcome and Introductions	Bucky Whitehouse Tooele County Emergency Services
11:10 A.M.	Presentation on DRAFT PDMP Plan – Plan Organization and Sections	Bucky Whitehouse
11:35 A.M.	Community Sections, Risk Analysis	Zac Covington Bear River Association of Governments
12:00 P.M.	<i>Lunch (Provided)</i>	Staff Assistance Filling Out Mitigation Strategy Surveys
12:30 P.M.	PDM Plan Adoption by Local Jurisdictions	Zac Covington
12:50 P.M.	Public Comment Period, Plan Adoption Timeline, and Questions	Bucky Whitehouse
1:00 P.M.	Adjourn	

APPENDIX I - 2014 UTAH GRASSHOPPER AND CRICKET INFESTATION MAP AND DATA

(www.ag.utah.gov)



2014 Grasshopper and Mormon Cricket Survey



Grasshopper Infested Acreage By Year															
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tooele	5,700	74,600	161,800	39,000	2,550	16,020	6,170	3,838	9,444	90,900	49,938	49,965	46,254	8,522	37,175
Mormon Cricket Infested Acreage By Year															
County	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Tooele	346000	622000	749,700	793,500	691,050	49,190	11,300	1,279	2,121	17,781				1280	10379

*Utah Mormon Cricket and Grasshopper Report 2014

Clinton E. Burfitt – UDAF: State Entomologist

Gregory C. Abbott – USDA APHIS: Domestic Programs Coordinator

APPENDIX J - HISTORIC NATURAL HAZARD EVENTS

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
(DPG)MICHAEL AAF DUG	6/13/1997	Funnel Cloud	0	0
(DPG)MICHAEL AAF DUG	6/30/1997	High Wind	0	10000
(DPG)MICHAEL AAF DUG	6/30/1997	High Wind	0	20000
(DPG)MICHAEL AAF DUG	8/26/1998	Hail	0	0
(T62)TOOELE	7/26/2007	Flood	0	0
ARINOSA	9/1/2012	Hail	0	0
ARINOSA	10/16/2012	High Wind	0	0
ARINOSA	10/16/2012	High Wind	0	0
ARINOSA	10/22/2012	High Wind	0	0
ARINOSA	10/22/2012	High Wind	0	0
ARINOSA	11/8/2012	High Wind	0	0
ARINOSA	11/9/2012	High Wind	0	0
ARINOSA	12/2/2012	High Wind	0	0
ARINOSA	12/2/2012	High Wind	0	0
ARINOSA	3/21/2013	High Wind	0	0
ARINOSA	4/8/2013	High Wind	0	35000
ARINOSA	4/8/2013	High Wind	0	0
ARINOSA	4/22/2013	High Wind	0	0
ARINOSA	6/13/2013	High Wind	0	0
ARINOSA	9/24/2013	High Wind	0	0
ARINOSA	10/28/2013	High Wind	0	0
ARINOSA	11/21/2013	High Wind	0	30000
ARINOSA	2/16/2014	High Wind	0	0
ARINOSA	3/1/2014	High Wind	0	0
ARINOSA	3/1/2014	High Wind	0	0
ARINOSA	3/10/2014	High Wind	0	0
ARINOSA	3/17/2014	High Wind	0	0
ARINOSA	3/17/2014	High Wind	0	80000
ARINOSA	3/30/2014	High Wind	0	0
ARINOSA	4/22/2014	High Wind	0	0
ARINOSA	4/22/2014	High Wind	0	500000
ARINOSA	5/11/2014	High Wind	0	0
CENTRAL PORTION	4/14/2000	Hail	0	0
CENTRAL PORTION	5/16/2000	High Wind	0	5000
CENTRAL PORTION	6/8/2000	High Wind	0	1000
CENTRAL PORTION	7/7/2001	Hail	0	0
CLOVER	8/18/2010	Flash Flood	0	0
CLOVER	8/22/2010	High Wind	0	0
CLOVER	10/25/2010	High Wind	0	0
CLOVER	10/25/2010	High Wind	0	0
CLOVER	11/16/2010	High Wind	0	0
CLOVER	11/20/2010	High Wind	0	0
CLOVER	11/20/2010	High Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
CLOVER	11/23/2010	High Wind	0	0
CLOVER	11/23/2010	High Wind	0	0
CLOVER	11/23/2010	Blizzard	0	0
CLOVER	2/7/2011	High Wind	0	0
CLOVER	2/16/2011	High Wind	0	10000
CLOVER	2/16/2011	High Wind	0	0
CLOVER	3/7/2011	High Wind	0	0
CLOVER	3/21/2011	High Wind	0	0
CLOVER	4/2/2011	High Wind	0	0
CLOVER	4/5/2011	High Wind	0	0
CLOVER	4/13/2011	High Wind	0	0
CLOVER	4/13/2011	High Wind	0	2000
CLOVER	4/21/2011	High Wind	0	0
CLOVER	5/15/2011	High Wind	0	0
CLOVER	5/15/2011	High Wind	0	1000
CLOVER	6/1/2011	High Wind	0	0
CLOVER	6/6/2011	High Wind	0	0
CLOVER	6/28/2011	High Wind	0	0
CLOVER	6/29/2011	High Wind	0	0
CLOVER	6/29/2011	High Wind	0	0
CLOVER	10/5/2011	High Wind	0	0
CLOVER	10/16/2011	High Wind	0	0
CLOVER	11/25/2011	High Wind	0	0
CLOVER	11/30/2011	High Wind	0	0
CLOVER	12/1/2011	High Wind	0	0
CLOVER	12/1/2011	High Wind	0	250000
CLOVER	12/30/2011	High Wind	0	0
CLOVER	12/30/2011	High Wind	0	0
CLOVER	1/21/2012	High Wind	0	0
CLOVER	1/21/2012	High Wind	0	0
CLOVER	2/22/2012	High Wind	0	0
CLOVER	2/25/2012	High Wind	0	0
CLOVER	2/25/2012	High Wind	0	0
CLOVER	3/2/2012	High Wind	0	0
CLOVER	3/6/2012	High Wind	0	15000
CLOVER	3/17/2012	High Wind	0	0
CLOVER	3/17/2012	High Wind	0	0
CLOVER	3/26/2012	High Wind	0	0
CLOVER	3/26/2012	High Wind	0	20000
CLOVER	3/31/2012	High Wind	0	0
CLOVER	3/31/2012	High Wind	0	0
CLOVER	4/1/2012	High Wind	0	0
CLOVER	4/1/2012	High Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
CLOVER	4/11/2012	High Wind	0	0
CLOVER	4/11/2012	High Wind	0	0
CLOVER	4/26/2012	High Wind	0	0
CLOVER	5/4/2012	High Wind	0	0
CLOVER	5/25/2012	High Wind	0	0
CLOVER	6/5/2012	High Wind	0	0
CLOVER	6/5/2012	High Wind	0	5000
CLOVER	6/9/2012	High Wind	0	0
CLOVER	6/18/2012	High Wind	0	15000
CLOVER	6/23/2012	High Wind	0	0
DUGWAY	8/12/1997	Hail	0	0
DUGWAY	11/19/1997	Heavy Snow	0	0
DUGWAY	12/1/1997	Heavy Snow	0	10000
DUGWAY	1/10/1998	Heavy Snow	0	0
DUGWAY	1/15/1998	Heavy Snow	0	0
DUGWAY	1/30/1998	Heavy Snow	0	15000
DUGWAY	2/7/1998	Heavy Snow	0	0
DUGWAY	2/11/1998	Heavy Snow	0	0
DUGWAY	2/14/1998	Heavy Snow	0	0
DUGWAY	2/14/1998	Heavy Snow	0	0
DUGWAY	2/18/1998	Heavy Snow	0	0
DUGWAY	3/27/1998	Heavy Snow	0	0
DUGWAY	7/8/2015	Debris Flow	0	0
EAST PORTION	8/14/2003	Flash Flood	0	0
EAST PORTION	10/30/2003	Heavy Snow	0	0
EAST PORTION	11/1/2003	Heavy Snow	0	0
EAST PORTION	11/1/2003	Heavy Snow	0	0
EAST PORTION	11/3/2003	Heavy Snow	0	0
EAST PORTION	11/3/2003	Heavy Snow	0	0
EAST PORTION	11/13/2003	High Wind	0	0
EAST PORTION	11/25/2003	Heavy Snow	0	100000
EAST PORTION	12/14/2003	Heavy Snow	0	0
EAST PORTION	12/20/2003	Heavy Snow	1	50000
EAST PORTION	12/20/2003	Heavy Snow	0	20000
EAST PORTION	1/25/2004	Heavy Snow	0	100000
EAST PORTION	4/28/2004	High Wind	0	0
EAST PORTION	5/10/2004	High Wind	0	30000
EAST PORTION	5/10/2004	High Wind	0	2000
EAST PORTION	6/18/2004	High Wind	0	5000
EAST PORTION	7/9/2004	High Wind	0	5000
EAST PORTION	11/27/2004	Heavy Snow	0	30000
EAST PORTION	11/30/2004	Cold/Wind Chill	0	0
EAST PORTION	12/21/2004	Heavy Snow	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
EAST PORTION	12/21/2004	Heavy Snow	0	0
EAST PORTION	1/3/2005	Heavy Snow	0	0
EAST PORTION	1/7/2005	Heavy Snow	0	0
EAST PORTION	2/6/2005	Heavy Snow	0	0
EAST PORTION	2/12/2005	Dense Fog	0	0
EAST PORTION	3/18/2005	Heavy Snow	0	0
EAST PORTION	3/28/2005	Heavy Snow	0	0
EAST PORTION	3/28/2005	Heavy Snow	0	0
EAST PORTION	4/8/2005	Heavy Snow	0	0
GRANTSVILLE	6/10/1997	Hail	0	2000
GRANTSVILLE	7/9/2001	Flash Flood	0	20000
GRANTSVILLE	7/9/2001	Funnel Cloud	0	0
GRANTSVILLE	9/6/2001	High Wind	0	0
GRANTSVILLE	12/14/2001	Heavy Snow	0	0
GRANTSVILLE	12/14/2001	Heavy Snow	0	0
GRANTSVILLE	1/3/2002	Heavy Snow	0	0
GRANTSVILLE	1/15/2002	Heavy Snow	0	100000
GRANTSVILLE	1/18/2002	Heavy Snow	0	0
GRANTSVILLE	1/22/2002	Heavy Snow	0	0
GRANTSVILLE	2/3/2002	Dense Fog	3	500000
GRANTSVILLE	3/17/2002	Heavy Snow	0	0
GRANTSVILLE	4/15/2002	High Wind	0	0
GRANTSVILLE	4/15/2002	High Wind	0	0
GRANTSVILLE	4/16/2002	Heavy Snow	0	0
GRANTSVILLE	4/17/2002	Heavy Snow	0	0
GRANTSVILLE	12/31/2002	Heavy Snow	0	0
GRANTSVILLE	1/8/2003	Dense Fog	0	500000
GRANTSVILLE	1/10/2003	Dense Fog	2	200000
GRANTSVILLE	2/16/2003	High Wind	0	100000
GRANTSVILLE	3/16/2003	Heavy Snow	0	0
GRANTSVILLE	4/2/2003	High Wind	0	0
GRANTSVILLE	4/2/2003	High Wind	0	200000
GRANTSVILLE	4/3/2003	Heavy Snow	0	0
GRANTSVILLE	4/5/2003	Heavy Snow	0	0
GRANTSVILLE	4/5/2003	Heavy Snow	0	0
GRANTSVILLE	7/25/2007	Flash Flood	0	5000
GRANTSVILLE	8/16/2007	Flash Flood	0	0
GRANTSVILLE	11/30/2007	Heavy Snow	0	0
GRANTSVILLE	12/1/2007	Heavy Snow	0	0
GRANTSVILLE	12/6/2007	Heavy Snow	0	0
GRANTSVILLE	12/7/2007	Heavy Snow	0	0
GRANTSVILLE	12/14/2007	Heavy Snow	0	0
GRANTSVILLE	12/20/2007	Heavy Snow	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
GRANTSVILLE	12/24/2007	Heavy Snow	0	0
GRANTSVILLE	1/4/2008	High Wind	0	0
GRANTSVILLE	1/4/2008	High Wind	0	500000
GRANTSVILLE	1/15/2008	High Wind	0	0
GRANTSVILLE	1/21/2008	Heavy Snow	0	0
GRANTSVILLE	1/27/2008	High Wind	0	0
GRANTSVILLE	1/27/2008	High Wind	0	0
GRANTSVILLE	1/31/2008	Heavy Snow	0	0
GRANTSVILLE	2/1/2008	Heavy Snow	0	0
GRANTSVILLE	2/1/2008	High Wind	0	0
GRANTSVILLE	2/1/2008	High Wind	0	0
GRANTSVILLE	2/7/2008	High Wind	0	0
GRANTSVILLE	2/7/2008	High Wind	0	0
GRANTSVILLE	2/24/2008	High Wind	0	0
GRANTSVILLE	2/24/2008	High Wind	0	0
GRANTSVILLE	3/1/2008	High Wind	0	0
GRANTSVILLE	3/1/2008	High Wind	0	0
GRANTSVILLE	3/15/2008	Heavy Snow	0	0
GRANTSVILLE	3/30/2008	Heavy Snow	0	0
GRANTSVILLE	4/15/2008	High Wind	0	0
GRANTSVILLE	4/15/2008	High Wind	0	0
GRANTSVILLE	4/19/2008	High Wind	0	0
GRANTSVILLE	4/19/2008	High Wind	0	0
GRANTSVILLE	5/11/2008	High Wind	0	0
GRANTSVILLE	5/20/2008	High Wind	0	0
GRANTSVILLE	5/20/2008	High Wind	0	1000
GRANTSVILLE	6/22/2008	High Wind	0	0
GRANTSVILLE	8/9/2008	Hail	0	0
GRANTSVILLE	10/11/2008	Heavy Snow	0	0
GRANTSVILLE	11/2/2008	High Wind	0	0
GRANTSVILLE	11/2/2008	High Wind	0	0
GRANTSVILLE	11/14/2008	High Wind	0	0
GRANTSVILLE	11/20/2008	High Wind	0	0
GRANTSVILLE	12/2/2008	High Wind	0	0
GRANTSVILLE	12/2/2008	High Wind	0	0
GRANTSVILLE	12/21/2008	Heavy Snow	0	0
GRANTSVILLE	2/9/2009	Heavy Snow	0	0
GRANTSVILLE	3/3/2009	High Wind	0	5000
GRANTSVILLE	3/4/2009	High Wind	0	30000
GRANTSVILLE	3/9/2009	Heavy Snow	0	0
GRANTSVILLE	3/22/2009	High Wind	0	0
GRANTSVILLE	3/29/2009	High Wind	0	50000
GRANTSVILLE	3/29/2009	High Wind	0	25000

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
GRANTSVILLE	4/1/2009	High Wind	0	0
GRANTSVILLE	4/8/2009	High Wind	0	0
GRANTSVILLE	4/23/2009	High Wind	0	0
GRANTSVILLE	5/4/2009	High Wind	0	0
GRANTSVILLE	5/19/2009	High Wind	0	0
GRANTSVILLE	7/4/2009	High Wind	0	0
GRANTSVILLE	7/12/2009	High Wind	0	0
GRANTSVILLE	7/19/2009	High Wind	0	0
GRANTSVILLE	8/6/2009	High Wind	0	2000
GRANTSVILLE	8/6/2009	High Wind	0	80000
GRANTSVILLE	8/13/2009	High Wind	0	0
GRANTSVILLE	9/29/2009	High Wind	0	0
GRANTSVILLE	9/30/2009	High Wind	0	0
GRANTSVILLE	10/27/2009	High Wind	0	0
GRANTSVILLE	10/27/2009	High Wind	0	0
GRANTSVILLE	11/20/2009	High Wind	0	0
GRANTSVILLE	3/30/2010	High Wind	0	0
GRANTSVILLE	3/30/2010	High Wind	0	0
GRANTSVILLE	4/12/2010	High Wind	0	0
GRANTSVILLE	4/27/2010	High Wind	0	250000
GRANTSVILLE	4/27/2010	High Wind	0	60000
GRANTSVILLE	5/4/2010	High Wind	0	0
GRANTSVILLE	5/28/2010	High Wind	0	0
GRANTSVILLE	6/16/2010	High Wind	0	0
GRANTSVILLE	6/16/2010	High Wind	0	0
GRANTSVILLE	8/20/2014	Hail	0	0
IBAPAH	8/12/2014	Hail	0	0
LAKE POINT	8/23/2000	Flash Flood	0	20000
LAKE POINT	11/8/2000	Heavy Snow	0	0
LAKE POINT	11/8/2000	Heavy Snow	0	0
LAKE POINT	11/11/2000	Heavy Snow	0	0
LAKE POINT	11/14/2000	Heavy Snow	0	0
LAKE POINT	11/14/2000	Heavy Snow	0	0
LAKE POINT	11/29/2000	High Wind	0	5000
LAKE POINT	12/12/2000	Heavy Snow	0	0
LAKE POINT	12/12/2000	Heavy Snow	0	0
LAKE POINT	1/24/2001	Heavy Snow	0	0
LAKE POINT	1/28/2001	High Wind	0	0
LAKE POINT	2/7/2001	Heavy Snow	0	0
LAKE POINT	2/11/2001	Heavy Snow	0	0
LAKE POINT	2/23/2001	Heavy Snow	0	0
LAKE POINT	3/16/2001	Heavy Snow	0	0
LAKE POINT	4/7/2001	Heavy Snow	1	100000

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
LAKE POINT	4/12/2001	Heavy Snow	0	0
LAKE POINT	5/2/2001	High Wind	0	1500000
LAKE POINT	6/12/2001	High Wind	0	0
LAKE PT	7/10/2000	Flash Flood	0	10000
MARSHALL	7/26/2007	Flood	0	0
MARSHALL	8/20/2014	Hail	0	0
MARSHALL	10/12/2014	High Wind	0	0
MARSHALL	11/1/2014	High Wind	0	0
MARSHALL	11/1/2014	High Wind	0	75000
MARSHALL	11/10/2014	High Wind	0	0
MARSHALL	11/22/2014	High Wind	0	0
MARSHALL	12/12/2014	High Wind	0	0
MARSHALL	12/22/2014	High Wind	0	0
MARSHALL	12/30/2014	High Wind	0	30000
MARSHALL	2/23/2015	High Wind	0	0
MARSHALL	3/23/2015	High Wind	0	0
MARSHALL	4/14/2015	High Wind	1	150000
MARSHALL	4/14/2015	High Wind	0	150000
RUSH VALLEY	5/25/1963	Hail	0	0
RUSH VALLEY	5/10/1971	Hail	0	0
RUSH VALLEY	7/2/1977	Hail	0	0
RUSH VALLEY	8/8/1983	Hail	0	0
RUSH VALLEY	8/21/1983	Hail	0	0
RUSH VALLEY	8/21/1983	Hail	0	0
RUSH VALLEY	9/3/1983	Hail	0	0
RUSH VALLEY	9/12/1991	Hail	0	0
RUSH VALLEY	5/1/1995	Hail	0	0
ST JOHN	6/3/2015	Debris Flow	0	0
ST JOHN	6/11/2015	Debris Flow	0	0
TOOELE	7/21/1995	Hail	0	0
TOOELE	2/21/1996	Heavy Snow	0	100000
TOOELE	2/25/1996	Heavy Snow	1	10000
TOOELE	2/25/1996	Heavy Snow	0	0
TOOELE	3/17/1996	High Wind	0	20000
TOOELE	3/28/1996	High Wind	0	1000
TOOELE	6/26/1996	High Wind	0	0
TOOELE	4/6/1998	Funnel Cloud	0	0
TOOELE	4/7/1998	Heavy Snow	0	8000
TOOELE	4/11/1998	High Wind	0	0
TOOELE	5/26/1998	High Wind	0	1000
TOOELE	5/29/1998	High Wind	0	600
TOOELE	6/3/1998	Hail	0	0
TOOELE	9/30/1998	Hail	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
TOOELE	11/21/1998	High Wind	0	0
TOOELE	11/23/1998	High Wind	0	0
TOOELE	11/23/1998	High Wind	0	0
TOOELE	12/6/1998	Heavy Snow	0	0
TOOELE	12/21/1998	Cold/Wind Chill	0	0
TOOELE	12/21/1998	Cold/Wind Chill	0	0
TOOELE	1/23/1999	Heavy Snow	0	0
TOOELE	1/23/1999	Heavy Snow	0	0
TOOELE	4/3/1999	Heavy Snow	0	0
TOOELE	4/3/1999	Heavy Snow	0	0
TOOELE	4/22/1999	High Wind	0	100000
TOOELE	10/6/1999	High Wind	0	0
TOOELE	11/21/1999	Heavy Snow	0	0
TOOELE	11/21/1999	Heavy Snow	0	0
TOOELE	12/2/1999	Heavy Snow	0	0
TOOELE	12/2/1999	Heavy Snow	0	0
TOOELE	12/7/1999	Heavy Snow	0	0
TOOELE	12/7/1999	Heavy Snow	0	0
TOOELE	12/10/1999	Heavy Snow	0	0
TOOELE	12/10/1999	Heavy Snow	0	0
TOOELE	12/13/1999	Heavy Snow	0	0
TOOELE	12/20/1999	Heavy Snow	0	0
TOOELE	1/4/2000	Heavy Snow	0	30000
TOOELE	1/4/2000	Heavy Snow	0	0
TOOELE	2/14/2000	High Wind	0	0
TOOELE	2/14/2000	High Wind	0	0
TOOELE	3/20/2000	High Wind	0	1000000
TOOELE	3/30/2000	Heavy Snow	0	0
TOOELE	8/15/2000	Funnel Cloud	0	0
TOOELE	5/30/2005	Flash Flood	0	0
TOOELE	6/25/2005	Hail	0	0
TOOELE	11/2/2005	High Wind	0	0
TOOELE	11/14/2005	High Wind	0	0
TOOELE	11/26/2005	Heavy Snow	0	0
TOOELE	11/26/2005	High Wind	0	0
TOOELE	11/26/2005	Heavy Snow	0	0
TOOELE	12/6/2005	Heavy Snow	0	0
TOOELE	12/28/2005	Heavy Snow	0	0
TOOELE	1/2/2006	High Wind	0	0
TOOELE	1/2/2006	High Wind	0	0
TOOELE	1/15/2006	Heavy Snow	0	0
TOOELE	1/15/2006	Heavy Snow	0	0
TOOELE	1/18/2006	Heavy Snow	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
TOOELE	2/4/2006	High Wind	0	0
TOOELE	2/15/2006	Heavy Snow	0	0
TOOELE	2/28/2006	High Wind	0	0
TOOELE	2/28/2006	High Wind	0	0
TOOELE	3/3/2006	High Wind	0	0
TOOELE	3/14/2006	Heavy Snow	0	0
TOOELE	3/18/2006	Heavy Snow	0	0
TOOELE	3/18/2006	Heavy Snow	0	0
TOOELE	3/25/2006	High Wind	0	0
TOOELE	3/25/2006	High Wind	0	0
TOOELE	4/5/2006	High Wind	0	0
TOOELE	4/16/2006	High Wind	0	0
TOOELE	4/17/2006	Heavy Snow	0	0
TOOELE	6/13/2006	High Wind	0	0
TOOELE	6/13/2006	High Wind	0	0
TOOELE	7/26/2006	High Wind	0	0
TOOELE	8/30/2006	High Wind	0	0
TOOELE	11/14/2006	High Wind	0	0
TOOELE	11/29/2006	Heavy Snow	0	0
TOOELE	12/17/2006	Heavy Snow	0	0
TOOELE	2/23/2007	Heavy Snow	0	0
TOOELE	2/27/2007	Heavy Snow	0	0
TOOELE	3/2/2007	Heavy Snow	0	0
TOOELE	3/28/2007	High Wind	0	0
TOOELE	3/28/2007	Heavy Snow	0	0
TOOELE	4/18/2007	High Wind	0	0
TOOELE	6/5/2007	High Wind	0	10000
TOOELE	6/5/2007	High Wind	0	0
WENDOVER	7/16/1996	Hail	0	0
WENDOVER	10/19/1996	Heavy Snow	0	300000
WENDOVER	10/30/1996	High Wind	0	0
WENDOVER	11/4/1996	Heavy Snow	0	50000
WENDOVER	11/15/1996	Heavy Snow	0	100000
WENDOVER	11/28/1996	Heavy Snow	0	100000
WENDOVER	12/3/1996	Heavy Snow	0	200
WENDOVER	12/5/1996	High Wind	0	1000
WENDOVER	12/5/1996	Heavy Snow	0	300000
WENDOVER	12/27/1996	High Wind	0	50000
WENDOVER	1/11/1997	Blizzard	0	40000000
WENDOVER	1/22/1997	Heavy Snow	0	0
WENDOVER	2/5/1997	Heavy Snow	0	200000
WENDOVER	2/17/1997	Heavy Snow	0	80000
WENDOVER	2/26/1997	Heavy Snow	0	500000

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
WENDOVER	3/2/1997	Heavy Snow	0	500000
WENDOVER	4/2/1997	High Wind	0	0
WENDOVER	4/4/1997	Heavy Snow	0	50000
WENDOVER	4/9/1997	Heavy Snow	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Location or County	Date	Type	Deaths	PD
(DPG)MICHAEL AAF DUG	7/9/1997	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/12/1997	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	10/10/1997	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	10/23/1997	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	12/7/1997	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	12/7/1997	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	12/23/1997	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	12/23/1997	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	1/4/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	1/4/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	1/11/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	1/19/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	2/21/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	2/21/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	3/3/1998	Winter Storm	0	5000
(DPG)MICHAEL AAF DUG	3/5/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	3/5/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	3/17/1998	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	8/25/1998	Thunderstorm Wind	0	1000
(DPG)MICHAEL AAF DUG	5/16/2005	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/29/2005	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	12/31/2005	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/18/2006	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/7/2006	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/4/2007	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	5/7/2008	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/22/2008	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/20/2008	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/27/2008	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/31/2008	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/2/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/25/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/30/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/5/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/14/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/14/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/14/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/14/2009	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/5/2010	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/18/2010	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/7/2010	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	4/21/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	4/21/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	4/21/2011	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
(DPG)MICHAEL AAF DUG	5/22/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	5/22/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/9/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/14/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/28/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/30/2011	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	5/17/2012	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/23/2012	Wildfire	0	35000
(DPG)MICHAEL AAF DUG	6/23/2012	Wildfire	0	400000
(DPG)MICHAEL AAF DUG	6/29/2012	Wildfire	0	0
(DPG)MICHAEL AAF DUG	7/1/2012	Wildfire	0	3000000
(DPG)MICHAEL AAF DUG	7/12/2012	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/26/2012	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/30/2012	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/24/2013	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/29/2013	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/4/2013	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/5/2013	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/6/2013	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	9/6/2013	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	12/2/2013	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	12/7/2013	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	12/19/2013	Winter Storm	0	40000
(DPG)MICHAEL AAF DUG	12/19/2013	Winter Storm	0	0
(DPG)MICHAEL AAF DUG	6/10/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/10/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	6/10/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/3/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/14/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/12/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/12/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/23/2014	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	5/14/2015	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/4/2015	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	7/8/2015	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/7/2015	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/7/2015	Thunderstorm Wind	0	0
(DPG)MICHAEL AAF DUG	8/11/2015	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	8/27/1999	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	5/16/2005	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	5/16/2005	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	6/7/2006	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	6/7/2006	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	6/9/2006	Thunderstorm Wind	0	10000
(ENV)WENDOVER ARPT	7/5/2006	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
(ENV)WENDOVER ARPT	7/4/2013	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	6/25/2014	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	7/8/2015	Thunderstorm Wind	0	0
(ENV)WENDOVER ARPT	8/7/2015	Thunderstorm Wind	0	0
(T62)TOOELE	5/16/2005	Thunderstorm Wind	0	3000
(T62)TOOELE	6/7/2006	Thunderstorm Wind	0	0
ARINOSA	7/26/2007	Thunderstorm Wind	0	0
ARINOSA	8/2/2011	Thunderstorm Wind	0	0
ARINOSA	8/14/2011	Thunderstorm Wind	0	0
ARINOSA	5/15/2013	Thunderstorm Wind	0	0
ARINOSA	6/9/2013	Thunderstorm Wind	0	0
ARINOSA	6/12/2014	Thunderstorm Wind	0	10000
ARINOSA	7/3/2014	Thunderstorm Wind	0	0
ARINOSA	7/3/2014	Thunderstorm Wind	0	0
ARINOSA	9/26/2014	Thunderstorm Wind	0	0
ARINOSA	6/3/2015	Thunderstorm Wind	0	0
ARINOSA	8/7/2015	Thunderstorm Wind	0	0
BARRO	6/16/2007	Thunderstorm Wind	0	0
BARRO	10/20/2007	Thunderstorm Wind	0	0
BARRO	10/20/2007	Thunderstorm Wind	0	0
BARRO	1/28/2008	Winter Storm	0	0
BARRO	1/29/2008	Winter Storm	0	0
BARRO	2/3/2008	Winter Storm	0	0
BARRO	2/13/2008	Winter Storm	0	0
BARRO	2/13/2008	Winter Storm	0	0
BARRO	8/13/2009	Thunderstorm Wind	0	0
BARRO	7/30/2010	Thunderstorm Wind	0	0
BARRO	5/13/2011	Thunderstorm Wind	0	0
BARRO	8/2/2011	Thunderstorm Wind	0	0
BARRO	8/14/2011	Thunderstorm Wind	0	0
BARRO	9/1/2012	Thunderstorm Wind	0	0
BARRO	10/25/2012	Winter Weather	0	10000
BARRO	11/9/2012	Winter Storm	0	100000
BARRO	12/16/2012	Winter Storm	0	0
BARRO	1/10/2013	Winter Storm	0	1000
BARRO	1/10/2013	Winter Storm	0	0
BARRO	1/24/2013	Ice Storm	0	0
BARRO	1/27/2013	Winter Storm	0	0
BARRO	1/27/2013	Winter Storm	0	0
BARRO	2/23/2013	Winter Storm	0	0
BARRO	2/23/2013	Winter Storm	0	0
BARRO	3/22/2013	Lake-Effect Snow	0	0
BARRO	7/7/2013	Thunderstorm Wind	0	0
BARRO	6/12/2014	Thunderstorm Wind	0	0
BARRO	6/25/2014	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
BARRO	6/1/2015	Thunderstorm Wind	0	0
BARRO	7/17/2015	Thunderstorm Wind	0	0
BARRO	8/7/2015	Thunderstorm Wind	0	0
BAUER	10/6/2010	Thunderstorm Wind	0	0
BAUER	11/20/2010	Winter Storm	0	0
BAUER	11/23/2010	Winter Storm	0	0
BAUER	11/28/2010	Winter Storm	0	0
BAUER	12/28/2010	Winter Storm	0	0
BAUER	12/29/2010	Winter Storm	0	0
BAUER	12/30/2010	Lake-Effect Snow	0	0
BURMESTER	7/7/2007	Thunderstorm Wind	0	0
BURMESTER	9/4/2007	Thunderstorm Wind	0	2000
BURMESTER	9/14/2009	Thunderstorm Wind	0	10000
CENTRAL PORTION	8/30/1999	Thunderstorm Wind	0	0
CENTRAL PORTION	8/23/2000	Lightning	2	0
CENTRAL PORTION	8/20/2001	Thunderstorm Wind	0	0
CENTRAL PORTION	3/23/2002	Thunderstorm Wind	0	0
CLIVE	9/16/2002	Thunderstorm Wind	0	0
CLIVE	12/16/2002	Winter Storm	0	0
CLIVE	12/16/2002	Winter Storm	0	0
CLIVE	12/29/2002	Winter Storm	0	0
CLIVE	12/29/2002	Winter Storm	0	100000
CLIVE	2/2/2003	Winter Storm	0	0
CLIVE	2/4/2003	Winter Storm	0	0
CLIVE	3/1/2003	Winter Storm	0	0
CLIVE	3/1/2003	Winter Storm	0	0
CLIVE	3/4/2003	Winter Storm	0	0
CLIVE	7/2/2005	Thunderstorm Wind	0	0
CLIVE	12/31/2005	Thunderstorm Wind	0	0
CLIVE	7/17/2007	Thunderstorm Wind	0	0
CLIVE	9/14/2010	Thunderstorm Wind	0	0
CLIVE	6/12/2013	Thunderstorm Wind	0	0
CLIVE	7/14/2014	Thunderstorm Wind	0	0
CLIVE	5/7/2015	Thunderstorm Wind	0	0
COUNTYWIDE	8/2/1999	Thunderstorm Wind	0	0
COUNTYWIDE	6/12/2001	Thunderstorm Wind	0	200000
COUNTYWIDE	8/22/2003	Thunderstorm Wind	0	100000
COUNTYWIDE	11/21/2003	Winter Storm	0	200000
COUNTYWIDE	12/25/2003	Winter Storm	0	500000
COUNTYWIDE	12/28/2003	Winter Storm	0	100000
COUNTYWIDE	1/1/2004	Winter Storm	0	0
COUNTYWIDE	4/28/2004	Strong Wind	0	1500
COUNTYWIDE	7/9/2004	Strong Wind	0	15000
DELLE	5/16/1998	Thunderstorm Wind	0	0
DELLE	7/10/1998	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
DELLE	9/14/2009	Thunderstorm Wind	0	10000
DOLOMITE	8/7/2015	Thunderstorm Wind	0	0
DUGWAY	9/9/1998	Thunderstorm Wind	0	0
DUGWAY	11/5/1998	Winter Storm	0	10000
DUGWAY	11/5/1998	Winter Storm	0	10000
DUGWAY	11/8/1998	Winter Storm	0	0
DUGWAY	11/8/1998	Winter Storm	0	0
DUGWAY	11/17/1998	Winter Storm	0	0
DUGWAY	11/17/1998	Winter Storm	0	0
DUGWAY	12/4/1998	Winter Storm	0	0
DUGWAY	12/19/1998	Winter Storm	0	0
DUGWAY	12/19/1998	Winter Storm	0	0
DUGWAY	12/19/1998	Winter Storm	0	0
DUGWAY	12/31/1998	Winter Storm	0	0
DUGWAY	1/20/1999	Winter Storm	0	10000
DUGWAY	1/26/1999	Winter Storm	0	0
DUGWAY	4/1/1999	Winter Storm	0	0
DUGWAY	4/1/1999	Winter Storm	0	100000
DUGWAY	4/7/1999	Winter Storm	0	0
DUGWAY	4/8/1999	Winter Storm	0	0
DUGWAY	4/8/1999	Winter Storm	0	0
DUGWAY	8/2/2002	Thunderstorm Wind	0	0
DUGWAY	5/24/2003	Thunderstorm Wind	0	0
DUGWAY	7/23/2003	Thunderstorm Wind	0	0
DUGWAY	8/1/2004	Thunderstorm Wind	0	0
DUGWAY	8/2/2004	Thunderstorm Wind	0	12000
DUGWAY	1/8/2005	Strong Wind	0	1000
DUGWAY	1/27/2005	Ice Storm	0	0
DUGWAY	3/24/2005	Winter Storm	1	0
DUGWAY	4/18/2005	Winter Storm	0	0
DUGWAY	7/2/2005	Thunderstorm Wind	0	0
DUGWAY	7/2/2005	Thunderstorm Wind	0	0
DUGWAY	7/29/2005	Thunderstorm Wind	0	0
DUGWAY	12/31/2005	Thunderstorm Wind	0	0
DUGWAY	8/5/2009	Thunderstorm Wind	0	0
DUGWAY	9/14/2009	Thunderstorm Wind	0	0
DUGWAY	9/14/2009	Thunderstorm Wind	0	0
DUGWAY	12/7/2009	Winter Storm	0	0
DUGWAY	12/12/2009	Winter Storm	0	0
DUGWAY	1/18/2010	Winter Storm	0	0
DUGWAY	3/13/2010	Winter Storm	0	0
DUGWAY	3/31/2010	Winter Storm	0	0
DUGWAY	4/1/2010	Winter Storm	0	0
DUGWAY	8/18/2010	Thunderstorm Wind	0	0
DUGWAY MCHL AAF	12/31/2005	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
DUGWAY RANGE	7/16/1996	Thunderstorm Wind	0	0
DUGWAY RANGE	10/24/1996	Winter Storm	0	1000000
DUGWAY RANGE	12/1/1996	Winter Storm	0	0
DUGWAY RANGE	12/1/1996	Winter Storm	0	1000000
DUGWAY RANGE	3/31/1997	Winter Storm	0	0
DUGWAY RANGE	3/31/1997	Winter Storm	1	2000000
DUGWAY RANGE	4/23/1997	Winter Storm	0	0
DUGWAY RANGE	4/23/1997	Winter Storm	0	0
ELLERBECK	4/25/2011	Lightning	0	50000
ELLERBECK	7/4/2015	Thunderstorm Wind	0	0
ERDA	5/3/1993	Tornado	0	500000
ERDA	5/5/2005	Thunderstorm Wind	0	0
ERDA	2/16/2011	Thunderstorm Wind	0	3000
ERDA	2/16/2011	Winter Storm	0	0
ERDA	2/25/2011	Winter Storm	0	0
ERDA	2/25/2011	Winter Storm	0	0
ERDA	3/7/2011	Winter Storm	0	0
ERDA	4/3/2011	Winter Storm	0	0
ERDA	4/7/2011	Winter Storm	0	0
GOLD HILL	6/22/2008	Thunderstorm Wind	0	0
GOLD HILL	8/31/2008	Thunderstorm Wind	0	0
GOLD HILL	11/5/2008	Lake-Effect Snow	0	0
GOLD HILL	11/5/2008	Lake-Effect Snow	0	0
GOLD HILL	12/13/2008	Winter Storm	0	0
GOLD HILL	12/13/2008	Winter Storm	0	0
GOLD HILL	12/19/2008	Winter Storm	0	0
GOLD HILL	12/24/2008	Winter Storm	0	0
GOLD HILL	12/25/2008	Winter Storm	0	0
GOLD HILL	6/30/2009	Thunderstorm Wind	0	0
GOLD HILL	7/11/2009	Thunderstorm Wind	0	0
GOLD HILL	8/5/2009	Thunderstorm Wind	0	0
GOLD HILL	7/7/2011	Thunderstorm Wind	0	0
GOLD HILL	7/9/2011	Thunderstorm Wind	0	0
GOLD HILL	8/2/2011	Thunderstorm Wind	0	0
GOLD HILL	8/28/2011	Thunderstorm Wind	0	0
GOLD HILL	5/15/2012	Thunderstorm Wind	0	0
GOLD HILL	5/15/2012	Thunderstorm Wind	0	0
GOLD HILL	5/15/2012	Thunderstorm Wind	0	0
GOLD HILL	5/15/2013	Thunderstorm Wind	0	0
GOLD HILL	8/24/2013	Thunderstorm Wind	0	0
GOLD HILL	7/3/2014	Thunderstorm Wind	0	0
GOLD HILL	7/3/2014	Thunderstorm Wind	0	0
GOLD HILL	7/3/2014	Thunderstorm Wind	0	0
GOLD HILL	9/26/2014	Thunderstorm Wind	0	0
GOLD HILL	9/26/2014	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
GOLD HILL	12/25/2014	Winter Storm	0	0
GOLD HILL	3/2/2015	Winter Storm	0	0
GOLD HILL	3/31/2015	Wildfire	0	20000
GOLD HILL	4/14/2015	Wildfire	0	50000
GOLD HILL	4/14/2015	Winter Storm	0	0
GOLD HILL	5/20/2015	Thunderstorm Wind	0	0
GOLD HILL	6/15/2015	Thunderstorm Wind	0	0
GOLD HILL	8/7/2015	Thunderstorm Wind	0	0
Grantsville	7/5/1994	Thunderstorm Wind	0	0
KNOLLS	6/17/2005	Thunderstorm Wind	0	0
KNOLLS	6/25/2005	Thunderstorm Wind	0	0
KNOLLS	7/2/2005	Thunderstorm Wind	0	0
KNOLLS	7/5/2006	Thunderstorm Wind	0	0
KNOLLS	7/9/2011	Thunderstorm Wind	0	0
KNOLLS	7/28/2013	Thunderstorm Wind	0	0
KNOLLS	8/10/2013	Wildfire	0	350000
KNOLLS	8/24/2013	Thunderstorm Wind	0	0
KNOLLS	7/24/2015	Thunderstorm Wind	0	0
LAKE PT	9/14/2010	Thunderstorm Wind	0	0
LAKE PT	9/19/2010	Wildfire	0	5000000
LAKE PT	4/21/2011	Thunderstorm Wind	0	0
LAKE PT	6/29/2011	Thunderstorm Wind	0	0
LAKE PT	9/10/2011	Thunderstorm Wind	0	0
LAKE PT	11/4/2011	Winter Storm	0	0
LAKE PT	2/29/2012	Winter Storm	0	0
LAKE PT	3/1/2012	Winter Storm	0	0
LAKE PT	3/6/2012	Winter Storm	0	0
LAKE PT	8/7/2015	Thunderstorm Wind	0	0
LOW	7/14/2014	Thunderstorm Wind	0	0
LOW	7/14/2014	Thunderstorm Wind	0	0
PEHRSON STATION	7/1/2009	Thunderstorm Wind	0	0
PEHRSON STATION	7/18/2009	Thunderstorm Wind	0	0
PEHRSON STATION	9/14/2009	Thunderstorm Wind	0	0
PEHRSON STATION	7/27/2010	Thunderstorm Wind	0	0
PEHRSON STATION	4/21/2011	Thunderstorm Wind	0	0
SALDURO	6/1/2015	Thunderstorm Wind	0	0
ST JOHN STATION	7/25/2002	Thunderstorm Wind	0	0
Stansbury Park	5/3/1993	Thunderstorm Wind	0	0
STOCKTON	6/7/2006	Thunderstorm Wind	0	0
STOCKTON	8/22/2010	Thunderstorm Wind	0	0
STOCKTON	7/13/2012	Thunderstorm Wind	0	0
TIMPIE	5/3/2009	Thunderstorm Wind	0	0
Tooele	5/31/1994	Thunderstorm Wind	0	500000
Tooele	8/23/1995	Thunderstorm Wind	0	0
TOOELE	6/2/2002	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
TOOELE	9/6/2002	Thunderstorm Wind	0	2000
TOOELE	6/7/2006	Thunderstorm Wind	0	0
VERNON	3/24/1998	Thunderstorm Wind	0	0
VERNON	4/12/1998	Winter Storm	0	0
VERNON	8/21/2001	Thunderstorm Wind	0	0
VERNON	9/12/2001	Thunderstorm Wind	0	0
VERNON	11/22/2001	Winter Storm	0	400000
VERNON	11/24/2001	Winter Storm	0	200000
VERNON	11/29/2001	Winter Storm	0	10000
VERNON	12/2/2001	Winter Storm	0	50000
VERNON	1/27/2002	Winter Storm	0	500000
VERNON	2/8/2002	Winter Storm	0	0
VERNON	3/7/2002	Winter Storm	2	140000
VERNON	3/13/2002	Winter Storm	0	0
VERNON	6/1/2002	Thunderstorm Wind	0	0
VERNON	7/25/2002	Thunderstorm Wind	0	0
VERNON MUNI ARPT	4/13/2014	Thunderstorm Wind	0	0
WARNER	6/12/2014	Thunderstorm Wind	0	0
Wendover	8/9/1961	Thunderstorm Wind	0	0
Wendover	6/25/1965	Tornado	0	0
Wendover	8/9/1965	Tornado	0	0
Wendover	9/11/1966	Thunderstorm Wind	0	0
Wendover	7/8/1967	Thunderstorm Wind	0	0
Wendover	5/5/1968	Thunderstorm Wind	0	0
Wendover	5/5/1968	Thunderstorm Wind	0	0
Wendover	5/22/1968	Tornado	0	0
Wendover	1/4/1975	Thunderstorm Wind	0	0
Wendover	7/8/1982	Thunderstorm Wind	0	0
Wendover	9/3/1983	Thunderstorm Wind	0	0
Wendover	4/17/1984	Thunderstorm Wind	0	0
Wendover	6/18/1984	Thunderstorm Wind	0	0
Wendover	7/7/1985	Thunderstorm Wind	0	0
Wendover	7/16/1985	Thunderstorm Wind	0	0
Wendover	8/27/1985	Thunderstorm Wind	0	0
Wendover	9/4/1985	Thunderstorm Wind	0	0
Wendover	7/26/1986	Thunderstorm Wind	0	0
Wendover	8/20/1987	Thunderstorm Wind	0	0
Wendover	6/25/1988	Thunderstorm Wind	0	0
Wendover	7/27/1988	Thunderstorm Wind	0	0
Wendover	8/17/1989	Thunderstorm Wind	0	0
Wendover	7/2/1990	Thunderstorm Wind	0	0
Wendover	8/11/1990	Thunderstorm Wind	0	0
Wendover	7/25/1991	Tornado	0	2500
Wendover	4/21/1992	Thunderstorm Wind	0	0
Wendover	4/21/1992	Thunderstorm Wind	0	0

Tooele County Severe Weather Events				
PD = Property Damage(InThousands)				
Wendover	6/14/1992	Thunderstorm Wind	0	0
Wendover	6/14/1992	Thunderstorm Wind	0	0
Wendover	6/14/1992	Thunderstorm Wind	0	0
Wendover	9/23/1992	Thunderstorm Wind	0	0
Wendover	9/23/1992	Thunderstorm Wind	0	0
Wendover	9/23/1992	Thunderstorm Wind	0	0
Wendover	9/23/1992	Thunderstorm Wind	0	0
Wendover	9/23/1992	Thunderstorm Wind	0	0
Wendover	5/3/1993	Thunderstorm Wind	0	0
Wendover	4/23/1994	Thunderstorm Wind	0	500
Wendover	7/23/1994	Thunderstorm Wind	0	0
Wendover	6/5/1995	Thunderstorm Wind	0	0
WENDOVER	7/19/1998	Thunderstorm Wind	0	4000
WENDOVER	8/4/2000	Thunderstorm Wind	0	0
WENDOVER	9/1/2000	Thunderstorm Wind	0	0
WENDOVER	7/16/2013	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	6/16/2007	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	6/22/2008	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	8/31/2008	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	7/25/2009	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	9/14/2009	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	4/21/2011	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	8/28/2011	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	8/31/2012	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	6/12/2013	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	6/12/2013	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	8/28/2013	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	8/29/2013	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	9/3/2013	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	9/26/2014	Thunderstorm Wind	0	0
WENDOVER AF AUX ARPT	9/26/2014	Thunderstorm Wind	0	0
WENDOVER ARPT	6/1/2001	Thunderstorm Wind	0	0
WENDOVER ARPT	5/29/2003	Thunderstorm Wind	0	0

APPENDIX K - RADON RISK MAPS AND INFORMATION

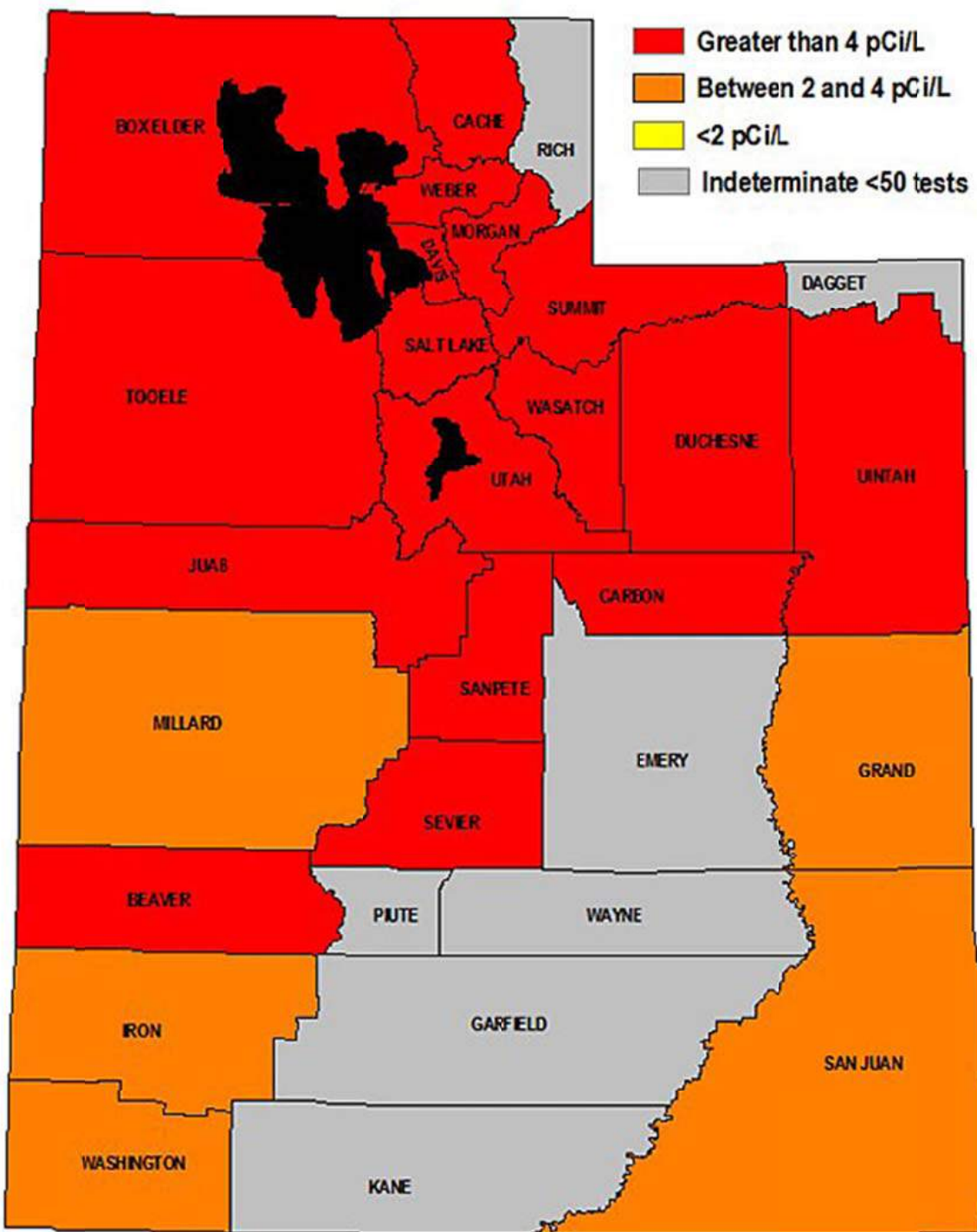
Courtesy of the Tooele County and Bear River Health Departments

Basic Radon Information Summary

Based on information from Tooele County and Bear River Health Departments.

- Many lung cancer victims never smoked tobacco products - and were never around second-hand smoke. Their lung cancers have been scientifically proven to have originated from radon gas exposure. Radon is odorless and colorless. It is estimated that 21,000 people die each year in the U.S. from lung cancer caused by radon. Radon-induced lung cancer is highly preventable.
- Radon gas is present throughout the U.S. Radon comes from the natural radioactive decay of uranium. It is estimated that the top 6 feet of soil for an average acre of land contains about 50 lbs. of uranium. Radon gas enters homes and radioactively decays - creating radon decay products (RDPs). RDPs are carried by dust, cigarette smoke, etc. - deep into our lungs where they emit alpha particles (a type of radiation) that damage our DNA - causing lung cancer.
- Radon gas enters homes through tiny (hair-like) pores in concrete slabs and basement walls. As air tends to rise in homes (especially in the winter-time). This air movement (chimney-effect) draws radon into homes. When the outside ground is frozen, has a snow-cover or is saturated with water - a "lid" is created over the ground outside - so radon more easily enters our homes. Wintertime radon gas levels measured in homes are often double summertime levels.
- Radon gas is very common within areas of the Tooele County Health Departments jurisdictions. US-EPA recommends corrective action when radon gas (year-round average) measures at or above 4pCi/L (units pronounced "pea-co-cure-ease" per liter). Many homes in Tooele County have tested much higher than 4pCi/L. The % of homes over 4pCi/L (as of July 2014 for people who used Utah DEQ radon test kits) are: Tooele County had an average of 4.8 (pCi/L). The highest radon levels found: Grantsville City 98.1 (pCi/L) and Rush Valley 43.4 (pCi/L).
- Homes next door to each other can have very different levels of radon (due to differing geology beneath every home). Testing of bare ground for radon before building a home is impossible (see RRNC info for new homes on next/back page). Everyone needs to test for radon gas in existing homes. Testing is the only way to know if dangerous levels of radon are present.
- Short term Radon self-test kits are available for Free (while supplies last) at Tooele County Health Department - 151 North Main Street Tooele, Utah 84074 Ph: (435) 277-2300.

- The most common way to stop radon gas from entering homes is “sub-slab depressurization.” With SSDP - a diamond-bit is used to drill a 3” or 4” hole into and to below the concrete slab. About 5 gal. of soil (sand/gravel) is excavated. Then, 3” or 4” PVC piping is sealed in the hole and connected so that radon vents above the roof. SSDP creates a pathway of least resistance for radon to exit soil beneath homes (so only a tiny amount of radon enters homes). A fan may be connected to increase flow (about 5-10 cents/day). SSDP systems cost about \$1,200-\$1,500.
- TCHD recommends that homeowners considering radon mitigation get several competitive bids from radon mitigators - and to only use currently certified National Radon Proficiency Program (NRPP) radon mitigators (see current list at www.radon.utah.gov.) Many NRPP mitigators will warranty that radon in mitigated homes will not exceed 2.7pCi/L for 15 years (or longer) – including the warranty being transferable to new owners for the life of the warranty.
- The modern and smart way to prevent radon gas from entering a new home is to build-in radon resistant new construction (RRNC) features. With trained mitigators in the construction crew, RRNC costs can be 1/2 the cost of doing mitigation. RRNC can be more efficient and attractive (with pipes carrying radon completely hidden under concrete and inside walls). Because of high radon levels in almost every community within TCHD’s jurisdiction, TCHD strongly encourages everyone building a new home to consider installing RRNC features in it. (Please go to www.radon.utah.gov to watch a short video showing how RRNC is installed.)
- Home buyers are increasingly asking for radon mitigated homes (radon <4pCi/L). And with new construction, more people are asking their builders to install RRNC features. When such mitigated/RRNC homes are sold, people are often getting their mitigation/RRNC costs back.
- Older homes are often drafty (poor insulation, cracks, open windows, evaporative coolers); and such conditions allow outdoor air to dilute radon levels. Newer homes are often very energy efficient (“tight” - more insulation, less cracks and AC) - which keeps more radon inside homes.
- To view current radon test results for your community visit www.radonutah.com you can find other useful radon info at: eh@tooelehealth.org or by calling (435)277-2440.
- Please go to www.epa.gov/radon for many extensive radon information guides. You will also see radon research references documenting how radon has been scientifically proven to cause approximately 21,000 lung cancer deaths in the U.S. each year. Most of these deaths could have been prevented with radon mitigation (<4pCi/L) - or with RRNC features in new homes.



This map represents radon test results reported (by zip code only) to the Utah Department of Environmental Quality (DEQ) - as of approx. July 2014. This map is helpful in encouraging all Utah home builders (and their clients) to strongly consider the advantages of installing Radon Resistant New Construction (RRNC) features in all new homes. (RRNC features can be ½ the cost of doing mitigation after a home is built.) ***This DEQ map should never be used to predict radon levels in existing homes.*** Because the geology beneath every home is different, similar homes next door to each other can have greatly differing radon levels. ***Every existing home needs to be tested for radon*** - and when high levels are found - mitigated by currently certified National Radon Proficiency Program (NRPP) mitigators only.

(Tooele County Health Department Annotated Short- Term Radon Test Results From DEQ(2016))

Utah Department of Environmental Quality - Division of Radiation Control**Short-Term Radon Test Results by Jurisdiction & Zip Code (2016)**

4 picocuries (pronounced "pea-co-cure-ease") per liter (pCi/L) is the US-EPA's recommended radon action level.

Note: all homes should be tested for radon. Neighboring homes frequently have very different radon readings.

TOOELE COUNTY				
Jurisdictions	Zip Code	Maximum	Average	Total Tests
Dugway	84022	1.2	0.8	21
Erda	84074	30.4	7.2	67
Grantsville	84029	98.1	3.5	219
Lake Point	84074	16.5	10.8	6
Rush Valley	84069	43.4	12.6	5
Skull Valley	84029	0.4	0.4	1
Stansbury Park	84074	114	4.5	252
Stockton	84071	14.5	6.7	8
Tooele City	84074	31.3	2.6	896
Vernon	84080	4.9	2.8	7
Wendover	84083	3.7	1	58
All Short-Term Results: Tooele County		98.1	4.8	1540

*Unsafe Radon levels are anything over 3.0 (pCi/L)

Why Do Radon Levels Inside a Home Fluctuate So Much?

Air Pressure Differentials Caused by Building Induced Soil Suction & Stack Effect from Heating

- Buildings can create vacuums that suck in soil gases/radon. These vacuums (referred to as **Air Pressure Differentials APD's**) may be very small. But even small APD's between the house air pressure and the soil gas pressure - can greatly change radon readings inside a home.
- When indoor air is warmer than outside air, it rises up and exits through the upper portion of the house. This air is replaced by soil gases which contain radon. The warmer the house and the colder it is outside – the greater is the stack (chimney) effect drawing radon into a home.
- APD's and the stack effect are the greatest factors causing radon levels to rise or fall inside a home. Because APD's and the stack effect are usually higher at night and lower during the day – indoor radon levels are usually higher at night and lower in the day (diurnal APD/stack effect).

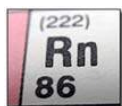
Use of Home Air Exhaust Devices

- When exhaust devices push air out of a home, the home's partial vacuum is increased - causing more soil gases and radon to be sucked in.
- Estimated air flows (cubic feet per minute – cfm) of home devices that exhaust air to the outside:
 - Open wood fireplace 170cfm
 - Central vacuum cleaner 110cfm
 - Clothes dryer 100cfm
 - Bathroom fan 24-90cfm
 - Open wood stove 65cfm
 - Gas combustion appliances 21-72cfm
(furnaces, space heaters, ranges, water heaters, etc.)
 - Air-tight wood stove 30cfm

Rain, Winds and Other Natural Forces

- Light rain and gentle winds have little effect on indoor radon concentrations.
- Severe storms and high winds can have a great effect on indoor radon levels.
- Rain can block soil pathways and either raise or reduce indoor radon concentrations.
- Indoor radon concentrations are usually higher during heavy rain events and winter seasons.
- High winds can raise or lower indoor radon. When wind blows on side of house with most door(s)/window(s), it creates more positive indoor pressure which pushes radon out. When it blows on side with least door(s)/window(s), it creates more negative indoor pressure, which sucks more radon in.
- Barometric pressure changes can change soil gas pressures and amount of radon entering a home.
- Indoor radon levels are usually higher in the wintertime because: 1. - the heating system is pulling air up and out of the home (stack effect); and 2. - frozen ground/soil saturation caps/blocks soil gas/radon from normal exiting into the atmosphere from outside soil - causing soil gas/radon pressures to rise. Thus entering the home becomes the pathway of least resistance for soil gas/radon to follow.
- Daily radon variation (sometimes 2-3 fold) is usually greater in the summer than in the winter. because of more variations in soil surface temperatures during the summer than in the winter.
- An activated sump pump can pump some radon out with the water (and lower indoor radon levels).

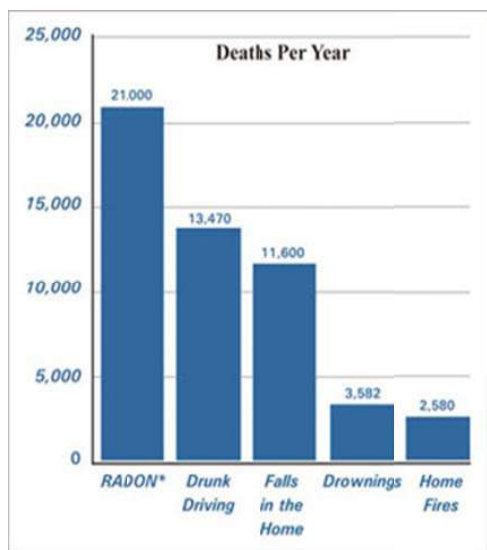
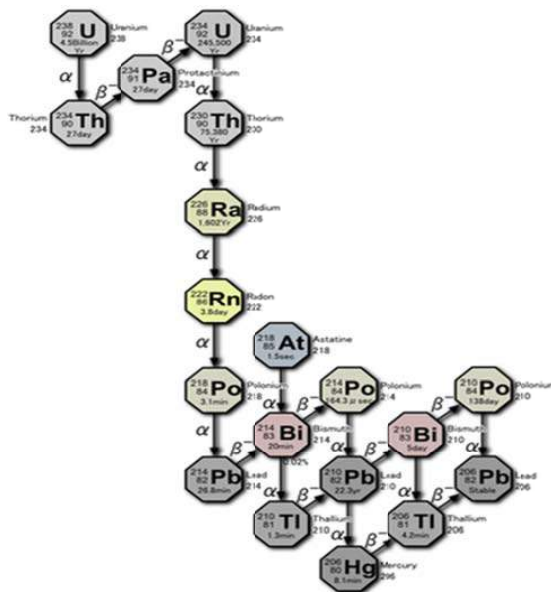
Brief Scientific (Technical) Explanation of How Radon Causes Lung Cancer



Radon is a colorless/odorless gas - a radioactive byproduct and part of the natural radioactive decay of uranium 238. Radon has a half-life of 3.8 days, decaying by emission of alpha particles and beta radiation to polonium, bismuth, and lead in successive steps (shown in the chart below).

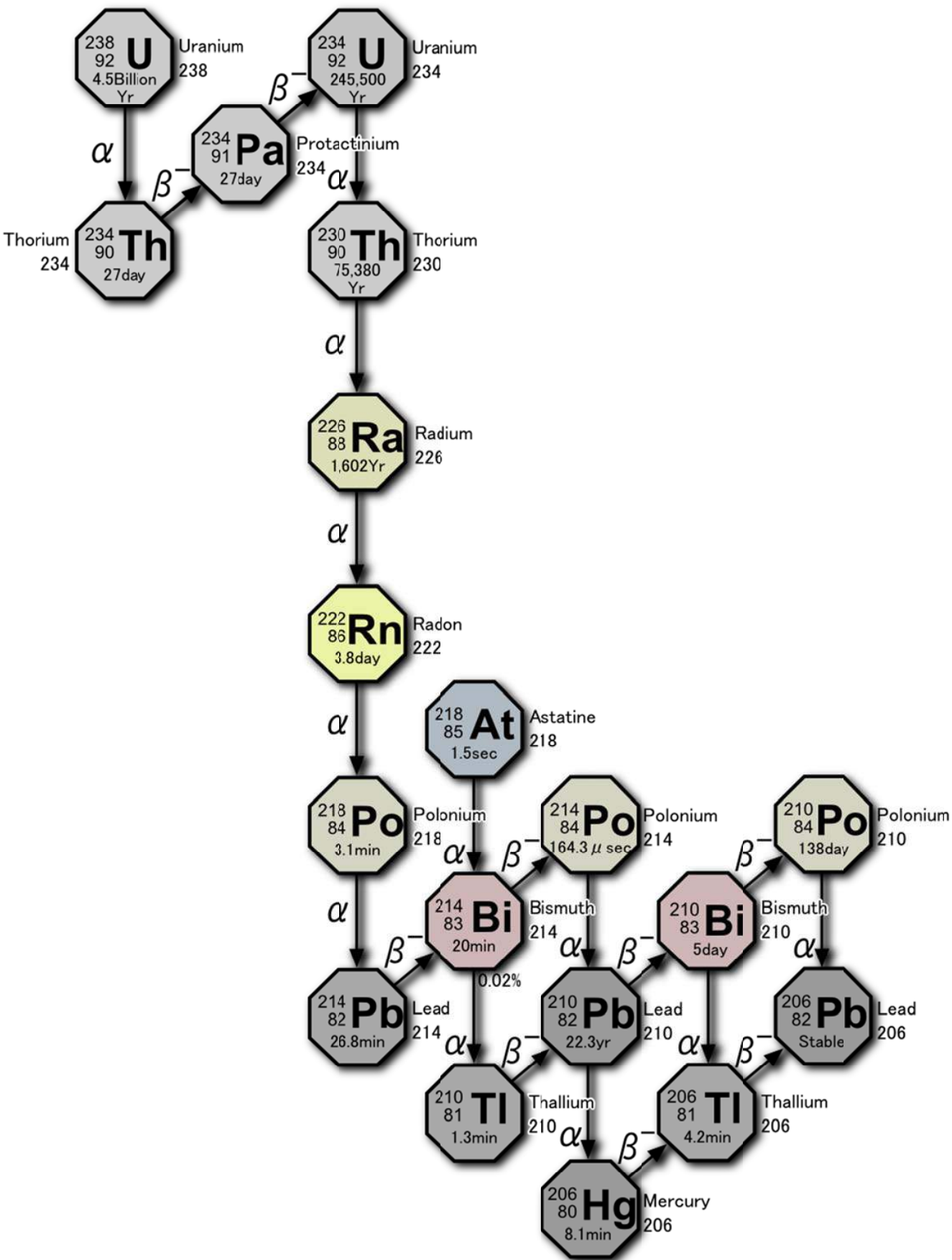
Radon 222 emits an alpha particle (alpha) and decays further into isotopes of polonium, lead, and bismuth [the most important being polonium isotopes 218 and 214 with a combined 13.7 million electron volts (MeV) of energy]. These isotopes are called radon decay products (RDPs). RDPs float around in the air during their minutes/seconds of existence, often become attached to dust particles, enter our lungs, and emit alphas which cause harm. (Details continue below-right.)

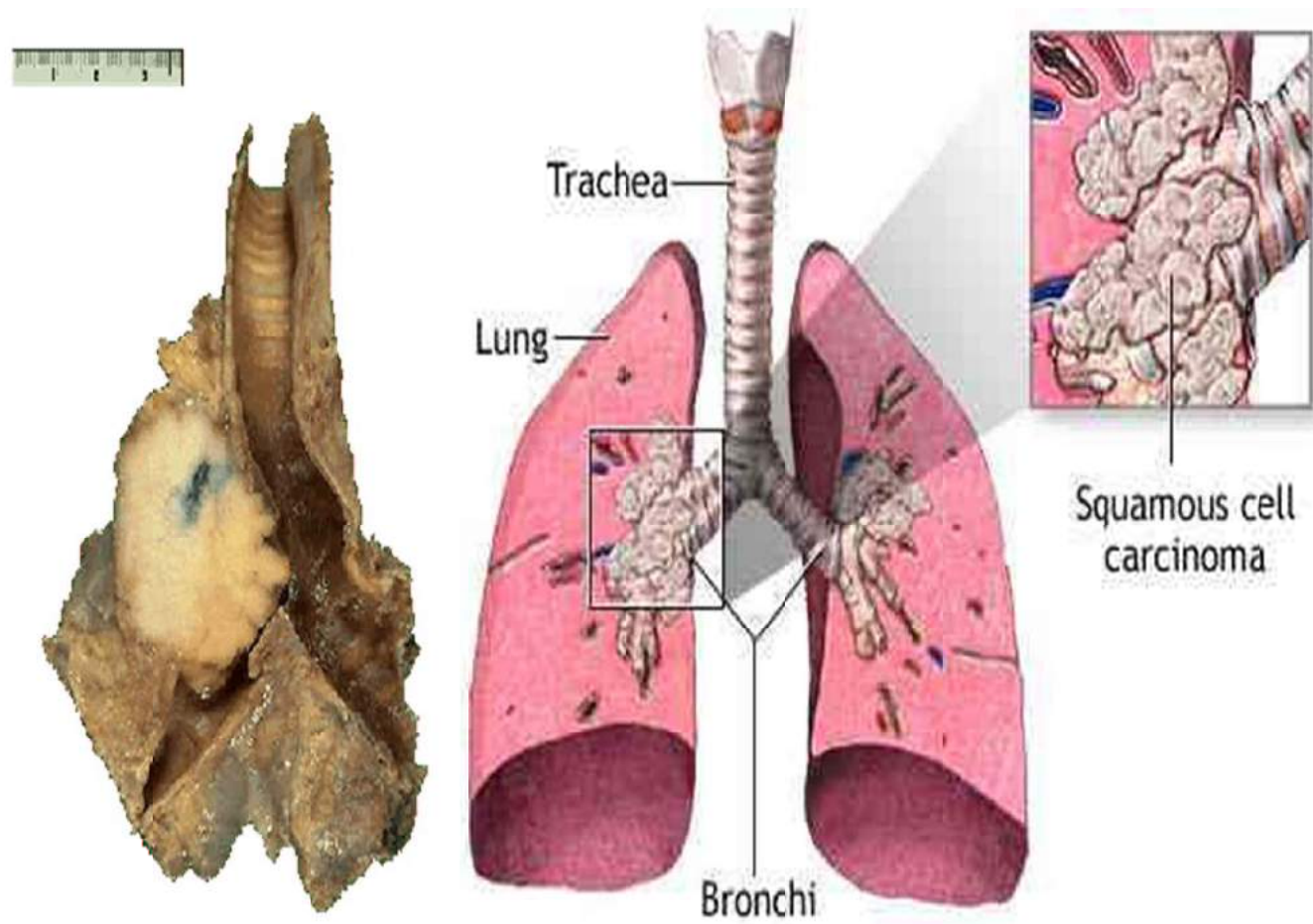
The top 6 feet of soil in an average acre of land contains about 50 lbs. of uranium that will decay into radon and RDPs. On average, about six atoms of radon emerge from every square inch of soil per second. Radon in outside air is diluted rapidly, but if it enters through basement floors and is trapped in tight houses, it can reach dangerous concentrations. Being an atom, radon can easily penetrate through concrete. As concrete cures, the water that was originally part of the concrete mix migrates to the surface and evaporates, leaving behind tiny capillaries (tubes). These tubes are thinner than a human hair, but large enough for radon gas atoms to pass through. Cement sealers, plastic sheeting, etc. also don't stop radon from entering homes. Only by creating a partial vacuum beneath concrete (sub-slab depressurization) and venting radon through piping (often with an exhaust fan) to above the roof - can radon be largely prevented from entering homes.



The US-EPA estimates radon causes many thousands of cancer deaths in the United States each year.

RDPs, being electrically charged solid particles often stick to the surfaces of our bronchial tubes where they can do the most harm (cells lining bronchial tubes are among the most sensitive cells of the body). When RDP alphas are emitted, they dump a lot of energy (MeV) into and severely damage the DNA of these cells. Passage of a single alpha has the potential to cause irreparable damage in cells that are not killed. If not properly repaired, DNA damage from the linear energy transfer (LET) in this type of interaction - can be preserved and incorporated into the genetic structure of transcribed DNA. Since LET-induced DNA mutations can sometimes exist through 50 cellular generations (or more) - at some point the mutational insult becomes too cytotoxic for the cell to continue correct replications, resulting in cancerous tumors. It is also believed that alphas induce oncogenes (make genes that may cause cancer) and damage tumor-suppressor genes, and that this results in chromosomes being fractured/improperly repaired. Also, the rebounding RDP atoms also release a lot of energy which damages DNA in adjacent cells. Because alphas/rebounding atoms are so harmful, they are a 100 times more likely to cause cancer than other radiation types. US-EPA estimates radon causes about 21,000 U.S. deaths each year. Only cigarette smoking causes more lung cancer deaths per year than radon.

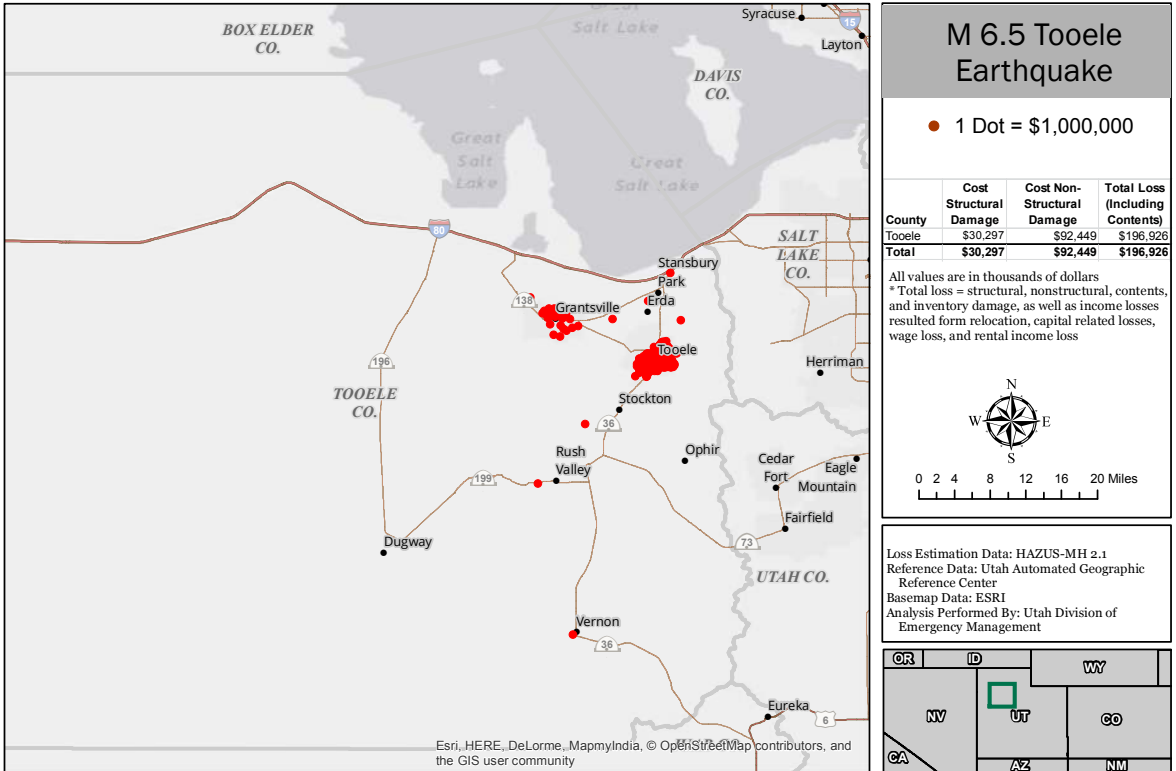




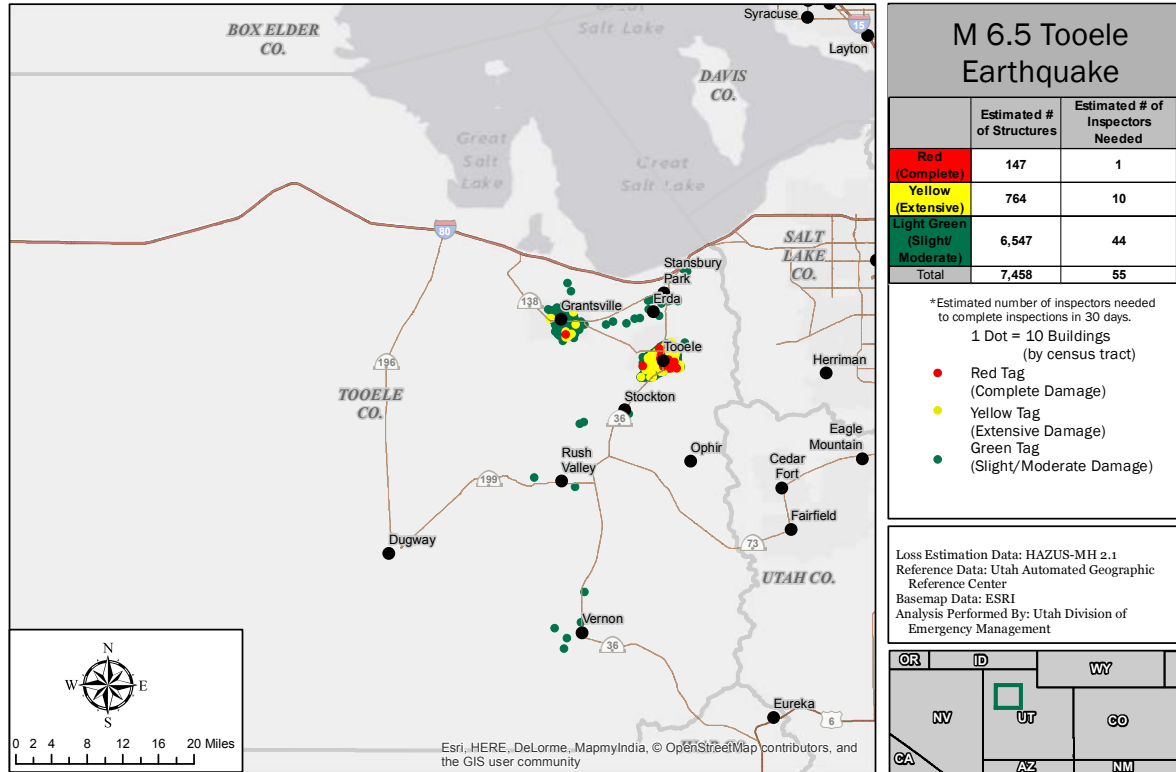
APPENDIX L - TOOELE COUNTY M6.5 HAZUS EQ SCENARIO

Courtesy of Josh Groeneveld with the Utah Division of Emergency Management

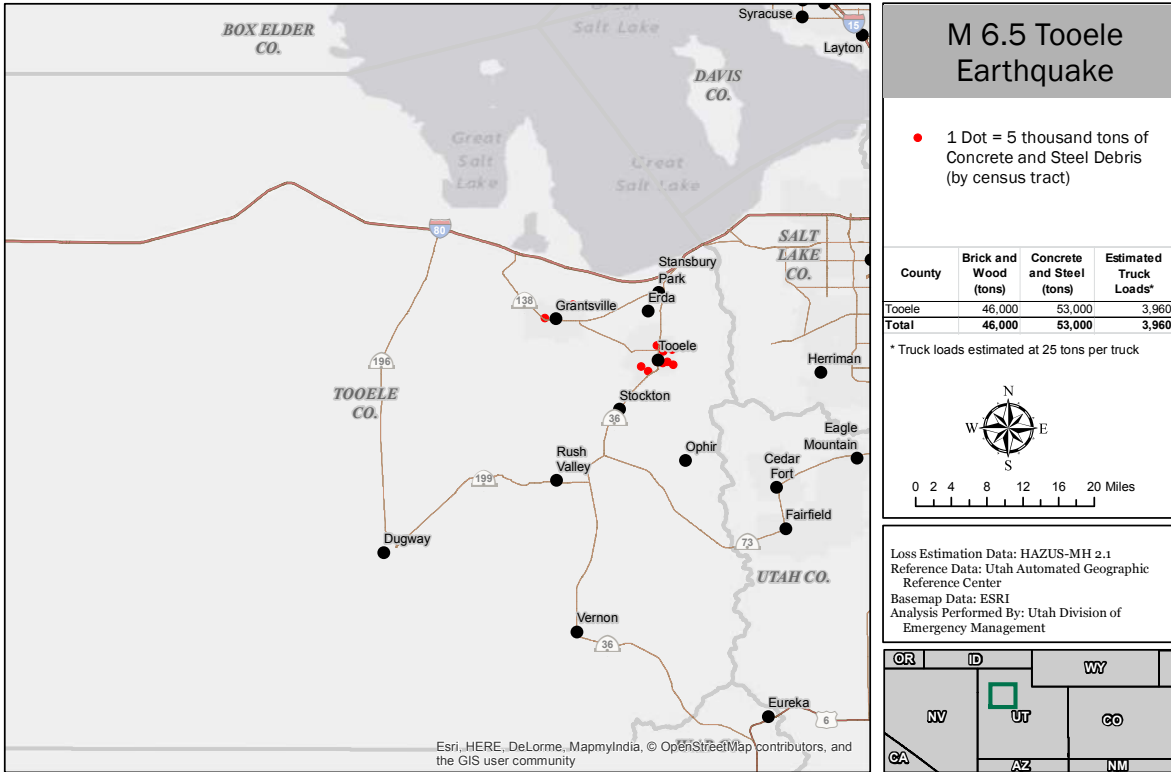
Direct Building Economic Loss



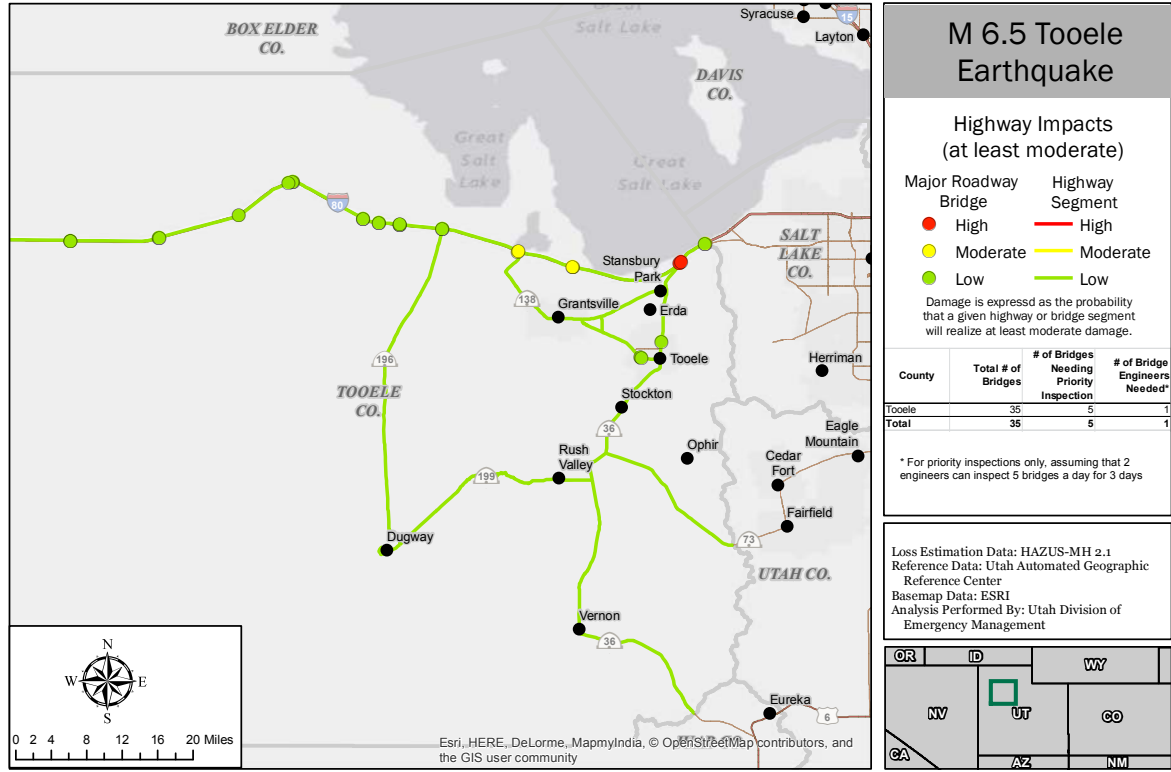
Estimated Building Inspection Needs



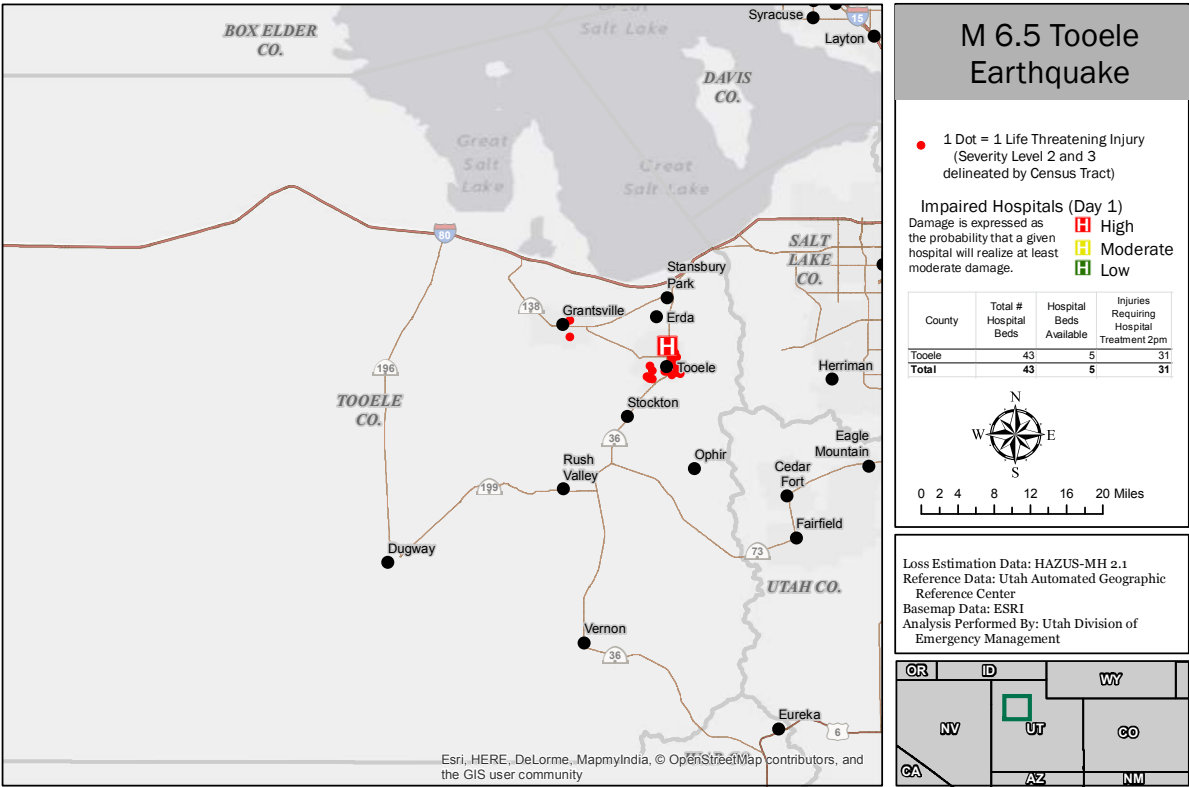
Estimated Concrete and Steel Debris



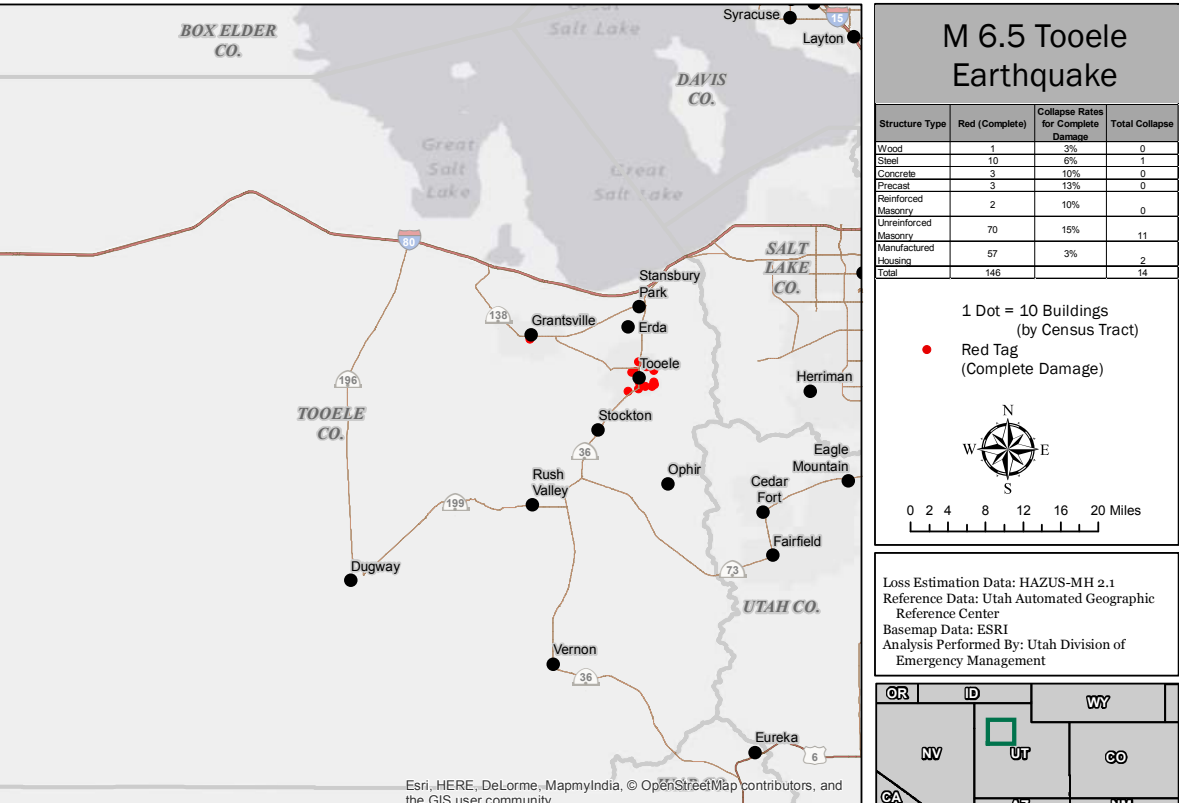
Highway Infrastructure Damage



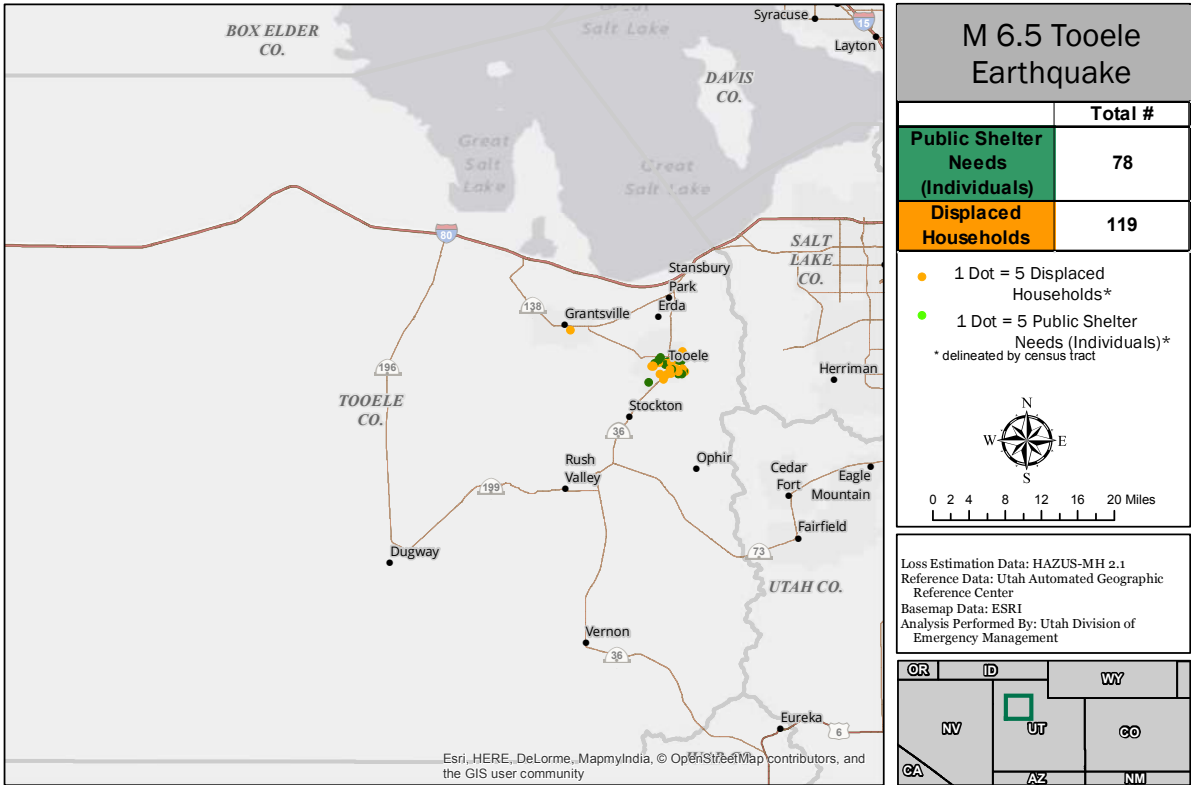
Life Threatening Injuries



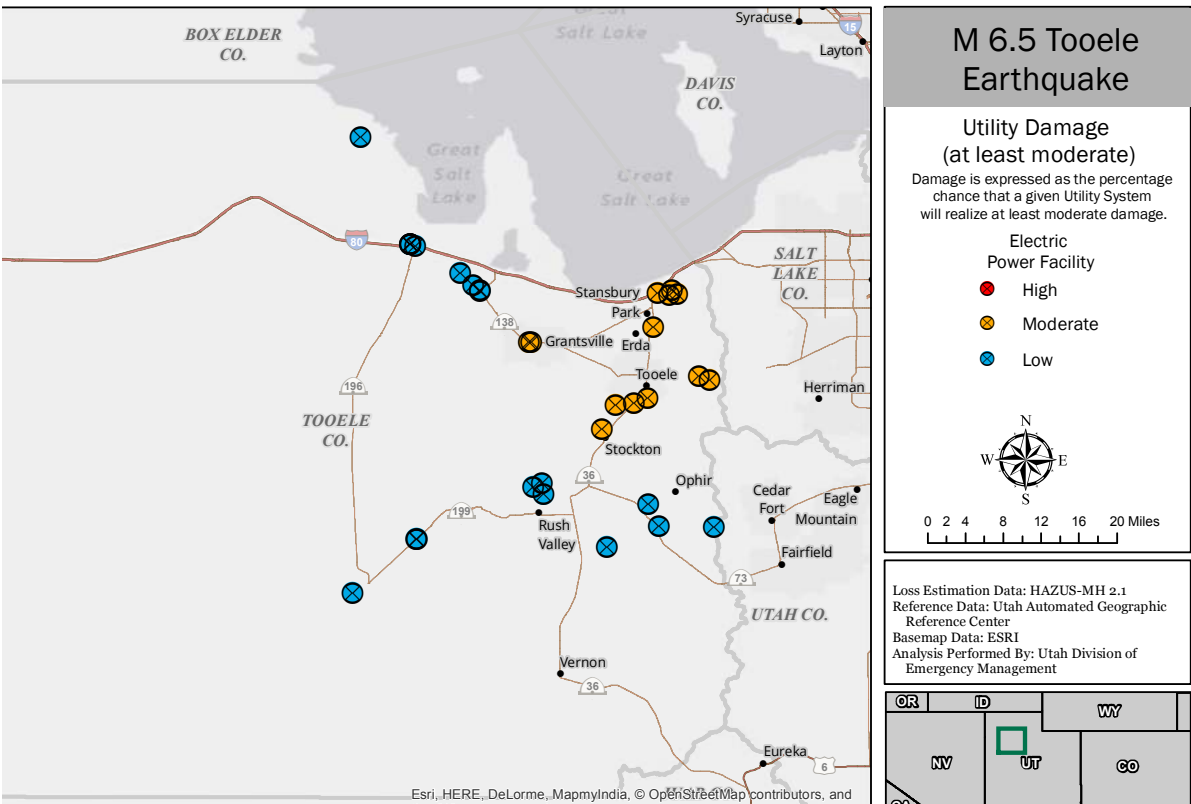
Potential Search and Rescue Needs



Displaced Households and Shelter Needs



Utility Infrastructure Damage



Using HAZUS to Model an M 6.5 Earthquake in Tooele County

Josh Groeneveld
GIS Coordinator

Utah Division of Emergency Management
10 November 2015

What HAZUS Can Analyze

- Earthquakes
- Floods (both riverine and coastal)
- Hurricane Winds
- Flood and Hurricane can be combined for a storm surge model

What HAZUS Can't Analyze

- Wind storms in areas outside of the hurricane states
- Wildfires
- Tornadoes
- Volcanoes

HAZUS Analysis Levels

- Level 1: Out of the box data and settings
- **Level 2: Combination of local and default hazard, building and damage data**
- Level 3: Use local building and damage data, as well as hazard specific damage functions (this usually requires engineering expertise)

HAZUS Model Inputs

- Census Data
 - **HAZUS relies heavily on Census data for population and demographics**
 - As of HAZUS 2.2, the 2010 Census geometries are available by default

HAZUS Model Inputs

- Inventory Data
 - Essential Facilities (hospitals, EOC's, police stations, fire stations, schools)
 - Transportation (bridges, highways, railroads, light rail, etc.)
 - High Potential Loss Facilities (dams, nuclear power, military installations, etc.)
 - Utilities (natural gas, electric, potable water and waste water)

HAZUS Key Points

- A HAZUS analysis occurs in a Study Region, which can consist of a state, county, Census Tract, Census Block, Community or Watershed
- Loss estimates are only for what is within the study region
-- **if the disaster extends past the study region boundaries, those losses won't be captured**

HAZUS Key Points: Building Damage Guidelines

Damage State	Range of Possible Loss Ratios	Probability of Long-Term Building Closure	Probability of Partial or Full Collapse	Immediate Post Earthquake Inspection
Slight	0% - 5%	P = 0	P = 0	Green Tag
Moderate	5% - 25%	P = 0	P = 0	Green Tag
Extensive	25% - 100%	P ≈ 0.5	P ≈ 0	Yellow Tag
Complete	100%	P ≈ 1.0	P > 0	Red Tag

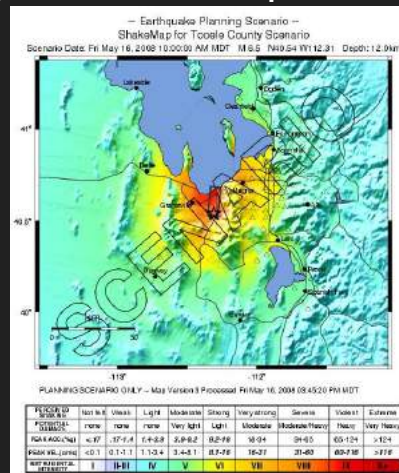
HAZUS Key Points

- You can download HAZUS here:
 - <https://msc.fema.gov/portal/resources/hazus>
- **HAZUS is free to download and use; but it requires ArcGIS 10.2.2**
- Useful info here:
 - <http://www.fema.gov/hazus>

Tooele County M 6.5 Earthquake Scenario

- M 6.5 represents a credible event in the Tooele Valley
- The University of Utah Seismograph Stations generated a scenario ShakeMap that we input into HAZUS
- Also included in this HAZUS analysis are geologic data layers:
 - Liquefaction potential
 - Landslide susceptibility
 - Soil type
 - Water depth

Tooele County M 6.5 Earthquake Scenario



Tooele County M 6.5 Earthquake Scenario

- Tooele County was the only county in this study region
- Total Economic Loss: \$254,470,000
- Total Building-Related Economic Loss: \$196,920,000
- ~3,000 buildings at least moderately damaged
- ~150 buildings damaged beyond repair

Tooele County M 6.5 Earthquake Scenario

- ~120 households displaced
- ~80 people seeking public shelter
- Depending on time of day:
 - 50 - 100 people with minor injuries
 - 15 - 30 people with life threatening injuries
 - 3 - 6 fatalities
- ~7,000 households without power on the first day

Other Earthquake Scenarios Covering Tooele

- **M 6.5 Tooele County: \$196,920,000 in building-related economic losses**
- M 7.0 Salt Lake City Segment of Wasatch Fault: \$34,969,000
- M 7.0 East Great Salt Lake Fault: \$46,060,000
- M 7.2 Provo Segment of Wasatch Fault: \$12,964,000
- M 7.0 Weber Segment of Wasatch Fault: \$4,469,000

Questions?

Josh Groeneveld

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Hazus-MH: Earthquake Event Report

Region Name: Tooele_County_M65_Peak_PGV_Sept_2014

Earthquake Scenario: Tooele_County_M65_Peak_Ground_Motions

Print Date: September 22, 2014

Totals only reflect data for those census tracts/blocks included in the user's study region.

Disclaimer:

The estimates of social and economic impacts contained in this report were produced using Hazus loss estimation methodology software which is based on current scientific and engineering knowledge. There are uncertainties inherent in any loss estimation technique. Therefore, there may be significant differences between the modeled results contained in this report and the actual social and economic losses following a specific earthquake. These results can be improved by using enhanced inventory, geotechnical, and observed ground motion data.

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General Description of the Region

Hazus is a regional earthquake loss estimation model that was developed by the Federal Emergency Management Agency and the National Institute of Building Sciences. The primary purpose of Hazus is to provide a methodology and software application to develop earthquake losses at a regional scale. These loss estimates would be used primarily by local, state and regional officials to plan and stimulate efforts to reduce risks from earthquakes and to prepare for emergency response and recovery.

The earthquake loss estimates provided in this report was based on a region that includes 1 county(ies) from the following state(s):

Utah

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 7,275.67 square miles and contains 7 census tracts. There are over 17 thousand households in the region which has a total population of 58,218 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 19 thousand buildings in the region with a total building replacement value (excluding contents) of 3,611 (millions of dollars). Approximately 94.00 % of the buildings (and 79.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 3,418 and 238 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

Hazus estimates that there are 19 thousand buildings in the region which have an aggregate total replacement value of 3,611 (millions of dollars) . Appendix B provides a general distribution of the building value by State and County.

In terms of building construction types found in the region, wood frame construction makes up 39% of the building inventory. The remaining percentage is distributed between the other general building types.

Critical Facility Inventory

Hazus breaks critical facilities into two (2) groups: essential facilities and high potential loss facilities (HPL). Essential facilities include hospitals, medical clinics, schools, fire stations, police stations and emergency operations facilities. High potential loss facilities include dams, levees, military installations, nuclear power plants and hazardous material sites.

For essential facilities, there are 1 hospitals in the region with a total bed capacity of 43 beds. There are 32 schools, 17 fire stations, 8 police stations and 1 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 9 dams identified within the region. Of these, 2 of the dams are classified as 'high hazard'. The inventory also includes 94 hazardous material sites, 0 military installations and 0 nuclear power plants.

Transportation and Utility Lifeline Inventory

Within Hazus, the lifeline inventory is divided between transportation and utility lifeline systems. There are seven (7) transportation systems that include highways, railways, light rail, bus, ports, ferry and airports. There are six (6) utility systems that include potable water, wastewater, natural gas, crude & refined oil, electric power and communications. The lifeline inventory data are provided in Tables 1 and 2.

The total value of the lifeline inventory is over 3,656.00 (millions of dollars). This inventory includes over 487 kilometers of highways, 35 bridges, 17,380 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# Locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	35	74.70
	Segments	39	2,790.00
	Tunnels	0	0.00
	Subtotal		2,864.70
Railways	Bridges	1	0.00
	Facilities	0	0.00
	Segments	254	418.50
	Tunnels	0	0.00
	Subtotal		418.50
Light Rail	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		0.00
Bus	Facilities	0	0.00
	Subtotal		0.00
Ferry	Facilities	0	0.00
	Subtotal		0.00
Port	Facilities	0	0.00
	Subtotal		0.00
Airport	Facilities	2	21.30
	Runways	3	113.90
	Subtotal		135.20
Total			3,418.50

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	216.20
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		216.20
Waste Water	Distribution Lines	NA	129.70
	Facilities	3	195.80
	Pipelines	0	0.00
	Subtotal		325.50
Natural Gas	Distribution Lines	NA	86.50
	Facilities	0	0.00
	Pipelines	3	42.30
	Subtotal		128.80
Oil Systems	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		0.00
Electrical Power	Facilities	33	0.00
	Subtotal		0.00
Communication	Facilities	4	0.40
	Subtotal		0.40
		Total	670.80

Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

Scenario Name	Tooele_County_M65_Peak_Ground_Motions
Type of Earthquake	User-defined
Fault Name	NA
Historical Epicenter ID #	NA
Probabilistic Return Period	NA
Longitude of Epicenter	NA
Latitude of Epicenter	NA
Earthquake Magnitude	6.50
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

Hazus estimates that about 2,993 buildings will be at least moderately damaged. This is over 15.00 % of the buildings in the region. There are an estimated 146 buildings that will be damaged beyond repair. The definition of the 'damage states' is provided in Volume 1: Chapter 5 of the Hazus technical manual. Table 3 below summarizes the expected damage by general occupancy for the buildings in the region. Table 4 below summarizes the expected damage by general building type.

Table 3: Expected Building Damage by Occupancy

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Agriculture	43	0.34	10	0.23	9	0.42	7	0.96	1	0.90
Commercial	417	3.33	168	3.76	94	4.54	32	4.17	5	3.29
Education	17	0.13	4	0.09	6	0.29	4	0.57	1	0.42
Government	38	0.31	7	0.15	4	0.20	3	0.41	1	0.42
Industrial	99	0.79	29	0.66	57	2.71	41	5.36	8	5.32
Other Residential	1,403	11.19	656	14.70	493	23.65	352	46.03	67	45.81
Religion	18	0.14	8	0.17	9	0.42	5	0.70	1	0.47
Single Family	10,502	83.76	3,582	80.23	1,412	67.78	319	41.80	64	43.38
Total	12,537		4,464		2,083		764		147	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	5,068	40.43	2423	54.28	362	17.36	8	1.05	1	0.37
Steel	91	0.73	23	0.52	40	1.92	39	5.10	10	6.69
Concrete	104	0.83	36	0.81	53	2.53	30	3.90	3	2.13
Precast	26	0.21	5	0.12	14	0.67	18	2.34	3	2.32
RM	5,874	46.85	1525	34.15	711	34.14	49	6.40	2	1.37
URM	1,081	8.62	353	7.91	593	28.48	321	41.98	70	48.03
MH	294	2.34	98	2.20	310	14.90	300	39.23	57	39.08
Total	12,537		4,464		2,083		764		147	

*Note:

RM Reinforced Masonry
URM Unreinforced Masonry
MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 43 hospital beds available for use. On the day of the earthquake, the model estimates that only 4 hospital beds (11.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 41.00% of the beds will be back in service. By 30 days, 92.00% will be operational.

Table 5: Expected Damage to Essential Facilities

Classification	Total	# Facilities		
		At Least Moderate Damage > 50%	Complete Damage > 50%	With Functionality > 50% on day 1
Hospitals	1	1	0	0
Schools	32	0	0	8
EOCs	1	0	0	0
PoliceStations	8	0	0	4
FireStations	17	0	0	10

Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

Table 6: Expected Damage to the Transportation Systems

System	Component	Number of Locations_				
		Locations/ Segments	With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	39	0	0	39	39
	Bridges	35	4	0	31	33
	Tunnels	0	0	0	0	0
Railways	Segments	254	0	0	254	254
	Bridges	1	0	0	1	1
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Light Rail	Segments	0	0	0	0	0
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	0	0	0	0	0
Bus	Facilities	0	0	0	0	0
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	2	0	0	2	2
	Runways	3	0	0	3	3

Note: Roadway segments, railroad tracks and light rail tracks are assumed to be damaged by ground failure only. If ground failure maps are not provided, damage estimates to these components will not be computed.

Tables 7-9 provide information on the damage to the utility lifeline systems. Table 7 provides damage to the utility system facilities. Table 8 provides estimates on the number of leaks and breaks by the pipelines of the utility systems. For electric power and potable water, Hazus performs a simplified system performance analysis. Table 9 provides a summary of the system performance information.

Table 7 : Expected Utility System Facility Damage

System	# of Locations				
	Total #	With at Least Moderate Damage	With Complete Damage	with Functionality > 50 %	
				After Day 1	After Day 7
Potable Water	0	0	0	0	0
Waste Water	3	2	0	0	3
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	33	6	0	20	33
Communication	4	0	0	4	4

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	10,808	196	50
Waste Water	6,485	98	25
Natural Gas	88	18	9
Oil	0	0	0

Table 9: Expected Potable Water and Electric Power System Performance

	Total # of Households	Number of Households without Service				
		At Day 1	At Day 3	At Day 7	At Day 30	At Day 90
Potable Water	17,971	0	0	0	0	0
Electric Power		6,915	2,601	566	76	18

Induced Earthquake Damage

Fire Following Earthquake

Fires often occur after an earthquake. Because of the number of fires and the lack of water to fight the fires, they can often burn out of control. Hazus uses a Monte Carlo simulation model to estimate the number of ignitions and the amount of burnt area. For this scenario, the model estimates that there will be 0 ignitions that will burn about 0.00 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 0 people and burn about 0 (millions of dollars) of building value.

Debris Generation

Hazus estimates the amount of debris that will be generated by the earthquake. The model breaks the debris into two general categories: a) Brick/Wood and b) Reinforced Concrete/Steel. This distinction is made because of the different types of material handling equipment required to handle the debris.

The model estimates that a total of 0.10 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 47.00% of the total, with the remainder being Reinforced Concrete/Steel. If the debris tonnage is converted to an estimated number of truckloads, it will require 3,920 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

Social Impact

Shelter Requirement

Hazus estimates the number of households that are expected to be displaced from their homes due to the earthquake and the number of displaced people that will require accommodations in temporary public shelters. The model estimates 119 households to be displaced due to the earthquake. Of these, 78 people (out of a total population of 58,218) will seek temporary shelter in public shelters.

Casualties

Hazus estimates the number of people that will be injured and killed by the earthquake. The casualties are broken down into four (4) severity levels that describe the extent of the injuries. The levels are described as follows;

- Severity Level 1: Injuries will require medical attention but hospitalization is not needed.
- Severity Level 2: Injuries will require hospitalization but are not considered life-threatening
- Severity Level 3: Injuries will require hospitalization and can become life threatening if not promptly treated.
- Severity Level 4: Victims are killed by the earthquake.

The casualty estimates are provided for three (3) times of day: 2:00 AM, 2:00 PM and 5:00 PM. These times represent the periods of the day that different sectors of the community are at their peak occupancy loads. The 2:00 AM estimate considers that the residential occupancy load is maximum, the 2:00 PM estimate considers that the educational, commercial and industrial sector loads are maximum and 5:00 PM represents peak commute time.

Table 10 provides a summary of the casualties estimated for this earthquake

Table 10: Casualty Estimates

		Level 1	Level 2	Level 3	Level 4
2 AM	Commercial	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	0	0	0	0
	Industrial	1	0	0	0
	Other-Residential	15	3	0	0
	Single Family	55	11	1	3
	Total	72	14	2	3
2 PM	Commercial	14	3	0	1
	Commuting	0	0	0	0
	Educational	68	15	2	4
	Hotels	0	0	0	0
	Industrial	10	2	0	1
	Other-Residential	3	1	0	0
	Single Family	13	3	0	1
	Total	110	24	4	6
5 PM	Commercial	13	3	0	1
	Commuting	3	3	6	1
	Educational	6	1	0	0
	Hotels	0	0	0	0
	Industrial	6	1	0	0
	Other-Residential	6	1	0	0
	Single Family	22	5	1	1
	Total	56	14	7	4

Economic Loss

The total economic loss estimated for the earthquake is 254.47 (millions of dollars), which includes building and lifeline related losses based on the region's available inventory. The following three sections provide more detailed information about these losses.

Building-Related Losses

The building losses are broken into two categories: direct building losses and business interruption losses. The direct building losses are the estimated costs to repair or replace the damage caused to the building and its contents. The business interruption losses are the losses associated with inability to operate a business because of the damage sustained during the earthquake. Business interruption losses also include the temporary living expenses for those people displaced from their homes because of the earthquake.

The total building-related losses were 196.92 (millions of dollars); 20 % of the estimated losses were related to the business interruption of the region. By far, the largest loss was sustained by the residential occupancies which made up over 59 % of the total loss. Table 11 below provides a summary of the losses associated with the building damage.

Table 11: Building-Related Economic Loss Estimates

(Millions of dollars)

Category	Area	Single Family	Other Residential	Commercial	Industrial	Others	Total
Income Losses							
	Wage	0.00	0.59	3.43	0.23	2.52	6.77
	Capital-Related	0.00	0.25	2.16	0.13	0.75	3.29
	Rental	2.46	1.42	1.31	0.06	0.53	5.78
	Relocation	9.10	2.19	2.04	0.40	9.10	22.83
	Subtotal	11.56	4.44	8.94	0.82	12.89	38.67
Capital Stock Losses							
	Structural	15.00	3.03	2.26	1.22	8.79	30.30
	Non_Structural	49.18	11.85	8.04	2.97	20.40	92.45
	Content	18.05	2.58	4.60	1.72	7.99	34.95
	Inventory	0.00	0.00	0.12	0.42	0.03	0.57
	Subtotal	82.24	17.46	15.03	6.32	37.22	158.26
	Total	93.80	21.90	23.97	7.14	50.11	196.92

Transportation and Utility Lifeline Losses

For the transportation and utility lifeline systems, Hazus computes the direct repair cost for each component only. There are no losses computed by Hazus for business interruption due to lifeline outages. Tables 12 & 13 provide a detailed breakdown in the expected lifeline losses.

Hazus estimates the long-term economic impacts to the region for 15 years after the earthquake. The model quantifies this information in terms of income and employment changes within the region. Table 14 presents the results of the region for the given earthquake.

Table 12: Transportation System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Highway	Segments	2,790.04	\$14.48	0.52
	Bridges	74.71	\$2.31	3.09
	Tunnels	0.00	\$0.00	0.00
	Subtotal	2864.70	16.80	
Railways	Segments	418.50	\$0.32	0.08
	Bridges	0.04	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	418.50	0.30	
Light Rail	Segments	0.00	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Bus	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Ferry	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Port	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Airport	Facilities	21.30	\$3.11	14.59
	Runways	113.89	\$0.83	0.73
	Subtotal	135.20	3.90	
	Total	3418.50	21.00	

Table 13: Utility System Economic Losses
(Millions of dollars)

System	Component	Inventory Value	Economic Loss	Loss Ratio (%)
Potable Water	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	216.20	\$0.89	0.41
	Subtotal	216.16	\$0.89	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	195.80	\$34.85	17.80
	Distribution Lines	129.70	\$0.45	0.34
	Subtotal	325.50	\$35.30	
Natural Gas	Pipelines	42.30	\$0.16	0.38
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	86.50	\$0.15	0.18
	Subtotal	128.79	\$0.31	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Electrical Power	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Communication	Facilities	0.40	\$0.01	3.34
	Subtotal	0.39	\$0.01	
	Total	670.84	\$36.51	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of \$)

LOSS	Total	%

Appendix A: County Listing for the Region

Tooele, UT

Appendix B: Regional Population and Building Value Data

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah	Tooele	58,218	2,862	748	3,611
Total State		58,218	2,862	748	3,611
Total Region		58,218	2,862	748	3,611