

**Scenario: M 7.2 Cle Elum Fault  
Benton County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Benton</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	306	1	0	0	0	307
Commercial	2,569	5	1	0	0	2,575
Education	78	0	0	0	0	78
Government	165	0	0	0	0	165
Industrial	764	2	0	0	0	766
Religion	183	0	0	0	0	183
Other Residential	13,815	93	6	0	0	13,914
Single Family	35,426	9	0	0	0	35,435

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$54,000	\$468,000	\$270,000	\$14,000	0	\$17,000	\$7,000	\$10,000	\$12,000	\$852,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large											
Medium	311	311	100	311	100	311	100	311	100	311	100
Small	32	32	100	32	100	32	100	32	100	32	100
<b>Total</b>	<b>343</b>	<b>343</b>	<b>—</b>								

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
155	155	0	0	0	0

**Scenario: M 7.2 Cle Elum Fault  
Benton County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
0	0	\$0

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
58,697	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
58,697	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
0	0	0	0

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	1	100
Fire Station Facilities	29	100
Police Station Facilities	6	100
School	62	100

**Scenario: M 7.2 Cle Elum Fault  
Chelan County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Chelan</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	376	3	0	0	0	379
Commercial	1615	14	2	0	0	1,631
Education	64	0	0	0	0	64
Government	67	1	0	0	0	68
Industrial	515	5	1	0	0	521
Religion	127	1	0	0	0	128
Other Residential	8906	95	7	0	0	9,008
Single Family	21,076	23	0	0	0	21,099

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$154,000	\$1,680,000	\$1,064,000	\$56,000	0.03	\$50,000	\$29,000	\$40,000	\$47,000	\$3,119,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large	206	205	100	205	100	206	100	206	100	206	100
Medium											
Small	78	77	99	77	99	78	100	78	100	78	100
<b>Total</b>	<b>284</b>	<b>282</b>	<b>—</b>	<b>282</b>	<b>—</b>	<b>284</b>	<b>—</b>	<b>284</b>	<b>—</b>	<b>284</b>	<b>—</b>

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
107	107	0	0	0	0

**Scenario: M 7.2 Cle Elum Fault  
Chelan County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
1	51	\$2,968,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
25,813	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
25,813	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
0	0	0	0

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	1	100
Fire Station Facilities	24	100
Police Station Facilities	3	100
School	43	100

**Scenario: M 7.2 Cle Elum Fault  
Douglas County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Douglas</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	176	1	0	0	0	177
Commercial	574	8	1	0	0	583
Education	22	0	0	0	0	22
Government	28	0	0	0	0	28
Industrial	166	3	0	0	0	169
Religion	49	0	0	0	0	49
Other Residential	5,065	101	9	0	0	5,175
Single Family	8,410	17	0	0	0	8,427

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	Total Loss
\$80,000	\$976,000	\$592,000	\$20,000	0.06	\$30,000	\$21,000	\$22,000	\$23,000	\$1,764,000

**Hospital Functionality (There are no hospitals for Douglas County in the HAZUS database)**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large											
Medium											
Small											
<b>Total</b>	<b>0</b>	<b>0</b>	<b>—</b>								

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
49	49	0	0	0	0

**Scenario: M 7.2 Cle Elum Fault  
Douglas County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
0	2	\$61,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
12,663	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
12,663	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
0	0	0	0

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	1	100
Fire Station Facilities	15	100
Police Station Facilities	3	100
School	19	100

**Scenario: M 7.2 Cle Elum Fault  
Grant County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total Grant</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	472	2	0	0	0	474
Commercial	1568	8	1	0	0	1,577
Education	65	0	0	0	0	65
Government	61	0	0	0	0	61
Industrial	386	2	0	0	0	388
Religion	132	1	0	0	0	133
Other Residential	15175	169	13	0	0	15,357
Single Family	16,539	11	0	0	0	16,550

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$100,000	\$726,000	\$434,000	\$19,000	0.02	\$39,000	\$16,000	\$20,000	\$27,000	\$1,380,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large											
Medium	161	161	100	161	100	161	100	161	100	161	100
Small	38	37	98	37	98	38	100	38	100	38	100
<b>Total</b>	<b>199</b>	<b>198</b>	<b>—</b>	<b>198</b>	<b>—</b>	<b>199</b>	<b>—</b>	<b>199</b>	<b>—</b>	<b>199</b>	<b>—</b>

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
272	272	0	0	0	0

**Scenario: M 7.2 Cle Elum Fault  
Grant County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
0	0	\$0

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
27,584	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
27,584	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
0	0	0	0

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	1	100
Fire Station Facilities	52	100
Police Station Facilities	13	100
School	60	100

**Scenario: M 7.2 Cle Elum Fault  
King County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1
Educational	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other-Residential	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Single Family	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total King</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	1,917	3	0	0	0	1,920
Commercial	37,052	56	5	0	0	37,113
Education	1,341	1	0	0	0	1,342
Government	554	1	0	0	0	555
Industrial	9,923	19	2	0	0	9,944
Religion	2,328	2	0	0	0	2,330
Other Residential	85,565	309	26	0	0	85,900
Single Family	448,504	66	0	0	0	448,570

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$558,000	\$5,484,000	\$3,105,000	\$173,000	0	\$171,000	\$126,000	\$140,000	\$210,000	\$9,968,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large	4,943	4,941	100	4,941	100	4,941	100	4,941	100	4,941	100
Medium	684	684	100	684	100	684	100	684	100	684	100
Small	100	100	100	100	100	100	100	100	100	100	100
<b>Total</b>	<b>5,727</b>	<b>5,725</b>	<b>—</b>								

Large Hospital: > 150 beds

Medium Hospital: 50-150 beds

Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
1,033	1,033	0	0	0	0

**Scenario: M 7.2 Cle Elum Fault  
King County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
1	2	\$150,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
745,853	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
745,853	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
1,000	0	1,000	40

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
0	0

**Essential Facilities Functionality**

	Count	Functionality (%)
	At Day 1	
Emergency Operation Center	18	100
Fire Station Facilities	164	100
Police Station Facilities	52	100
School	721	100

**Scenario: M 7.2 Cle Elum Fault  
Kittitas County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Commercial	0	12	11	0	2	2	0	0	0	0	1	1	0	15	14
Educational	0	6	1	0	1	0	0	0	0	0	0	0	0	7	1
Hotels	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Industrial	0	2	1	0	0	0	0	0	0	0	0	0	0	2	1
Other-Residential	14	2	5	2	0	1	0	0	0	0	0	0	16	2	6
Single Family	8	2	3	1	0	0	0	0	0	0	0	0	9	2	3
<b>Total Kittitas</b>	<b>23</b>	<b>24</b>	<b>21</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>26</b>	<b>28</b>	<b>26</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	132	23	21	8	2	186
Commercial	590	153	143	54	9	949
Education	16	5	5	2	0	28
Government	26	4	4	2	0	36
Industrial	178	41	47	22	5	293
Religion	47	13	10	4	1	75
Other Residential	5,268	1,063	665	296	52	7,344
Single Family	7,599	1,946	716	36	4	10,301

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$13,885,000	\$56,679,000	\$22,897,000	\$557,000	2.69	\$9,900,000	\$4,063,000	\$4,918,000	\$4,524,000	\$117,424,000

**Hospital Functionality**

	Total Number of Beds	At Day 1		At day 3		At day 7		At day 30		At day 90	
		Number of Beds	%								
Large											
Medium											
Small	25	20	81	20	81	24	96	25	100	25	100
<b>Total</b>	<b>25</b>	<b>20</b>	<b>—</b>	<b>20</b>	<b>—</b>	<b>24</b>	<b>—</b>	<b>25</b>	<b>—</b>	<b>25</b>	<b>—</b>

Large Hospital: > 150 beds  
 Medium Hospital: 50-150 beds  
 Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
257 (258*)	231	8	8	8	3

\* values in parentheses include rounding error.

**Scenario: M 7.2 Cle Elum Fault  
Kittitas County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
2	30	\$1,985,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
14,952	395	3	107	1	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
14,952	1,516	10	1,058	7	516	4	117	1	2	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
14,000	21,000	35,000	1,400

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
98	79

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	2	75
Fire Station Facilities	27	82
Police Station Facilities	5	75
School	18	80

**Scenario: M 7.2 Cle Elum Fault  
Yakima County**

**Casualties Summary Report**

	Injury Severity Level														
	Severity 1			Severity 2			Severity 3			Severity 4			Total		
	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	2:00 AM	2:00 PM	5:00 PM	12:00 AM	2:00 PM	5:00 PM
Commuting	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
Commercial	0	12	9	0	1	1	0	0	0	0	0	0	0	13	10
Educational	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0
Hotels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	0	2	1	0	0	0	0	0	0	0	0	0	0	2	1
Other-Residential	14	3	5	1	0	0	0	0	0	0	0	0	15	3	5
Single Family	4	1	2	0	0	0	0	0	0	0	0	0	4	1	2
<b>Total Yakima</b>	<b>18</b>	<b>21</b>	<b>17</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>22</b>	<b>20</b>

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

**Number of Buildings Damaged by General Occupancy Class**

	Number of Buildings					
	None	Slight	Moderate	Extensive	Complete	Total
Agriculture	789	64	25	2	0	880
Commercial	3,365	528	203	13	0	4,109
Education	124	14	5	0	0	143
Government	132	22	9	1	0	164
Industrial	879	141	68	6	0	1,094
Religion	315	37	13	1	0	366
Other Residential	20,191	3,191	1,404	100	1	24,887
Single Family	50,778	2,459	97	3	0	53,337

Structural damage states vary by building type. See HAZUS Technical Manual Vol. I. "Complete damage" indicates structural collapse or is in imminent danger of collapse.

**Direct Economic Losses For Buildings**

Capital Stock Losses				Income Losses					Total Loss
Cost Structural Damage	Cost Non-structural Damage	Cost Contents Damage	Inventory Loss	Loss Ratio %	Relocation Loss	Capital Loss	Wages Losses	Rental Income Loss	
\$12,820,000	\$60,678,000	\$31,718,000	\$1,163,000	0.54	\$8,117,000	\$4,410,000	\$5,442,000	\$4,452,000	\$128,799,000

**Hospital Functionality**

	At Day 1			At day 3		At day 7		At day 30		At day 90	
	Total Number of Beds	Number of Beds	%								
Large	426	369	87	370	87	422	99	426	100	426	100
Medium	63	54	86	54	86	62	99	63	100	63	100
Small	38	36	94	36	94	38	100	38	100	38	100
<b>Total</b>	<b>527</b>	<b>459</b>	<b>—</b>	<b>460</b>	<b>—</b>	<b>522</b>	<b>—</b>	<b>527</b>	<b>—</b>	<b>527</b>	<b>—</b>

Large Hospital: > 150 beds

Medium Hospital: 50-150 beds

Small Hospital: < 50 beds

**Highway Bridge Damage**

Total Number of Bridges	Average Number for Damage State				
	None	Slight	Moderate	Extensive	Complete
520 (519*)	504	5	5	5	0

\* values in parentheses include rounding error.

**Scenario: M 7.2 Cle Elum Fault  
Yakima County**

**Fire Following Analysis Summary Report**

Number of Ignitions	Population Exposed	Value Exposed
6	307	\$16,818,000

**Potable Water System Performance**

Total Households	Number of Households Without Water									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
76,461	0	0	0	0	0	0	0	0	0	0

**Electrical Power System Performance**

Total Households	Number of Households Without Power									
	At day 1		At day 3		At day 7		At day 30		At day 90	
	Count	%	Count	%	Count	%	Count	%	Count	%
76,461	0	0	0	0	0	0	0	0	0	0

**Debris Summary Report**

Brick, Wood & Others (tons)	Concrete & Steel (tons)	Total (tons)	Number of Truckloads
11,000	16,000	27,000	1,080

**Shelter Summary Report**

Number of Displaced Households	Number of People Needing Short Term Shelter
40	31

**Essential Facilities Functionality**

	Count	Functionality (%)
		At Day 1
Emergency Operation Center	1	95
Fire Station Facilities	55	91
Police Station Facilities	18	97
School	114	95

# HAZUS-MH: Earthquake Event Report

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**Region Name:** CleElumM68

**Earthquake Scenario:** CleElum-RedoM6.8

**Print Date:** March 10, 2010

*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 23 county(ies) from the following state(s):

Washington

Note:

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

The geographical size of the region is 36,495.82 square miles and contains 1,084 census tracts. There are over 2,043 thousand households in the region and has a total population of 5,283,432 people (2005 Census Bureau data). The distribution of population by State and County is provided in Appendix B.

There are an estimated 1,877 thousand buildings in the region with a total building replacement value (excluding contents) of 402,081 (millions of dollars). Approximately 92.00 % of the buildings (and 0.00% of the building value) are associated with residential housing.

The replacement value of the transportation and utility lifeline systems is estimated to be 151,145 and 21,726 (millions of dollars) , respectively.

## Building and Lifeline Inventory

### **Building Inventory**

HAZUS estimates that there are 1,877 thousand buildings in the region which have an aggregate total replacement value of 402,081 (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 81% 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 75 hospitals in the region with a total bed capacity of 14,258 beds. There are 2,254 schools, 938 fire stations, 226 police stations and 55 emergency operation facilities. With respect to HPL facilities, there are 450 dams identified within the region. Of these, 146 of the dams are classified as 'high hazard'. The inventory also includes 839 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 172,871.00 (millions of dollars). This inventory includes over 9,562 kilometers of highways, 4,996 bridges, 286,170 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	4,996	90,051.60
	Segments	3,454	53,323.90
	Tunnels	29	67.00
	<b>Subtotal</b>		<b>143,442.50</b>
<b>Railways</b>	Bridges	77	20.00
	Facilities	68	181.10
	Segments	1,407	2,642.40
	Tunnels	0	0.00
	<b>Subtotal</b>		<b>2,843.50</b>
<b>Light Rail</b>	Bridges	0	0.00
	Facilities	38	101.20
	Segments	48	203.90
	Tunnels	0	0.00
	<b>Subtotal</b>		<b>305.00</b>
<b>Bus</b>	Facilities	45	54.00
	<b>Subtotal</b>		<b>54.00</b>
<b>Ferry</b>	Facilities	45	59.90
	<b>Subtotal</b>		<b>59.90</b>
<b>Port</b>	Facilities	486	970.50
	<b>Subtotal</b>		<b>970.50</b>
<b>Airport</b>	Facilities	62	660.40
	Runways	74	2,809.30
	<b>Subtotal</b>		<b>3,469.70</b>
		<b>Total</b>	<b>151,145.10</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	2,861.70
	Facilities	41	1,501.80
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>4,363.50</b>
<b>Waste Water</b>	Distribution Lines	NA	1,717.00
	Facilities	146	10,696.00
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>12,413.00</b>
<b>Natural Gas</b>	Distribution Lines	NA	1,144.70
	Facilities	56	67.10
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>1,211.80</b>
<b>Oil Systems</b>	Facilities	15	1.70
	Pipelines	0	0.00
		<b>Subtotal</b>	<b>1.70</b>
<b>Electrical Power</b>	Facilities	78	9,438.00
		<b>Subtotal</b>	<b>9,438.00</b>
<b>Communication</b>	Facilities	196	21.60
		<b>Subtotal</b>	<b>21.60</b>
		<b>Total</b>	<b>27,449.60</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>	CleElum-RedoM6.8
<b>Type of Earthquake</b>	User-defined
<b>Fault Name</b>	NA
<b>Historical Epicenter ID #</b>	NA
<b>Probabilistic Return Period</b>	NA
<b>Longitude of Epicenter</b>	NA
<b>Latitude of Epicenter</b>	NA
<b>Earthquake Magnitude</b>	6.80
<b>Depth (Km)</b>	NA
<b>Rupture Length (Km)</b>	NA
<b>Rupture Orientation (degrees)</b>	NA
<b>Attenuation Function</b>	NA

## Building Damage

### Building Damage

HAZUS estimates that about 4,117 buildings will be at least moderately damaged. This is over 0.00 % of the total number of buildings in the region. There are an estimated 74 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 summaries the expected damage by general occupancy for the buildings in the region. Table 4 summaries 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>	8,201	0.44	94	0.90	47	1.35	10	1.86	2	2.82
<b>Commercial</b>	97,637	5.24	767	7.30	354	10.13	68	12.28	9	12.42
<b>Education</b>	3,524	0.19	21	0.20	10	0.29	2	0.41	0	0.42
<b>Government</b>	2,326	0.12	28	0.26	13	0.37	2	0.41	0	0.45
<b>Industrial</b>	30,263	1.62	213	2.03	118	3.38	28	5.12	5	6.81
<b>Other Residential</b>	376,110	20.19	4,803	45.74	2,113	60.50	396	71.97	53	71.11
<b>Religion</b>	6,781	0.36	53	0.50	24	0.69	5	0.86	1	0.88
<b>Single Family</b>	1,338,337	71.83	4,522	43.06	813	23.29	39	7.09	4	5.10
<b>Total</b>	<b>1,863,179</b>		<b>10,501</b>		<b>3,492</b>		<b>550</b>		<b>75</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>	1,509,994	81.04	5666	53.95	940	26.91	46	8.33	6	7.49
<b>Steel</b>	39,867	2.14	376	3.58	271	7.75	49	8.89	5	6.53
<b>Concrete</b>	39,010	2.09	361	3.43	161	4.60	34	6.24	4	5.46
<b>Precast</b>	28,649	1.54	245	2.33	161	4.61	35	6.43	5	6.53
<b>RM</b>	69,241	3.72	333	3.17	198	5.66	40	7.32	3	4.45
<b>URM</b>	14,958	0.80	292	2.78	98	2.80	21	3.84	7	9.01
<b>MH</b>	161,459	8.67	3229	30.75	1,665	47.68	324	58.95	45	60.52
<b>Total</b>	<b>1,863,179</b>		<b>10,501</b>		<b>3,492</b>		<b>550</b>		<b>75</b>	

\*Note:

RM Reinforced Masonry  
 URM Unreinforced Masonry  
 MH Manufactured Housing

## **Essential Facility Damage**

Before the earthquake, the region had 14,258 hospital beds available for use. On the day of the earthquake, the model estimates that only 14,124 hospital beds (99.00%) are available for use by patients already in the hospital and those injured by the earthquake. After one week, 100.00% of the beds will be back in service. By 30 days, 100.00% 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	75	0	0	75
Schools	2,254	0	0	2,254
EOCs	55	0	0	55
PoliceStations	226	0	0	226
FireStations	938	0	0	937

## Transportation and Utility Lifeline Damage

Table 6 provides damage estimates for the transportation system.

**Table 6: Expected Damage to the Transportation Systems**

System	Component	Locations/ Segments	Number of Locations_			
			With at Least Mod. Damage	With Complete Damage	With Functionality > 50 %	
					After Day 1	After Day 7
Highway	Segments	3,454	0	0	3,454	3,454
	Bridges	4,996	2	0	4,994	4,996
	Tunnels	29	0	0	29	29
Railways	Segments	1,407	0	0	1,407	1,407
	Bridges	77	0	0	77	77
	Tunnels	0	0	0	0	0
	Facilities	68	0	0	68	68
Light Rail	Segments	48	0	0	48	48
	Bridges	0	0	0	0	0
	Tunnels	0	0	0	0	0
	Facilities	38	0	0	38	38
Bus	Facilities	45	0	0	45	45
Ferry	Facilities	45	0	0	45	45
Port	Facilities	486	0	0	486	486
Airport	Facilities	62	0	0	62	62
	Runways	74	0	0	74	74

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	41	0	0	41	41
Waste Water	146	0	0	140	146
Natural Gas	56	0	0	56	56
Oil Systems	15	0	0	15	15
Electrical Power	78	0	0	75	78
Communication	196	0	0	196	196

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

System	Total Pipelines Length (kms)	Number of Leaks	Number of Breaks
Potable Water	143,085	673	204
Waste Water	85,851	532	161
Natural Gas	57,234	569	172
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	2,043,617	395	107	0	0	0
Electric Power		1,516	1,058	516	117	2

### **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 11 ignitions that will burn about 0.37 sq. mi (0.00 % of the region's total area.) The model also estimates that the fires will displace about 711 people and burn about 47 (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 0.070 million tons of debris will be generated. Of the total amount, Brick/Wood comprises 42.00% 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 2,600,000 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 138 households to be displaced due to the earthquake. Of these, 110 people (out of a total population of 5,283,432) 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	0	0	0	0
	Commuting	0	0	0	0
	Educational	0	0	0	0
	Hotels	1	0	0	0
	Industrial	1	0	0	0
	Other-Residential	29	3	0	0
	Single Family	12	1	0	0
	<b>Total</b>	<b>43</b>	<b>4</b>	<b>0</b>	<b>0</b>
<b>2 PM</b>	Commercial	25	3	0	1
	Commuting	0	0	0	0
	Educational	9	2	0	0
	Hotels	0	0	0	0
	Industrial	4	1	0	0
	Other-Residential	6	1	0	0
	Single Family	2	0	0	0
	<b>Total</b>	<b>47</b>	<b>6</b>	<b>1</b>	<b>1</b>
<b>5 PM</b>	Commercial	21	3	0	1
	Commuting	1	1	2	0
	Educational	1	0	0	0
	Hotels	0	0	0	0
	Industrial	3	0	0	0
	Other-Residential	10	1	0	0
	Single Family	4	0	0	0
	<b>Total</b>	<b>41</b>	<b>6</b>	<b>2</b>	<b>1</b>

## Economic Loss

The total economic loss estimated for the earthquake is 498.55 (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 261.77 (millions of dollars); 18 % 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 55 % 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	0.58	8.69	0.46	0.84	10.57
	Capital-Related	0.00	0.25	7.97	0.27	0.16	8.66
	Rental	1.09	2.84	4.87	0.18	0.31	9.28
	Relocation	3.87	4.44	6.72	0.93	2.32	18.28
	<b>Subtotal</b>	<b>4.96</b>	<b>8.11</b>	<b>28.25</b>	<b>1.84</b>	<b>3.63</b>	<b>46.79</b>
<b>Capital Stock Losses</b>							
	Structural	7.11	6.45	8.15	2.29	3.57	27.57
	Non_Structural	54.26	28.69	26.28	7.97	8.69	125.90
	Content	25.60	7.60	15.39	5.23	5.70	59.52
	Inventory	0.00	0.00	0.48	1.15	0.36	1.99
	<b>Subtotal</b>	<b>86.97</b>	<b>42.74</b>	<b>50.30</b>	<b>16.64</b>	<b>18.32</b>	<b>214.98</b>
	<b>Total</b>	<b>91.93</b>	<b>50.86</b>	<b>78.55</b>	<b>18.47</b>	<b>21.96</b>	<b>261.77</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	53,323.90	\$17.85	0.03
	Bridges	90,051.61	\$53.68	0.06
	Tunnels	66.98	\$0.00	0.00
	<b>Subtotal</b>	<b>143442.50</b>	<b>71.50</b>	
Railways	Segments	2,642.42	\$0.21	0.01
	Bridges	19.99	\$0.01	0.03
	Tunnels	0.00	\$0.00	0.00
	Facilities	181.08	\$0.32	0.17
	<b>Subtotal</b>	<b>2843.50</b>	<b>0.50</b>	
Light Rail	Segments	203.85	\$0.00	0.00
	Bridges	0.00	\$0.00	0.00
	Tunnels	0.00	\$0.00	0.00
	Facilities	101.19	\$0.23	0.23
	<b>Subtotal</b>	<b>305.00</b>	<b>0.20</b>	
Bus	Facilities	53.96	\$0.44	0.81
	<b>Subtotal</b>	<b>54.00</b>	<b>0.40</b>	
Ferry	Facilities	59.90	\$0.03	0.04
	<b>Subtotal</b>	<b>59.90</b>	<b>0.00</b>	
Port	Facilities	970.54	\$0.17	0.02
	<b>Subtotal</b>	<b>970.50</b>	<b>0.20</b>	
Airport	Facilities	660.36	\$9.11	1.38
	Runways	2,809.34	\$0.47	0.02
	<b>Subtotal</b>	<b>3469.70</b>	<b>9.60</b>	
	<b>Total</b>	<b>151145.10</b>	<b>82.50</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	1,501.80	\$1.30	0.09
	Distribution Lines	2,861.70	\$3.38	0.12
	<b>Subtotal</b>	<b>4,363.54</b>	<b>\$4.69</b>	
Waste Water	Pipelines	0.00	\$0.00	0.00
	Facilities	10,696.00	\$67.24	0.63
	Distribution Lines	1,717.00	\$2.68	0.16
	<b>Subtotal</b>	<b>12,412.98</b>	<b>\$69.91</b>	
Natural Gas	Pipelines	0.00	\$0.00	0.00
	Facilities	67.10	\$0.09	0.13
	Distribution Lines	1,144.70	\$2.86	0.25
	<b>Subtotal</b>	<b>1,211.83</b>	<b>\$2.95</b>	
Oil Systems	Pipelines	0.00	\$0.00	0.00
	Facilities	1.70	\$0.00	0.00
	<b>Subtotal</b>	<b>1.65</b>	<b>\$0.00</b>	
Electrical Power	Facilities	9,438.00	\$76.57	0.81
	<b>Subtotal</b>	<b>9,438.00</b>	<b>\$76.57</b>	
Communication	Facilities	21.60	\$0.14	0.66
	<b>Subtotal</b>	<b>21.56</b>	<b>\$0.14</b>	
	<b>Total</b>	<b>27,449.55</b>	<b>\$154.26</b>	

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

	LOSS	Total	%
<b>First Year</b>			
	Employment Impact	81,899	4.55
	Income Impact	240	0.27
<b>Second Year</b>			
	Employment Impact	25,457	1.41
	Income Impact	108	0.12
<b>Third Year</b>			
	Employment Impact	555	0.03
	Income Impact	23	0.03
<b>Fourth Year</b>			
	Employment Impact	27	0.00
	Income Impact	(6)	-0.01
<b>Fifth Year</b>			
	Employment Impact	0	0.00
	Income Impact	(7)	-0.01
<b>Years 6 to 15</b>			
	Employment Impact	0	0.00
	Income Impact	(7)	-0.01

## **Appendix A: County Listing for the Region**

Chelan,WA

Clallam,WA

Clark,WA

Cowlitz,WA

Grays Harbor,WA

Island,WA

Jefferson,WA

King,WA

Kitsap,WA

Kittitas,WA

Klickitat,WA

Lewis,WA

Mason,WA

Pacific,WA

Pierce,WA

San Juan,WA

Skagit,WA

Skamania,WA

Snohomish,WA

Thurston,WA

Wahkiakum,WA

Whatcom,WA

Yakima,WA

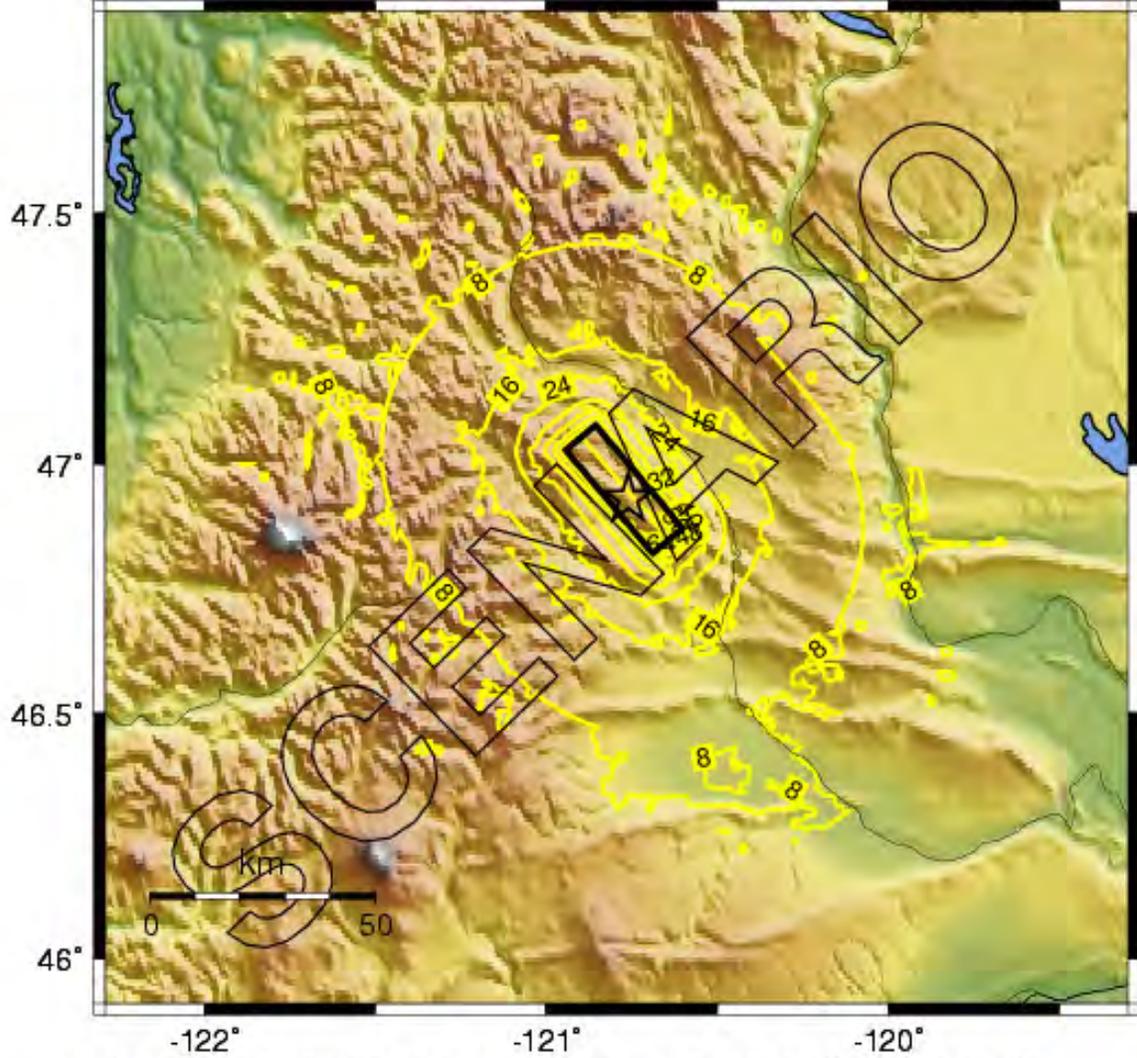
**Appendix B: Regional Population and Building Value Data**

State	County Name	Population	Building Value (millions of dollars)		
			Residential	Non-Residential	Total
Washington	Chelan	68,646	3,915	1,524	5,439
	Clallam	68,232	3,789	1,128	4,917
	Clark	395,707	21,358	5,081	26,439
	Cowlitz	96,113	5,167	1,575	6,742
	Grays Harbor	69,881	3,866	1,228	5,095
	Island	78,149	5,289	842	6,132
	Jefferson	28,169	1,741	517	2,258
	King	1,828,516	123,492	35,829	159,322
	Kitsap	245,278	14,460	2,974	17,435
	Kittitas	37,701	2,087	539	2,627
	Klickitat	20,162	908	287	1,195
	Lewis	70,750	3,424	1,286	4,711
	Mason	53,236	3,094	593	3,687
	Pacific	20,855	1,443	384	1,828
	Pierce	757,734	42,208	10,185	52,394
	San Juan	15,413	1,454	350	1,805
	Skagit	111,356	6,119	1,896	8,015
	Skamania	10,300	551	118	670
	Snohomish	661,444	38,562	8,570	47,132
	Thurston	226,721	12,793	3,286	16,080
Wahkiakum	3,900	204	62	267	
Whatcom	185,545	10,528	3,715	14,244	
Yakima	229,624	9,899	3,738	13,637	
<b>Total State</b>		<b>5,283,432</b>	<b>316,351</b>	<b>85,707</b>	<b>402,071</b>
<b>Total Region</b>		<b>5,283,432</b>	<b>316,351</b>	<b>85,707</b>	<b>402,071</b>

-- Earthquake Planning Scenario --

Peak Accel. Map (in %g) for clew6.8 Scenario

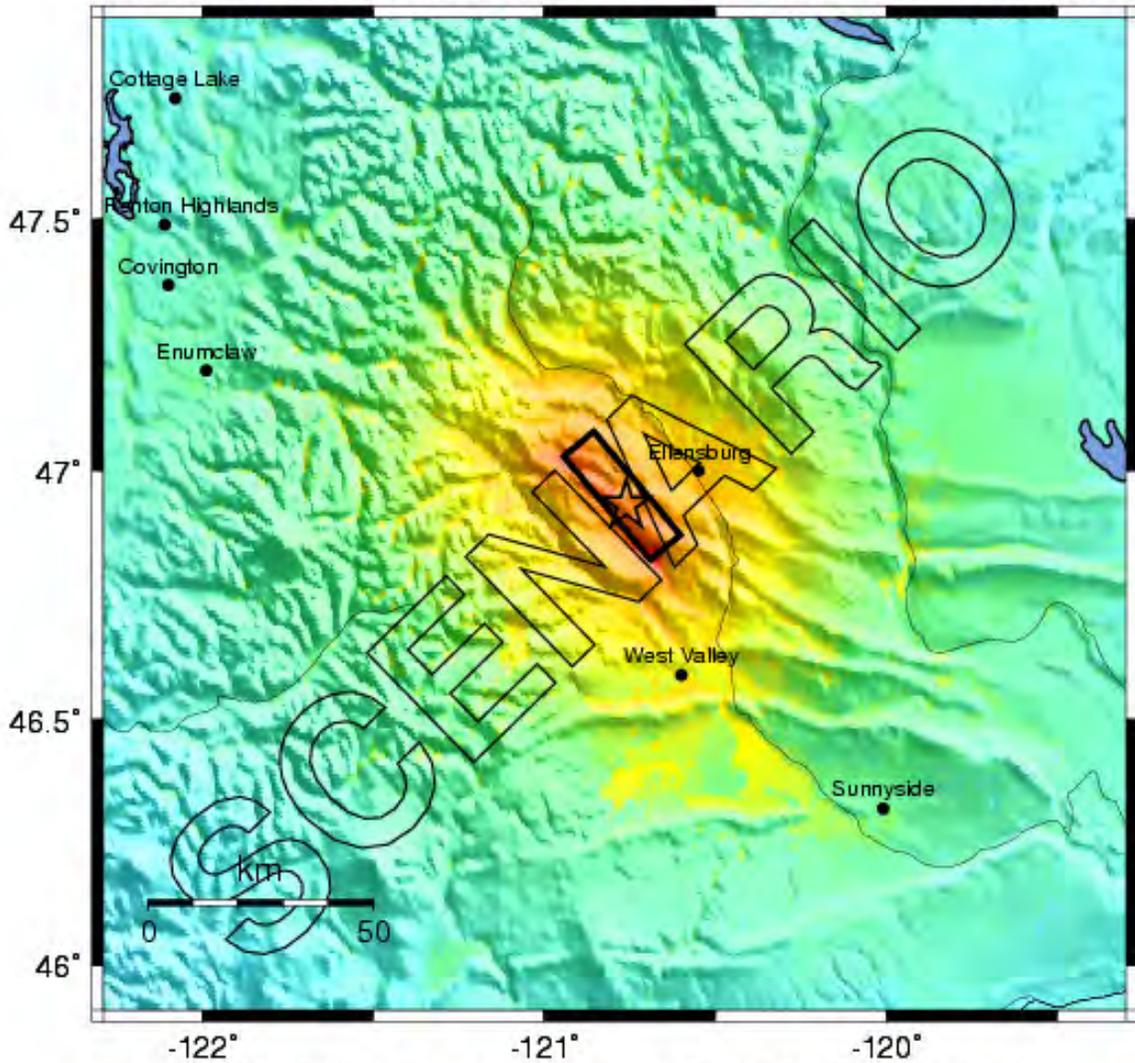
Scenario Date: Tue May 5, 2009 12:00:00 GMT M 6.8 N46.93 W120.76 Depth: 0.0km



PLANNING SCENARIO ONLY -- Map Version 7 Processed Thu May 7, 2009 02:07:12 AM MDT

-- Earthquake Planning Scenario --  
ShakeMap for clew6.8 Scenario

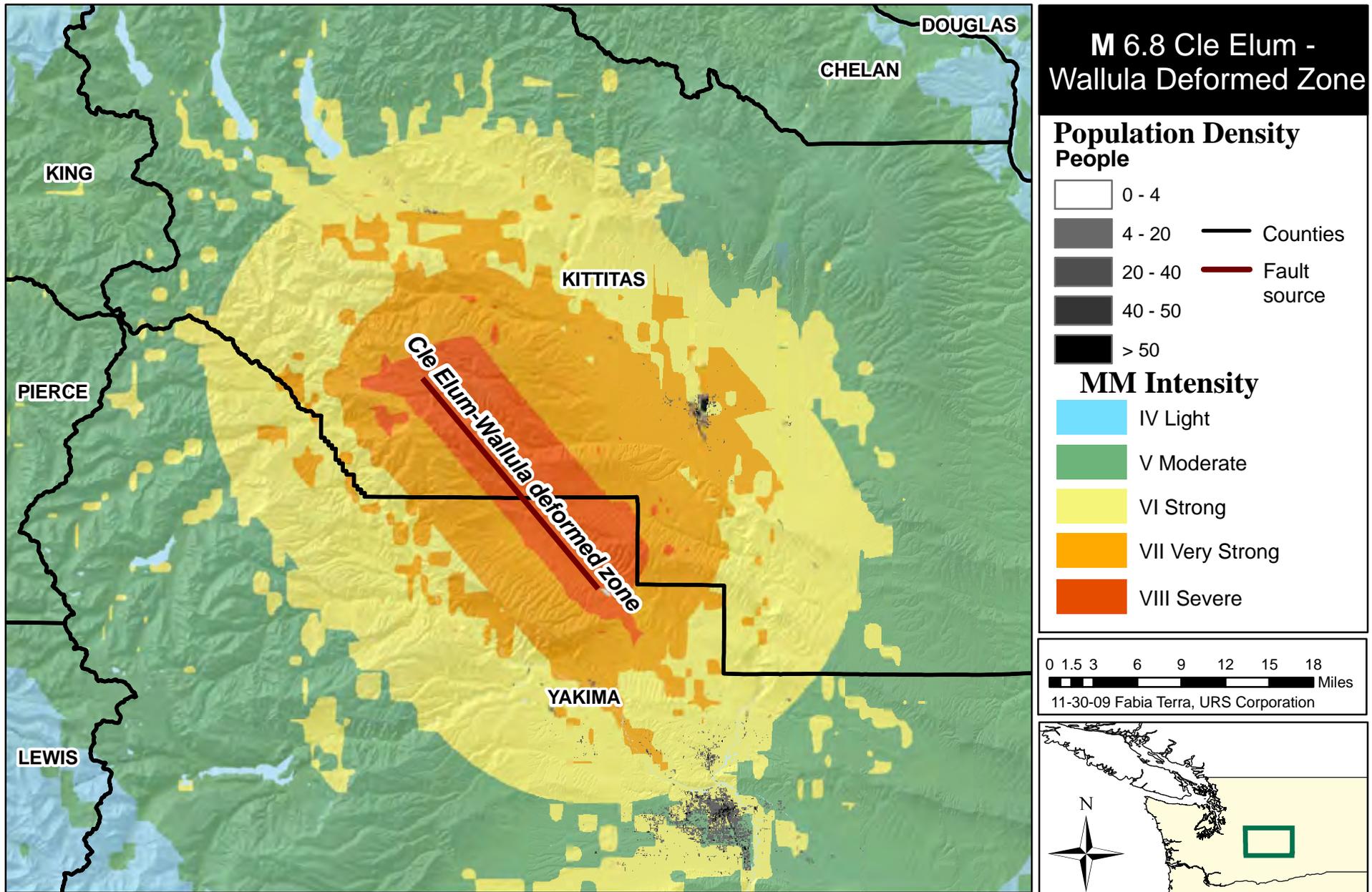
Scenario Date: Tue May 5, 2009 12:00:00 GMT M 6.8 N46.93 W120.76 Depth: 0.0km



PLANNING SCENARIO ONLY -- Map Version 7 Processed Thu May 7, 2009 02:07:12 AM MDT

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

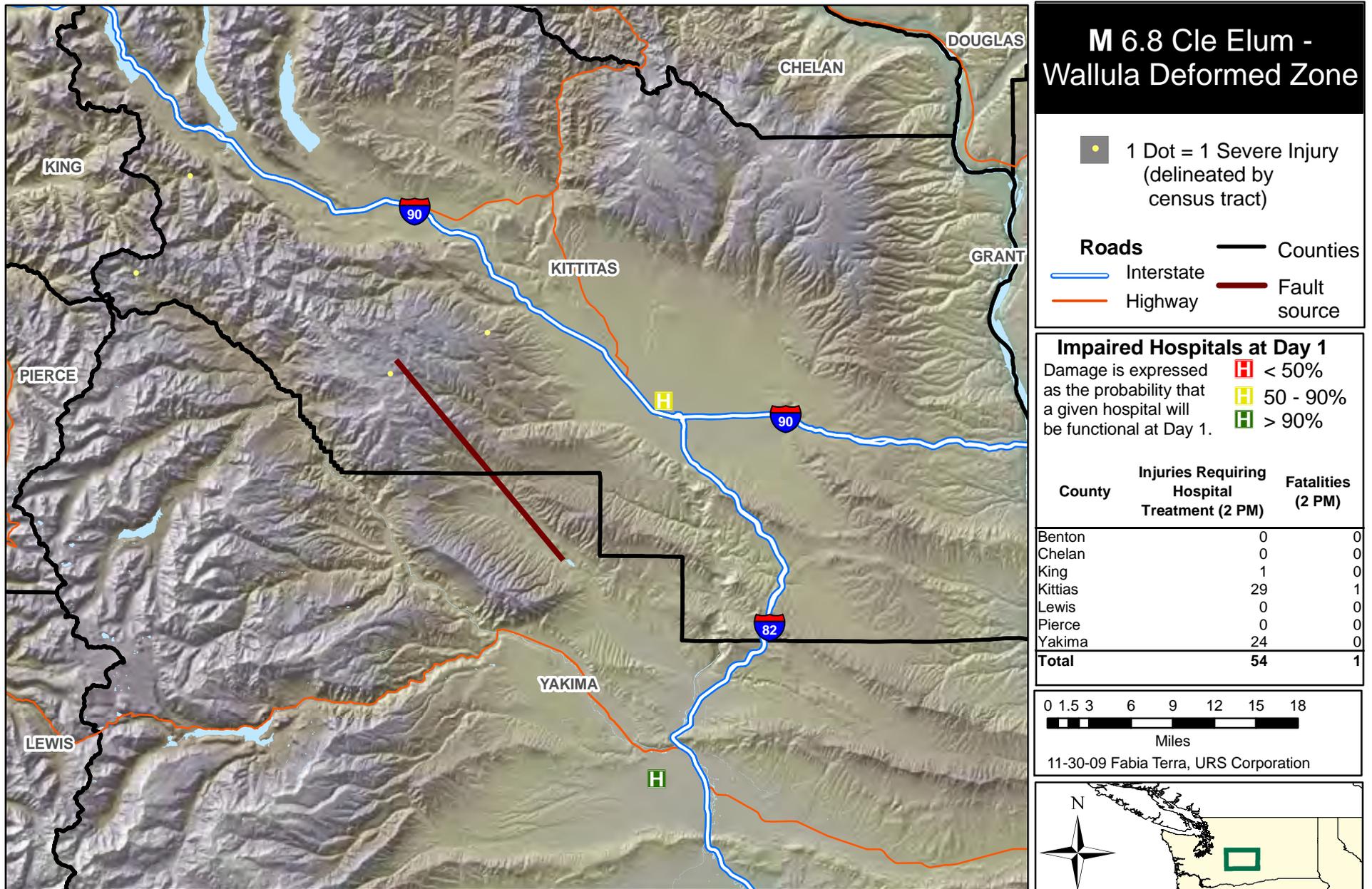
# Population Density and Ground Shaking Intensities - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, MMI Map USGS 2009  
Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 1

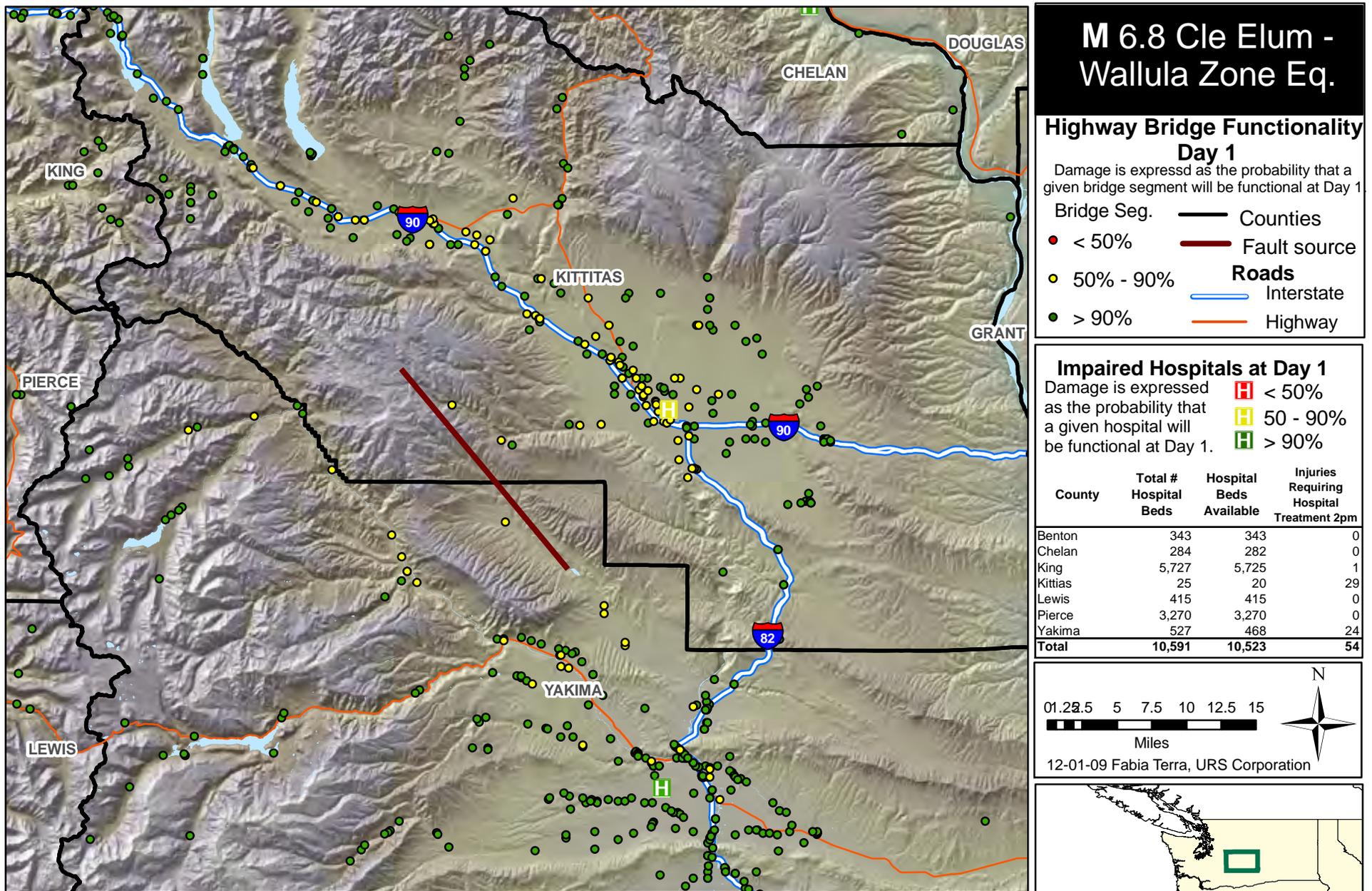
# Injuries (2 pm) and Impaired Hospitals (Day 1) - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 2

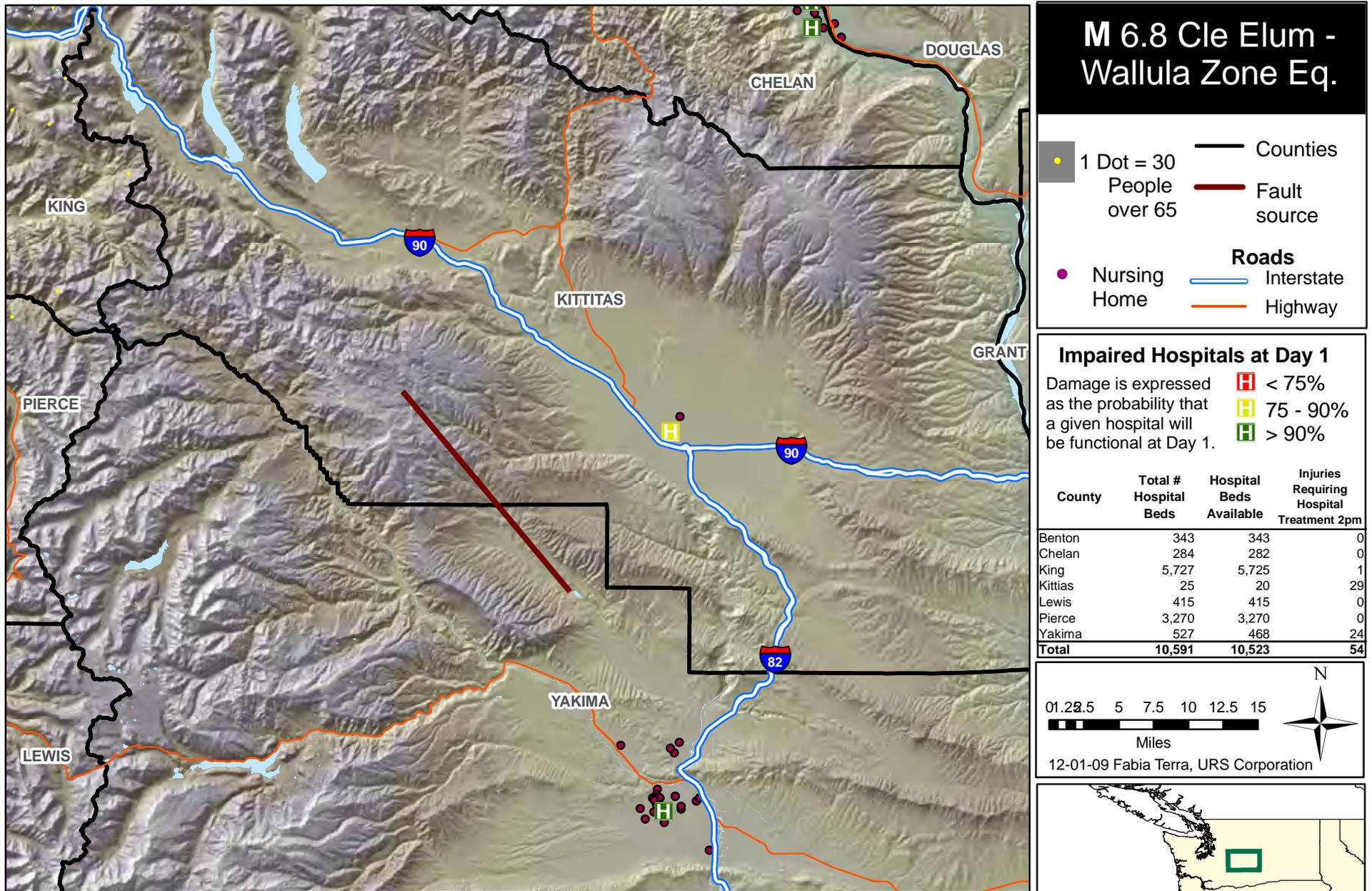
# Impaired Hospitals (Day 1), Hospital Bed Availability, & Bridge Functionality - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 3

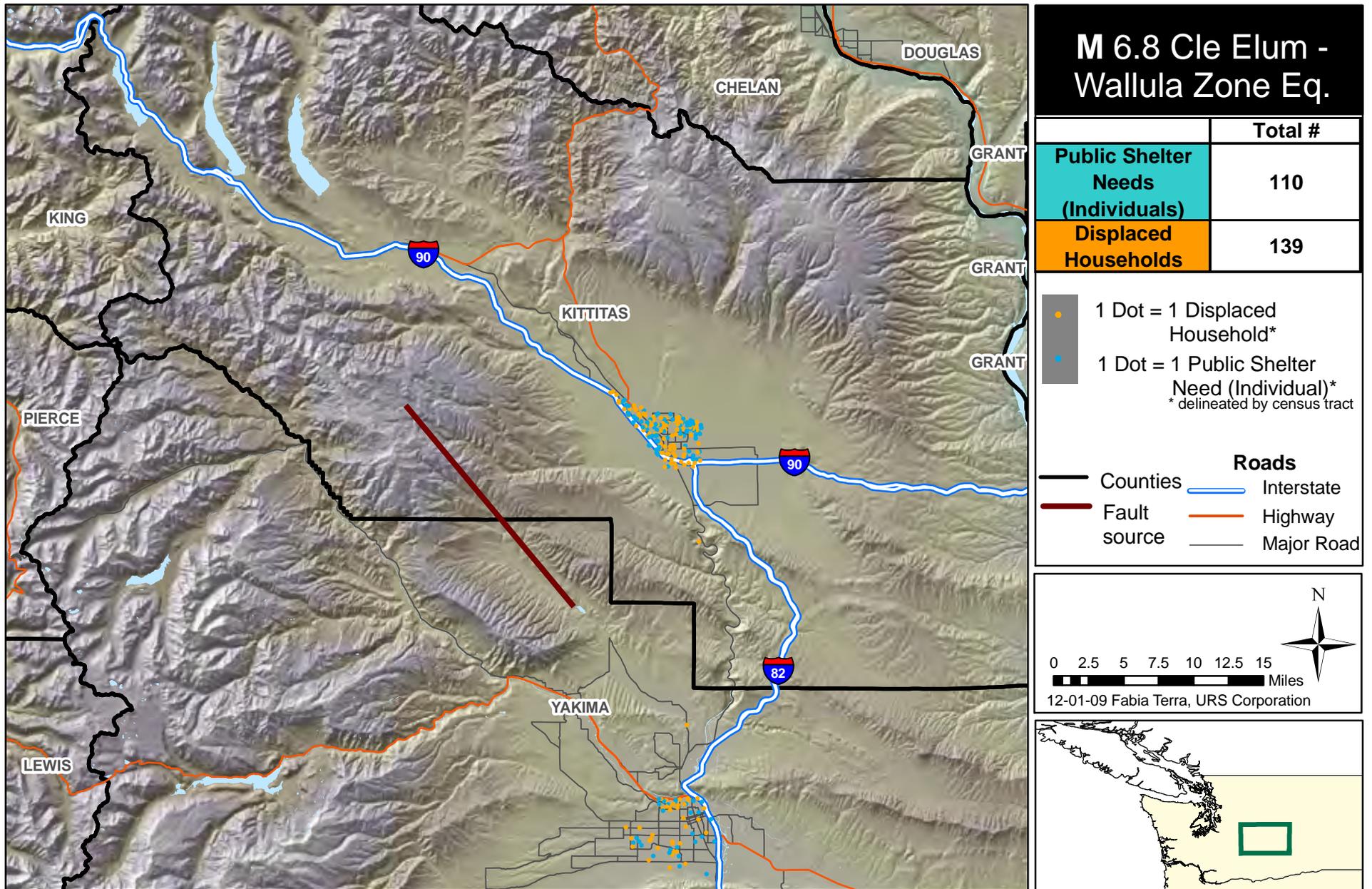
# Distribution of Elderly, Impaired Hospitals (Day 1), & Hospital Bed Availability - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 4

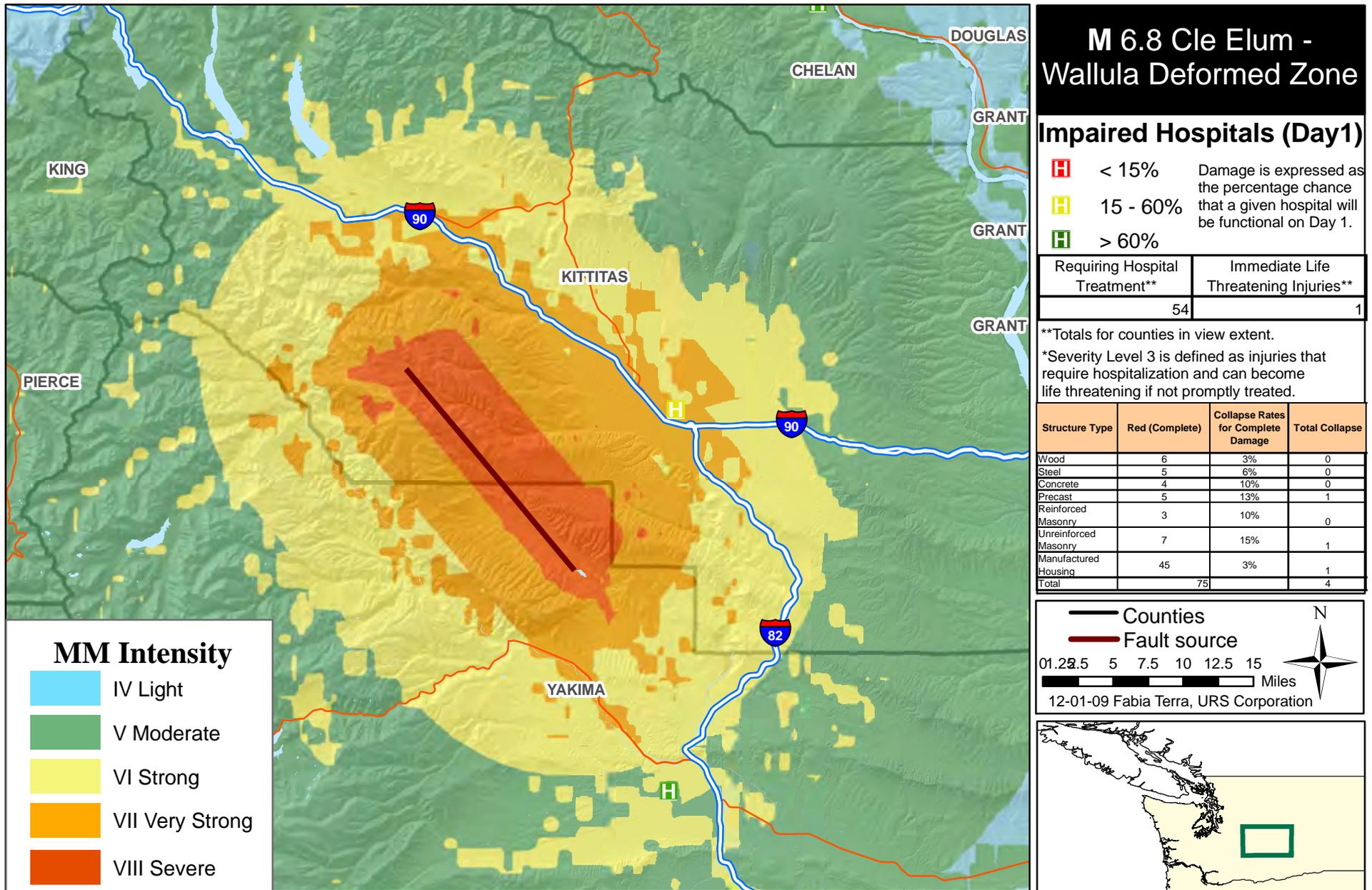
# Estimated Displaced Households & Short Term Public Shelter Needs - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 5

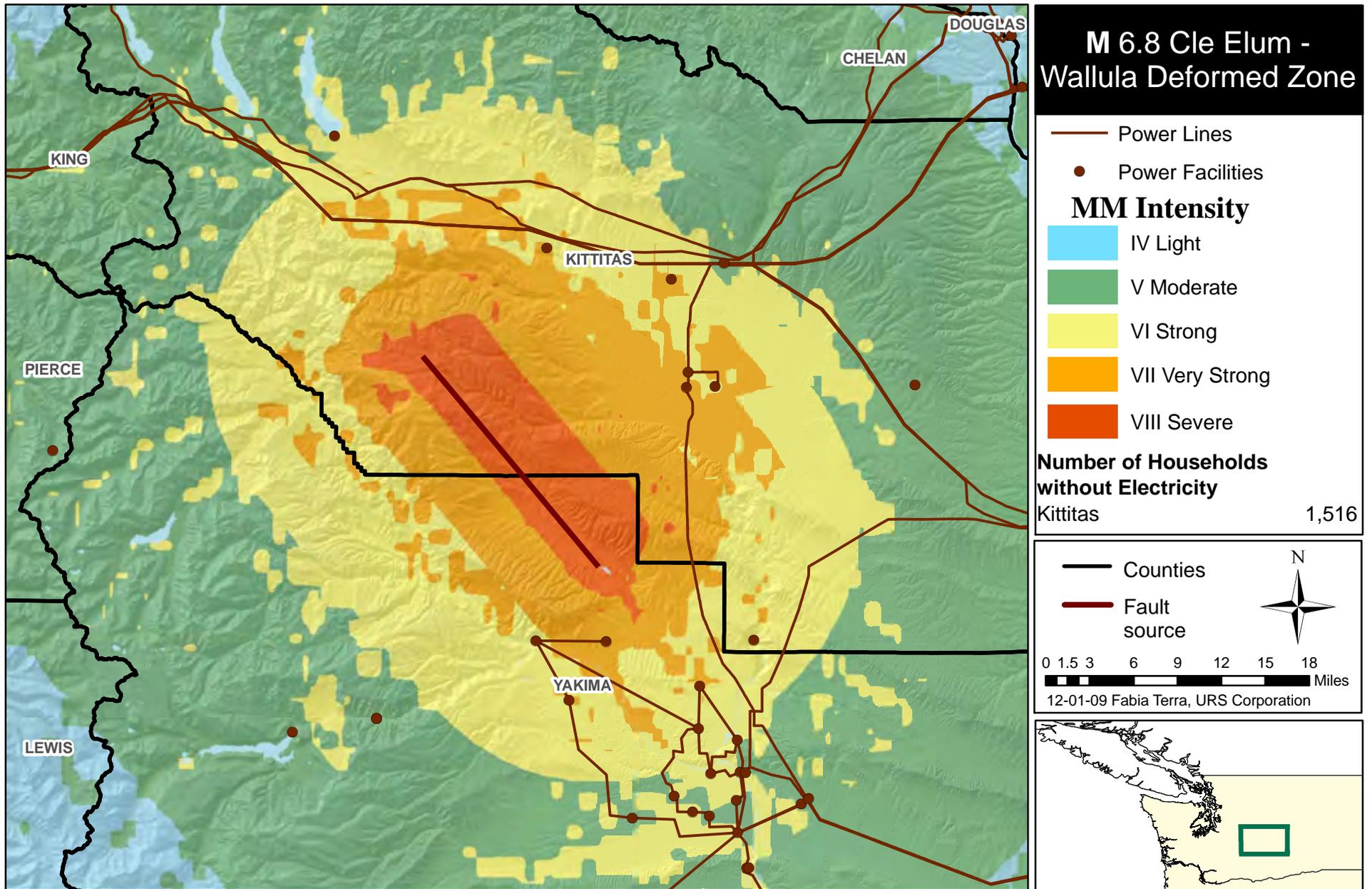
# Potential Search and Rescue Needs, Collapsed Structures and Impaired Hospitals - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, MMI Map USGS 2009, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 6

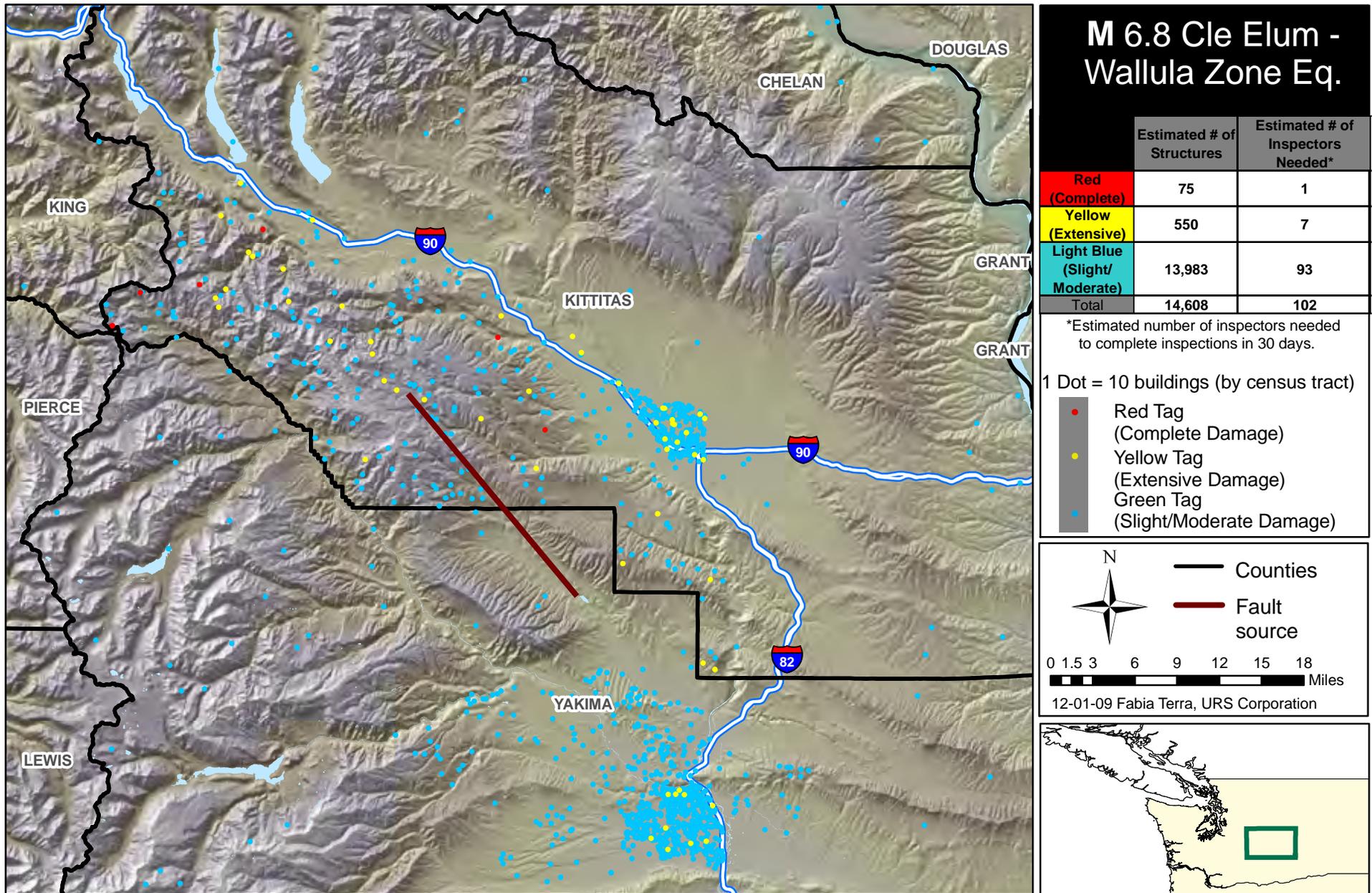
# Power Lines and Facilities and Ground Shaking Intensities - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, MMI Map USGS 2009, Power lines and facilities HSIP Gold 2007  
Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 7

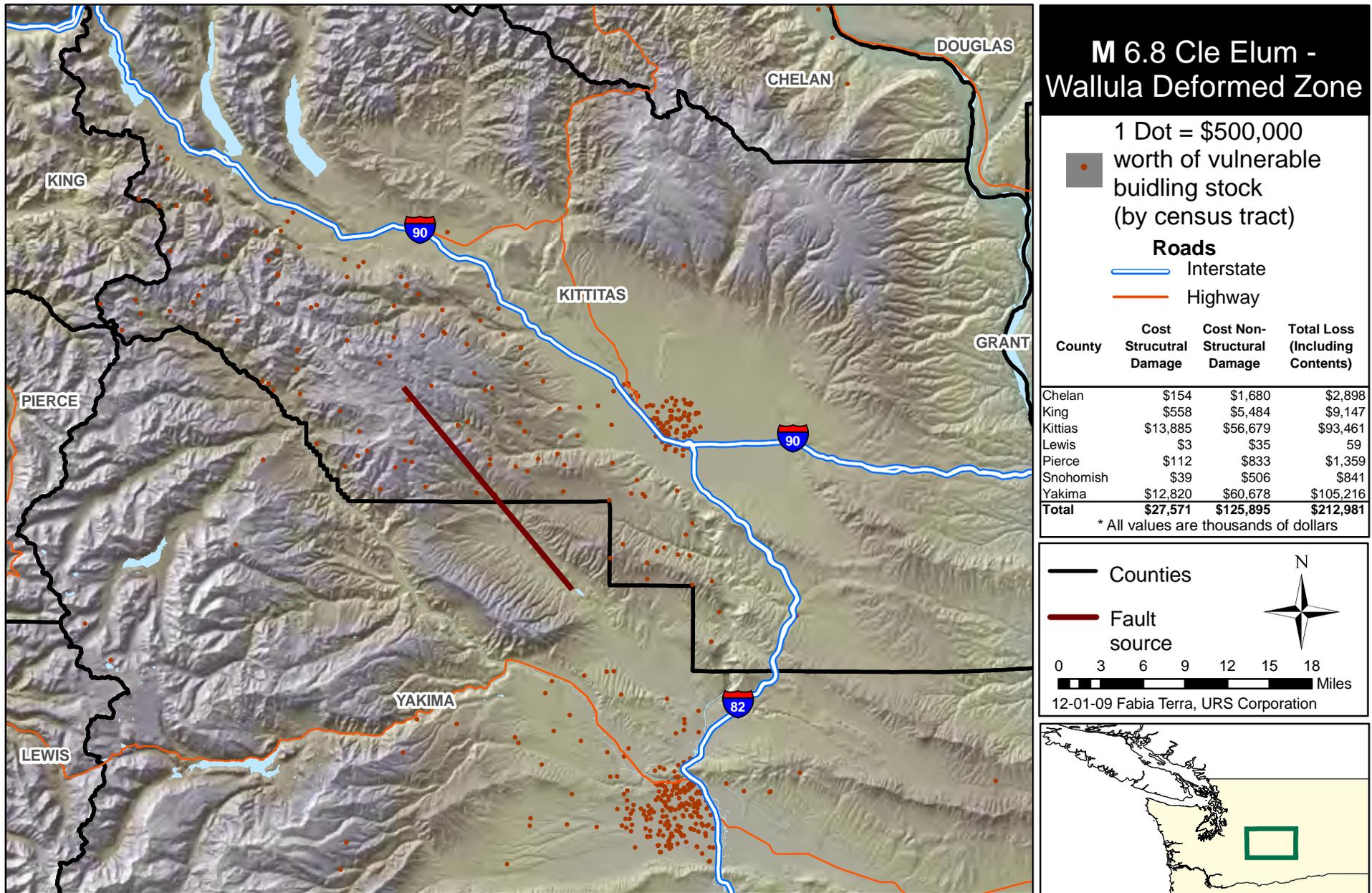
# Estimated Building Inspection Needs - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 8

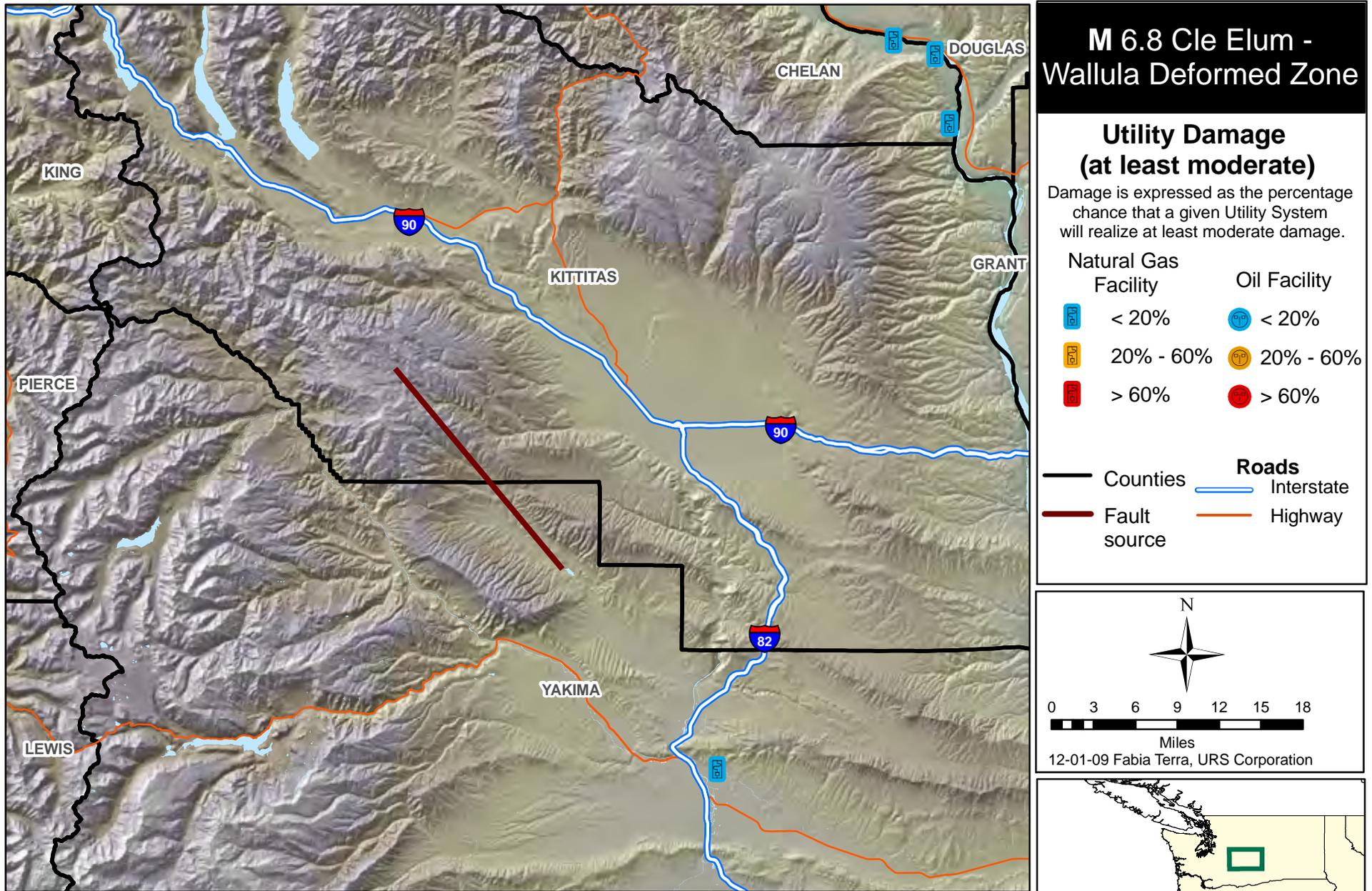
# Direct Building Economic Loss - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 9

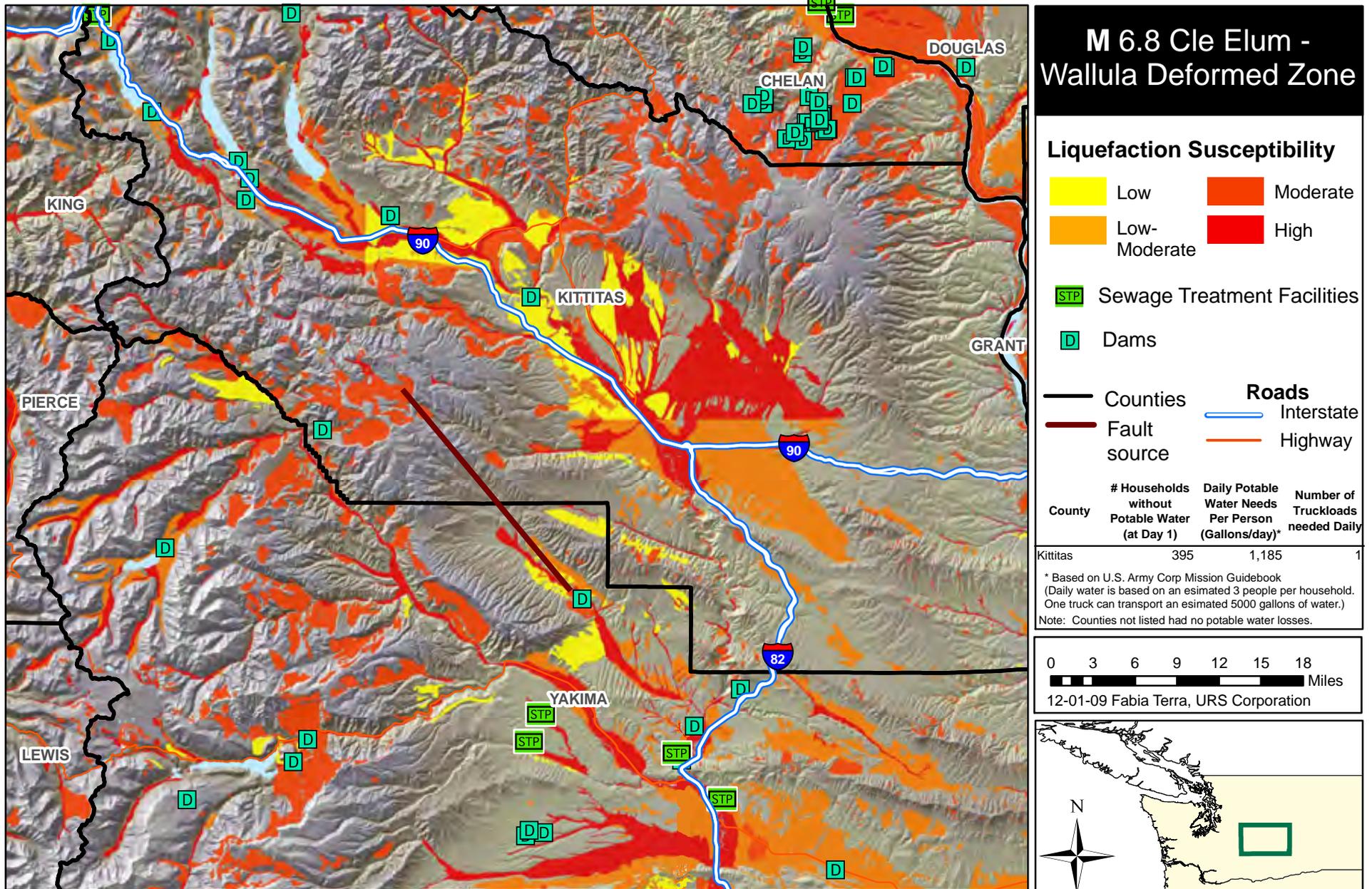
# Natural Gas and Oil Facility Damage - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 10

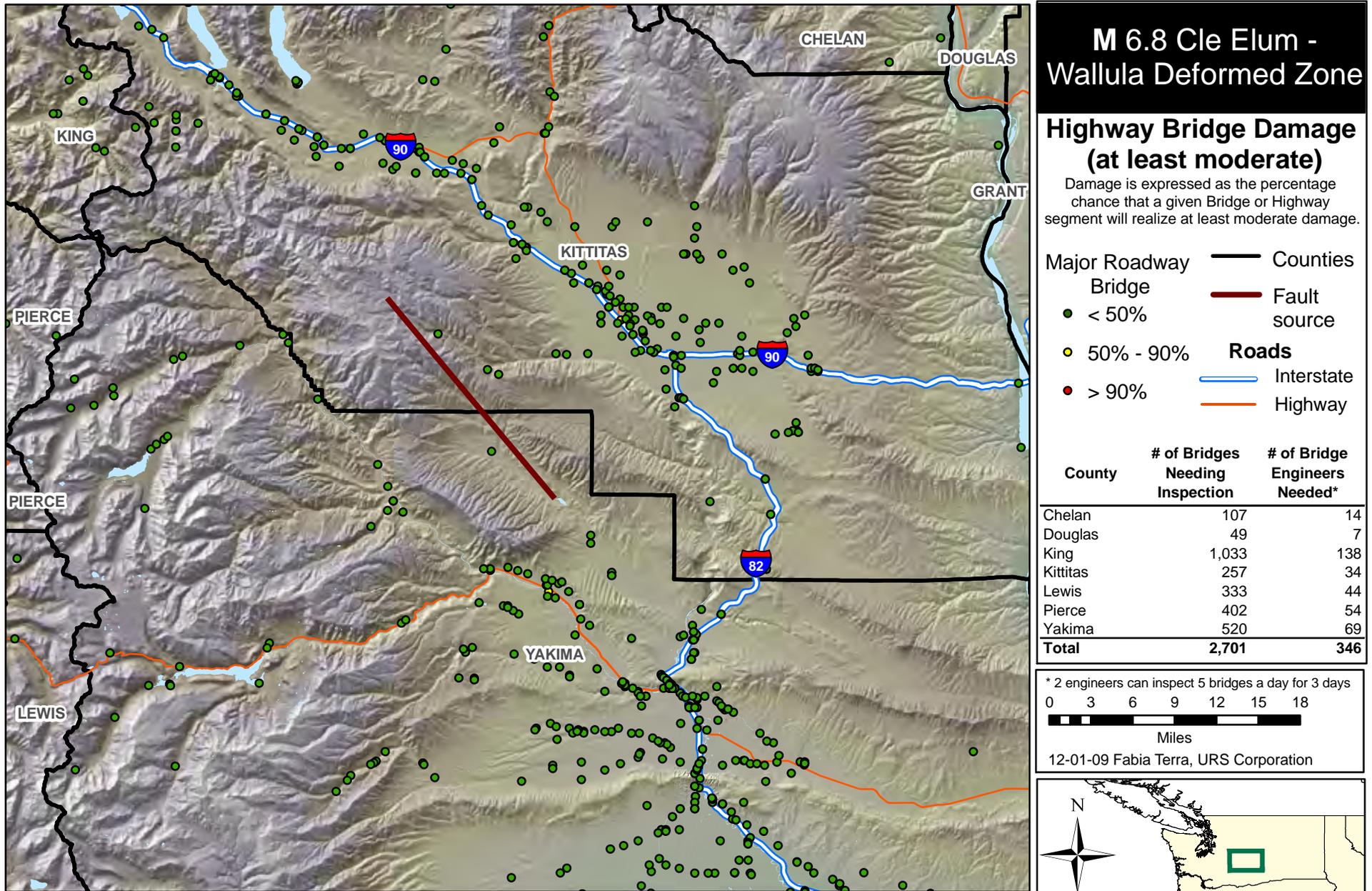
# Dams, Sewage Treatment Facility Distribution and Liquefaction Susceptibility - Earthquake Scenario: Seattle, WA



Sources: 2009 HAZUS runs by URS Corporation, Highways dams, and sewage treatment facilities HSIP Gold 2007  
 Liquefaction Washington State Geological Survey  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 11

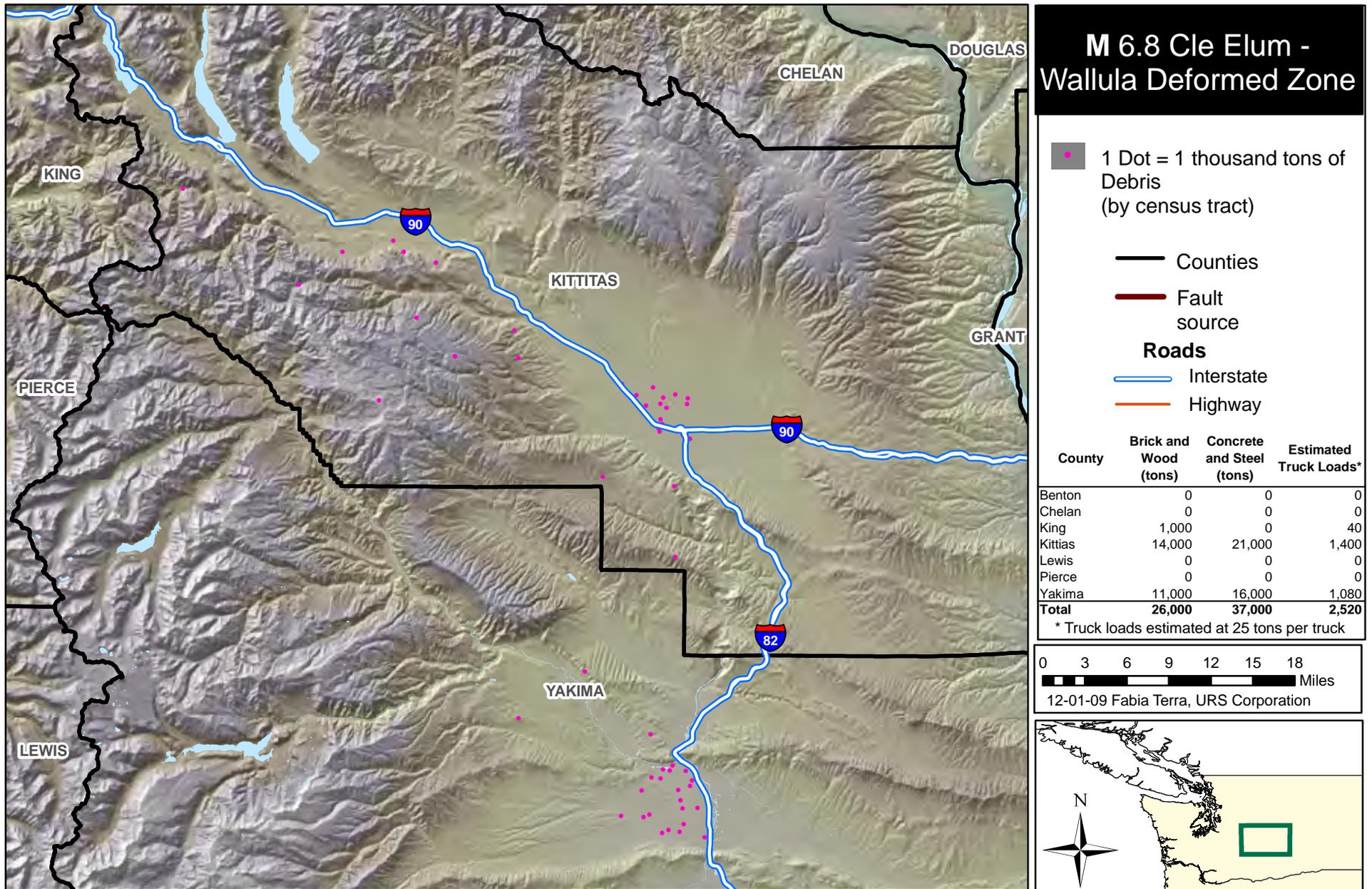
# Estimated Highway Bridge Damage - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
 Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 12

# Estimated Concrete, Steel Debris and Highway Damage - Earthquake Scenario: Washington



Sources: 2009 HAZUS runs by URS Corporation, Highways HSIP Gold 2007  
Projection: NAD83 Harn State Plane Washington 4602 (feet)

Figure 13