

HAZUS-MH: Earthquake Event Report

Region Name: Anderson Junction Segment M74

Earthquake Scenario: Anderson Junction Segment M7.4

Print Date: December 18, 2009

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 8 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 22,771.95 square miles and contains 39 census tracts. There are over 63 thousand households in the region and has a total population of 192,276 people (2000 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 62 thousand buildings in the region with a total building replacement value (excluding contents) of 10,229 (millions of dollars). Approximately 97.00 % of the buildings (and 68.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 13,287 and 1,079 (millions of dollars) , respectively.

Building and Lifeline Inventory

Building Inventory

HAZUS estimates that there are 62 thousand buildings in the region which have an aggregate total replacement value of 10,229 (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 70% 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 (HPL) facilities. 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 8 hospitals in the region with a total bed capacity of 537 beds. There are 112 schools, 82 fire stations, 19 police stations and 2 emergency operation facilities. With respect to HPL facilities, there are 124 dams identified within the region. Of these, 44 of the dams are classified as 'high hazard'. The inventory also includes 8 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 14,366.00 (millions of dollars). This inventory includes over 2,523 kilometers of highways, 520 bridges, 58,288 kilometers of pipes.

Table 1: Transportation System Lifeline Inventory

System	Component	# locations/ # Segments	Replacement value (millions of dollars)
Highway	Bridges	520	401.40
	Segments	255	12,083.90
	Tunnels	2	0.20
	Subtotal		12,485.60
Railways	Bridges	0	0.00
	Facilities	0	0.00
	Segments	103	238.30
	Tunnels	0	0.00
	Subtotal		238.30
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	1	1.30
	Subtotal		1.30
Port	Facilities	0	0.00
	Subtotal		0.00
Airport	Facilities	10	106.50
	Runways	12	455.60
	Subtotal		562.10
		Total	13,287.20

Table 2: Utility System Lifeline Inventory

System	Component	# Locations / Segments	Replacement value (millions of dollars)
Potable Water	Distribution Lines	NA	726.00
	Facilities	0	0.00
	Pipelines	0	0.00
	Subtotal		726.00
Waste Water	Distribution Lines	NA	435.60
	Facilities	5	326.30
	Pipelines	0	0.00
	Subtotal		761.90
Natural Gas	Distribution Lines	NA	290.40
	Facilities	0	0.00
	Pipelines	6	212.10
	Subtotal		502.50
Oil Systems	Facilities	2	0.20
	Pipelines	0	0.00
	Subtotal		0.20
Electrical Power	Facilities	5	539.00
	Subtotal		539.00
Communication	Facilities	18	1.80
	Subtotal		1.80
		Total	2,531.40

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	Anderson Junction Segment M7.4
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	7.40
Depth (Km)	NA
Rupture Length (Km)	NA
Rupture Orientation (degrees)	NA
Attenuation Function	NA

Building Damage

Building Damage

HAZUS estimates that about 9,329 buildings will be at least moderately damaged. This is over 15.00 % of the total number of buildings in the region. There are an estimated 714 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 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	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Commercial	505	1.22	108	0.93	239	4.15	186	6.52	55	7.64
Education	60	0.15	8	0.07	11	0.19	11	0.38	5	0.65
Government	208	0.50	18	0.15	24	0.42	20	0.69	6	0.81
Industrial	107	0.26	21	0.18	47	0.82	44	1.56	16	2.20
Other Residential	4,390	10.62	1,375	11.83	1,739	30.19	1,257	44.02	362	50.74
Religion	149	0.36	38	0.33	52	0.91	47	1.65	13	1.83
Single Family	35,917	86.89	10,050	86.50	3,647	63.32	1,290	45.18	258	36.13
Total	41,336		11,618		5,759		2,856		714	

Table 4: Expected Building Damage by Building Type (All Design Levels)

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
Wood	31,918	77.22	9605	82.67	1,993	34.60	50	1.75	2	0.24
Steel	270	0.65	39	0.33	99	1.71	119	4.15	51	7.18
Concrete	237	0.57	46	0.40	105	1.82	88	3.08	27	3.77
Precast	126	0.31	18	0.16	47	0.81	57	1.98	20	2.80
RM	4,775	11.55	734	6.32	1,668	28.97	1,221	42.73	242	33.89
URM	597	1.44	200	1.72	272	4.72	154	5.38	47	6.57
MH	3,413	8.26	976	8.40	1,576	27.37	1,169	40.93	325	45.56
Total	41,336		11,618		5,759		2,856		714	

*Note:

RM Reinforced Masonry
 URM Unreinforced Masonry
 MH Manufactured Housing

Essential Facility Damage

Before the earthquake, the region had 537 hospital beds available for use. On the day of the earthquake, the model estimates that only 352 hospital beds (66.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 74.00% of the beds will be back in service. By 30 days, 89.00% 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	8	2	0	5
Schools	112	0	0	88
EOCs	2	0	0	2
PoliceStations	19	0	0	15
FireStations	82	0	0	68

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	255	0	0	255	255
	Bridges	520	47	10	472	495
	Tunnels	2	0	0	2	2
Railways	Segments	103	0	0	103	103
	Bridges	0	0	0	0	0
	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	1	0	0	1	1
Port	Facilities	0	0	0	0	0
Airport	Facilities	10	0	0	10	10
	Runways	12	0	0	12	12

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	5	0	0	2	5
Natural Gas	0	0	0	0	0
Oil Systems	2	0	0	2	2
Electrical Power	5	0	0	4	5
Communication	18	6	0	18	18

Table 8 : Expected Utility System Pipeline Damage (Site Specific)

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	36,298	5328	1332
Waste Water	21,779	4214	1054
Natural Gas	211	1	0
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	63,223	24,520	22,096	16,504	0	0
Electric Power		3,820	2,146	758	129	5

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 5 ignitions that will burn about 0.33 sq. mi 0.00 % of the region's total area.) The model also estimates that the fires will displace about 425 people and burn about 22 (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 0.720 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 22.00% 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 28,800,000 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 1,034 households to be displaced due to the earthquake. Of these, 830 people (out of a total population of 192,276) 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	4	1	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	7	2	0	0
	Industrial	9	2	0	1
	Other-Residential	175	39	4	8
	Single Family	183	41	6	12
	Total	379	85	11	21
2 PM	Commercial	293	74	11	22
	Commuting	1	1	2	0
	Educational	150	41	7	13
	Hotels	1	0	0	0
	Industrial	64	17	3	5
	Other-Residential	29	6	1	1
	Single Family	32	6	1	2
	Total	571	146	24	43
5 PM	Commercial	253	65	10	20
	Commuting	14	21	33	6
	Educational	35	10	2	3
	Hotels	2	0	0	0
	Industrial	40	11	2	3
	Other-Residential	64	14	2	3
	Single Family	71	16	2	4
	Total	480	137	50	40

Economic Loss

The total economic loss estimated for the earthquake is 1,328.55 (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 1,201.69 (millions of dollars); 30 % 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 33 % 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	6.78	64.15	2.79	15.77	89.50
	Capital-Related	0.00	2.93	56.29	1.66	4.84	65.72
	Rental	8.24	14.19	30.61	0.78	5.17	58.98
	Relocation	29.80	12.47	45.84	4.10	58.86	151.06
	Subtotal	38.04	36.36	196.89	9.32	84.65	365.26
Capital Stock Losses							
	Structural	39.11	22.19	56.26	12.62	35.72	165.91
	Non_Structural	124.86	80.88	122.47	32.91	122.62	483.74
	Content	43.30	16.48	48.89	19.03	52.30	180.00
	Inventory	0.00	0.00	1.82	4.95	0.00	6.77
	Subtotal	207.27	119.55	229.44	69.51	210.64	836.42
	Total	245.31	155.92	426.33	78.84	295.29	1,201.69

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	12,083.95	\$0.00	0.00
	Bridges	401.43	\$22.42	5.59
	Tunnels	0.20	\$0.00	0.00
	Subtotal	12485.60	22.40	
Railways	Segments	238.26	\$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	238.30	0.00	
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	1.33	\$0.00	0.00
	Subtotal	1.30	0.00	
Port	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	0.00	
Airport	Facilities	106.51	\$6.24	5.86
	Runways	455.57	\$0.00	0.00
	Subtotal	562.10	6.20	
	Total	13287.20	28.70	

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	726.00	\$23.98	3.30
	Subtotal	725.97	\$23.98	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	326.30	\$22.31	6.84
	Distribution Lines	435.60	\$18.96	4.35
	Subtotal	761.92	\$41.27	
Natural Gas	Pipelines	212.10	\$0.01	0.00
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	290.40	\$20.27	6.98
	Subtotal	502.51	\$20.28	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	0.20	\$0.01	2.55
	Subtotal	0.20	\$0.01	
Electrical Power	Facilities	539.00	\$12.48	2.31
	Subtotal	539.00	\$12.48	
Communication	Facilities	1.80	\$0.19	10.86
	Subtotal	1.76	\$0.19	
	Total	2,531.35	\$98.20	

Table 14. Indirect Economic Impact with outside aid
(Employment as # of people and Income in millions of \$)

	LOSS	Total	%
First Year			
	Employment Impact	0	0.00
	Income Impact	(8)	-0.77
Second Year			
	Employment Impact	0	0.00
	Income Impact	(24)	-2.36
Third Year			
	Employment Impact	0	0.00
	Income Impact	(31)	-3.04
Fourth Year			
	Employment Impact	0	0.00
	Income Impact	(31)	-3.05
Fifth Year			
	Employment Impact	0	0.00
	Income Impact	(31)	-3.05
Years 6 to 15			
	Employment Impact	0	0.00
	Income Impact	(31)	-3.05

Appendix A: County Listing for the Region

Beaver,UT

Garfield,UT

Iron,UT

Kane,UT

Piute,UT

Sevier,UT

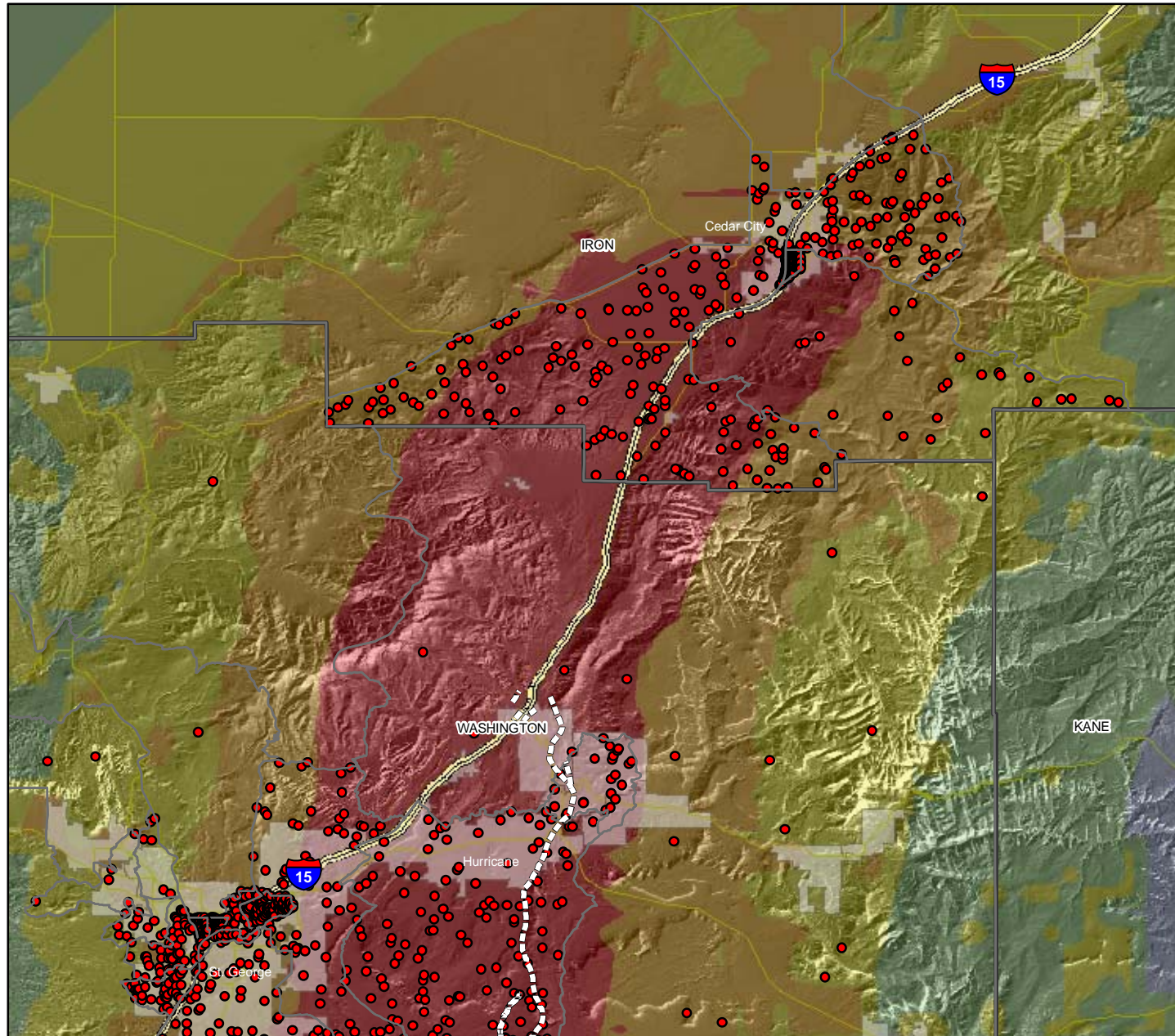
Washington,UT

Wayne,UT

Appendix B: Regional Population and Building Value Data

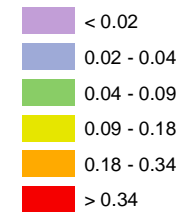
State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Utah	Beaver	6,295	252	89	341
	Garfield	4,957	276	94	370
	Iron	37,498	1,323	741	2,065
	Kane	6,385	323	127	450
	Piute	1,439	69	24	93
	Sevier	19,623	697	315	1,013
	Washington	113,489	3,900	1,839	5,739
	Wayne	2,590	115	38	154
Total State		192,276	6,955	3,267	10,225
Total Region		192,276	6,955	3,267	10,225

Direct Building Economic Loss - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

PGA (% g's)



1 Dot =
\$1,000,000

County	Cost Structural Damage	Cost Non- Structural Damage	Total Loss (Including Contents)
Piute	1	7	14
Sevier	0	0	0
Kane	2	31	57
Washington	103,343	271,812	699,861
Beaver	12	96	182
Wayne	0	0	0
Iron	62,432	211,520	501,051
Garfield	27	274	522
Total	\$165,908	\$483,739	\$1,201,687

* All values are thousands of dollars

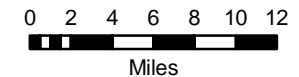
□□□□ Hurricane Fault:
Anderson Junction Segment

□ Counties

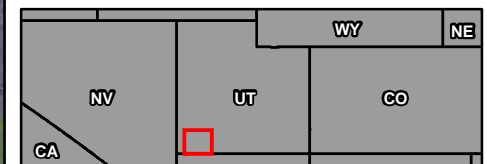
— Interstate

— Major Roads

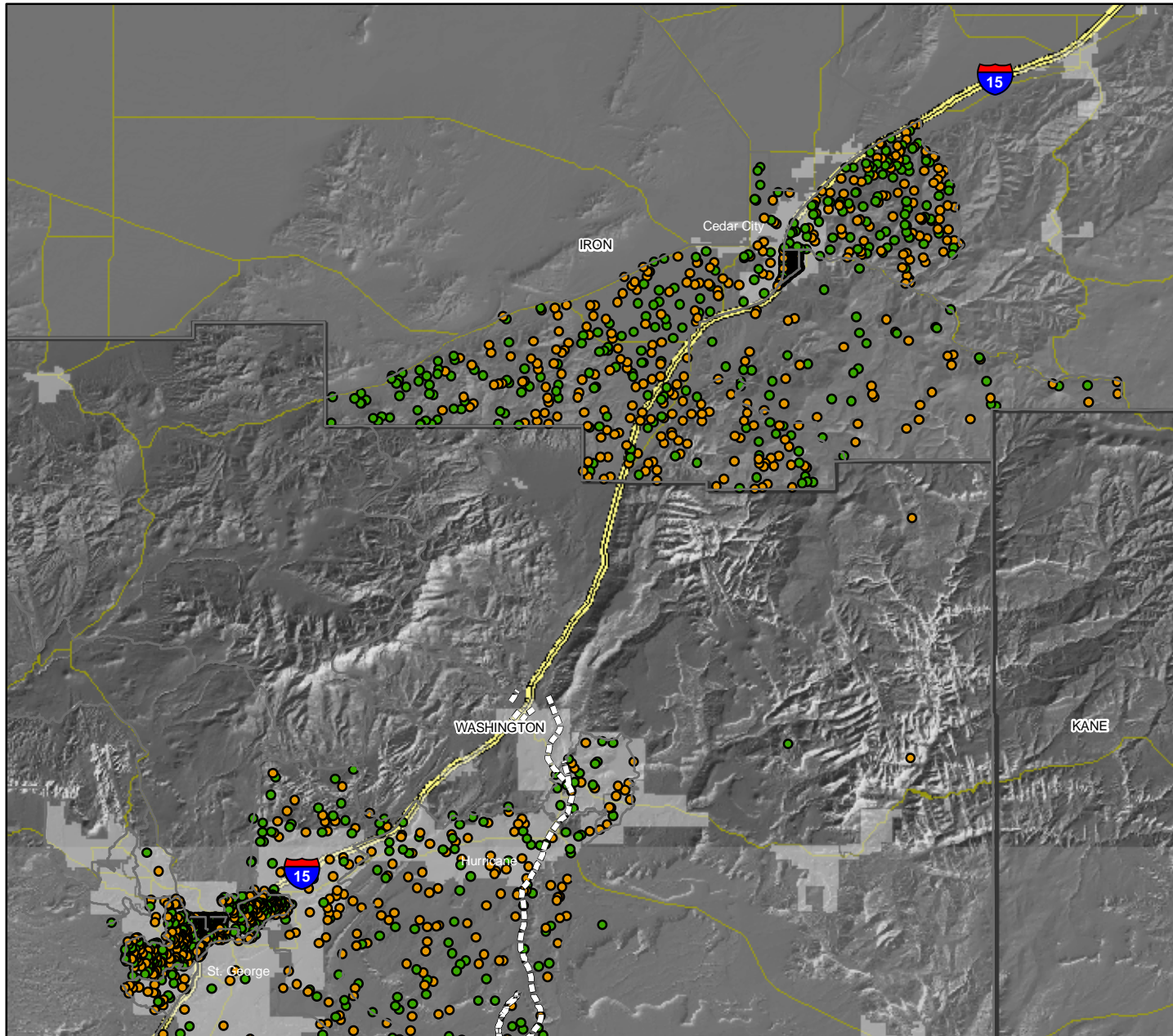
□ City Boundaries



12-10-09 FEMA & URS Corporation



Estimated Displaced Households & Short Term Public Shelter Needs - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

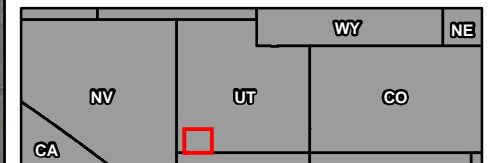
	Total #
Public Shelter Needs (Individuals)	830
Displaced Households	1,035

- 1 Dot = 1 Public Shelter Need (Individuals)*
 - 1 Dot = 1 Displaced Household*
- * delineated by census tract*

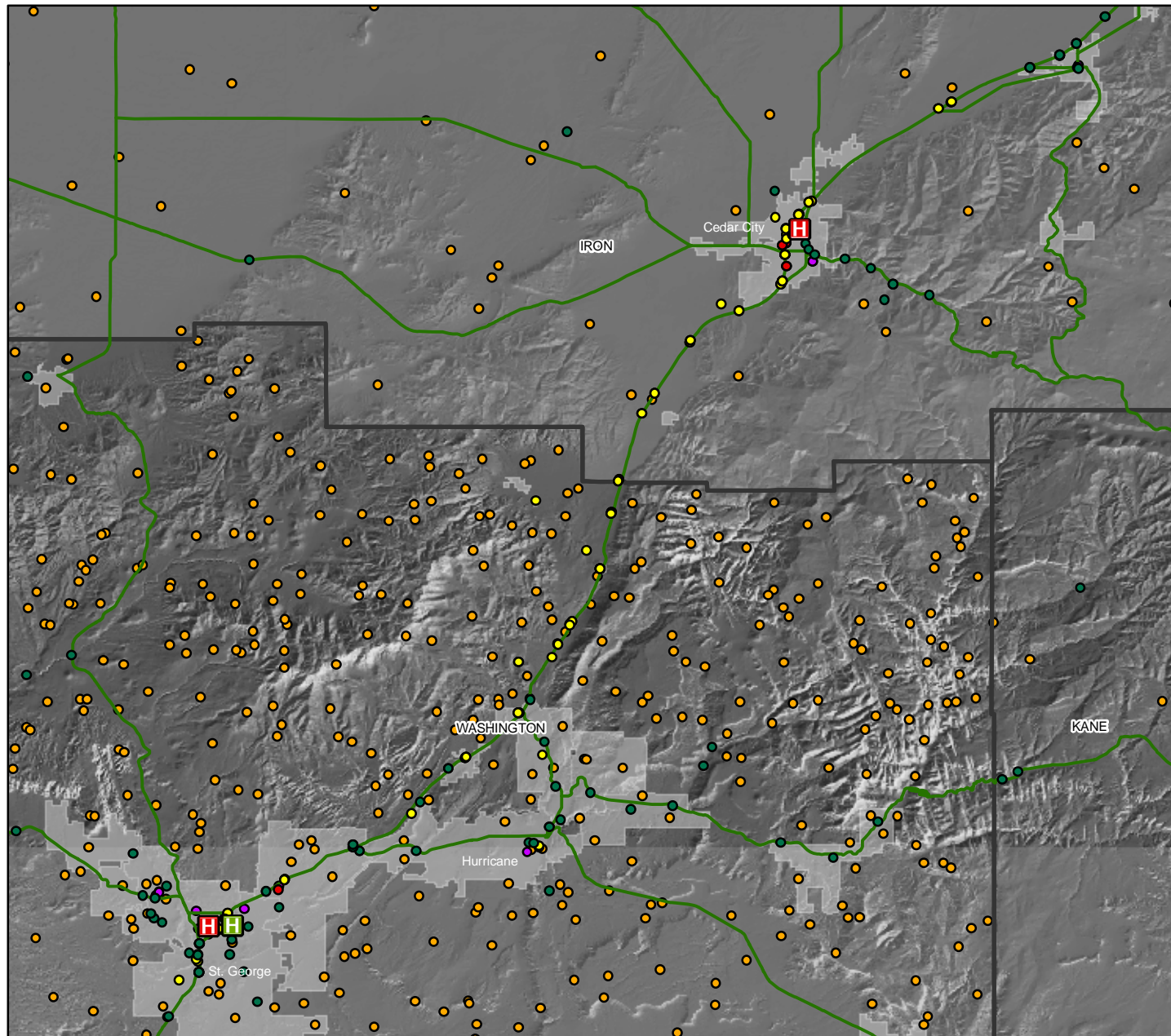
- Hurricane Fault: Anderson Junction Segment
- Counties
- ▬ Interstate
- ▬ Major Roads
- ▬ City Boundaries



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Distribution of Elderly, Impaired Hospitals (Day1) & Hospital Bed Availability - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

Highway Damage

Damage is expressed as the probability that a given bridge or highway segment will realize at least moderate damage.

Highway Segment Impact	Major Roadway Bridge Impact
Low	Low
Moderate	Moderate
High	High

Impaired Hospitals (Day 1)

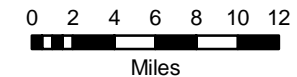
Damage is expressed as the probability that a given hospital will realize at least moderate damage.

Low
Moderate
High

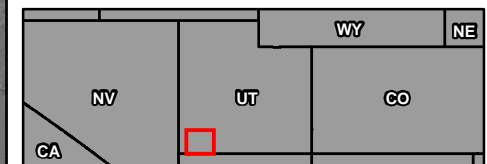
County	Total # Hospital Beds	Hospital Beds Available	Injuries Requiring Hospital Treatment 2pm
Beaver	70	70	0
Garfield	44	41	0
Iron	48	0	74
Kane	37	36	0
Sevier	42	42	0
Washington	296	50	96
Total	537	239	170

1 Dot = 30 People Over 65

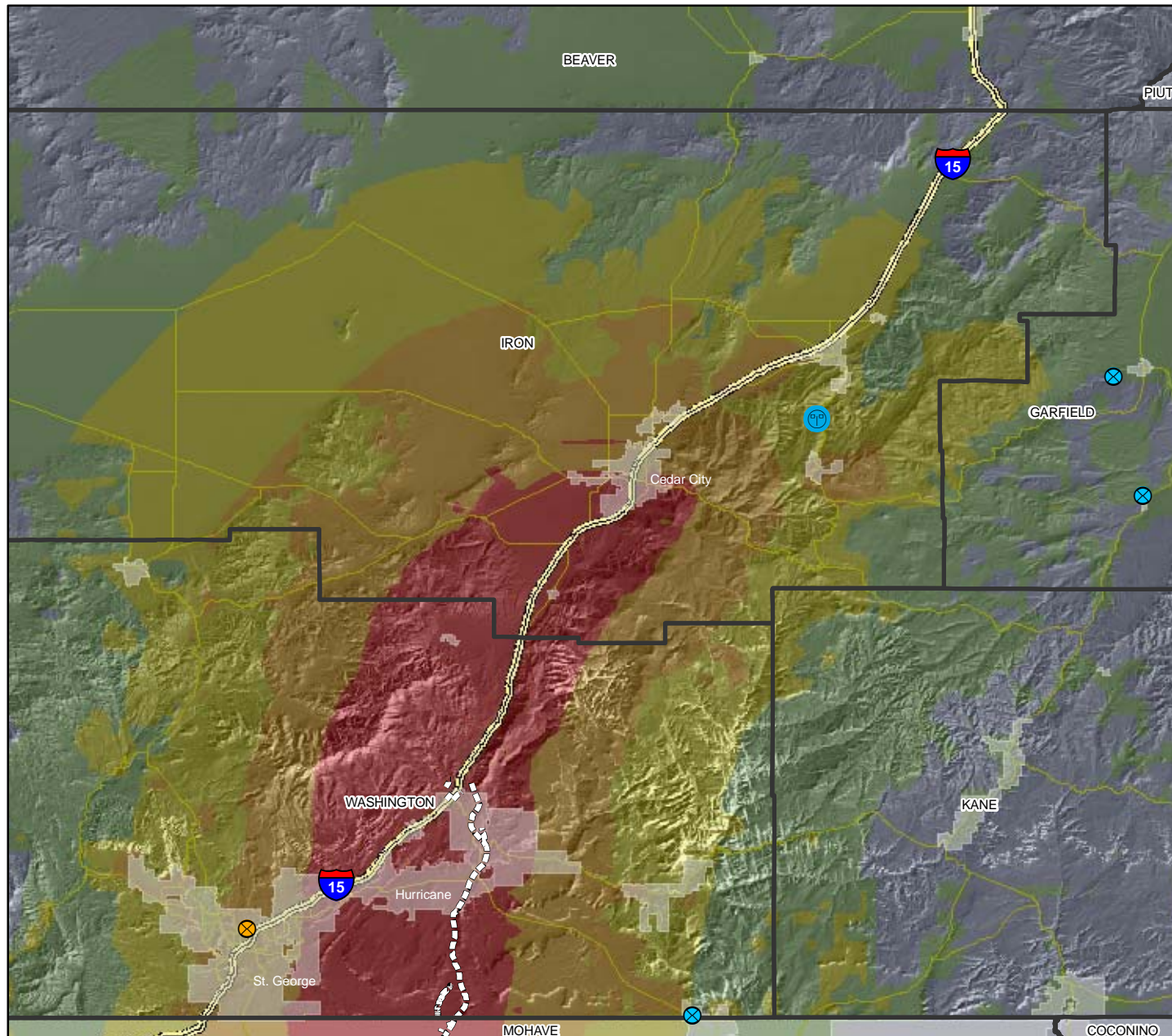
Nursing Home



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Electrical, Natural Gas & Oil Facility Damage - Earthquake Scenario: Anderson Junction Segment, UT






M 7.4 Anderson Junction Segment Earthquake




Utility Damage (at least moderate)

Damage is expressed as the probability chance that a given utility system will realize at least moderate damage.

Electric Power Facility







-  Low
-  Moderate
-  High






Oil Facility

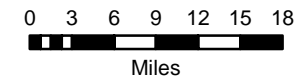
-  Low
-  Moderate
-  High

** There are NO Natural Gas Facilities in our database for the study region.*

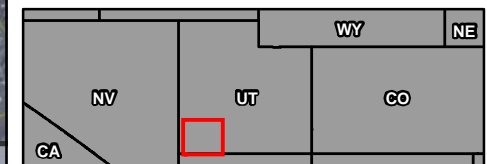
PGA (% g's)

-  < 0.02
-  0.02 - 0.04
-  0.04 - 0.09
-  0.09 - 0.18
-  0.18 - 0.34
-  > 0.34

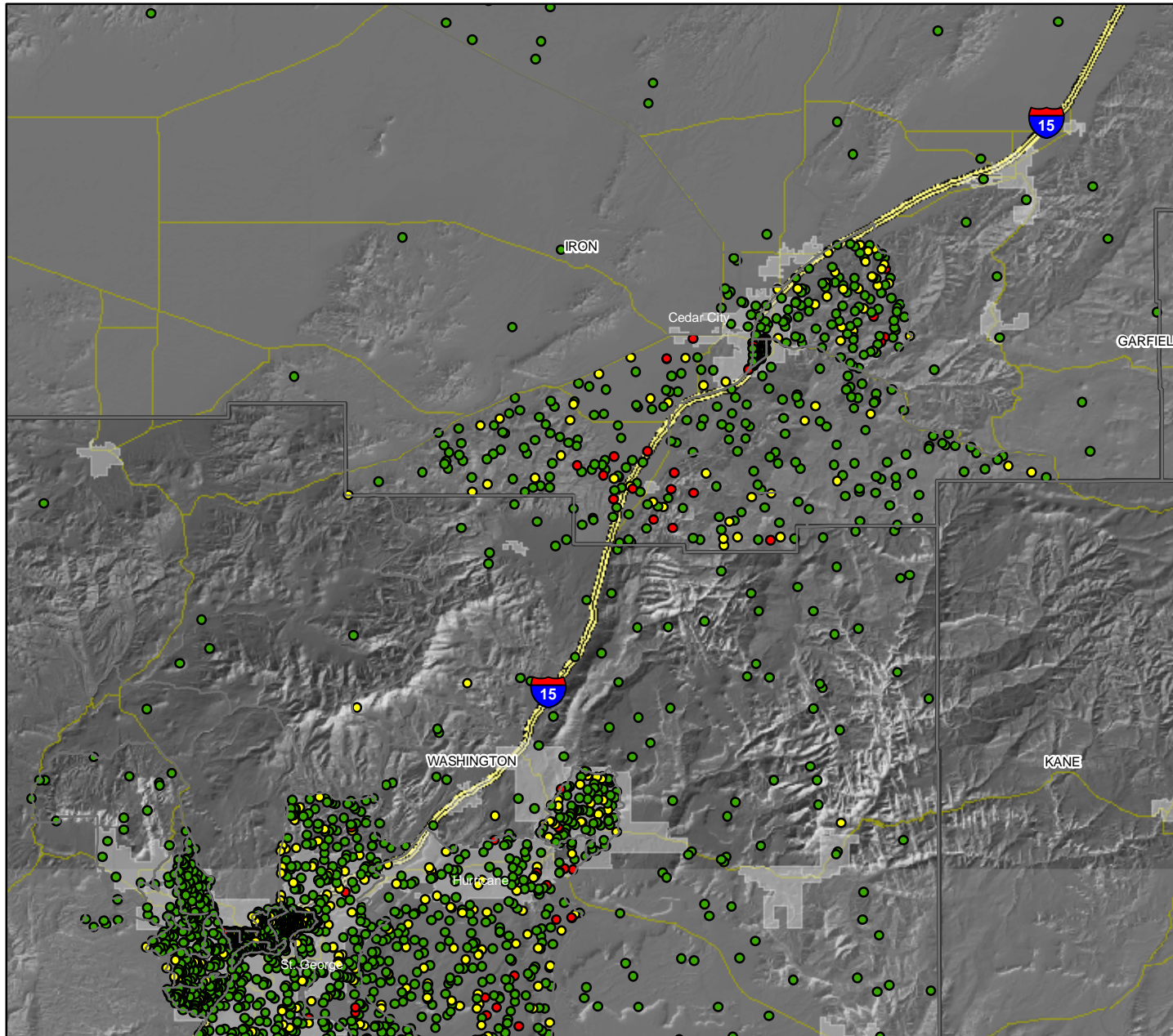
-  Hurricane Fault: Anderson Junction Segment
-  Counties
-  Interstate
-  Major Roads
-  City Boundaries



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Estimated Building Inspection Needs - Earthquake Scenario: Anderson Junction Segment, UT



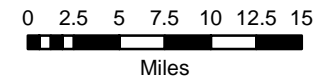
M 7.4 Anderson Junction Segment Earthquake

	Estimated # of Structures	Estimated # of Inspectors Needed
Red (Complete)	714	5
Yellow (Extensive)	2,856	39
Light Green (Slight/ Moderate)	17,380	116
Total	20,950	160

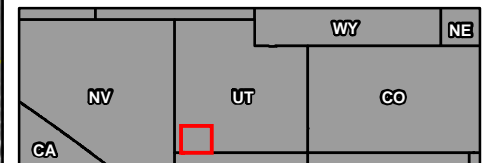
*Estimated number of inspectors needed to complete inspections in 30 days.

- Red Tag
(Complete Damage)
- Yellow Tag
(Extensive Damage)
- Green Tag
(Slight/Moderate Damage)

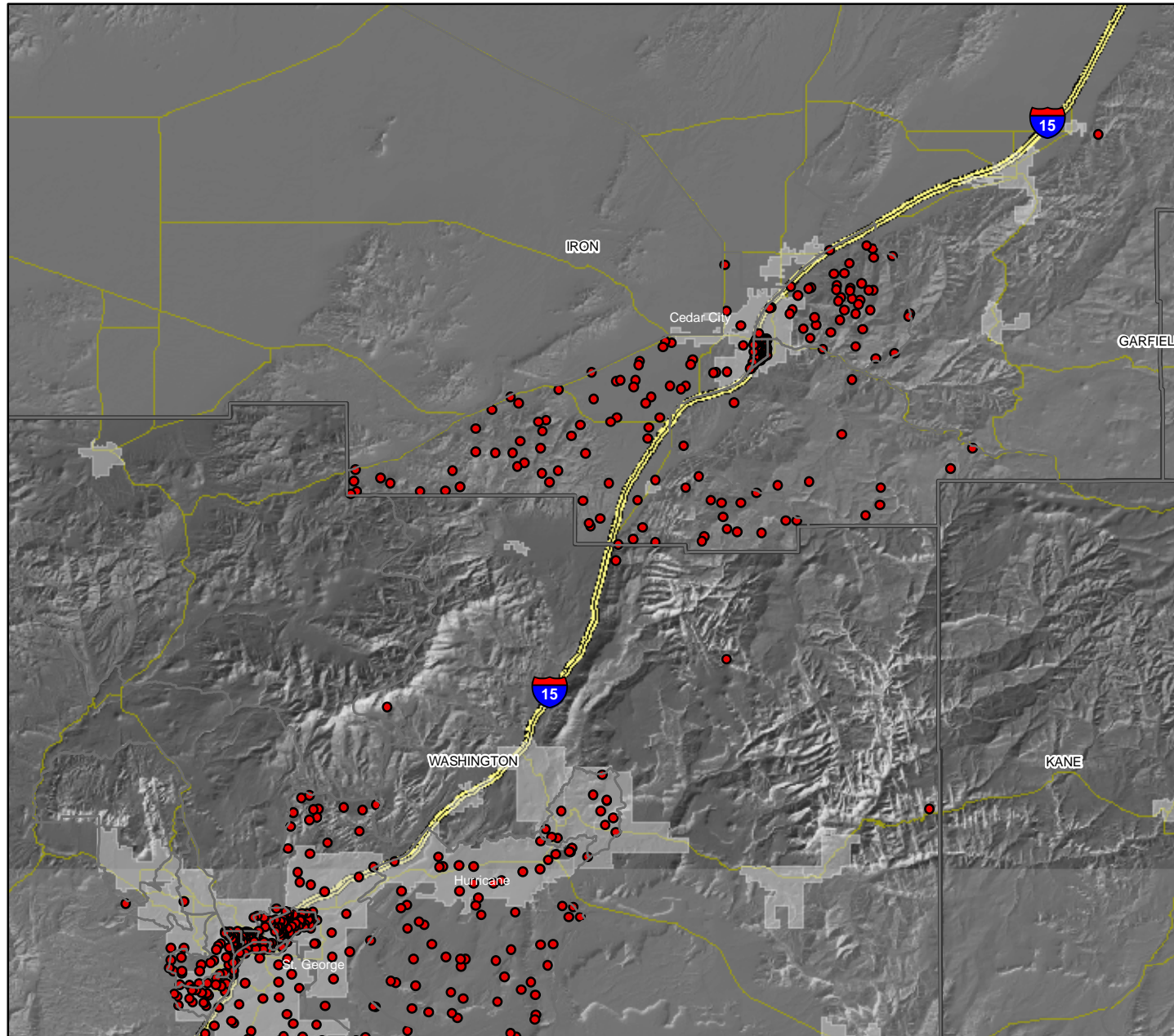
*1 Dot = 10 (by census tract)



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Estimated Concrete, Steel Debris & Highway Damage - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

1 Dot = 1 thousand tons of
Concrete and Steel Debris
(by census tract)

County	Brick and Wood (tons)	Concrete and Steel (tons)	*Estimated Truck Loads
Beaver	0	0	0
Garfield	0	0	0
Iron	58,000	219,000	11,080
Kane	0	0	0
Piute	0	0	0
Sevier	0	0	0
Washington	103,000	341,000	17,720
Wayne	0	0	0
Total	161,000	560,000	2,360

* Truck loads estimated at 25 tons per truck

□□□□□ Hurricane Fault:
Anderson Junction Segment

□ Counties

▬ Interstate

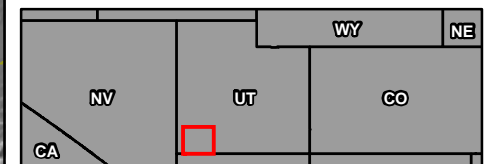
▬ Major Roads

▬ City Boundaries

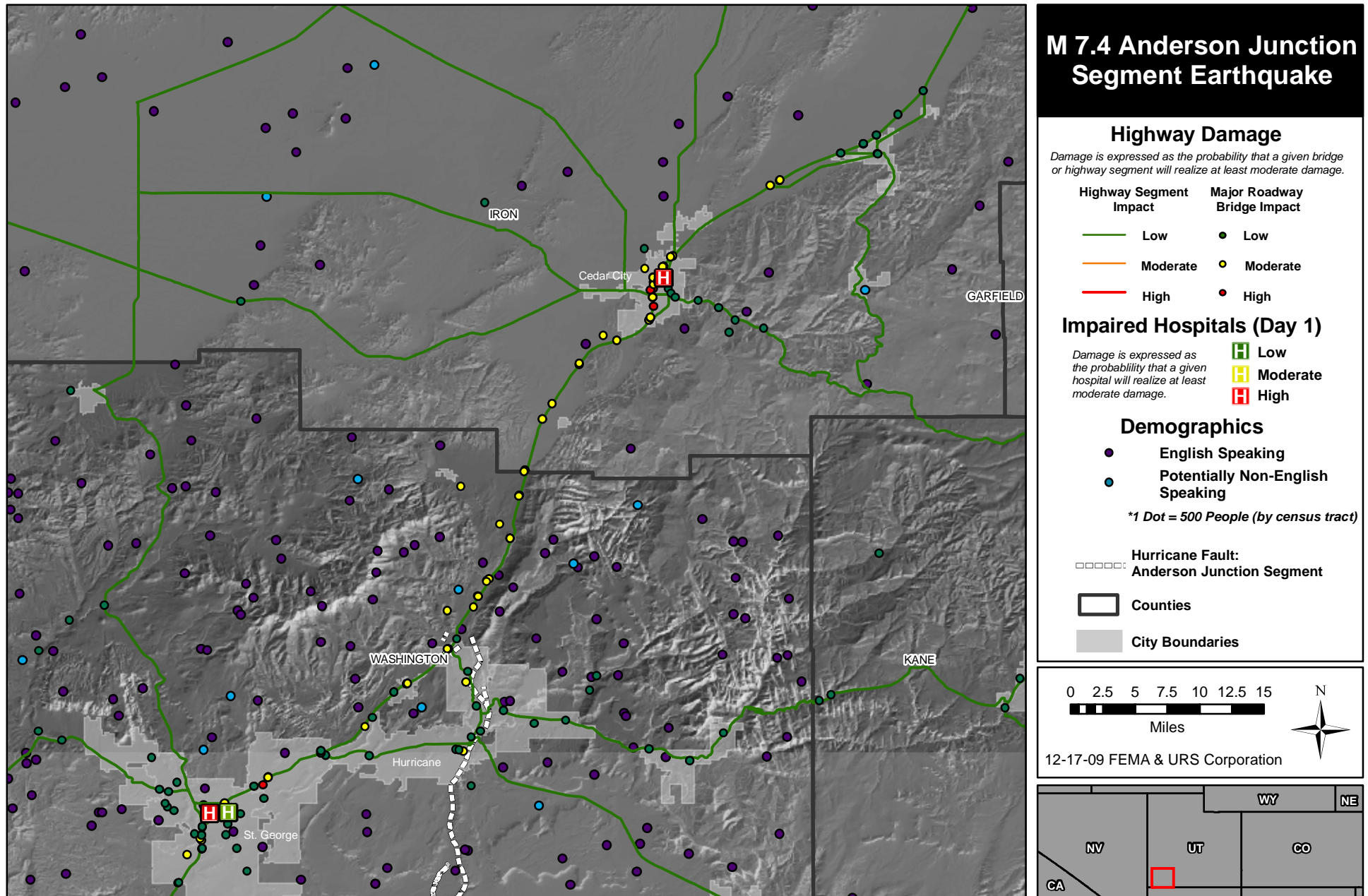
0 2.5 5 7.5 10 12.5 15
Miles



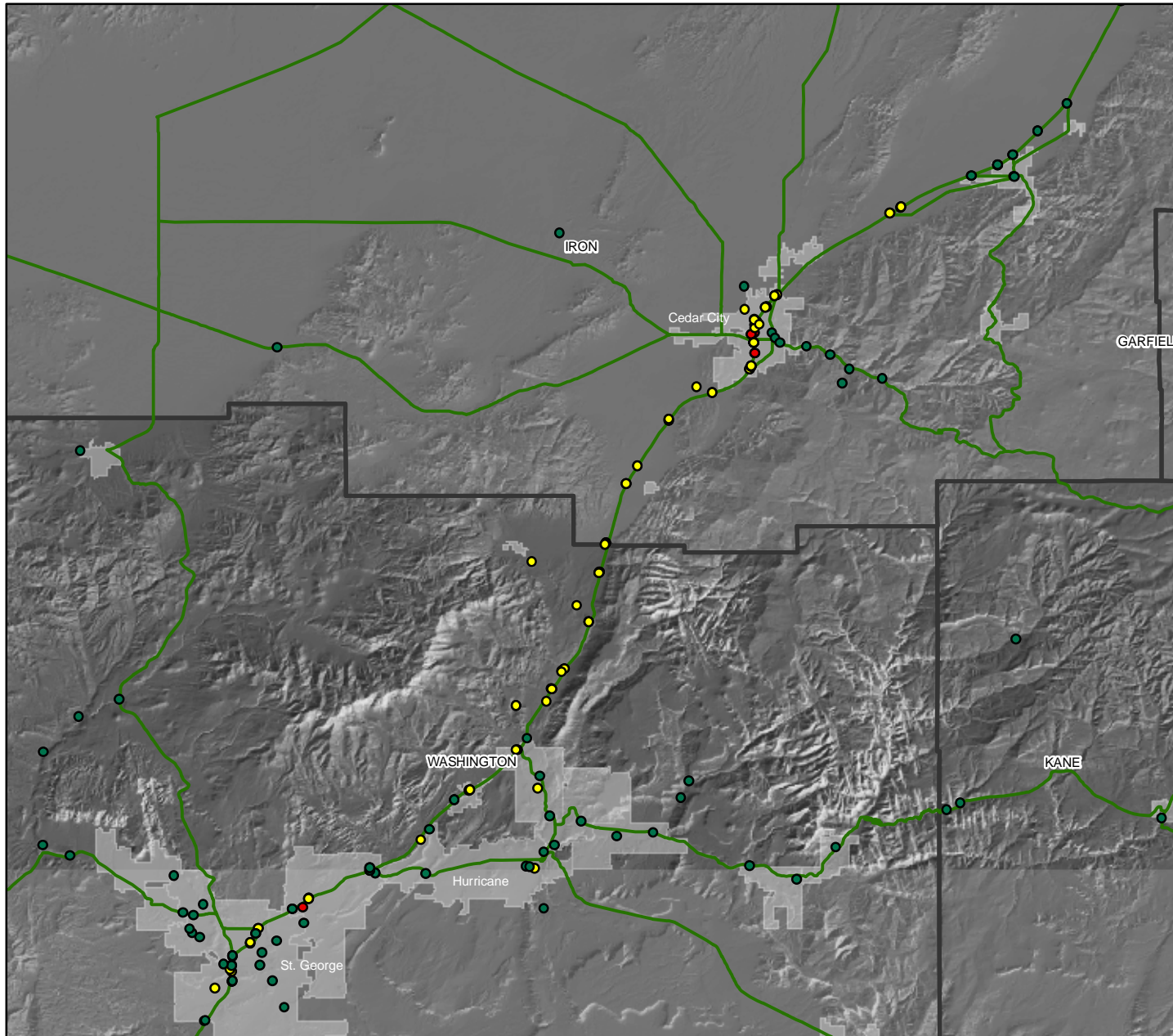
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Demographic Distribution & Highway Damage - Earthquake Scenario: Anderson Junction Segment, UT



Estimated Highway Infrastructure Damage - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

Highway Damage

Damage is expressed as the probability that a given bridge or highway segment will realize at least moderate damage.

Highway Segment Impact

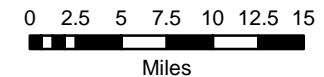
- Low
- Moderate
- High

Major Roadway Bridge Impact

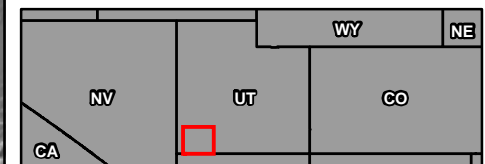
- Low
- Moderate
- High

County	Total # of Bridges	# of Bridges Needing Priority Inspection	*# of Bridge Engineers Needed
Beaver	54	0	0
Garfield	57	0	0
Iron	89	31	4
Kane	22	0	0
Piute	17	0	0
Sevier	157	0	0
Washington	109	27	4
Wayne	15	0	0
Total	520	58	8

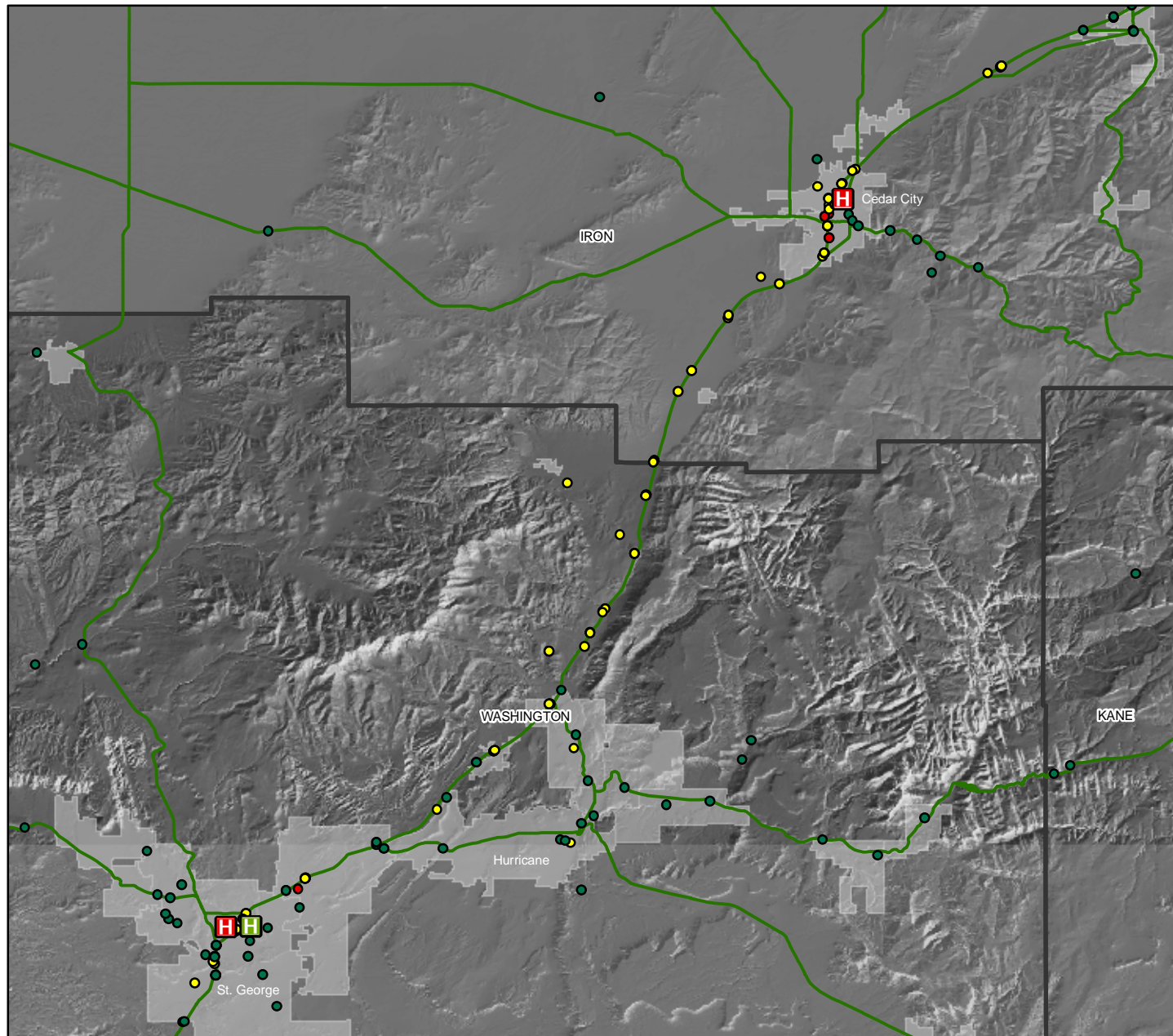
*Based on assuming that 2 engineers can inspect 5 bridges a day for 3 days.



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Impaired Hospitals (Day 1), Hospital Availability & Highway Functionality - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

Highway Damage

Damage is expressed as the probability that a given bridge or highway segment will realize at least moderate damage.

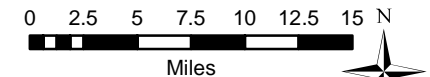
Highway Segment Impact	Major Roadway Bridge Impact
Low	Low
Moderate	Moderate
High	High

Impaired Hospitals (Day 1)

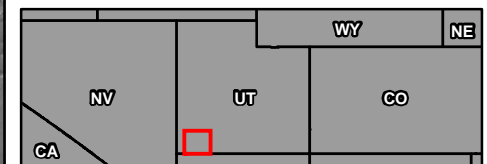
Damage is expressed as the probability that a given hospital will realize at least moderate damage.

Low
Moderate
High

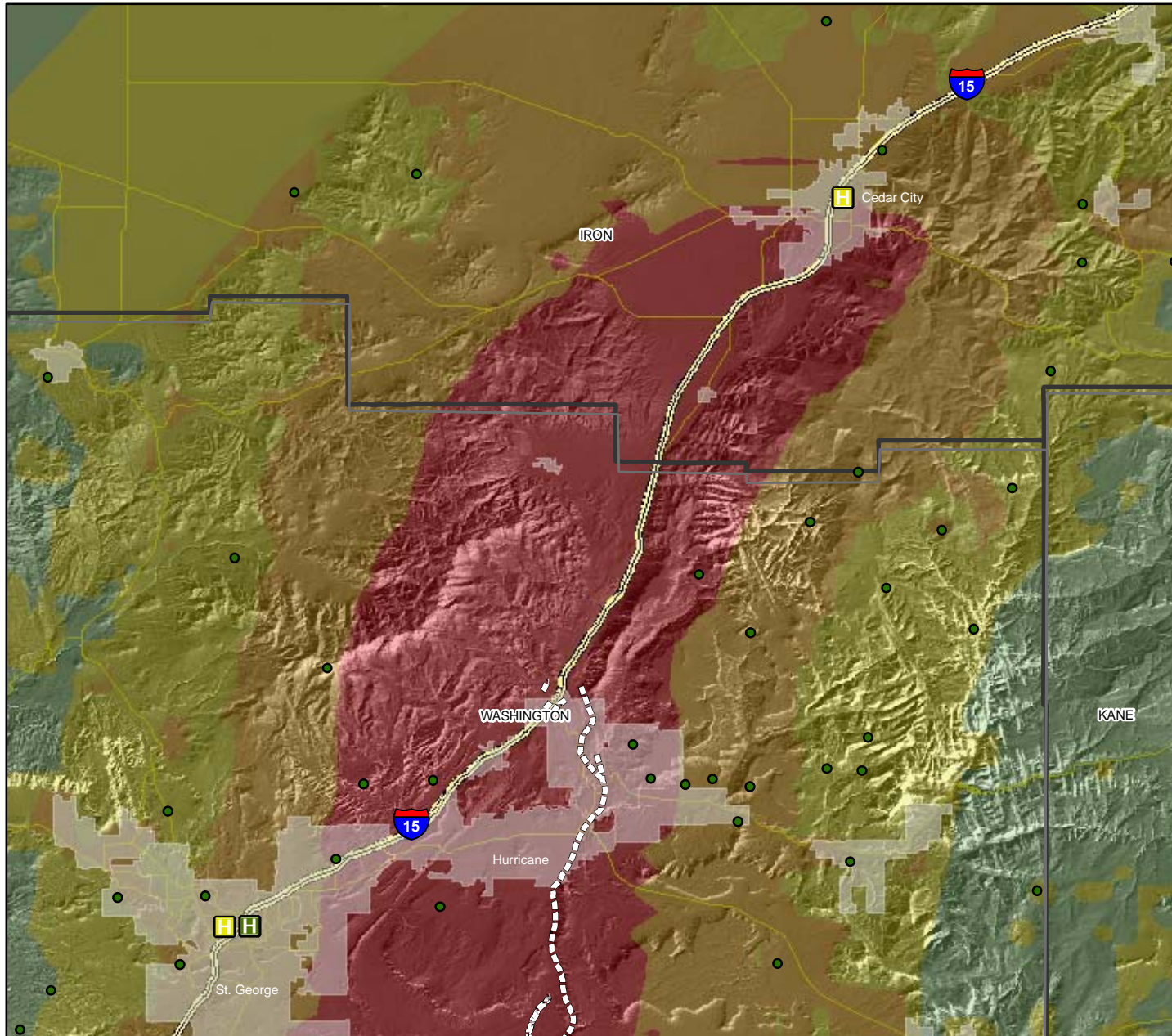
County	Total # Hospital Beds	Hospital Beds Available	Injuries Requiring Hospital Treatment 2pm
Beaver	70	70	0
Garfield	44	41	0
Iron	48	0	74
Kane	37	36	0
Sevier	42	42	0
Washington	296	50	96
Total	537	239	170



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Potential Search & Rescue Needs - Earthquake Scenario: Anderson Junction Segment, UT



M 7.4 Anderson Junction Segment Earthquake

Impaired Hospitals (Day 1)

Damage is expressed as the probability that a given hospital will realize at least moderate damage.

H Low
H Moderate
H High

PGA (% g's)

< 0.02
0.02 - 0.04
0.04 - 0.09
0.09 - 0.18
0.18 - 0.34
> 0.34

**1 Dot = 1 Life
Threatening Injury
(Severity Level 3)**

*Severity Level 3 is defined as injuries that require hospitalization and can become life threatening if not promptly treated.

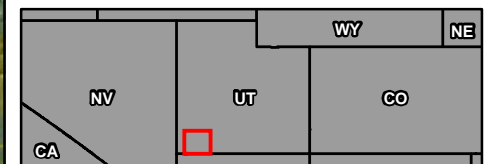
Hurricane Fault:
Anderson Junction Segment

Structure Type	Red (Complete)	Collapse Rates for Complete Damage	Total Collapse
Wood	2	3%	0
Steel	51	6%	3
Concrete	27	10%	3
Precast	20	13%	3
Reinforced Masonry	242	10%	24
Unreinforced Masonry	47	15%	7
Manufactured Housing	325	3%	10
Total	714		49
Requiring Hospital Treatment		Immediate Life Threatening Injuries	
453		85	

0 2 4 6 8 10 12
Miles



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Correctional and Daycare Facilities, Impaired Hospitals (Day 1) & Highway Functionality - Earthquake Scenario: Anderson Junction Segment, UT

