

Table ES-1. Loss estimate summary for two earthquake scenarios in the Portland metropolitan area. Lower value: dry soil conditions. Upper value: saturated soil conditions.

County	U.S. Census Population Estimate (2010)	Number of Buildings	Building Value (\$ Billion)	Building Repair Cost (\$ Billion)	Building Loss Ratio	Debris (Millions of Tons)	Long-Term Displaced Population (Thousands)	Total Casualties*	
								Daytime Scenario (Thousands)	Nighttime Scenario (Thousands)
<i>Cascadia Subduction Zone magnitude 9.0 earthquake</i>									
Clackamas	375,992	179,164	62.4	3.2–4.6	5%–7%	1.7–2.1	1.9–10.1	2.0–2.8	0.5–1.1
Multnomah	735,334	255,577	114.0	13.3–20.5	12%–18%	7.7–10.4	9.7–37.5	11.4–16.7	2.8–5.6
Washington	529,710	181,111	82.7	7.0–11.6	8%–14%	3.4–4.8	5.2–37.7	4.9–7.7	1.1–3.7
Total	1,641,036	615,852	259.1	23.5–36.7	9%–14%	12.8–17.3	16.8–85.3	18.3–27.2	4.4–10.4
<i>Portland Hills fault magnitude 6.8 earthquake</i>									
Clackamas	375,992	179,164	62.4	12.9–16.4	21%–26%	4.9–6.0	25.2–50.8	8.9–10.9	3.3–5.2
Multnomah	735,334	255,577	114.0	32.3–42.7	28%–37%	15.7–19.3	50.8–120	28.9–36.3	9.3–15.3
Washington	529,710	181,111	82.7	15.4–24.3	19%–29%	6.0–8.6	19.6–86.0	10.0–15.8	3.2–8.5
Total	1,641,036	615,852	259.1	60.6–83.4	23%–32%	26.6–33.9	95.6–257	47.8–63.0	15.8–29.0

* Casualty estimates include minor injuries, injuries requiring hospitalization, and fatalities.

Table 12-5. Buildings and permanent residents per building damage state for Cascadia Subduction Zone magnitude 9.0 earthquake, “wet” (saturated) soil conditions. Dash (—): not applicable

Building Category	Total Number of Buildings	Building Square Footage (Thousand)	Building Value (\$ Million)	Building Repair Cost (\$ Million)	Building Loss Ratio	Number of Collapsed Buildings	Number of Buildings								Number of Permanent Residents								
							Slight Damage		Moderate Damage		Extensive Damage		Complete Damage		Total	Slight Damage		Moderate Damage		Extensive Damage		Complete Damage	
							Number	Percent	Number	Percent	Number	Percent	Number	Percent		Number	Percent	Number	Percent	Number	Percent	Number	Percent
<i>Clackamas County</i>																							
Agricultural	22,768	52,063	5,541	598	11%	114	3,747	16%	3,159	14%	1,733	8%	1,570	7%	—	—	—	—	—	—	—	—	
Commercial	4,593	54,616	7,929	1,124	14%	34	801	17%	864	19%	516	11%	367	8%	—	—	—	—	—	—	—	—	
Industrial	1,573	20,621	3,063	476	16%	15	240	15%	360	23%	263	17%	188	12%	—	—	—	—	—	—	—	—	
Institutional	2,558	23,264	3,940	461	12%	23	437	17%	511	20%	314	12%	229	9%	—	—	—	—	—	—	—	—	
Multi-family residential	8,959	40,880	6,293	426	7%	9	1,919	21%	946	11%	186	2%	223	2%	55,042	13,269	24%	8,746	16%	1,906	3%	1,663	3%
Single-family residential	132,641	286,514	35,282	1,431	4%	99	24,909	19%	7,924	6%	1,038	1%	3,075	2%	309,744	58,361	19%	18,680	6%	2,548	1%	7,377	2%
Manufactured housing	6,072	8,163	343	57	17%	18	1,080	18%	1,622	27%	1,177	19%	614	10%	11,206	2,040	18%	3,045	27%	2,126	19%	1,053	9%
<i>Multnomah County</i>																							
Agricultural	2,540	8,146	867	191	22%	30	408	16%	358	14%	219	9%	408	16%	—	—	—	—	—	—	—	—	
Commercial	11,544	210,231	33,390	9,977	30%	226	1,747	15%	2,196	19%	1,713	15%	2,150	19%	—	—	—	—	—	—	—	—	
Industrial	1,685	45,292	6,874	2,613	38%	53	183	11%	300	18%	317	19%	542	32%	—	—	—	—	—	—	—	—	
Institutional	3,094	50,145	8,812	1,614	18%	37	530	17%	628	20%	406	13%	364	12%	—	—	—	—	—	—	—	—	
Multi-family residential	24,197	140,585	22,428	3,180	14%	56	4,868	20%	2,408	10%	621	3%	1,109	5%	215,232	44,050	20%	36,542	17%	13,911	6%	17,065	8%
Single-family residential	206,322	348,436	41,371	2,846	7%	247	43,729	21%	16,126	8%	2,217	1%	7,543	4%	507,022	105,712	21%	39,101	8%	5,664	1%	18,591	4%
Manufactured housing	6,195	7,253	304	68	22%	28	896	14%	1,930	31%	1,523	25%	924	15%	13,080	1,974	15%	4,044	31%	3,068	23%	1,806	14%
<i>Washington County</i>																							
Agricultural	10,753	26,823	2,855	558	20%	123	2,126	20%	1,657	15%	1,016	9%	1,601	15%	—	—	—	—	—	—	—	—	
Commercial	5,863	104,377	15,815	3,031	19%	76	1,016	17%	1,242	21%	891	15%	784	13%	—	—	—	—	—	—	—	—	
Industrial	1,399	50,567	8,548	1,799	21%	21	218	16%	318	23%	257	18%	225	16%	—	—	—	—	—	—	—	—	
Institutional	1,931	28,098	4,856	1,039	21%	31	312	16%	410	21%	315	16%	298	15%	—	—	—	—	—	—	—	—	
Multi-family residential	18,475	98,385	15,671	2,016	13%	59	4,319	23%	2,592	14%	766	4%	1,367	7%	141,844	33,289	23%	27,529	19%	8,377	6%	11,319	8%
Single-family residential	138,117	289,198	34,755	3,144	9%	287	33,018	24%	11,313	8%	1,556	1%	8,993	7%	379,323	90,437	24%	32,039	8%	4,695	1%	24,858	7%
Manufactured housing	4,573	5,523	232	61	26%	23	798	17%	1,480	32%	1,089	24%	758	17%	8,543	1,442	17%	2,745	32%	2,092	24%	1,480	17%
<i>Study Area (All Three Counties)</i>																							
Agricultural	36,061	87,033	9,263	1,347	15%	268	6,281	17%	5,174	14%	2,969	8%	3,579	10%	—	—	—	—	—	—	—	—	
Commercial	22,000	369,224	57,134	14,133	25%	337	3,564	16%	4,302	20%	3,121	14%	3,301	15%	—	—	—	—	—	—	—	—	
Industrial	4,657	116,480	18,485	4,888	26%	89	641	14%	979	21%	837	18%	955	21%	—	—	—	—	—	—	—	—	
Institutional	7,583	101,507	17,609	3,114	18%	91	1,278	17%	1,549	20%	1,036	14%	891	12%	—	—	—	—	—	—	—	—	
Multi-family residential	51,631	279,849	44,391	5,621	13%	124	11,106	22%	5,946	12%	1,573	3%	2,698	5%	412,118	90,608	22%	72,818	18%	24,195	6%	30,047	7%
Single-family residential	477,080	924,147	111,408	7,421	7%	632	101,656	21%	35,363	7%	4,812	1%	19,611	4%	1,196,089	254,510	21%	89,820	8%	12,906	1%	50,826	4%
Manufactured housing	16,840	20,940	879	186	21%	69	2,774	16%	5,031	30%	3,789	22%	2,296	14%	32,829	5,457	17%	9,833	30%	7,286	22%	4,338	13%
Total	615,852	1,899,180	259,169	36,710	14%	1,609	127,301	21%	58,344	9%	18,137	3%	33,331	5%	1,641,036	350,575	21%	172,471	11%	44,387	3%	85,211	5%

Number of buildings estimates are derived using the Hazus Advanced Engineering Building Module (AEBM) structural probability of damage states (FEMA, 2010).

Institutional combines Hazus occupancy classes REL1, GOV1, GOV2, EDU1, and EDU2. Commercial combines all Hazus COM occupancy classes and RES4. Multi-family residential combines the Hazus occupancy classes RES3, RES5, and RES6 categories.

Permanent resident values are based on U.S. Census 2010 population data. Permanent residents are assigned only to buildings designated as Hazus occupancy class RES1, RES2, RES3, RES5, and RES6.

Manufactured housing building category is limited to Hazus occupancy class RES2, and does not include modular construction that may be present in other Hazus occupancy classes.

Table 12-9. Loss estimates by jurisdiction, Cascadia Subduction Zone magnitude 9.0 earthquake, "wet" (saturated) soil conditions.

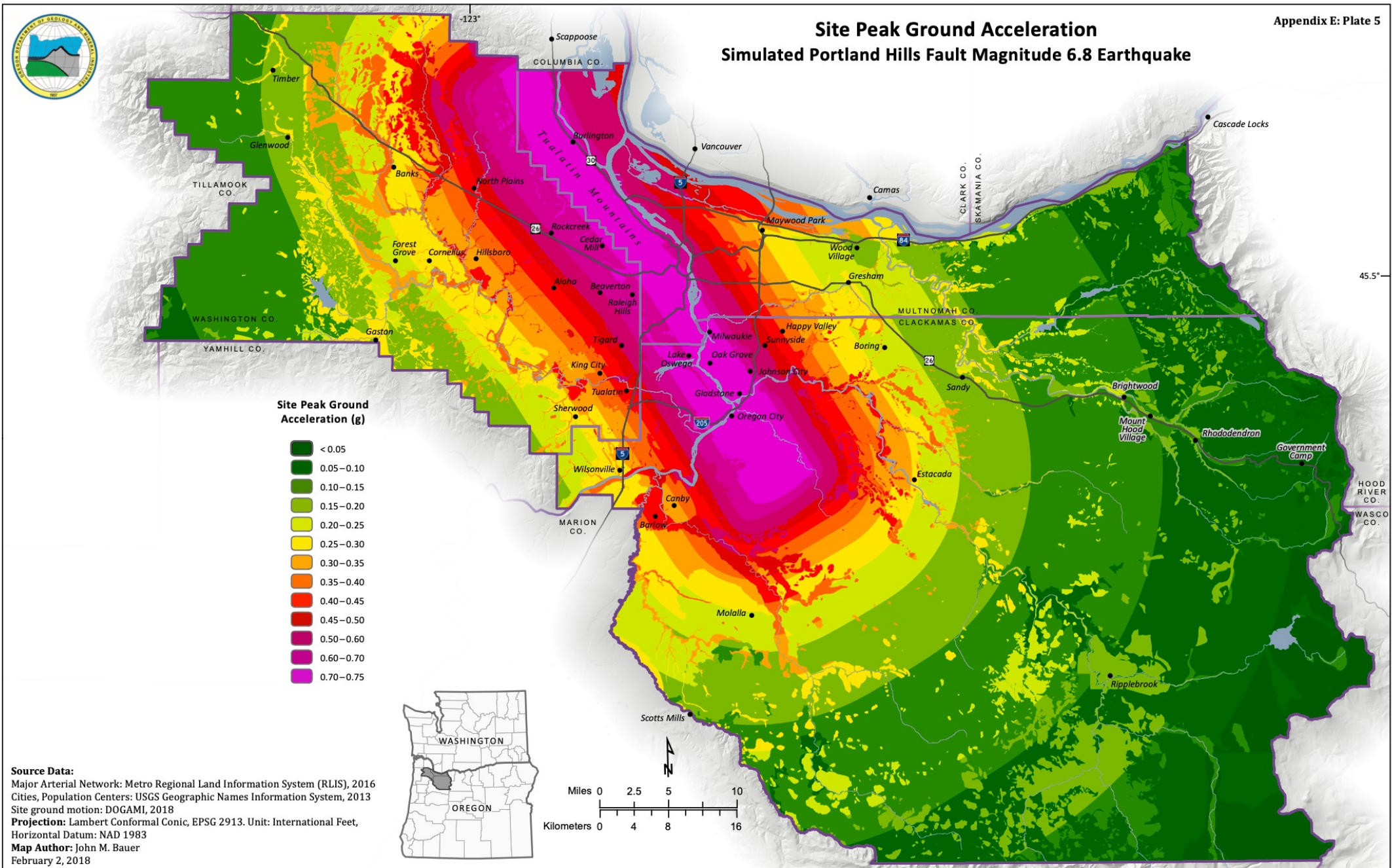
	U.S. Census Population 2010	Number of Buildings	Square Footage (Thousand)	Building Value (\$ Million)	Building Repair Cost (\$ Million)	Building Loss Ratio	Debris (Thousands of Tons)	Long-Term Displaced Population	Casualties: Daytime Scenario					Casualties: Nighttime Scenario					
									Total	Level 1	Level 2	Level 3	Level 4	Total	Level 1	Level 2	Level 3	Level 4	
									Study area total	1,641,036	615,852	1,899,180	259,169	36,710	14%	17,292	85,211	27,175	19,489
Clackamas County																			
Clackamas County total	375,992	179,164	486,122	62,390	4,573	7%	2,092	10,093	2,757	2,038	523	67	129	1,115	866	202	17	30	
Barlow	135	60	124	15	7	47%	3	28	5	4	1	0	0	3	2	1	0	0	
Canby	15,829	5,559	14,978	1,890	61	3%	36	159	40	33	6	1	1	20	16	3	0	0	
Estacada	2,695	1,309	3,361	448	27	6%	18	27	33	24	6	1	2	5	4	1	0	0	
Gladstone	11,497	4,022	8,749	1,129	69	6%	32	235	61	44	12	2	3	26	21	5	0	1	
Happy Valley	13,903	5,856	19,882	2,692	75	3%	32	89	50	38	9	1	2	11	9	2	0	0	
Johnson City	566	275	249	11	4	35%	5	97	3	2	0	0	0	9	7	2	0	0	
Lake Oswego	36,619	13,770	47,252	6,805	523	8%	184	1,207	258	191	49	6	12	130	99	24	2	4	
Milwaukie	20,291	7,891	21,596	2,890	394	14%	193	830	380	278	74	10	19	92	71	17	1	3	
Molalla	8,108	3,176	6,827	854	21	2%	11	8	12	9	2	0	0	3	3	0	0	0	
Molalla Prairie Hamlet	—	4,165	10,102	1,137	83	7%	45	133	29	22	6	1	1	12	10	2	0	0	
Mulino Hamlet	—	2,021	4,178	491	70	14%	32	151	28	20	6	1	2	14	10	3	0	0	
Oregon City	31,859	12,641	31,984	4,190	342	8%	170	307	318	228	63	9	18	57	44	10	1	2	
Rivergrove	289	196	539	70	8	12%	2	40	1	1	0	0	0	3	3	1	0	0	
Sandy	9,570	3,734	8,551	1,077	12	1%	5	6	5	4	1	0	0	2	2	0	0	0	
Stafford Hamlet	—	1,206	3,543	477	36	8%	14	68	33	23	7	1	2	6	5	1	0	0	
The Villages at Mt Hood	—	3,795	7,268	886	67	8%	21	411	15	11	3	0	1	34	26	7	0	1	
West Linn	25,109	9,170	28,162	3,817	209	5%	64	797	99	73	19	3	5	72	56	13	1	2	
Wilsonville	19,509	5,492	31,168	4,410	423	10%	196	894	315	235	59	7	14	100	77	19	2	3	
Clackamas County Jurisdictions total*	195,979	84,338	248,512	33,289	2,429	7%	1,063	5,488	1,686	1,239	322	43	82	601	465	109	9	17	
Clackamas County Unincorporated total	—	94,481	240,494	29,470	2,180	7%	1,060	4,652	1,058	793	197	23	45	508	397	91	7	13	
Multnomah County																			
Multnomah County total	735,334	255,577	810,087	114,046	20,489	18%	10,395	37,461	16,660	11,824	3,397	487	950	5,558	4,126	1,072	124	236	
Fairview	8,920	2,611	7,976	1,061	58	6%	29	335	51	36	11	2	3	32	25	6	0	1	
Gresham	105,594	29,043	83,478	11,160	726	7%	279	4,244	549	400	107	14	27	382	296	72	5	10	
Maywood Park	752	339	627	74	3	4%	1	2	5	3	1	0	0	0	0	0	0	0	
Portland (by Bureau of Emergency Management Risk Reporting Areas):																			
Airport	—	284	12,971	1,898	983	52%	565	14	694	470	151	25	48	118	82	25	4	8	
Central City	—	2,809	108,884	18,436	5,672	31%	3,369	7,422	4,419	3,102	907	138	271	1,591	1,142	317	45	88	
Central Northeast Neighborhoods	—	19,883	47,310	6,226	979	16%	459	1,177	758	562	148	17	31	203	154	38	4	7	
East Portland Neighborhood Office	—	46,301	114,853	15,359	1,212	8%	576	1,204	964	705	188	24	47	289	223	50	5	10	
Neighbors West/Northwest	—	7,663	50,308	7,320	2,419	33%	1,285	4,073	2,039	1,430	428	62	120	566	411	114	14	28	
North Portland Neighborhood Services	—	25,468	87,894	12,076	3,581	30%	1,770	3,972	3,126	2,224	645	88	169	611	455	119	13	24	
Northeast Coalition	—	22,178	52,444	6,994	641	9%	308	1,920	697	494	139	21	42	230	175	43	4	8	
Southeast Uplift Neighborhood Program	—	57,291	124,011	16,652	1,676	10%	786	5,492	1,431	1,023	284	42	82	656	499	122	12	23	
Southwest Neighborhoods	—	24,288	72,458	10,945	1,785	16%	658	5,352	1,518	1,084	304	44	86	666	500	128	13	24	
Portland (total)	583,776	206,165	671,134	95,906	18,947	20%	9,776	30,627	15,645	11,095	3,194	459	896	4,930	3,641	955	115	220	
Troutdale	15,962	5,161	13,481	1,730	169	10%	83	245	188	130	40	6	12	35	27	7	1	1	
Wood Village	3,878	1,194	3,507	408	9	2%	6	55	5	5	1	0	0	9	7	1	0	0	
Multnomah County Jurisdictions total*	718,882	244,513	780,203	110,339	19,911	18%	10,175	35,507	16,444	11,668	3,354	482	939	5,389	3,996	1,040	121	232	
Multnomah County Unincorporated total	—	11,053	29,359	3,614	565	16%	216	1,891	204	148	41	5	10	164	127	31	2	4	
Washington County																			
Washington County total	529,710	181,111	602,970	82,732	11,648	14%	4,805	37,657	7,758	5,627	1,534	204	394	3,727	2,846	705	63	113	
Banks	1,777	646	1,491	194	35	18%	15	113	56	40	11	1	3	11	9	2	0	0	
Beaverton	89,803	24,005	96,327	13,813	1,943	14%	751	6,267	1,313	964	254	33	63	633	481	119	12	22	
Cornelius	11,869	3,517	7,844	963	159	17%	62	1,089	119	89	23	2	5	94	73	18	1	2	
Durham	1,351	399	1,887	277	33	12%	9	94	10	7	2	0	0	9	7	2	0	0	
Forest Grove	21,083	7,267	19,462	2,617	496	19%	223	2,238	596	418	124	19	36	216	165	41	4	6	
Gaston*	637	312	618	79	9	12%	5	17	10	7	2	0	1	3	2	1	0	0	
Hillsboro	91,611	26,846	116,113	17,603	2,884	16%	1,280	7,124	2,186	1,564	439	62	121	800	602	154	16	29	
King City	3,111	1,610	3,702	494	56	11%	17	195	15	11	3	0	1	20	15	4	0	1	
North Plains	1,947	952	2,602	328	61	19%	32	157	56	39	12	2	4	15	11	3	0	0	
Sherwood	18,194	5,873	17,792	2,335	217	9%	113	534	209	149	42	6	12	54	41	10	1	2	
Tigard	48,035	16,004	62,578	8,490	1,087	13%	516	2,306	672	494	130	17	32	248	191	46	4	7	
Tualatin	26,054	7,535	41,411	5,751	732	13%	362	1,030	549	409	104	12	24	144	110	27	3	5	
Washington County Jurisdictions total*	315,472	94,966	371,828	52,943	7,712	15%	3,383	21,164	5,792	4,191	1,146	155	300	2,247	1,707	425	40	74	
Washington County Unincorporated total	—	86,501	228,783	29,512	3,913	13%	1,395	16,509	1,992	1,451	394	50	96	1,491	1,146	282	22	40	

* The jurisdiction is associated with the county it occupies most by area. Figures are for the entire jurisdiction and may include building data from neighboring counties. Summaries by all jurisdictions and unincorporated area for a given county will vary slightly with the county total.

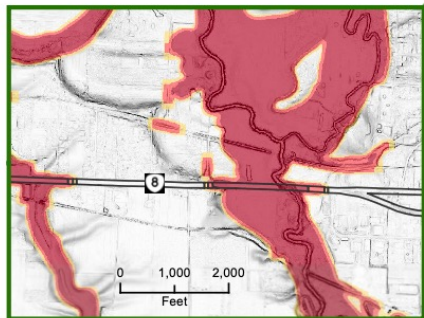
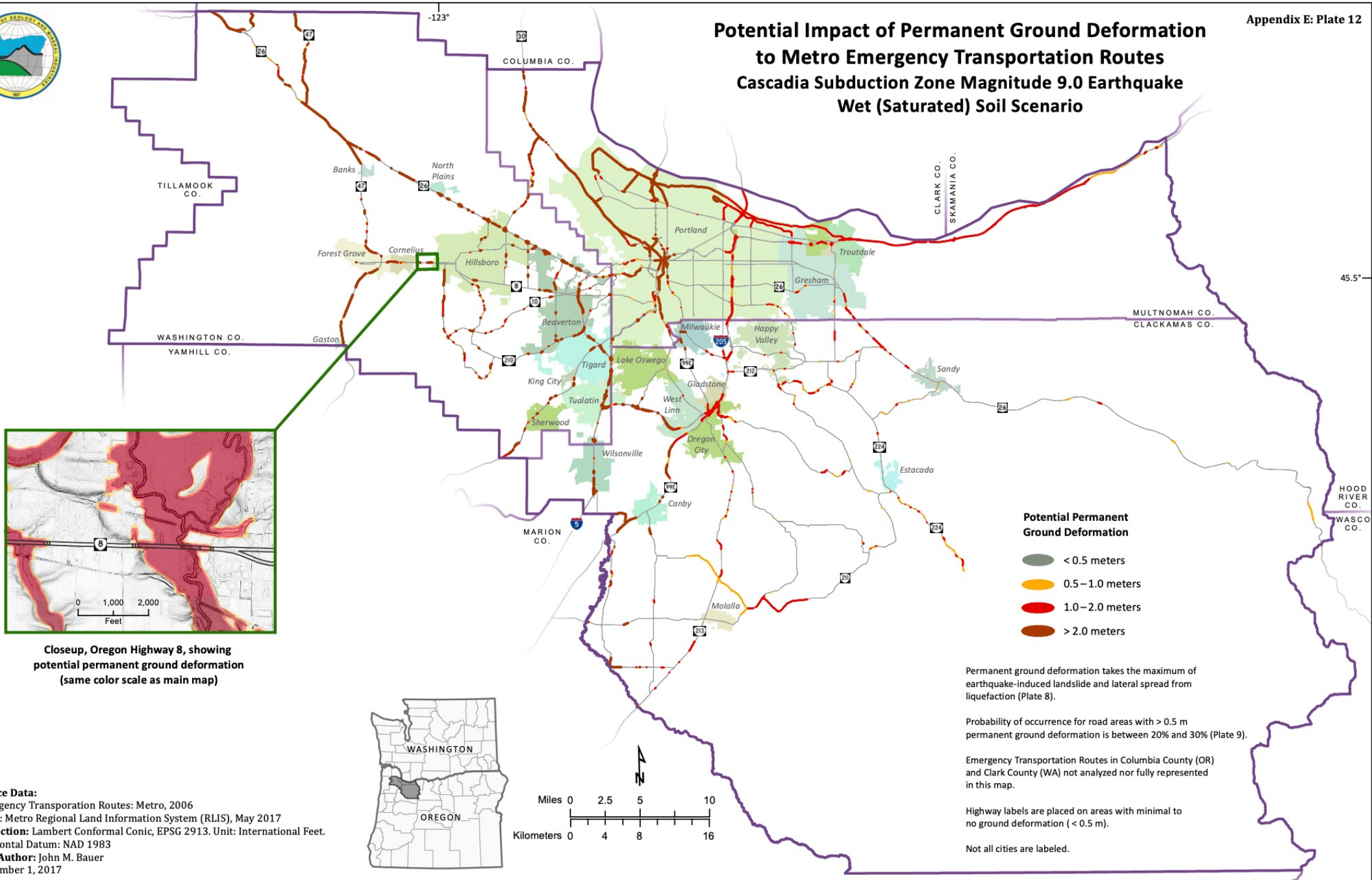
* Gaston census numbers are for entire jurisdiction. Gaston loss figures limited to buildings and residences in Washington County and do not include buildings, casualties, debris, and displaced population in Yamhill County.

Casualty level definitions are provided in Table 4-1 and are based on U.S. Census 2010 population figures.

Site Peak Ground Acceleration Simulated Portland Hills Fault Magnitude 6.8 Earthquake



Potential Impact of Permanent Ground Deformation to Metro Emergency Transportation Routes Cascadia Subduction Zone Magnitude 9.0 Earthquake Wet (Saturated) Soil Scenario



Closeup, Oregon Highway 8, showing potential permanent ground deformation (same color scale as main map)

- Potential Permanent Ground Deformation**
- < 0.5 meters
 - 0.5–1.0 meters
 - 1.0–2.0 meters
 - > 2.0 meters

Permanent ground deformation takes the maximum of earthquake-induced landslide and lateral spread from liquefaction (Plate 8).

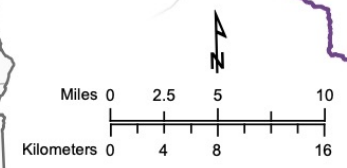
Probability of occurrence for road areas with > 0.5 m permanent ground deformation is between 20% and 30% (Plate 9).

Emergency Transportation Routes in Columbia County (OR) and Clark County (WA) not analyzed nor fully represented in this map.

Highway labels are placed on areas with minimal to no ground deformation (< 0.5 m).

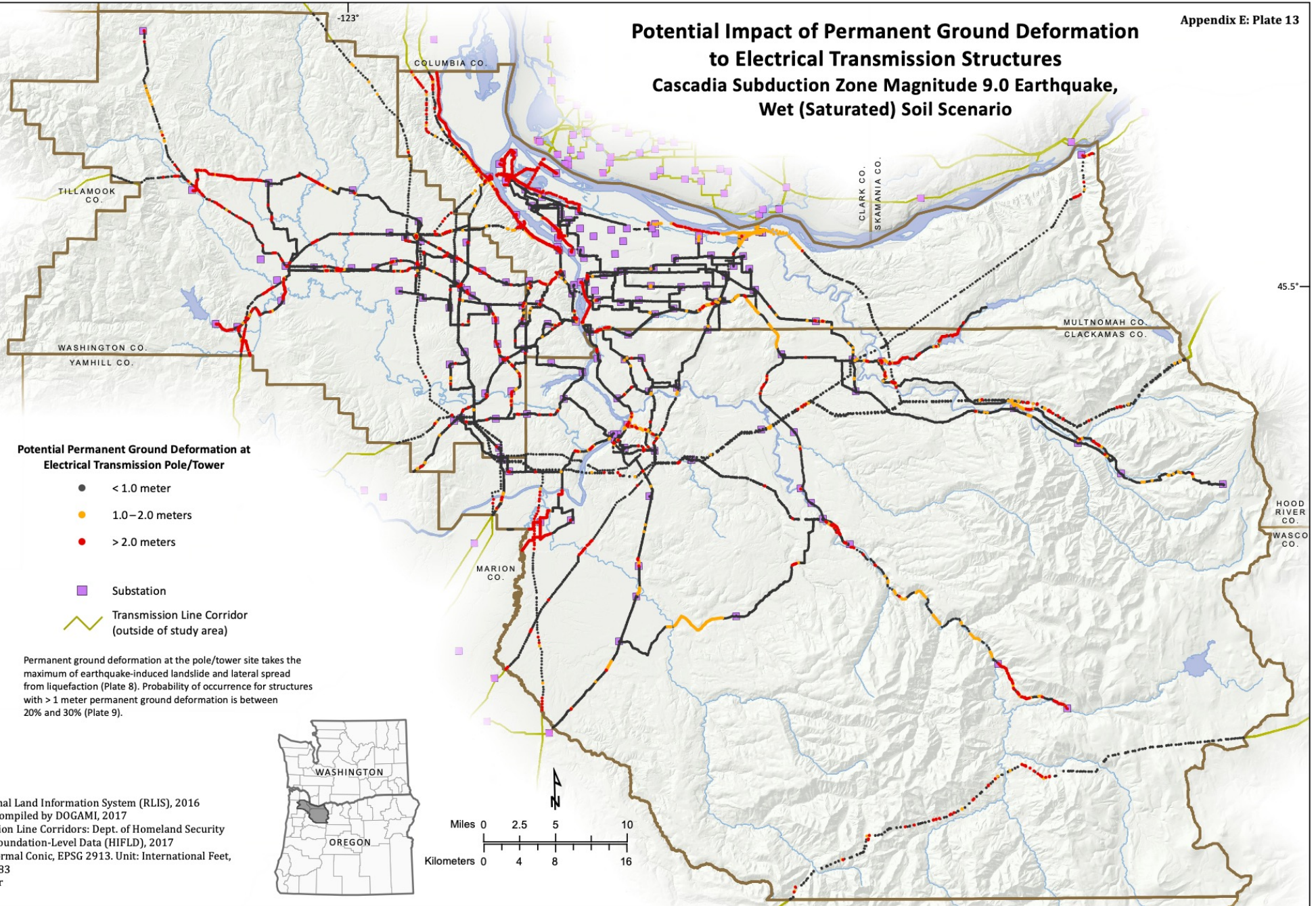
Not all cities are labeled.

Source Data:
 Emergency Transportation Routes: Metro, 2006
 Cities: Metro Regional Land Information System (RLIS), May 2017
Projection: Lambert Conformal Conic, EPSG 2913. Unit: International Feet.
 Horizontal Datum: NAD 1983
Map Author: John M. Bauer
 September 1, 2017





Potential Impact of Permanent Ground Deformation to Electrical Transmission Structures Cascadia Subduction Zone Magnitude 9.0 Earthquake, Wet (Saturated) Soil Scenario



Injuries Requiring Hospitalization Multnomah County, Oregon Cascadia Subduction Zone Magnitude 9.0 Earthquake Wet (Saturated) Soil Conditions, Daytime ("2 PM") Scenario

