

# Hazus-MH: Earthquake Event Report

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**Region Name:** El Paso County Rampart fault 2010 Census

**Earthquake Scenario:** Rampart Range fault 7.0

**Print Date:** April 11, 2013

*Totals only reflect data for those census tracts/blocks included in the user's study region.*

**DOI:** <https://doi.org/10.58783/cgs.ha21.nujh3917>

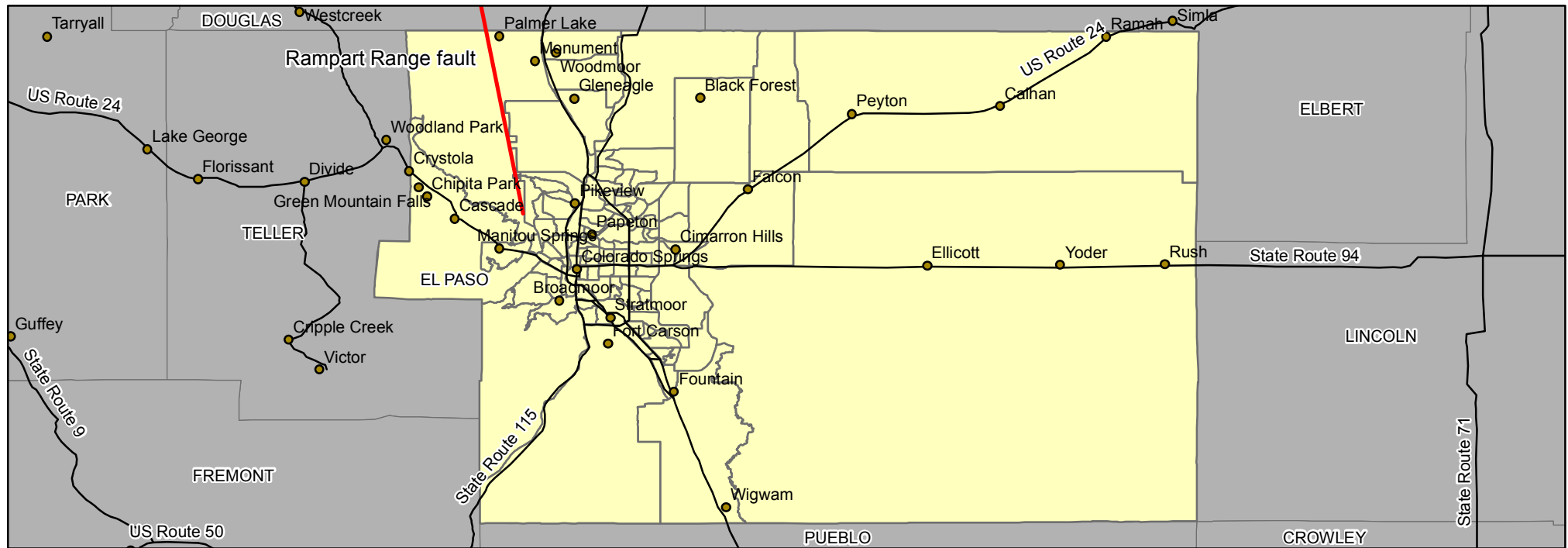
**Disclaimer:**

*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.*

# Study Region: El Paso County

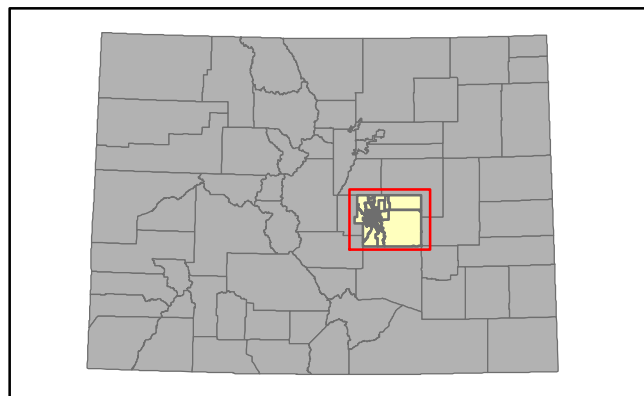
## Hazard Scenario: Rampart Range Fault 7

### Overview Map



### Legend

- Cities
- Fault
- Roads
- Study Region Tract



Created by: Colorado Geological Survey

Team: Matt Morgan and Scot Fitzgerald

Date Created: April 2013

Location: Denver County Colorado

Fault Parameters: arbitrary, magnitude 7, depth 10km

Data: Changed to CGS Landslides and CGS/FEMA Soils data

Projection: GCS North American 1983

0 10 20 40 Miles



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## Table of Contents

Section	Page #
General Description of the Region	3
Building and Lifeline Inventory	4
Building Inventory	
Critical Facility Inventory	
Transportation and Utility Lifeline Inventory	
Earthquake Scenario Parameters	6
Direct Earthquake Damage	7
Buildings Damage	
Critical Facilities Damage	
Transportation and Utility Lifeline Damage	
Induced Earthquake Damage	11
Fire Following Earthquake	
Debris Generation	
Social Impact	12
Shelter Requirements	
Casualties	
Economic Loss	13
Building Losses	
Transportation and Utility Lifeline Losses	
Long-term Indirect Economic Impacts	
Appendix A: County Listing for the Region	
Appendix B: Regional Population and Building Value Data	

## 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):

Colorado

Note:

Appendix A contains a complete listing of the counties contained in the region.

The geographical size of the region is 2,127.31 square miles and contains 111 census tracts. There are over 235 thousand households in the region which has a total population of 622,262 people (2002 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 265 thousand buildings in the region with a total building replacement value (excluding contents) of 57,243 (millions of dollars). Approximately 94.00 % of the buildings (and 76.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 5,396 and 760 (millions of dollars) , respectively.

## Building and Lifeline Inventory

### **Building Inventory**

Hazus estimates that there are 265 thousand buildings in the region which have an aggregate total replacement value of 57,243 (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 69% 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 11 hospitals in the region with a total bed capacity of 0 beds. There are 248 schools, 71 fire stations, 19 police stations and 2 emergency operation facilities. With respect to high potential loss facilities (HPL), there are 82 dams identified within the region. Of these, 12 of the dams are classified as 'high hazard'. The inventory also includes 66 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 6,156.00 (millions of dollars). This inventory includes over 816 kilometers of highways, 427 bridges, 15,180 kilometers of pipes.

**Table 1: Transportation System Lifeline Inventory**

<b>System</b>	<b>Component</b>	<b># Locations/ # Segments</b>	<b>Replacement value (millions of dollars)</b>
<b>Highway</b>	Bridges	427	494.60
	Segments	296	4,420.50
	Tunnels	2	0.10
	Subtotal		<b>4,915.20</b>
<b>Railways</b>	Bridges	12	1.60
	Facilities	0	0.00
	Segments	79	141.90
	Tunnels	0	0.00
	Subtotal		<b>143.50</b>
<b>Light Rail</b>	Bridges	0	0.00
	Facilities	0	0.00
	Segments	0	0.00
	Tunnels	0	0.00
	Subtotal		<b>0.00</b>
<b>Bus</b>	Facilities	2	2.10
	Subtotal		<b>2.10</b>
<b>Ferry</b>	Facilities	0	0.00
	Subtotal		<b>0.00</b>
<b>Port</b>	Facilities	0	0.00
	Subtotal		<b>0.00</b>
<b>Airport</b>	Facilities	3	32.00
	Runways	8	303.70
	Subtotal		<b>335.70</b>
		Total	<b>5,396.50</b>

**Table 2: Utility System Lifeline Inventory**

<b>System</b>	<b>Component</b>	<b># Locations / Segments</b>	<b>Replacement value (millions of dollars)</b>
<b>Potable Water</b>	Distribution Lines	NA	185.70
	Facilities	2	64.60
	Pipelines	0	0.00
	Subtotal		<b>250.30</b>
<b>Waste Water</b>	Distribution Lines	NA	111.40
	Facilities	9	581.40
	Pipelines	0	0.00
	Subtotal		<b>692.90</b>
<b>Natural Gas</b>	Distribution Lines	NA	74.30
	Facilities	0	0.00
	Pipelines	14	48.20
	Subtotal		<b>122.50</b>
<b>Oil Systems</b>	Facilities	0	0.00
	Pipelines	11	62.80
	Subtotal		<b>62.80</b>
<b>Electrical Power</b>	Facilities	38	0.00
	Subtotal		<b>0.00</b>
<b>Communication</b>	Facilities	32	3.10
	Subtotal		<b>3.10</b>
		<b>Total</b>	<b>1,131.60</b>

## Earthquake Scenario

Hazus uses the following set of information to define the earthquake parameters used for the earthquake loss estimate provided in this report.

<b>Scenario Name</b>	Rampart Range fault 7.0
<b>Type of Earthquake</b>	Arbitrary
<b>Fault Name</b>	NA
<b>Historical Epicenter ID #</b>	NA
<b>Probabilistic Return Period</b>	NA
<b>Longitude of Epicenter</b>	-104.92
<b>Latitude of Epicenter</b>	39.06
<b>Earthquake Magnitude</b>	7.00
<b>Depth (Km)</b>	10.00
<b>Rupture Length (Km)</b>	35.48
<b>Rupture Orientation (degrees)</b>	171.00
<b>Attenuation Function</b>	Central & East US (CEUS 2008)



## Building Damage

### Building Damage

Hazus estimates that about 76,707 buildings will be at least moderately damaged. This is over 29.00 % of the buildings in the region. There are an estimated 15,672 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	(%)
<b>Agriculture</b>	246	0.19	103	0.17	107	0.26	83	0.40	79	0.51
<b>Commercial</b>	2,527	1.95	1,449	2.46	2,418	5.99	2,059	9.98	1,901	12.13
<b>Education</b>	86	0.07	38	0.06	50	0.12	45	0.22	44	0.28
<b>Government</b>	174	0.13	73	0.12	93	0.23	63	0.31	44	0.28
<b>Industrial</b>	709	0.55	409	0.69	724	1.79	649	3.14	628	4.00
<b>Other Residential</b>	31,183	24.09	14,057	23.86	10,225	25.31	5,799	28.10	4,768	30.42
<b>Religion</b>	258	0.20	126	0.21	164	0.41	150	0.73	150	0.96
<b>Single Family</b>	94,288	72.83	42,651	72.41	26,617	65.89	11,790	57.13	8,059	51.42
<b>Total</b>	<b>129,472</b>		<b>58,905</b>		<b>40,398</b>		<b>20,637</b>		<b>15,672</b>	

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

	None		Slight		Moderate		Extensive		Complete	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)	Count	(%)
<b>Wood</b>	106,169	82.00	49,413	83.89	23,502	58.18	4,354	21.10	662	4.23
<b>Steel</b>	889	0.69	537	0.91	1,312	3.25	1,415	6.86	1,616	10.31
<b>Concrete</b>	1,681	1.30	927	1.57	1,452	3.59	1,303	6.32	1,244	7.94
<b>Precast</b>	713	0.55	314	0.53	680	1.68	725	3.51	765	4.88
<b>RM</b>	14,846	11.47	4,493	7.63	8,835	21.87	9,010	43.66	7,764	49.54
<b>URM</b>	2,227	1.72	1,415	2.40	1,746	4.32	1,280	6.20	1,432	9.14
<b>MH</b>	2,948	2.28	1,806	3.07	2,872	7.11	2,550	12.35	2,188	13.96
<b>Total</b>	<b>129,472</b>		<b>58,905</b>		<b>40,398</b>		<b>20,637</b>		<b>15,672</b>	

\*Note:

RM      Reinforced Masonry  
URM     Unreinforced Masonry  
MH      Manufactured Housing

## **Essential Facility Damage**

Before the earthquake, the region had 0 hospital beds available for use. On the day of the earthquake, the model estimates that only 0 hospital beds (21.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 39.00% of the beds will be back in service. By 30 days, 69.00% 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	11	7	0	2
Schools	248	160	71	35
EOCs	2	0	0	2
PoliceStations	19	2	0	13
FireStations	71	5	0	46

## 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	296	0	0	296	296
	Bridges	427	43	7	384	389
	Tunnels	2	0	0	2	2
Railways	Segments	79	0	0	79	79
	Bridges	12	0	0	12	12
	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	2	0	0	2	2
Ferry	Facilities	0	0	0	0	0
Port	Facilities	0	0	0	0	0
Airport	Facilities	3	0	0	3	3
	Runways	8	0	0	8	8

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	2	1	0	1	2
Waste Water	9	4	0	3	8
Natural Gas	0	0	0	0	0
Oil Systems	0	0	0	0	0
Electrical Power	38	13	0	23	38
Communication	32	2	0	32	32

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

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	9,287	2253	563
Waste Water	5,572	1132	283
Natural Gas	91	7	2
Oil	231	23	6

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	235,959	61,495	53,042	35,993	0	0
Electric Power		156,775	80,914	25,857	4,129	236

## 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 5.04 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 25.00% 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 201,600 truckloads (@25 tons/truck) to remove the debris generated by the earthquake.

**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 13,900 households to be displaced due to the earthquake. Of these, 8,600 people (out of a total population of 622,262) 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
<b>2 AM</b>	Commercial	49	15	3	5
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	23	6	1	2
	Industrial	46	14	2	4
	Other-Residential	960	269	38	74
	Single Family	2,036	610	105	207
	<b>Total</b>	<b>3,114</b>	<b>915</b>	<b>149</b>	<b>293</b>
<b>2 PM</b>	Commercial	2,865	887	151	297
	Commuting	2	3	4	1
	Educational	4,846	1,545	271	530
	Hotels	4	1	0	0
	Industrial	336	101	16	32
	Other-Residential	144	39	5	10
	Single Family	322	95	16	31
	<b>Total</b>	<b>8,519</b>	<b>2,670</b>	<b>464</b>	<b>901</b>
<b>5 PM</b>	Commercial	2,293	705	120	233
	Commuting	61	77	135	26
	Educational	842	268	47	92
	Hotels	7	2	0	1
	Industrial	210	63	10	20
	Other-Residential	362	101	15	27
	Single Family	792	234	40	77
	<b>Total</b>	<b>4,568</b>	<b>1,451</b>	<b>368</b>	<b>476</b>

## Economic Loss

The total economic loss estimated for the earthquake is 11,883.48 (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 11,707.55 (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 51 % 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
<b>Income Losses</b>							
	Wage	0.00	30.22	384.13	12.08	72.46	498.88
	Capital-Related	0.00	12.94	318.40	7.11	25.35	363.80
	Rental	104.08	99.57	157.35	4.50	31.36	396.86
	Relocation	366.48	63.53	274.72	18.31	316.91	1,039.95
	<b>Subtotal</b>	<b>470.57</b>	<b>206.26</b>	<b>1,134.60</b>	<b>42.00</b>	<b>446.08</b>	<b>2,299.49</b>
<b>Capital Stock Losses</b>							
	Structural	817.42	194.95	369.21	65.46	253.66	1,700.71
	Non_Structural	2,584.52	835.50	1,146.31	222.33	943.66	5,732.31
	Content	678.96	178.27	522.41	134.64	423.37	1,937.65
	Inventory	0.00	0.00	11.20	25.04	1.15	37.39
	<b>Subtotal</b>	<b>4,080.90</b>	<b>1,208.72</b>	<b>2,049.12</b>	<b>447.48</b>	<b>1,621.84</b>	<b>9,408.05</b>
	<b>Total</b>	<b>4,551.47</b>	<b>1,414.98</b>	<b>3,183.71</b>	<b>489.47</b>	<b>2,067.91</b>	<b>11,707.55</b>



## 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	4,420.54	\$1.07	0.02
	Bridges	494.61	\$31.42	6.35
	Tunnels	0.09	\$0.00	0.68
	Subtotal	<b>4915.20</b>	<b>32.50</b>	
Railways	Segments	141.90	\$0.00	0.00
	Bridges	1.59	\$0.04	2.60
	Tunnels	0.00	\$0.00	0.00
	Facilities	0.00	\$0.00	0.00
	Subtotal	<b>143.50</b>	<b>0.00</b>	
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	<b>0.00</b>	<b>0.00</b>	
Bus	Facilities	2.11	\$0.32	15.06
	Subtotal	<b>2.10</b>	<b>0.30</b>	
Ferry	Facilities	0.00	\$0.00	0.00
	Subtotal	<b>0.00</b>	<b>0.00</b>	
Port	Facilities	0.00	\$0.00	0.00
	Subtotal	<b>0.00</b>	<b>0.00</b>	
Airport	Facilities	31.95	\$8.18	25.61
	Runways	303.71	\$0.00	0.00
	Subtotal	<b>335.70</b>	<b>8.20</b>	
	<b>Total</b>	<b>5396.50</b>	<b>41.00</b>	

**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	64.60	\$12.38	19.17
	Distribution Lines	185.70	\$10.14	5.46
	Subtotal	250.33	\$22.52	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	581.40	\$105.26	18.10
	Distribution Lines	111.40	\$5.09	4.57
	Subtotal	692.86	\$110.35	
Natural Gas	Pipelines	48.20	\$0.03	0.06
	Facilities	0.00	\$0.00	0.00
	Distribution Lines	74.30	\$1.74	2.35
	Subtotal	122.50	\$1.78	
Oil Systems	Pipelines	62.80	\$0.06	0.09
	Facilities	0.00	\$0.00	0.00
	Subtotal	62.78	\$0.06	
Electrical Power	Facilities	0.00	\$0.00	0.00
	Subtotal	0.00	\$0.00	
Communication	Facilities	3.10	\$0.20	6.33
	Subtotal	3.10	\$0.20	
	Total	1,131.58	\$134.90	

**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**

El Paso,CO

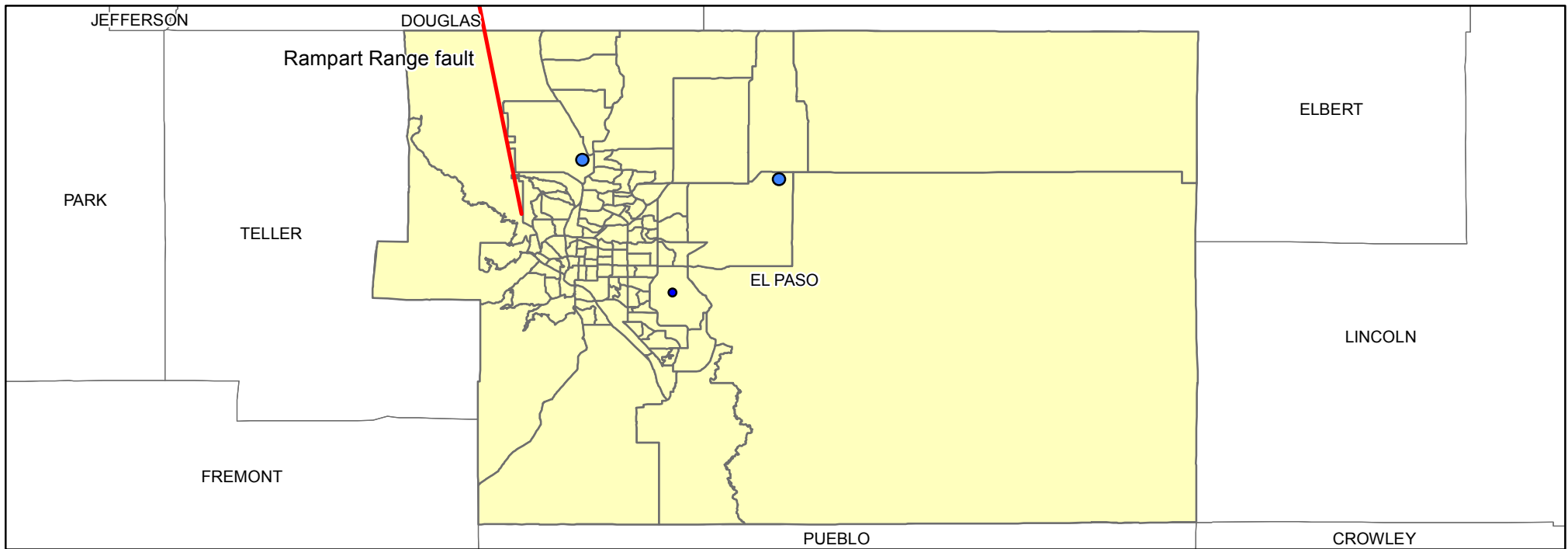
**Appendix B: Regional Population and Building Value Data**

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Colorado	El Paso	622,262	43,740	13,503	57,243
Total State		622,262	43,740	13,503	57,243
Total Region		622,262	43,740	13,503	57,243

# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

### Airports Map



#### Legend

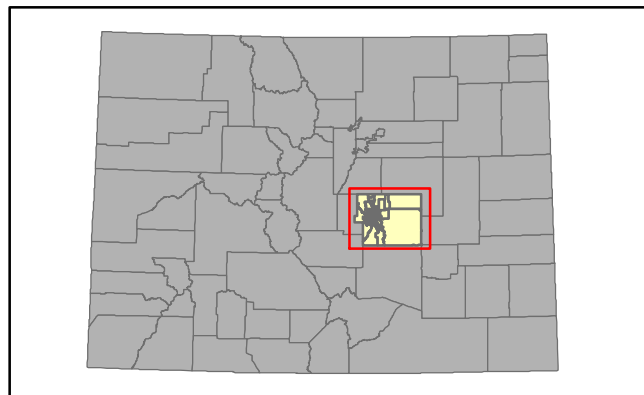
— Fault

#### Airports

##### Probability Damage > Extensive

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 70%
- 70 - 100%

Study Region Tract



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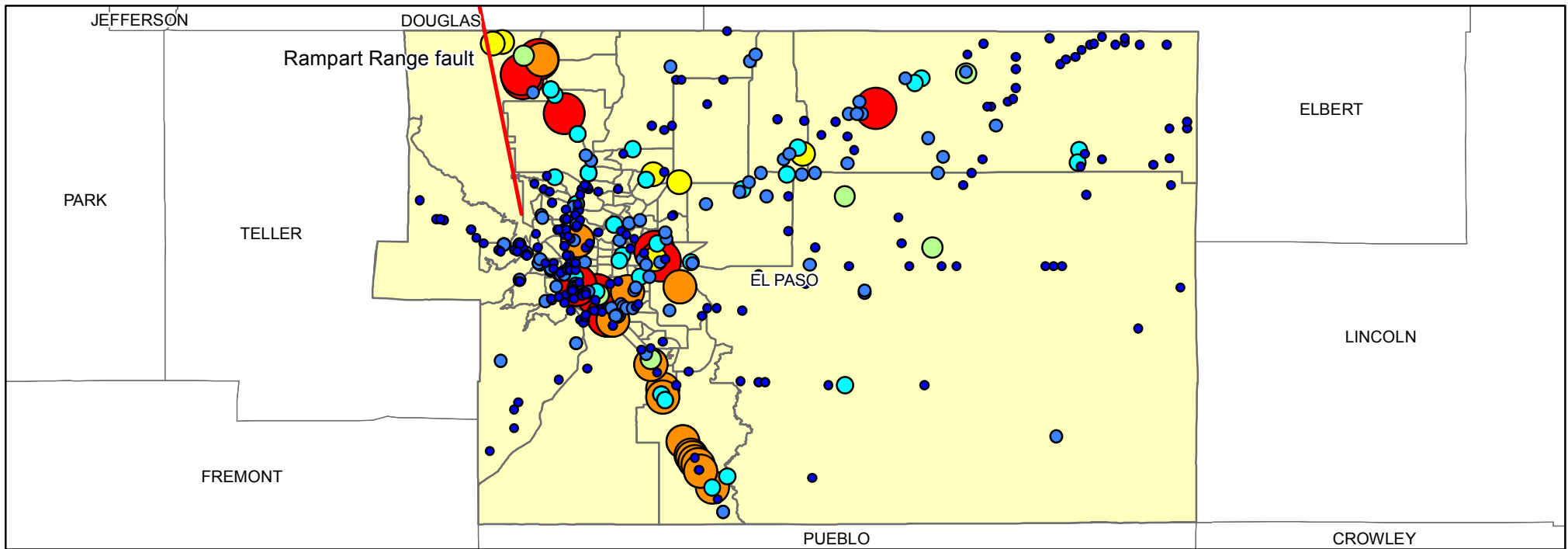


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# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

### Bridges Map

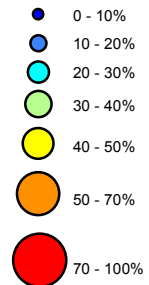


#### Legend

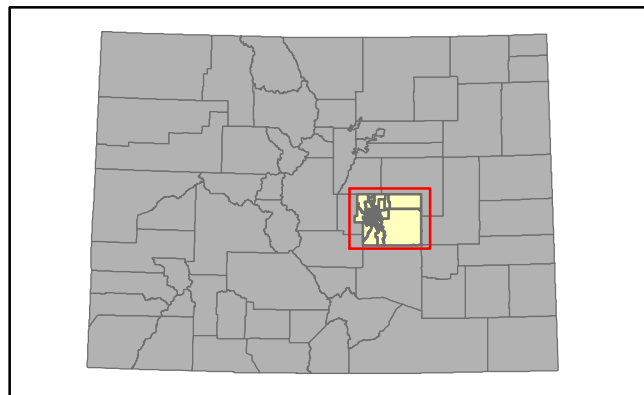
— Fault

#### Bridges

##### Probability Damage > Extensive



Study Region Tract



Created by: Colorado Geological Survey

Team: Matt Morgan and Scot Fitzgerald

Date Created: April 2013

Location: Denver County Colorado

Fault Parameters: arbitrary, magnitude 7, depth 10km

Data: Changed to CGS Landslides and CGS/FEMA Soils data

Projection: GCS North American 1983

0 10 20 40 Miles

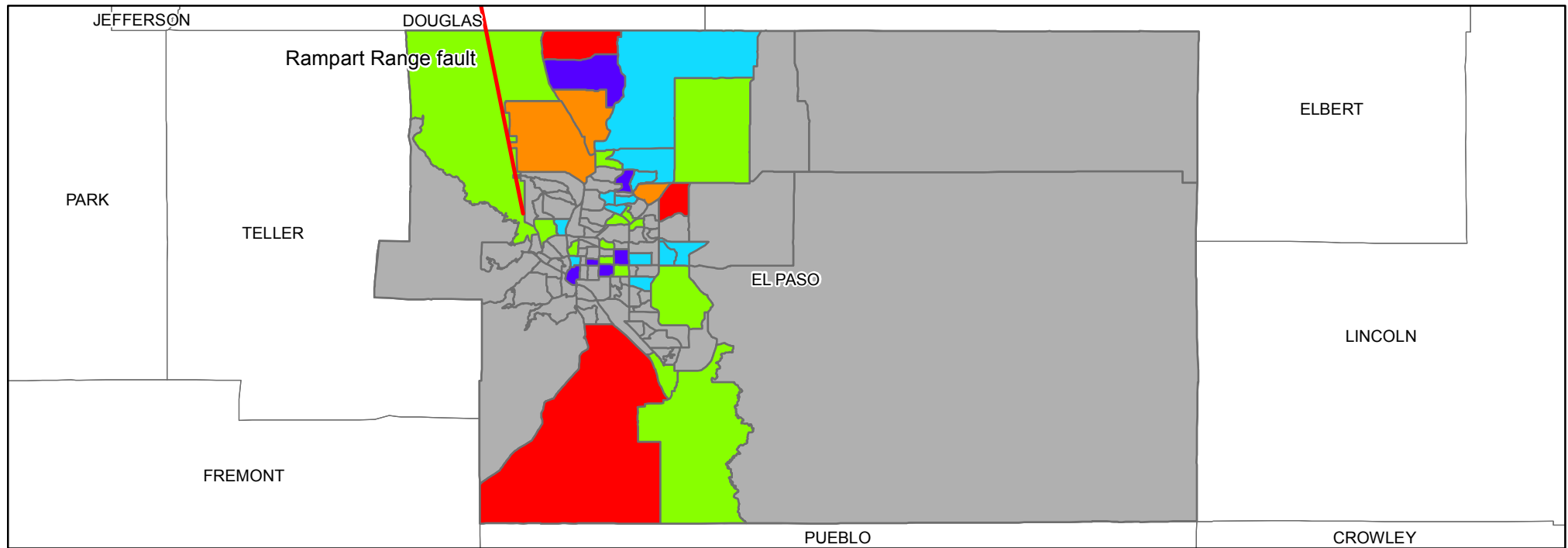


**HAZUS**  
EARTHQUAKE • WIND • FLOOD

# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

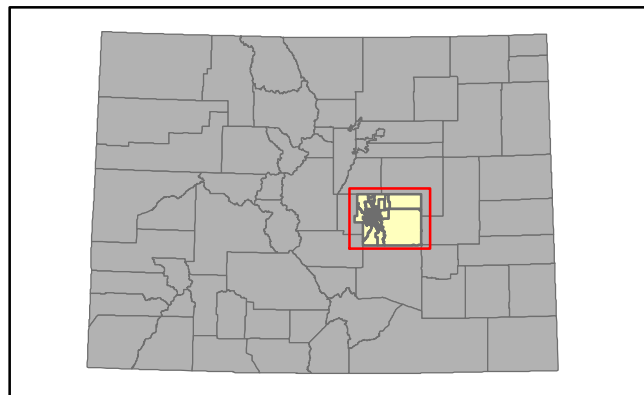
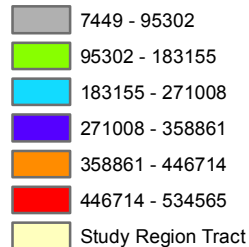
## Building Economic Loss Map



### Legend

— Fault

#### Building Economic Loss in Thousands of Dollars



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0 10 20 40 Miles

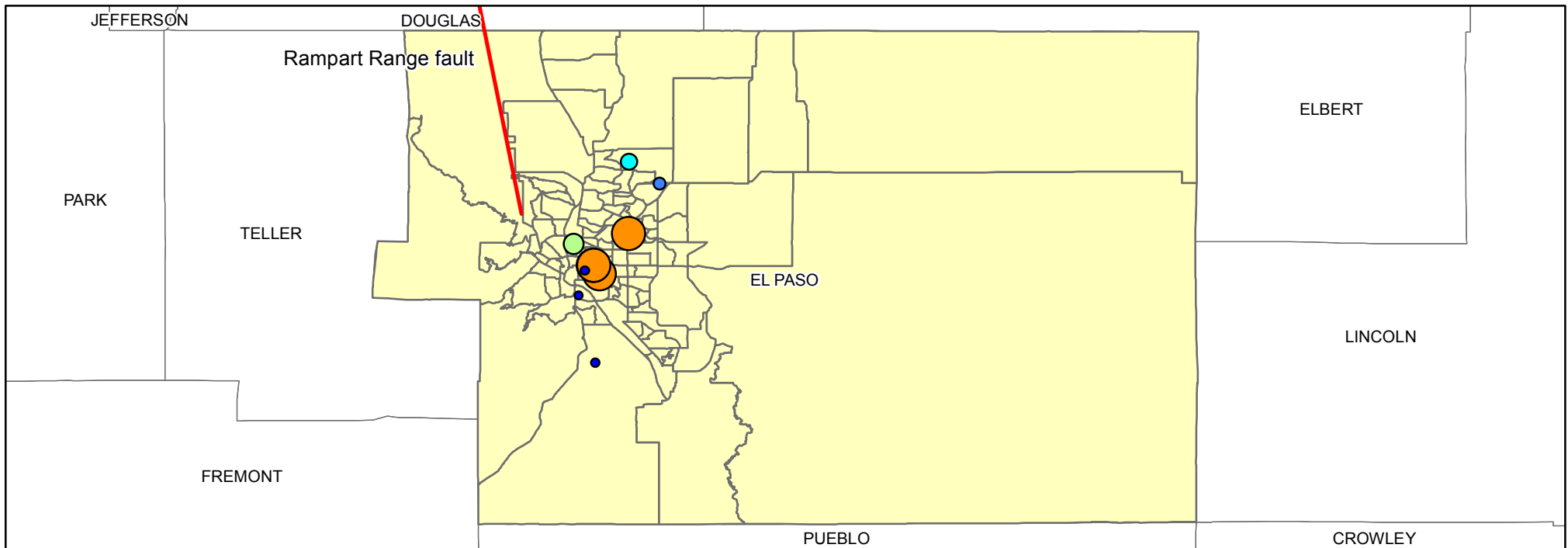


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# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

## Care Facilities Map



### Legend

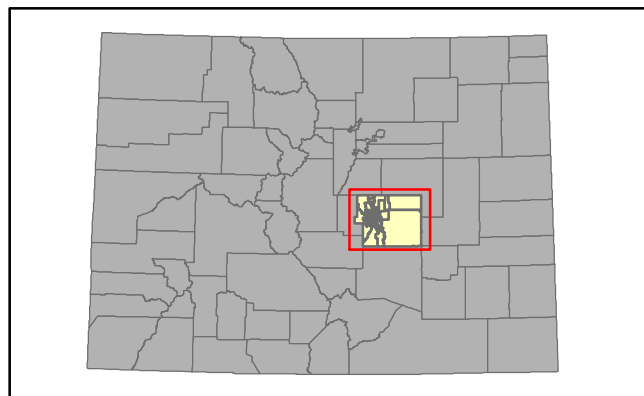
— Fault

### Care Facilities

#### Probability Damage > Extensive

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 70%
- 70 - 100%

Study Region Tract



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Team: Matt Morgan and Scot Fitzgerald

Date Created: April 2013

Location: Denver County Colorado

Fault Parameters: arbitrary, magnitude 7, depth 10km

Data: Changed to CGS Landslides and CGS/FEMA Soils data

Projection: GCS North American 1983

0 10 20 40 Miles



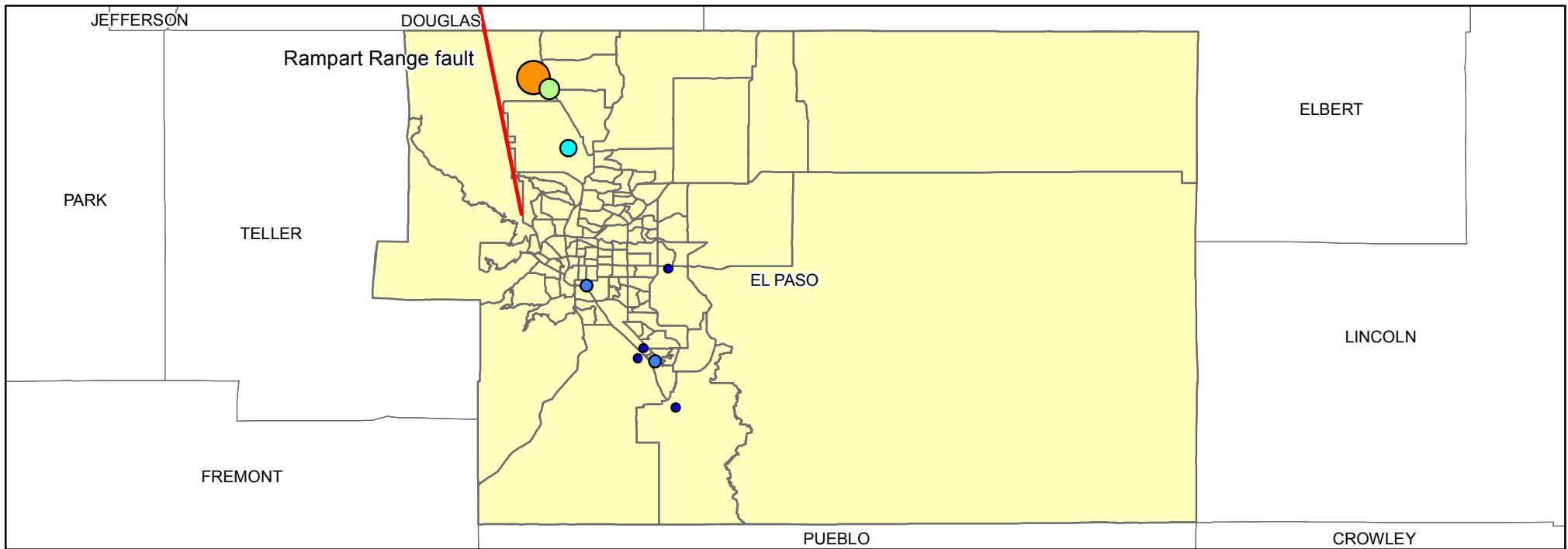
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# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

## Waste Water Facilities Map



### Legend

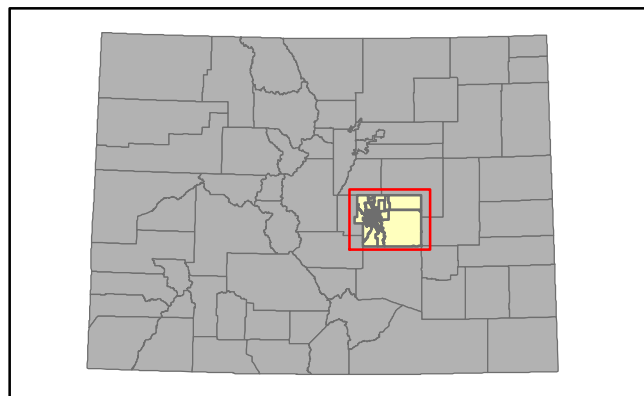
— Fault

#### Waste Water Facilities

Probability Damage > Extensive

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 70%
- 70 - 100%

Study Region Tract



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Team: Matt Morgan and Scot Fitzgerald

Date Created: April 2013

Location: Denver County Colorado

Fault Parameters: arbitrary, magnitude 7, depth 10km

Data: Changed to CGS Landslides and CGS/FEMA Soils data

Projection: GCS North American 1983

0 10 20 40 Miles

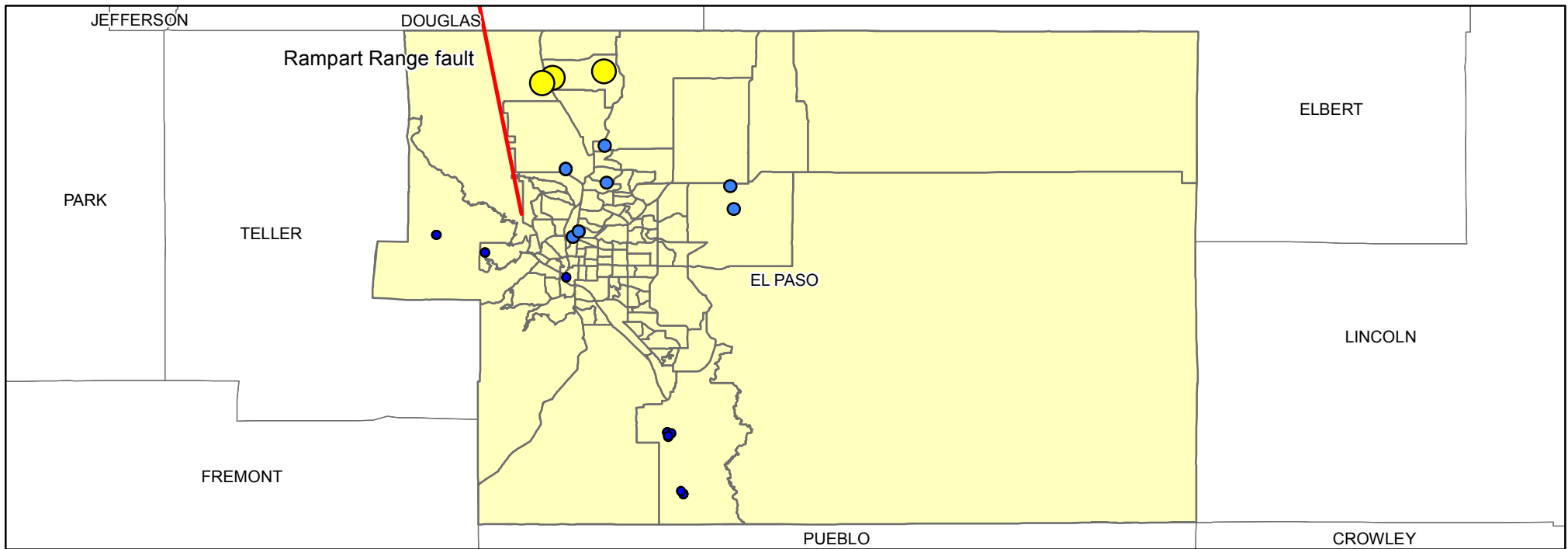


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# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

## Electrical Facilities Map



### Legend

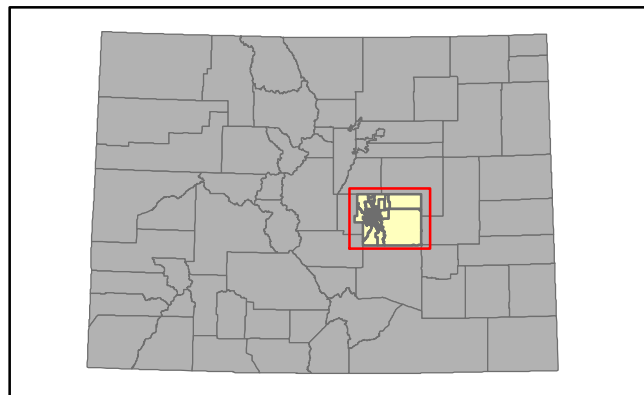
— Fault

#### Electrical Power Facilities

##### Probability Damage > Extensive

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 70%
- 70 - 100%

Study Region Tract



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Team: Matt Morgan and Scot Fitzgerald

Date Created: April 2013

Location: Denver County Colorado

Fault Parameters: arbitrary, magnitude 7, depth 10km

Data: Changed to CGS Landslides and CGS/FEMA Soils data

Projection: GCS North American 1983

0 10 20 40 Miles

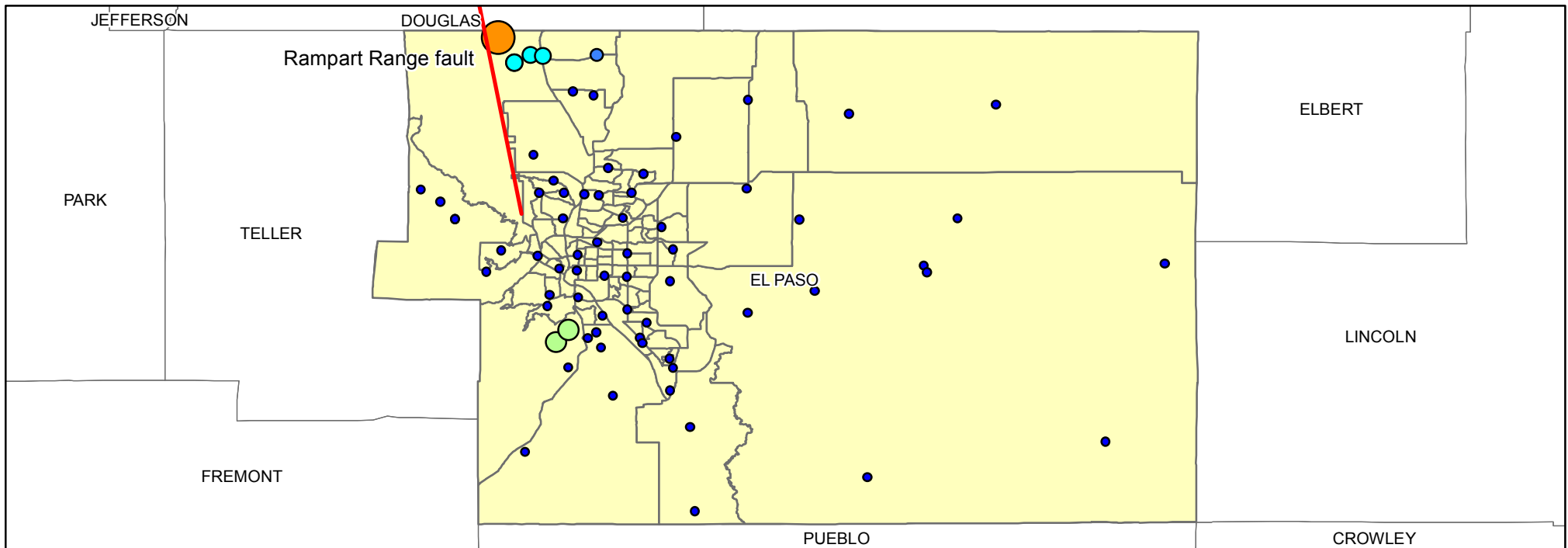


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# Study Region: El Paso County

## Hazard Scenario: Rampart Range Fault 7

## Fire Stations Map



### Legend

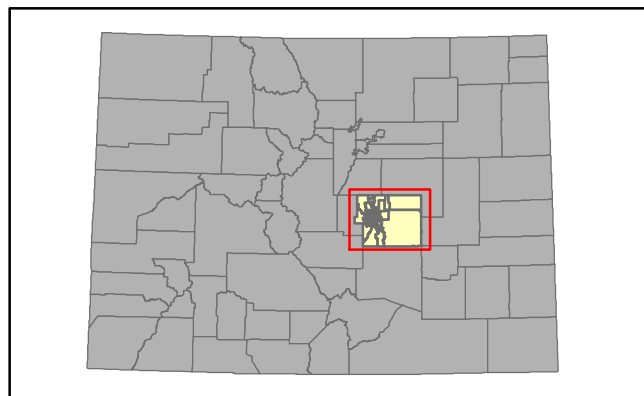
— Fault

### Fire Stations

#### Probability Damage > Extensive

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 70%
- 70 - 100%

Study Region Tract



Created by: Colorado Geological Survey

Team: Matt Morgan and Scot Fitzgerald

Date Created: April 2013

Location: Denver County Colorado

Fault Parameters: arbitrary, magnitude 7, depth 10km

Data: Changed to CGS Landslides and CGS/FEMA Soils data

Projection: GCS North American 1983

0 10 20 40 Miles

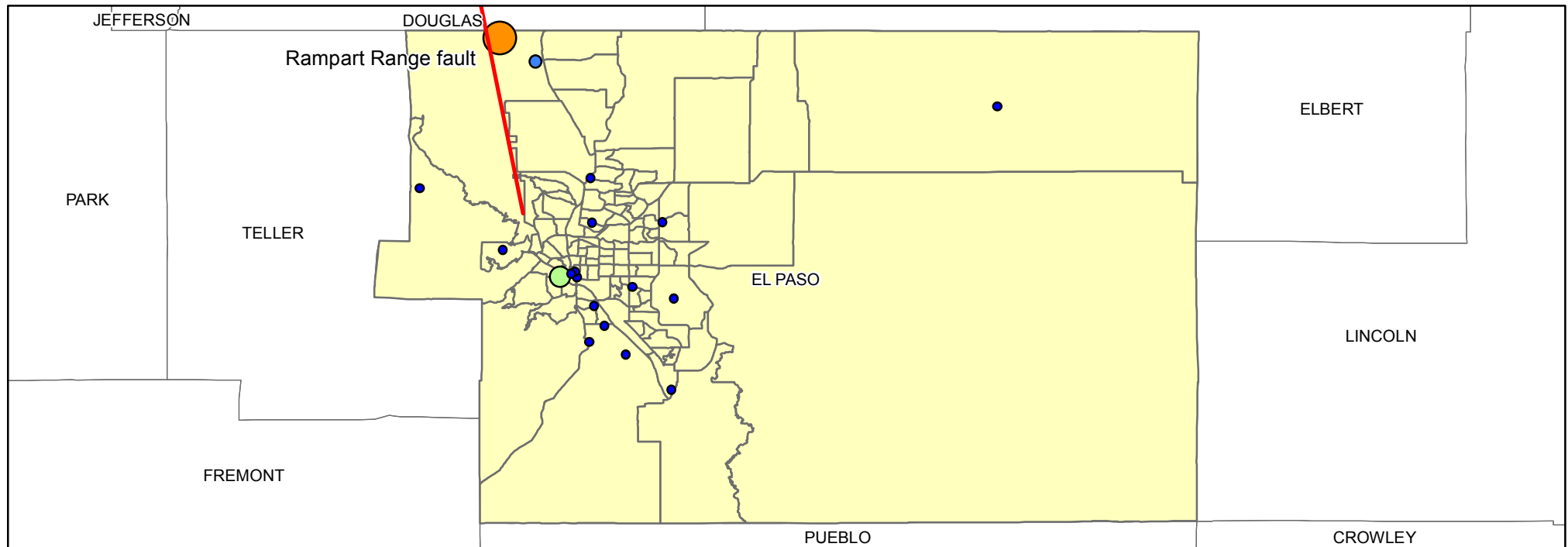


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# Study Region: El Paso County

## Police Stations Map

### Hazard Scenario: Rampart Range Fault 7



#### Legend

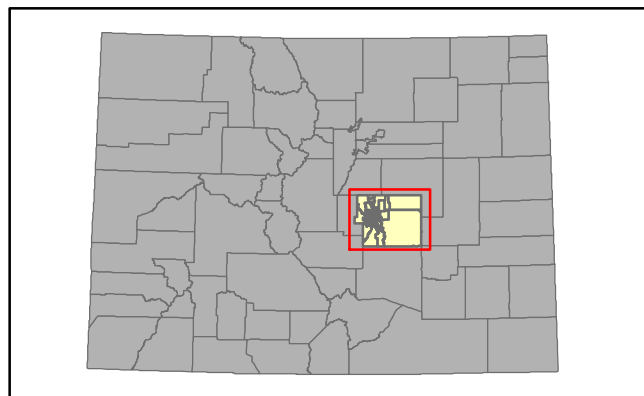
— Fault

#### Police Stations

##### Probability Damage > Extensive

- 0 - 10%
- 10 - 20%
- 20 - 30%
- 30 - 40%
- 40 - 50%
- 50 - 70%
- 70 - 100%

Study Region Tract



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Date Created: April 2013

Location: Denver County Colorado

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Data: Changed to CGS Landslides and CGS/FEMA Soils data

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0 10 20 40 Miles

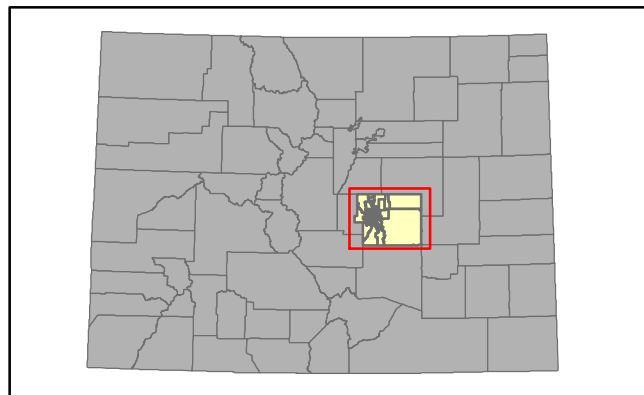
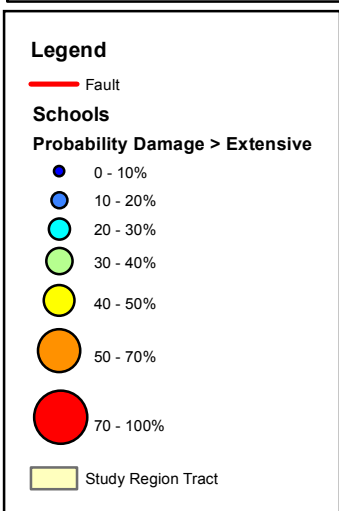
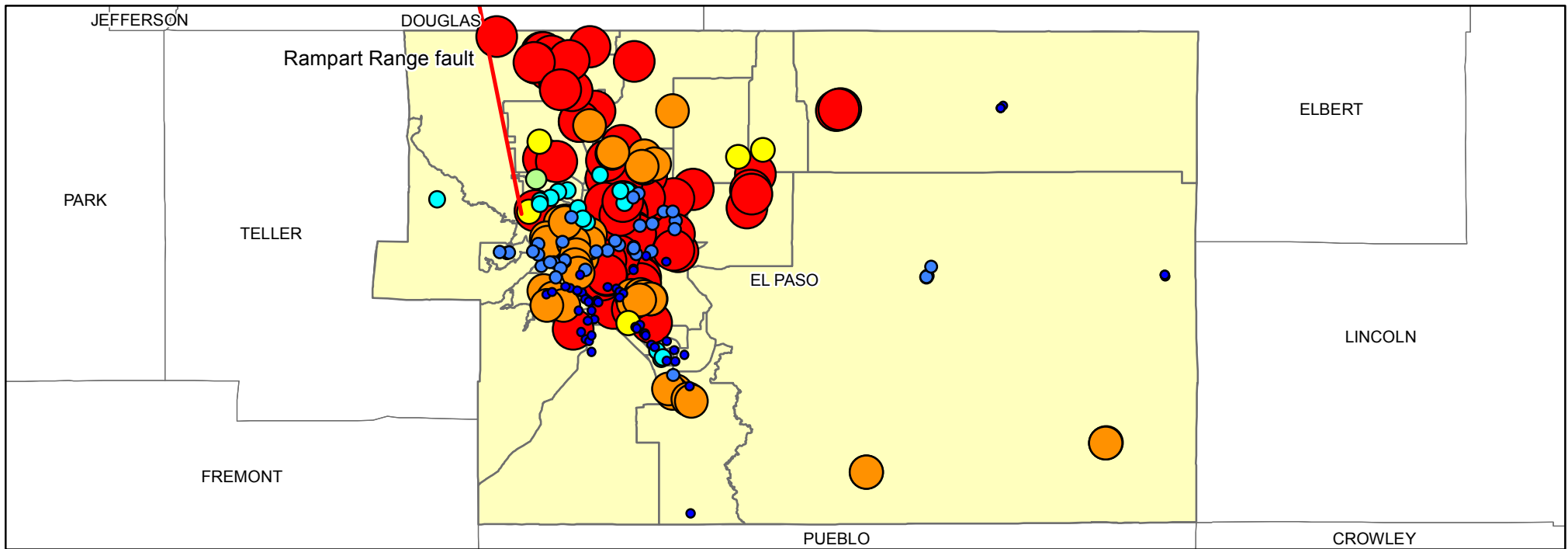


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# Study Region: El Paso County

## Schools Map

### Hazard Scenario: Rampart Range Fault 7



Created by: Colorado Geological Survey  
Team: Matt Morgan and Scot Fitzgerald  
Date Created: April 2013  
Location: Denver County Colorado  
Fault Parameters: arbitrary, magnitude 7, depth 10km  
Data: Changed to CGS Landslides and CGS/FEMA Soils data  
Projection: GCS North American 1983

0 10 20 40 Miles

