
Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as Part of New and Redevelopment in WRIA 9

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Department of Natural Resources and Parks
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EXECUTIVE SUMMARY

King County was awarded a Puget Sound Watershed Management Assistance Program Fiscal Year 2009 grant by Region 10 of the U.S. Environmental Protection Agency (U.S. EPA) to develop a stormwater retrofit plan for Water Resources Inventory Area (WRIA) 9 (King County 2010). The primary goal of this grant-funded study is to develop a plan and associated costs to implement stormwater Best Management Practices (BMPs) in developed areas of WRIA 9, that were built primarily without stormwater controls. Another overall goal of the study is to extrapolate stormwater mitigation costs to all of the developed area draining to Puget Sound. This report is one of the interim project reports needed to complete the overall study goals. It documents the methodology and results for estimating how much of the study area is projected to have new stormwater controls as a result of new and redevelopment based on simulated projections of development associated with estimated population growth by 2040.

Current (2007) and projected future (2040) land use and land cover data used in this study were obtained from the University Washington. The 2007 land use and land cover data were developed as a composite of observed satellite imagery and outputs from a land cover change model. Future (2040) land use and land cover data were based on output from the land cover change model, which projects changes in the spatial distribution of households, jobs, land cover variables, the number of residential and commercial units, and prices driven by projected population changes in the Puget Sound region, current land use regulations, and growth management policies.

Current stormwater guidelines (King County 2009 Stormwater Design Manual) allow limited amounts of disturbance without requiring stormwater facilities to mitigate stormwater impacts. Determination of land use requiring stormwater mitigation as a result of new development, redevelopment, or retrofitting unchanged conditions is based on defining the 14 categories of land use land cover into two categories: (1) developed with incremental levels of disturbance (agriculture, grasslands, cleared lands, light, medium, and heavy urban); and (2) not developed (mixed forest, coniferous, clear cut, and regenerating forests, wetlands, open water, bare rock, and shorelines).

When future land uses were projected to change from a lesser level of development to a higher level in the same geographic location, it was assumed mitigation would be required. Based on 2007 land use conditions, there is forecasted to be approximately an eight percent increase in overall development by 2040 (73% of the study area) than in existing conditions (65% of the study area). Based on this study, 39% of the study area is forecasted to be redeveloped. Thus, new and redevelopment is estimated to account for 47 percent of the study area. Amortizing this over a 30-year period translates to an annual rate of 1.6 percent mitigation of new and redevelopment. Because new and redevelopment that exceed certain size or cost thresholds are required to include on-site stormwater mitigation, it is anticipated that a substantial fraction of the project area will have stormwater facilities constructed as part of new and redevelopment by 2040.

1.0. INTRODUCTION

King County was awarded a Puget Sound Watershed Management Assistance Program Fiscal Year 2009 grant by Region 10 of the U.S. Environmental Protection Agency (U.S. EPA) to develop a stormwater retrofit plan for Water Resources Inventory Area (WRIA) 9 (King County 2010)¹. The goal of this grant-funded study was to develop a plan and associated costs to implement stormwater Best Management Practices (BMPs) in developed areas of WRIA 9 built primarily without adequate stormwater controls. Another goal of the study was to extrapolate stormwater mitigation to all of the developed area draining to Puget Sound.

A vast majority of the landscape within King County was developed (King County 2009) under pre-1990 stormwater management regulations shown to be ineffective in protecting receiving waters (Booth et al. 2002). Development that has occurred since the early 1990s has been mitigated to a greater extent than was achieved by earlier regulations. However, these regulations are applied only to new and certain types of redevelopment. Given the level of existing development that has occurred, restoring habitat to sustainable conditions requires retrofitting ineffective and/or missing stormwater infrastructure.

This report describes methods and results used to identify the percent of the project area where stormwater mitigation is projected to be constructed as a result of new development and redevelopment.

1.1 Study Area

The project study area includes drainages starting a short distance downstream of the Howard Hanson Dam on the Green River down to approximately 4.3 miles upstream from the mouth of the Duwamish River in Elliot Bay. In addition, approximately 17 miles of shoreline drainages (39 square miles) directly flowing into the Puget Sound are included—in total, approximately 278 square miles of WRIA 9 (Figure 1). Areas not assessed include Vashon Island, the area within the City of Seattle which is comprised of a combined sewer system, and areas upstream of Howard Hanson Dam comprised of forests managed to protect Tacoma Public Utility's water supply.

¹ <http://your.kingcounty.gov/dnrp/library/water-and-land/watersheds/green-duwamish/stormwater-retrofit-project/stormwater-retrofit-workplan.pdf>

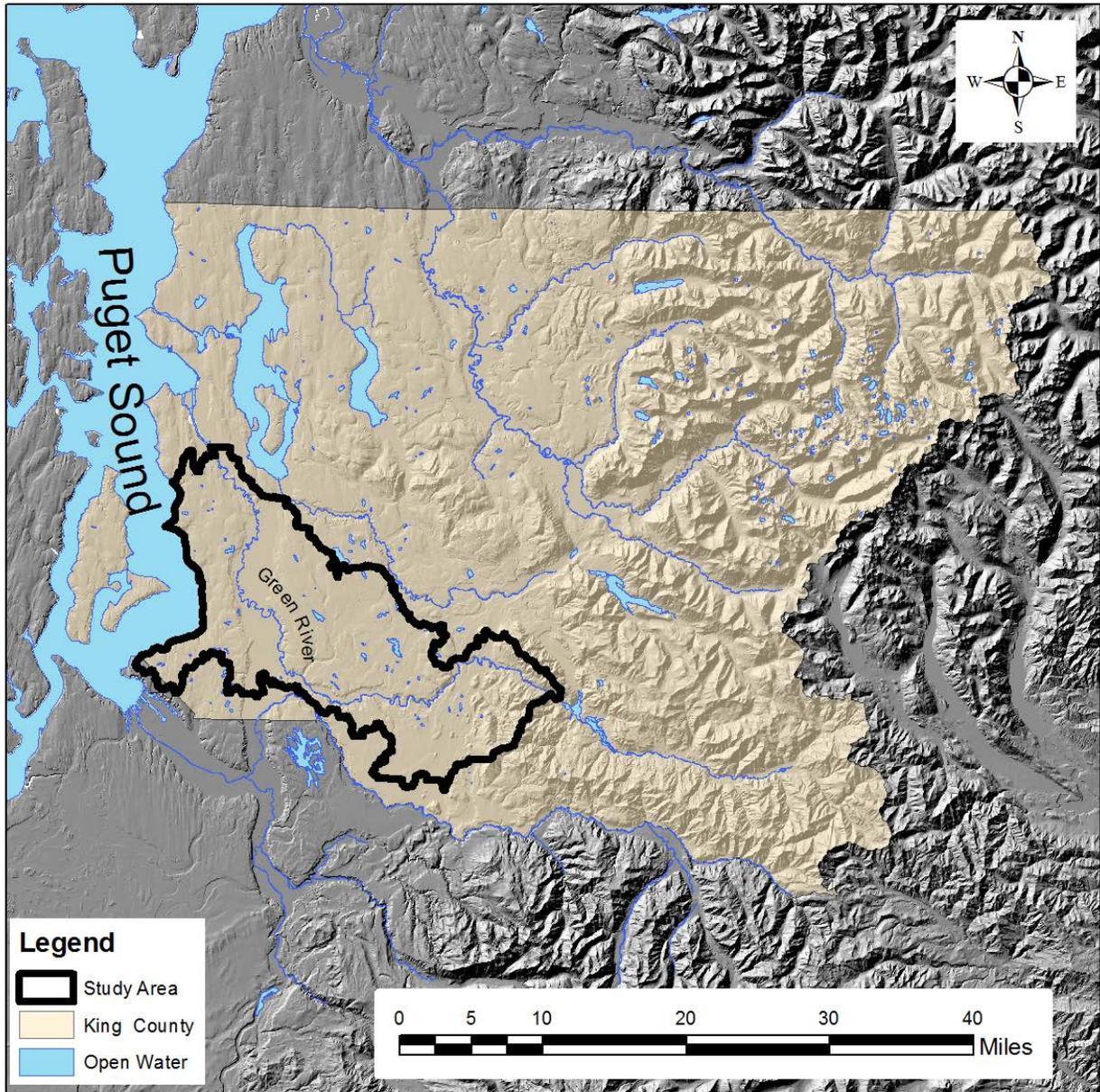


Figure 1 Map of project area.

1.2 Goals and Objectives

The overall goal of the project is to assess stormwater facility needs and associated costs to meet defined goals for biological protection and restoration associated with stormwater in the WRIA 9. The objective of this report is to identify the percent of the project area where stormwater mitigation is projected to be constructed by 2040 as a result of new and redevelopment.

1.3 New Development and Redevelopment Stormwater Mitigation Requirements

Stormwater mitigation is required to occur when a project meets any one of multiple criteria. As defined in King County Surface Water Design Manual 2009 (King County 2009) (KCSWDM) Core Requirement #3: Flow Control, new development and redevelopment are required to provide flow control if **any** of these criteria are exceeded:

- More than 2,000 ft² of impervious surfaces are either added (New development) or replaced (Redevelopment).
- More than 35,000 ft² of forested area are converted to non-forested pervious landscapes (e.g., grass lawns) lacking equivalent soils storage functionality as a forested landscape.
- New impervious surfaces added are more than 50% of existing impervious surfaces
- Project site improvements are estimated to increase property value 50% or greater from existing site improvements.

When flow control is required, Low Impact Development (LID) is encouraged. In addition, thresholds instigating water quality mitigation are similar (KCSWDM Core Requirement #8) to above with the exceptions that 5,000 ft² of new or replaced impervious surfaces are pollution generating surfaces—roof tops are **not** considered pollution generating (at this time) and are not considered part of the total impervious area potentially triggering treatment.

1.4 Population Growth

Population growth in the central Puget Sound four-county region (King, Snohomish, Pierce, and Kitsap) is expected to grow by 1 million people over the next 30 years (Washington State 2012, Table 1 below). This pressure from population growth will result in substantial new and redevelopment in 30 years. Multiple planning agencies comprised of state and local jurisdictions have established a regional planning organization, Puget Sound Regional Council (PSRC), responsible for balancing future growth in population, economic, and transportation needs with sustaining and restoring a healthy environment.

Table 1 Projections of the total resident population for the Growth Management Act Medium Series: 2010 to 2040 (Washington State OFM 2012).

County	Census	Projections					
	2010	2015	2020	2025	2030	2035	2040
King	1,931,249	2,012,782	2,108,814	2,196,202	2,277,160	2,350,576	2,418,850
Kitsap	251,133	262,032	275,546	289,265	301,642	311,737	320,475
Pierce	795,225	831,944	876,565	923,912	967,601	1,006,614	1,042,341
Snohomish	713,335	750,358	805,015	857,939	908,807	955,281	997,634
	Projected Percent Growth Relative to 2010 Census						
County	2010	2015	2020	2025	2030	2035	2040
King	0%	4%	9%	14%	18%	22%	25%
Kitsap	0%	4%	10%	15%	20%	24%	28%
Pierce	0%	5%	10%	16%	22%	27%	31%
Snohomish	0%	5%	13%	20%	27%	34%	40%

The PSRC goals directing management decisions encapsulate a shared strategy defined as VISION 2040². Technical analyses supporting this strategy include regional models simulating socio-economic, environmental, and transportation projections from 2010 to 2035 using inputs from GMA and the multiple jurisdictions within the four county regions.

The regional models include spatially distributed population growth projections organized into Traffic Analysis Zones (TAZ³ 2010) as defined by the PSRC. Many of the TAZ areas split between jurisdictions within the study area. Some of the jurisdictions expand beyond the watershed study area (Figure 2). Moreover, nearly all the TAZ segmentations span two or more catchment boundaries. The union among those three delineations presents a challenge when reporting projected population estimates by jurisdiction and by drainage area when fractions of a TAZ may span multiples thereof.

Population estimates were redistributed using a weighted area approach. Land areas associated with TAZs were divided by population totals within each TAZ to estimate a population density per unit area (Figure 3). An underlying assumption is the premise that population within each TAZ is evenly distributed. The population densities were then used to redistribute projected populations to each jurisdiction and drainage area.

² <http://www.psrc.org/growth/vision2040>

³ TAZs are the units of the geographic boundary system used by the PSRC to run and report results from its Travel Demand Forecast Model. The TAZs nest within a larger Forecast Analysis Zone (FAZ) geographic boundary system, with each FAZ containing between 1 and 20 TAZs. TAZ boundaries generally, with few exceptions, also line up with census tract boundaries, with each census tract containing between 1 to 9 TAZs. There are a total of 938 TAZs in the region (<http://www.psrc.org/data/gis/map-catalog/>).

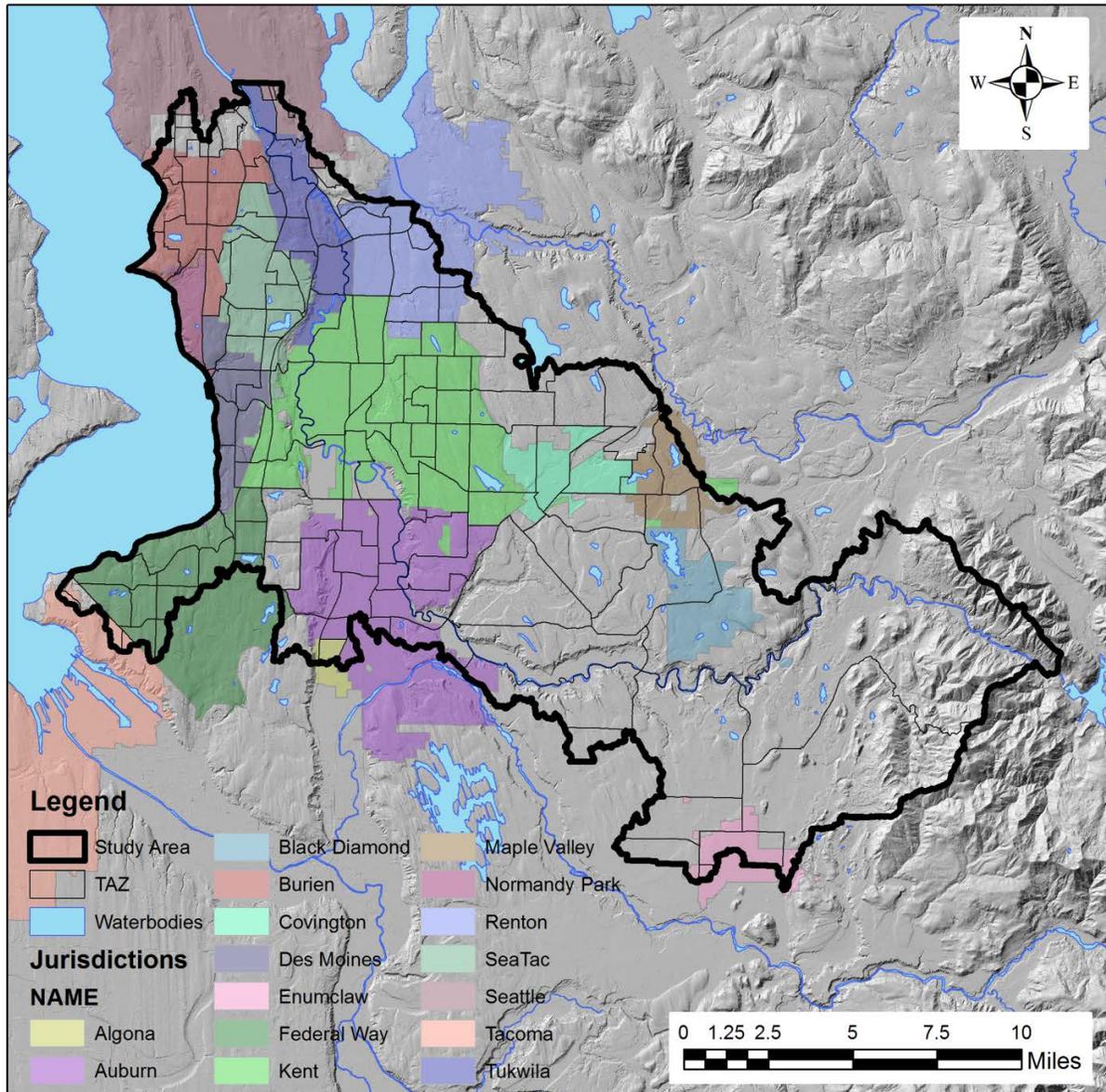


Figure 2 Map illustrating Traffic Analysis Zones (TAZ 2010) and jurisdictional boundaries

However, population distributions may not be uniform within a TAZ, thus using unit area averages (e.g., # of people/acre) to reapportion estimated populations that cross jurisdictional and study area boundaries may not correctly add up when comparing to original projections as structured in TAZ delineations. This is apparent when comparing TAZ generated population estimates within jurisdictions that are entirely located within the study area (see footnote 2 in Table 2). For example, City of Kent spans multiple TAZs, some only partially (Figure 2). Because the average population density does not reflect the true density, this introduces error when estimating total population based on TAZ segmentation for jurisdictions and drainage areas. In the case of City of Kent, redistributed populations are over estimated by 18 percent—this technique over estimates population projections by jurisdiction on average 12 percent. This is deemed not to be significant given

the uncertainty estimating distributions of population growth 30 years into the future at the scale presented in this study.

Table 2 Population estimates for 2010 and 2035 by jurisdiction based on PSRC VISION 2040 management plan using TAZ population densities to redistribute by jurisdiction.

Jurisdiction	Estimated population within study area ¹		Estimated Population for whole jurisdiction		Relative Percent Growth to YR 2010	
	YR 2010	YR 2035	YR 2010	YR 2035	Study Area	Jurisdiction
Algona	1741	1975	3014	3476	13%	15%
Auburn	42663	60932	70159	94302	43%	34%
Black Diamond ²	4229	6561	4151	9012	55%	117%
Burien ²	42979	51868	33277	42174	21%	27%
Covington ²	15407	18049	17565	20551	17%	17%
Des Moines ²	28793	34891	29672	35212	21%	19%
Enumclaw	4400	5143	11839	14508	17%	23%
Federal Way	61976	70658	89306	107057	14%	20%
Kent ²	109380	129370	92435	109673	18%	19%
King County	87470	105745	324610	364559	21%	18%
Maple Valley	9305	10981	20703	23564	18%	14%
Normandy Park ²	6524	6846	6336	6464	5%	2%
Pierce County	1916	2105	368474	456938	10%	24%
Renton	31560	44129	89845	122010	40%	36%
SeaTac ²	31662	46574	26945	43335	47%	61%
Seattle	6622	7529	608656	747128	14%	23%
Tacoma	3887	4312	198397	299164	11%	51%
Tukwila ²	18996	29985	19091	31579	58%	65%
Study Area	509510	637653	n/a		25%	n/a

¹Population estimates are based on area weighted average using TAZ segmentation (<http://www.psrc.org/data/forecasts/2013-forecast-products/>).

²Jurisdictions that nearly entirely fall within the study area.

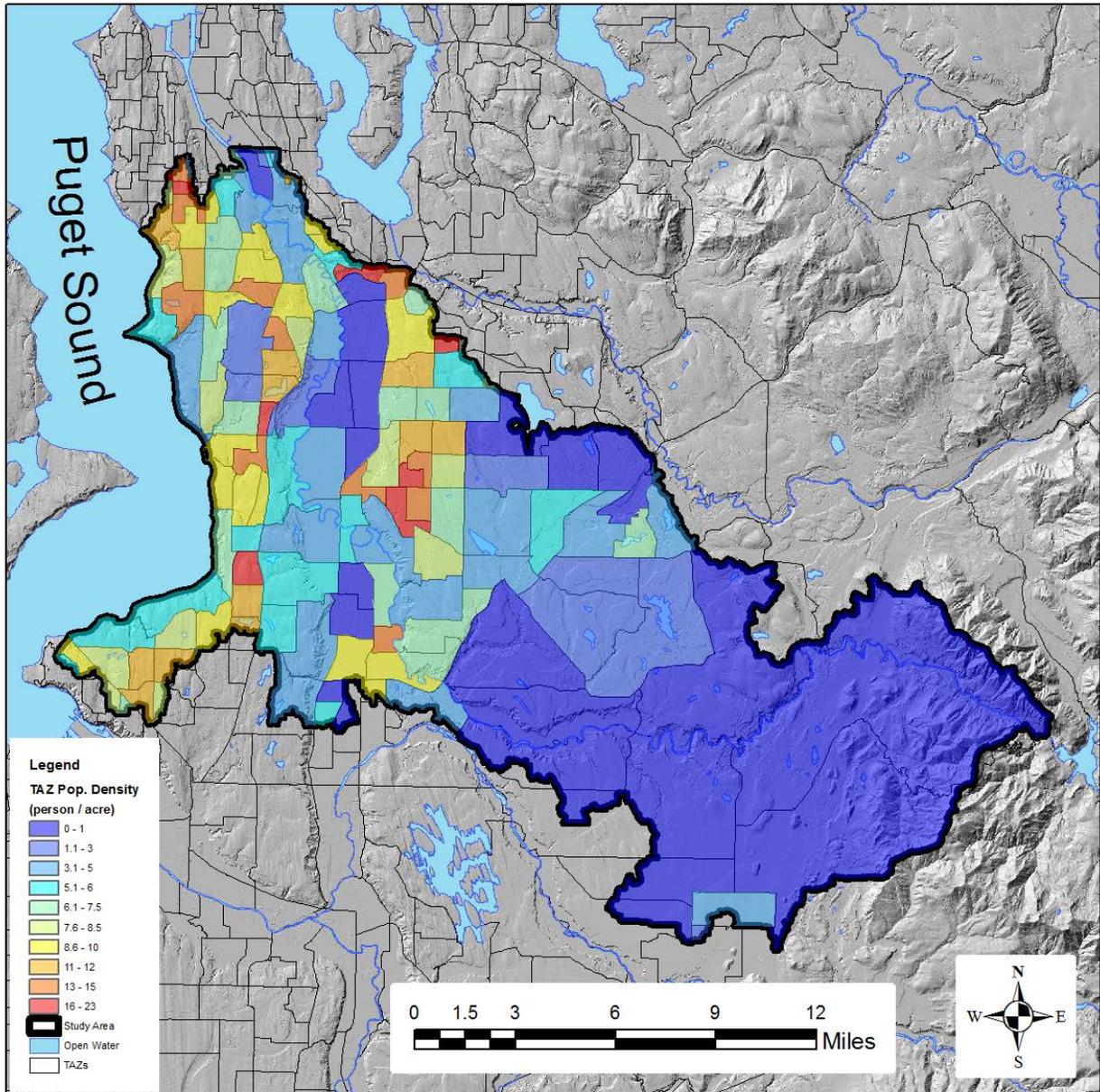


Figure 3 Population density (persons/acre) by TAZ.

It is possible that modifying methodologies estimating population when TAZ areas and jurisdictions span multiple drainage basins and study area boundaries may improve accuracy conserving population projections, but a consistent more simple method was considered appropriate generating future population growth for this study.

Population growth estimates between 2010 and 2035 are projected to range between 10 and 21 percent for about three-quarters of the population in the study area. Five of the jurisdictions (Auburn, Black Diamond, Renton, SeaTac, and Tukwila) have substantially greater growth rates ranging between 40 and 58 percent. One jurisdiction (Normandy Park) within the study area is projected to have little growth (i.e., 5 percent) over the next 25 years. The average projected population growth for the study area is 25 percent between 2010 and 2035, or about 1 percent per year. On average, projections are similar when considering whole jurisdictional areas.

2.0. METHODS AND DATA USED

This analysis compares current (2007) land use land cover with projected 2040 land use land cover (LULC) to estimate the amount of new development and redevelopment that would include stormwater mitigation by catchment and by jurisdiction.

2.1 Existing Conditions

Existing conditions are characterized using observed and simulated GIS data. Satellite imagery taken in 2007 was classified into 14 categories (Table 3) of land use land cover (University of Washington 2007) for Pierce, King, Snohomish, and Kitsap Counties. The categories include three levels of urban intensity; lands cleared for or associated with development; agriculture; and forested lands in different phases of disturbance and growth. For this analysis, these 14 categories are grouped into two classes: developed and not developed. Developed categories are assumed to adversely alter stormwater runoff and may require stormwater mitigation. 2007 land use land cover for the project area is shown in Figure 4.

Table 3 Summary of land use land cover categories.

Category	Class
Heavy Urban	Developed (Disturbed)
Medium Urban	
Light Urban	
Cleared	
Grass, grasslands	
Agriculture	
Mixed Forest	Not developed (Undisturbed)
Coniferous Forest	
Clear cut Forest	
Regenerating Forest	
Wetlands	
Open Water	
Snow, Bare Rock	
Shorelines	

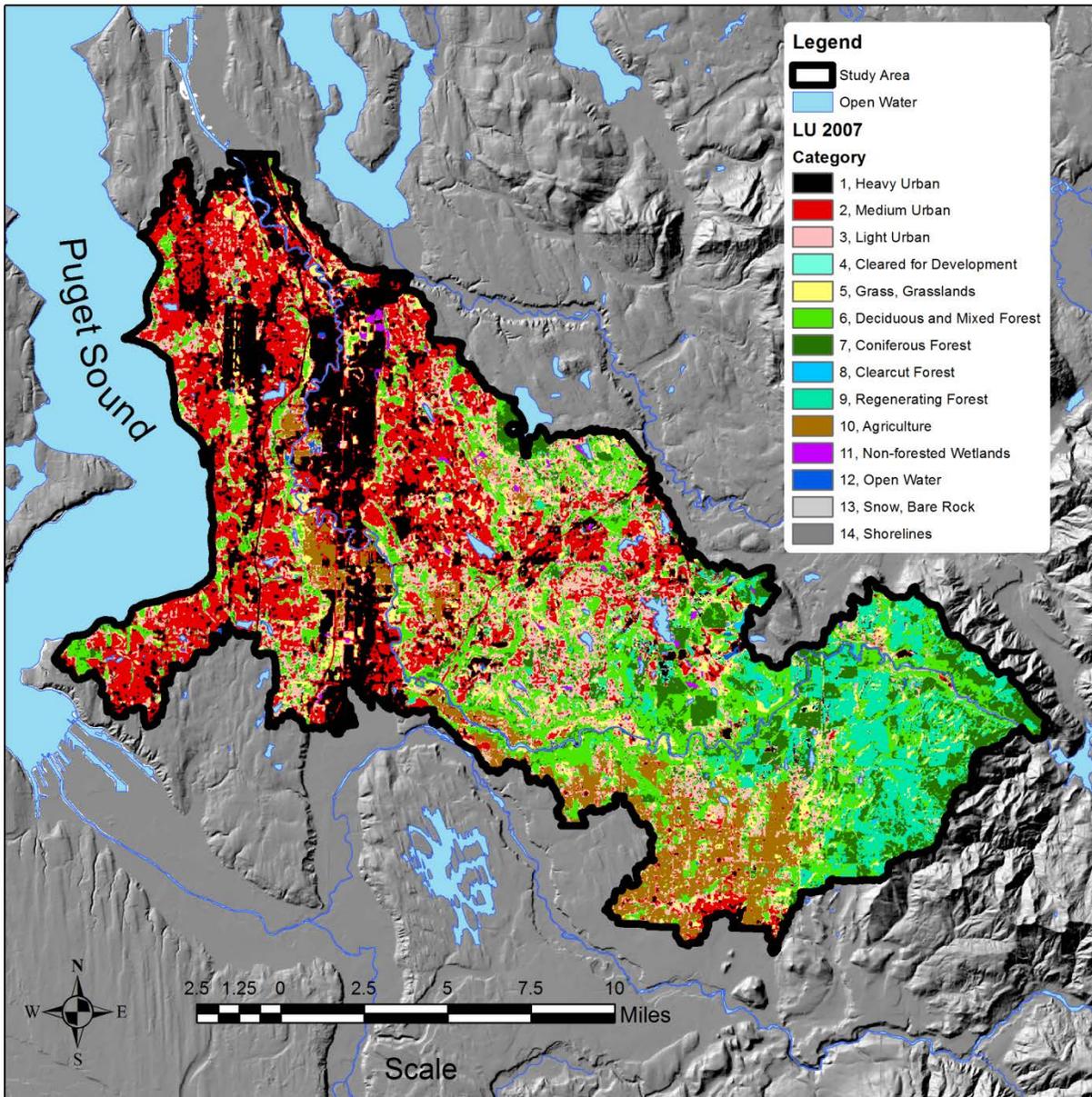


Figure 4 2007 Land use land cover.

2.2 Future Conditions

Simulated future conditions (year 2040) for this analysis is based on output from a modeling framework (Alberti 2009) coupling a land cover change model (LCCM) and an urban socio-economic and transportation model (UrbanSim). The modeling scenario used for this study is described as “Business as Usual” and includes existing regulations and land use planning for future projections. Simulation of future conditions include the same 14 categories as previously described above. Future conditions for this study are characterized using simulated 2040 projections (Figure 5).

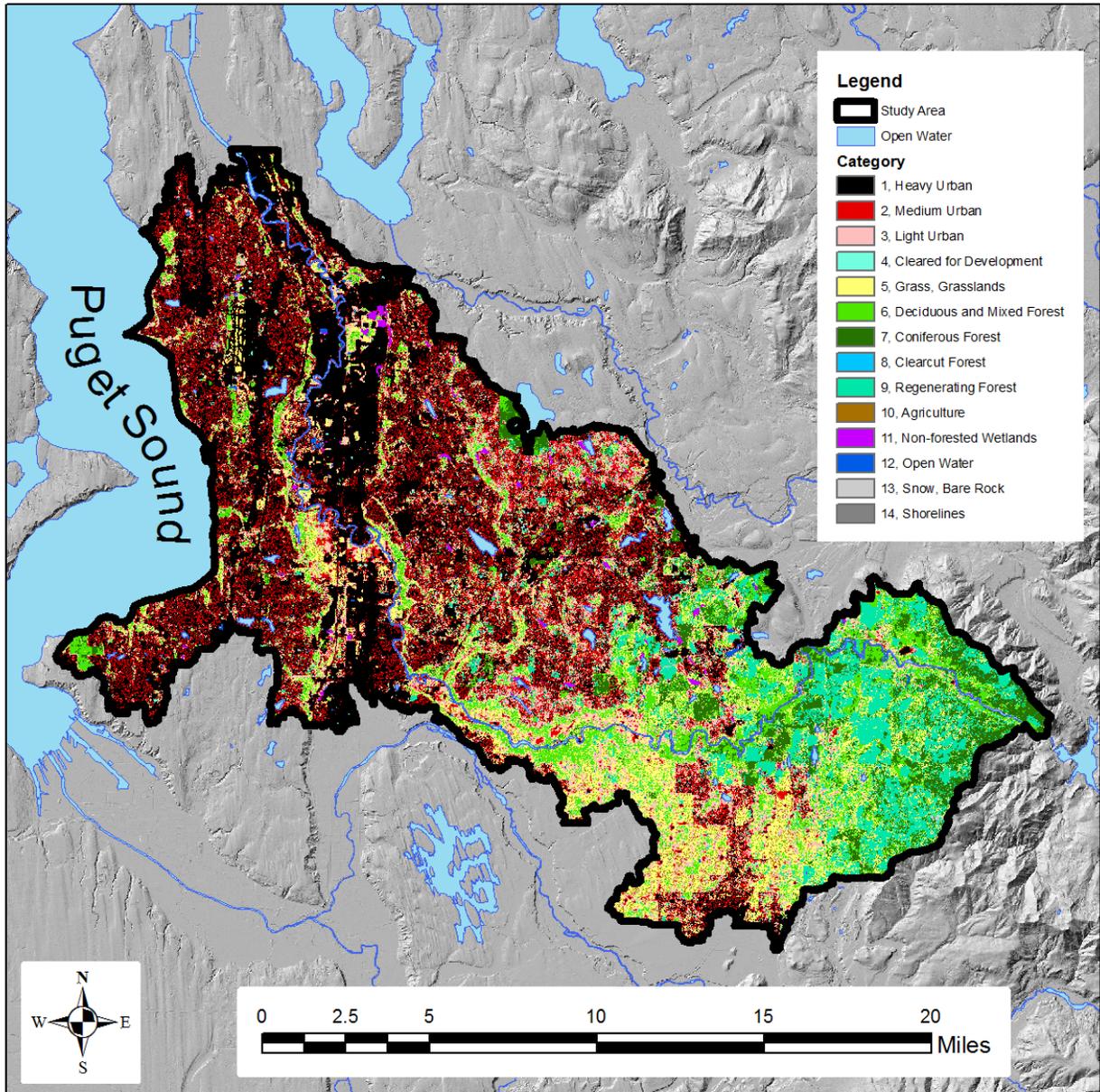


Figure 5 2040 Land use land cover.

2.3 Determination of New and Redevelopment

The six development categories (Table 3) are assigned a simple hierarchy of disturbance starting with agriculture as the lowest level to heavy urban (i.e., typically reflecting commercial and/or industrial land use) development. For this analysis, it is assumed that flow controls would be built as part of any new development when land is converted from one of the undeveloped classes (e.g., forest) to developed classes (e.g., urban) as shown in Table 3. It was also assumed that flow controls would be built as part of redevelopment

when the level of disturbance of land use land cover increased by one or more categories between 2007 and 2040 (Table 4). This is based on the assumption that increases in development would exceed the flow control criteria described in Section 1.3.

Table 4 Hierarchy of disturbance among land use land cover categories

Category	Level of disturbance
Heavy Urban (> 80% Imp.)	
Medium Urban (50-80% Imp.)	
Light Urban (20-50% Imp.)	
Cleared	
Grass, grasslands	
Agriculture	
Forest, and all other	
	Low

Because heavy urban is defined as the most disturbed category, any increases in development intensity within that category would not be recognized using the approach described above. Instead, the areas with stormwater mitigation due to future new and redevelopment in heavy urban areas were estimated by using UrbanSim simulated floor space increases in the heavy urban (i.e., commercial and industrial) areas. Stormwater mitigation was assumed to be constructed where commercial floor space increases by 5,000 ft² or greater per 0.22 acre as projected in 2040.

Output from UrbanSim produced a number of grid cells with less than 100 ft² of commercial/retail floor space in 2007. Since one of the criteria triggering stormwater mitigation is a 50% increase in property value added, simulated floor space in 2040 that was greater than 100 ft² when it was less than 100 ft² in 2007 was also assumed to have stormwater mitigation.

Cleared land is a transitional state of development; therefore it's assumed any lands defined as such in either 2007 or 2040 are assumed to be mitigated.

The conceptual framework for assessing stormwater mitigation built due to land use land cover by 2040 is presented in Figure 6.

Category		Existing						
		Non-developed	Agriculture	Grasslands	Cleared	Low	Medium	High
Future	Non-developed							
	Agriculture							
	Grasslands							
	Cleared							
	Low							
	Medium							
	High							*

Mitigated as part of new development or redevelopment by 2040
No stormwater facilities built by 2040 due to new or redevelopment
* Mitigated based on commercial and industrial floor space increases => 5,000 ft ² , otherwise no stormwater facilities built by 2040 due to new and redevelopment.
No mitigation necessary

Figure 6 Framework for assessing stormwater mitigation built due to land cover change.

2.4 Land Ownership

Land ownership was defined using King County GIS (feature: parcel_address) based on Tax Payer identity and Right-of-Ways. Land owned by a city or county jurisdictions was defined as public; all other properties were defined as private⁴.

2.5 Jurisdictions

Jurisdiction boundaries were defined using King County GIS data (feature: city_3co)

⁴ Port of Seattle properties are defined to behave like private land ownership.

3.0. SUMMARY OF RESULTS

Results are summarized by study area and jurisdictions. Results summarized by catchment are in Appendix A.

3.1 Existing and Future Land and Use Land Cover

Current and projected future land use and land cover were compared (Table 5). As shown, the amount of developed land in the study area is projected to increase by eight percent from 65 percent in 2007 to 73 percent in 2040. In 2007, heavy urban is generally associated with commercial and industrial land use. However, in 2040 heavy urban presumably includes a mix of high density residential, commercial, and industrial land uses. This is illustrated by the large shift in intensity from light and medium urban to heavy urban (Table 5, Figure 4, and Figure 5), and the projections estimating a 29 percent increase in population⁵ and 69 percent increase in employment by 2040 for the study area (PSRC 2013). Another substantive shift is the projected conversion of agriculture lands to grasslands associated with large acreage residential lots.

Table 5 Summary of land use land cover in the study area for 2007 and 2040 conditions.

LULC Category		2007	2040	2007	2040
		(square miles)		% of Study Area	
Heavy Urban	Developed	39.72	86.51	14%	31%
Medium Urban		62.97	48.20	23%	17%
Light Urban		41.11	31.10	15%	11%
Cleared		0.14	0.42	0%	0%
Grasslands		18.68	35.21	7%	13%
Agriculture		17.63	1.89	6%	1%
Sub total		180.25	203.34	65%	73%
Mixed Forest	Not developed	45.52	25.62	16%	9%
Forest		23.71	19.55	9%	7%
Clearcut Forest		0.35	0.19	0%	0%
Regenerating Forest		22.02	23.18	8%	8%
Wetlands		1.17	1.19	0%	0%
Open Water		5.36	5.26	2%	2%
Bare Rock		0.13	0.17	0%	0%
Shorelines		0.08	0.08	0%	0%
Subtotal		98.33	75.24	35%	27%

⁵ Based on FAZ 2010 boundaries.

3.2 Jurisdictions

There are 18 jurisdictions that either partially or fully reside within the study area (Figure 2). Nearly all jurisdictions are 80 percent developed (using the classification previously described) or greater in 2007. However, four of the jurisdictions (Algona, Seattle, Tacoma, and Pierce County) have very small areas that reside in the study area and likely may not be representative of the whole jurisdiction landscape. With these exceptions, two jurisdictions are substantially less developed in 2007 than future forecasts with 17 percent and 12 percent more area developed in Black Diamond and King County, respectively. Maple Valley was the only jurisdiction to remain the same with 1 percent less developed land in the future (Table 6). These results do not reflect the potential maximum amount of development per jurisdiction, simply how much is developed now and as projected in 2040. Individual land use land cover categories by jurisdiction are summarized in Table 7 through Table 10 for current and future conditions.

Table 6 Amount of jurisdiction developed.

Jurisdiction	Developed (acres)		Developed (% of Juris.)		Jurisdiction Area (acres)
	2007	2040	2007	2040	
Algona	356	357	99%	99%	361
Auburn	10592	11441	85%	91%	12524
Black Diamond	1659	2441	36%	53%	4610
Burien	5657	5890	90%	94%	6258
Covington	3090	3367	82%	89%	3788
Des Moines	3483	3742	86%	92%	4055
Enumclaw	1833	1888	93%	96%	1976
Federal Way	6782	7246	85%	91%	7944
Kent	19150	20120	88%	93%	21725
King County	40612	50832	45%	57%	89318
Maple Valley	2582	2544	81%	80%	3172
Normandy Park	1267	1454	80%	91%	1591
Pierce County	38	52	17%	24%	219
Renton	5233	5524	85%	90%	6122
SeaTac	5891	5989	90%	91%	6580
Seattle	971	1009	92%	95%	1058
Tacoma	503	492	94%	92%	535
Tukwila	5486	5550	89%	90%	6158
Total	115185	129940	65%	73%	177994

Table 7 2007 Existing LULC area (acres) by jurisdiction

Jurisdiction		Algona	Auburn	Black Diamond	Burien	Covington	Des Moines	Enumclaw	Kent	Maple Valley
Heavy Urban	Developed	133	3491	240	1207	607	800	252	6675	478
Medium Urban		163	3292	451	3334	1541	2039	689	7886	1280
Light Urban		38	2060	663	893	716	518	229	2822	630
Cleared		0	12	2	0	7	0	0	4	28
Grasslands		18	1007	291	222	189	121	127	1162	139
Agriculture		3	730	12	2	30	4	535	601	26
Subtotal			356	10592	1659	5657	3090	3483	1833	19150
Mixed Forest	Not Developed	3	1424	1047	425	456	509	124	1668	157
Forest		0	283	1161	95	131	28	9	252	166
Clearcut Forest		0	0	3	0	0	0	0	0	0
Regenerating Forest		0	74	279	5	41	3	8	98	122
Wetlands		0	37	67	4	17	2	0	103	0
Open Water		2	114	394	60	45	16	2	455	145
Bare Rock		0	0	0	0	8	0	0	0	0
Shorelines		0	0	0	12	0	14	0	0	0
Subtotal		5	1932	2951	601	698	572	142	2575	590
Total		361	12524	4610	6258	3788	4055	1976	21725	3172

Table 8 2007 Existing LULC area (acres) by jurisdiction (cont'd)

Jurisdiction		Normandy Park	Pierce	Renton	SeaTac	Seattle	Tukwila	Federal Way	Tacoma	King
Heavy Urban	Developed	78	4	1969	2642	437	2811	1015	211	2318
Medium Urban		677	9	2099	2350	398	1701	4479	226	7620
Light Urban		470	23	795	594	90	644	1067	49	13981
Cleared		0	0	5	0	0	0	8	0	24
Grasslands		41	3	363	289	46	286	211	17	7414
Agriculture		0	0	3	17	0	44	3	0	9254
Subtotal		1267	38	5233	5891	971	5486	6782	503	40612
Mixed Forest	Not Developed	271	159	610	454	83	271	785	25	20620
Forest		29	22	60	60	1	18	208	1	12627
Clearcut Forest		0	0	0	0	0	0	0	0	217
Regenerating Forest		1	1	20	9	0	0	19	2	13388
Wetlands		0	0	180	9	0	8	12	0	313
Open Water		9	0	19	153	1	376	134	4	1473
Bare Rock		0	0	0	4	0	0	0	0	69
Shorelines		15	0	0	0	0	0	3	0	1
Subtotal		324	181	888	689	86	672	1162	32	48706
Total		1591	219	6122	6580	1058	6158	7944	535	89318

Table 9 Future LULC area (acres) by jurisdiction

Jurisdiction		Algona	Auburn	Black Diamond	Burien	Covington	Des Moines	Enumclaw	Kent	Maple Valley
Heavy Urban	Developed	227	6275	691	3419	1721	2162	877	12320	1309
Medium Urban		90	2500	529	1708	1009	1044	475	4650	727
Light Urban		19	1416	521	503	417	358	248	1888	378
Cleared		1	64	1	1	31	5	5	42	7
Grasslands		20	1170	700	259	189	172	269	1217	123
Agriculture		0	16	0	0	0	0	13	4	0
Subtotal			357	11441	2441	5890	3367	3742	1888	20120
Mixed Forest	Undeveloped	2	654	471	234	171	249	55	752	154
Forest		0	110	754	47	108	22	14	125	232
Clearcut Forest		0	0	3	0	0	0	0	0	2
Regenerating Forest		0	163	489	13	68	10	17	168	103
Wetlands		0	38	69	5	17	2	0	105	0
Open Water		2	116	384	58	43	16	3	454	137
Bare Rock		0	2	0	0	14	0	0	0	0
Shorelines		0	0	0	12	0	14	0	0	0
Subtotal		4	1083	2169	368	421	313	88	1605	628
Total		361	12524	4610	6258	3788	4055	1976	21725	3172

Table 10 Future LULC area (acres) by jurisdiction (cont'd)

Jurisdiction		Normandy Park	Pierce County	Renton	SeaTac	Seattle	Tukwila	Federal Way	Tacoma	King County
Heavy Urban	Developed	688	13	3344	3935	681	3879	4059	356	9326
Medium Urban		506	14	1165	1195	175	892	2239	101	11783
Light Urban		179	15	624	429	77	481	604	24	11694
Cleared		0	0	16	19	0	15	24	0	40
Grasslands		2	0	34	21	0	2	35	3	13683
Agriculture		81	10	376	412	76	283	320	11	16817
Subtotal		1456	52	5558	6010	1009	5552	7282	495	63343
Mixed Forest	Undeveloped	102	138	331	373	36	203	391	34	12029
Forest		8	26	34	33	11	19	126	1	10818
Clearcut Forest		0	3	0	0	0	0	0	0	113
Regenerating Forest		0	0	0	0	0	0	0	0	1172
Wetlands		0	0	179	9	0	8	13	0	315
Open Water		10	0	20	150	1	376	130	4	1443
Bare Rock		0	0	0	5	0	0	0	0	85
Shorelines		15	0	0	0	0	0	3	0	1
Subtotal	134	167	564	570	48	607	663	39	25975	
Total		1591	219	6122	6580	1058	6158	7944	535	89318

3.3 Land Ownership

The ratio of public versus privately owned lands in the study area was similar among the jurisdictions. Private land ownership ranged from 71% to 79% among the jurisdictions (Table 11), with a few exceptions (i.e., jurisdictions that have very small areas in the study area, Black Diamond, and SeaTac). Black Diamond is presently 90% privately owned—presumably a result of low amounts of development including the expected public road infrastructure. Most of SeaTac’s land area is owned by the Port of Seattle where they operate Sea-Tac International Airport. For this analysis, the Port of Seattle is assumed to operate similar to privately owned lands and is categorized as private for this study. Overall, three quarters of the study area is defined as privately owned lands and public versus private ownership is assumed to remain constant. Figure 7 illustrates the land ownership for the study area.

Table 11 Summary of public and privately owned land

Jurisdiction	Private	Public	Total	(% of Jurisdiction)	
	(Acres)			Private	Public
Algona	259	101	360	72%	28%
Auburn	9496	3014	12509	76%	24%
Black Diamond	4136	474	4610	90%	10%
Burien	4707	1536	6242	75%	25%
Covington	2806	982	3788	74%	26%
Des Moines	2970	1066	4036	74%	26%
Enumclaw	1536	434	1970	78%	22%
Federal Way	5810	2107	7917	73%	27%
Kent	15786	5939	21725	73%	27%
King County	68595	20616	89211	77%	23%
Maple Valley	2220	949	3169	70%	30%
Normandy Park	1252	328	1580	79%	21%
Pierce County*	217	1	218	100%	0%
Renton	4443	1673	6116	73%	27%
SeaTac	5310	1270	6580	81%	19%
Seattle	575	471	1046	55%	45%
Tacoma*	526	0	526	100%	0%
Tukwila	4377	1781	6158	71%	29%
Study Area	135021	42742	177763	76%	24%

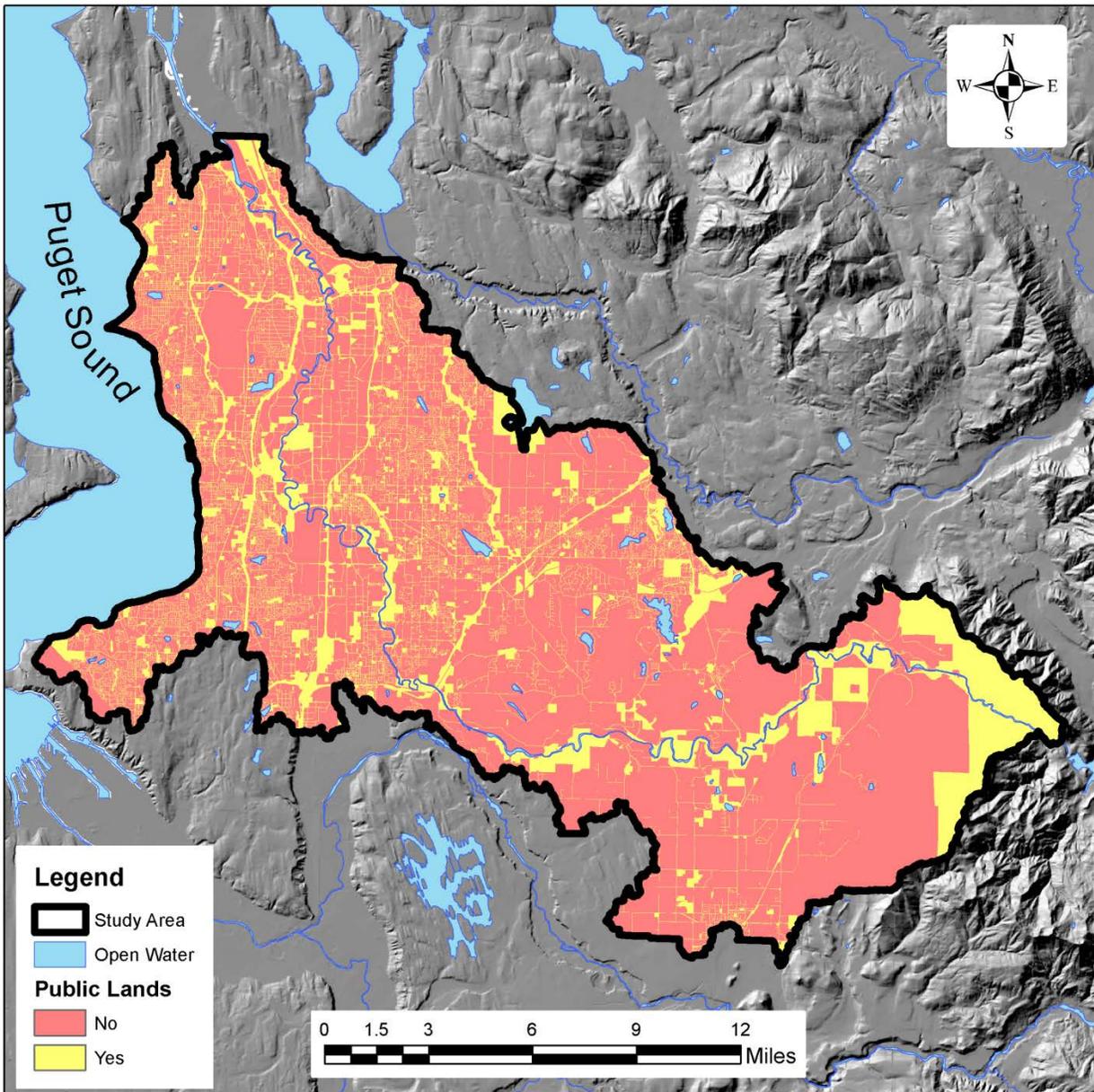


Figure 7 Map illustrating land ownership, public and private.

3.4 Estimate of Stormwater Mitigation Built as Part of New and Redevelopment

The analysis estimates that 47% of the study area will have stormwater mitigation as a result of new and redevelopment by 2040. Another 23% of the study area in 2040 is projected to not need stormwater mitigation because it will remain undeveloped. The remaining 30% of the study area is not projected to have stormwater mitigation between

now and 2040 due to lack of new and redevelopment not exceeding previously defined criteria requiring stormwater control in those areas (Table 12).

Table 12 Estimate of stormwater mitigation built by 2040 as part of new and redevelopment

Projection	Area (sq. mi.)	Percent of Study Area
Mitigated between 2007 and 2040 due to redevelopment	95	34%
Mitigated between 2007 and 2040 due to new development	35	13%
No stormwater mitigation necessary (i.e., undisturbed)	63	23%
Developed but no stormwater mitigation built by 2040 due to new and redevelopment	85	30%
Total	278	100%

The sensitivity of the area where stormwater mitigation is projected to different assumptions was tested. Under the worst-case scenario where mitigation would not occur without an increase in two levels of development (e.g., from light urban to heavy urban), the area mitigated due to redevelopment would be 43 square miles and the area developed without stormwater mitigation would be 137 square miles.

Table 13 below summarizes by jurisdiction, the amount of stormwater mitigation due to new and redevelopment categorized as public and private lands (Figure 9) and amortized based on a 30-year projection. Aside from exceptions reported previously, three of the jurisdictions, Black Diamond, King County, and SeaTac, are forecasted to have below average amounts of mitigation resulting from new and redevelopment, 42%, 40%, and 41% respectively. Enumclaw is expected to have 70% of its jurisdiction mitigated resulting from new and redevelopment, well above the other jurisdiction forecasts.

Developed land not projected to be mitigated by 2040 due to falling below triggers and exceptions requiring mitigation to new and redevelopment would be a likely candidate for focusing stormwater mitigation activities. The stormwater mitigation rates were calculated by dividing the total fraction of each by 30 years. Thus to meet projected 2040 development, mitigating unmitigated development ranges from 0.6 to 1.4 percent per year, excluding the previously listed exceptions. Similarly, new and redevelopment requiring stormwater mitigation ranges from 1.4 to 2.3 percent per year. Averaging over the entire study area, the annual rate to mitigate unmitigated development is 1.0 percent and new and redevelopment mitigation rates of 1.6 percent per year. Focusing on public lands, the annual rate over a 30 year period drops to 0.2 percent of the study area for mitigating unmitigated developed lands and 0.3 percent for new and redevelopment.

Similar to Table 13 in content, Table 15 (in the appendix) summarizes undisturbed, developed but not mitigated, and development with stormwater mitigation by catchment in the study area and is visualized in Figure 9 through Figure 11.

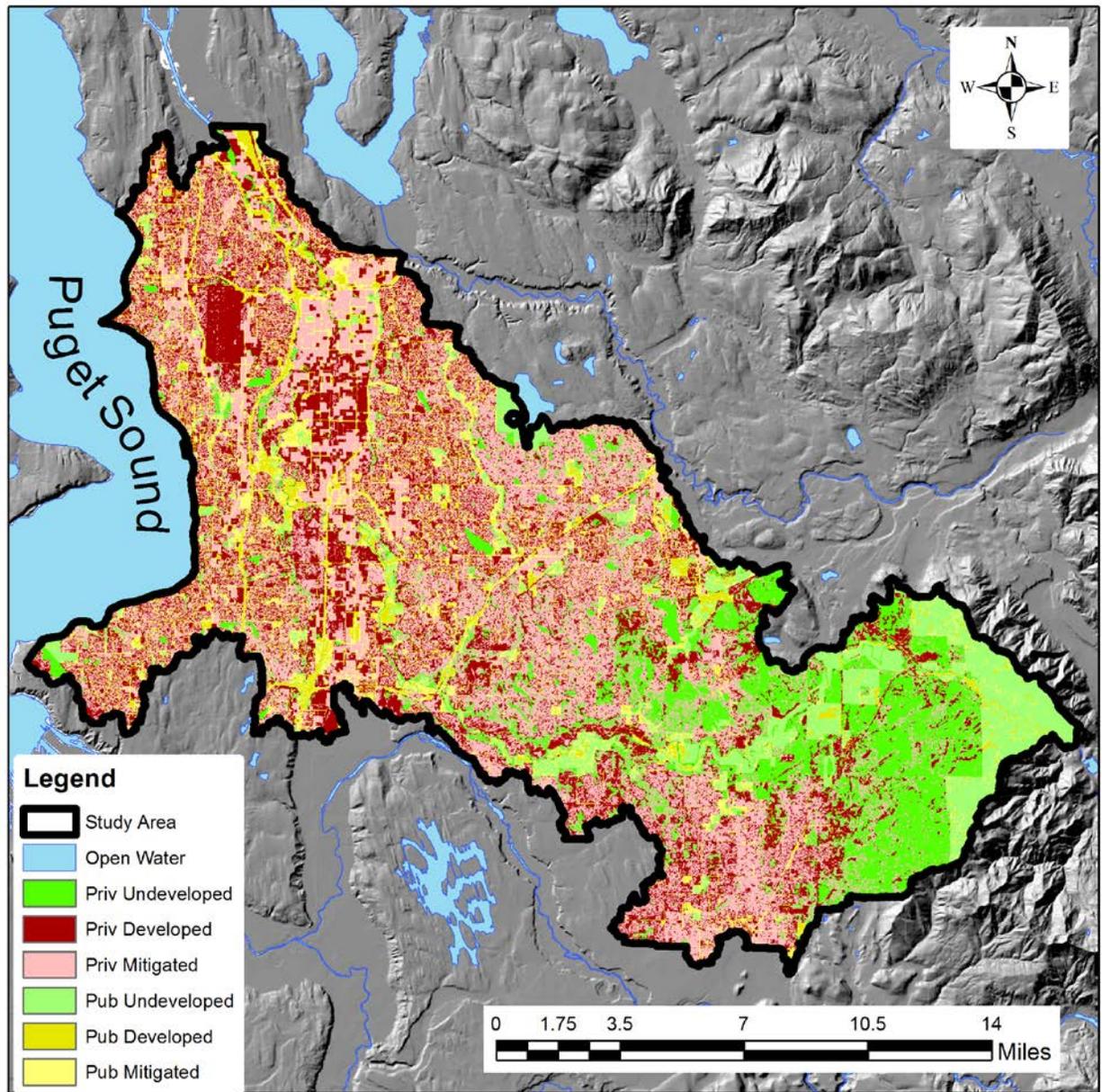


Figure 8 Map illustrating study area that will be developed but not mitigated by 2040 by new or redevelopment and mitigated as part of new or redevelopment for public and private lands.

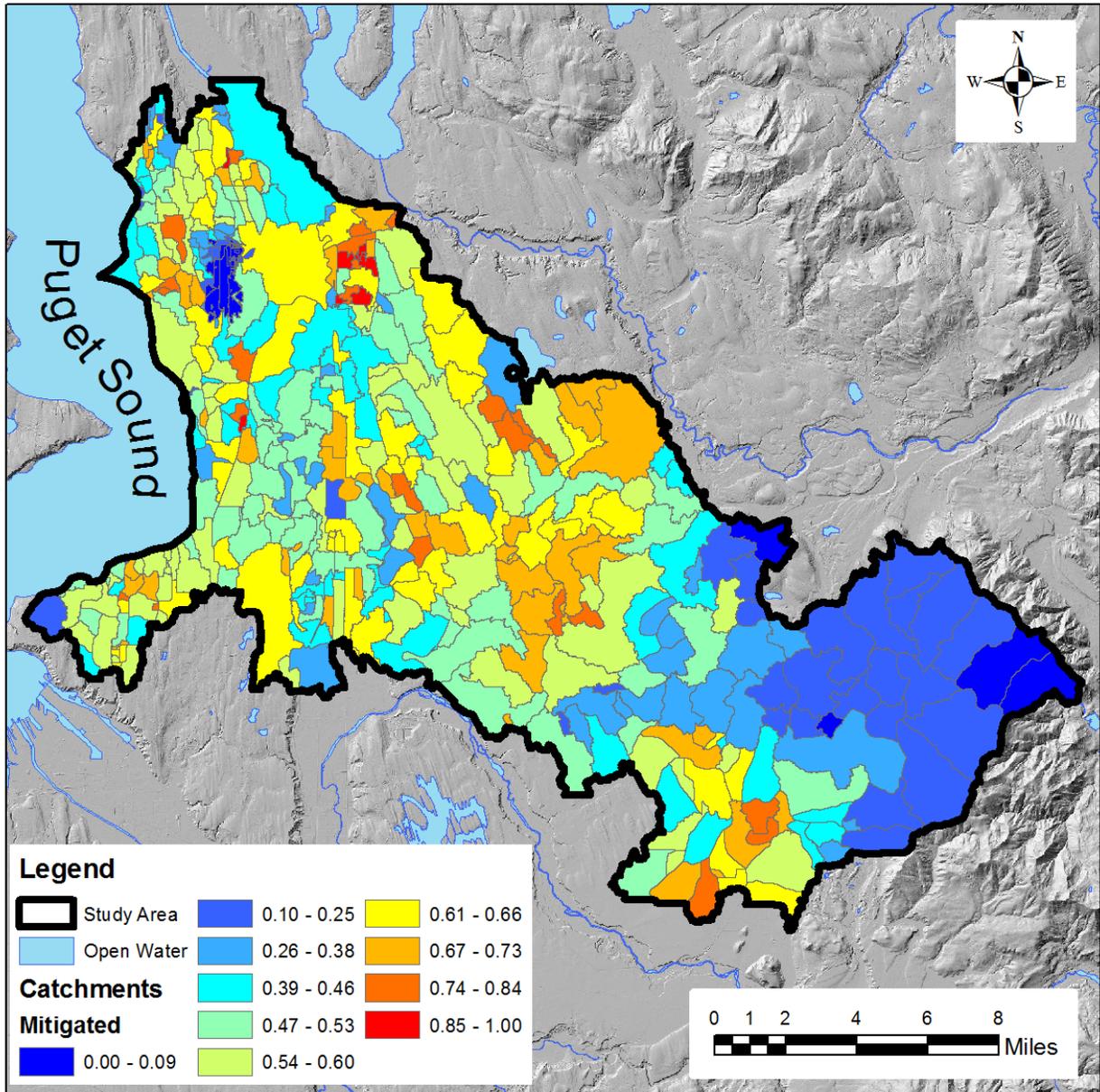


Figure 9 Fraction of each catchment projected to have development with stormwater mitigation constructed as part of the new- or redevelopment between 2007 and 2040.

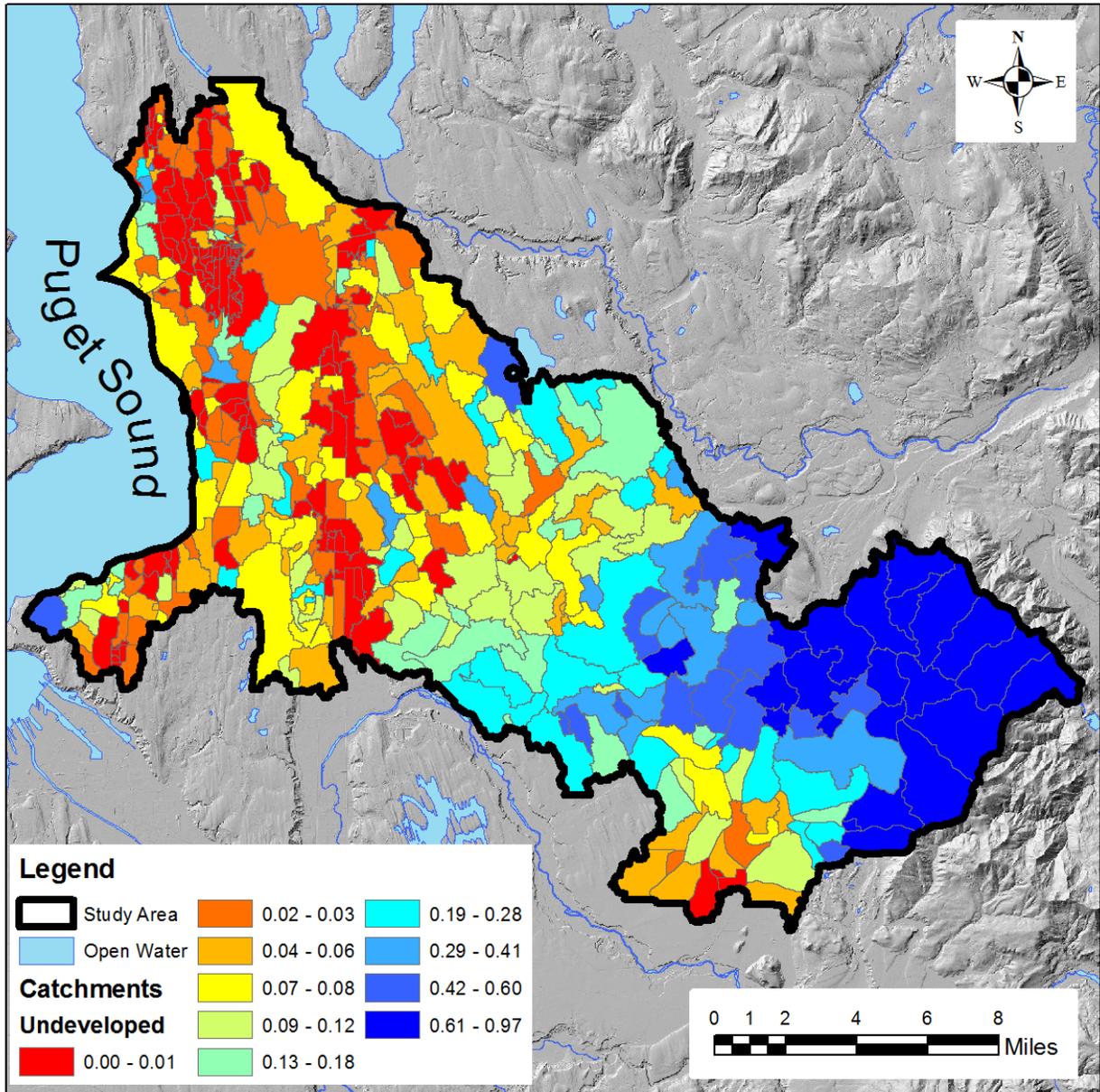


Figure 10 Fraction of each catchment "Undisturbed" in 2007 and not projected to be developed by 2040.

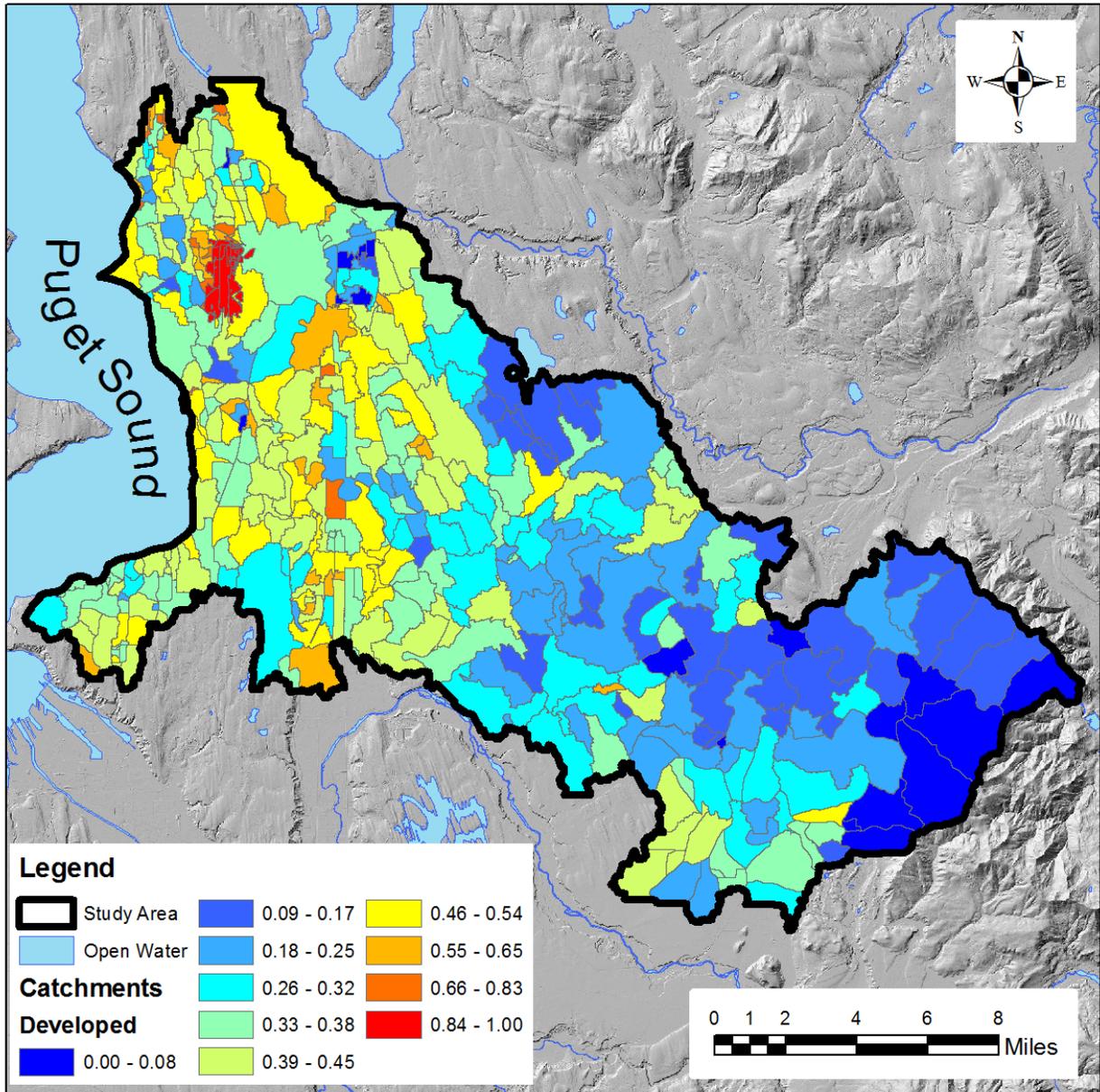


Figure 11 Fraction of each catchment developed by 2007 but not projected to have stormwater mitigation constructed by 2040 as part of new or redevelopment.

Table 13 Summary by jurisdiction of land area projected to be undisturbed, developed but unmitigated, and mitigated by 2040.

Jurisdiction	Private Lands (acres)			Public Lands (acres)			Jurisdiction Area (acres)			
	Un-disturbed	Developed	Mitigated	Un-disturbed	Developed	Mitigated	Total	Un-disturbed	Developed	Mitigated
Algona	0.2	107.1	151.7	0.2	42	58.6	359.9	0.4	149.1	210.3
Auburn	516.7	3618.2	5360.8	230.4	1285.1	1498.1	12509.3	747.1	4903.3	6858.9
Black Diamond	1771.4	677.4	1687.5	149.5	84.2	240.3	4610.3	1920.9	761.6	1927.8
Burien	141.5	1854	2711.1	127.1	593.7	815	6242.3	268.6	2447.6	3526
Covington	161.1	965	1680	84.6	365.7	531.9	3788.3	245.7	1330.7	2211.9
Des Moines	120.8	1243.7	1605.2	109.9	407.9	548.6	4036.2	230.7	1651.6	2153.9
Enumclaw	35.4	367.9	1132.8	22.4	174.1	237.2	1969.7	57.8	542	1370
Federal Way	260.2	2281.6	3268.7	292.1	772.8	1042	7917.3	552.3	3054.3	4310.7
Kent	669.1	6572.7	8543.8	477.1	2208.5	3253.9	21725.1	1146.2	8781.2	11797.7
King County	21499.5	16394.8	30800.5	11979.9	3569	5067.4	89211.1	33479.4	19964	35868
Maple Valley	218.1	815	1186.9	149.2	344.3	455.2	3168.7	367.3	1159.3	1642.2
Normandy Park	87	394.9	769.9	26	92.8	209.2	1579.8	113	487.8	979.1
Pierce County*	164.1	19.2	33.7	0.7	0	0	217.6	164.8	19.2	33.7
Renton	140.1	1505.2	2798.1	139.7	546.1	986.9	6116.2	279.8	2051.4	3785
SeaTac	328.1	2913	2068.9	51.3	583.2	635.5	6580.1	379.4	3496.2	2704.4
Seattle	5.9	339.9	229.3	26.6	292.8	151.6	1046.2	32.5	632.7	380.9
Tacoma*	16.2	315.7	194.1	0	0.2	0	526.1	16.2	315.8	194.1
Tukwila	275.1	1481.8	2620	64.7	940.7	775.9	6158.3	339.8	2422.5	3395.9
Study Area	26311	41867	66843	13931	12303	16507	177763	40242	54170	83350

* Parcel data used for determining public versus private lands was not readily available for Pierce County, all lands were considered Private

Table 14 Percent of jurisdiction area projected to be undisturbed, developed but unmitigated, and mitigated by 2040.

Jurisdiction	Private Lands (acres)			Public Lands (acres)			Jurisdiction Area (acres)			Annual Rate (%/30yr)		
	Undist	Dev	Mit	Undist	Dev	Mit	Undist	Dev	Mit	Undist	Dev	Mit
Algona	0%	30%	42%	0%	12%	16%	0%	41%	58%	0.0%	1.4%	1.9%
Auburn	4%	29%	43%	2%	10%	12%	6%	39%	55%	0.2%	1.3%	1.8%
Black Diamond	38%	15%	37%	3%	2%	5%	42%	17%	42%	1.4%	0.6%	1.4%
Burien	2%	30%	43%	2%	10%	13%	4%	39%	56%	0.1%	1.3%	1.9%
Covington	4%	25%	44%	2%	10%	14%	6%	35%	58%	0.2%	1.2%	1.9%
Des Moines	3%	31%	40%	3%	10%	14%	6%	41%	53%	0.2%	1.4%	1.8%
Enumclaw	2%	19%	58%	1%	9%	12%	3%	28%	70%	0.1%	0.9%	2.3%
Federal Way	3%	29%	41%	4%	10%	13%	7%	39%	54%	0.2%	1.3%	1.8%
Kent	3%	30%	39%	2%	10%	15%	5%	40%	54%	0.2%	1.3%	1.8%
King County	24%	18%	35%	13%	4%	6%	38%	22%	40%	1.3%	0.7%	1.3%
Maple Valley	7%	26%	37%	5%	11%	14%	12%	37%	52%	0.4%	1.2%	1.7%
Normandy Park	6%	25%	49%	2%	6%	13%	7%	31%	62%	0.2%	1.0%	2.1%
Pierce County*	75%	9%	15%	0%	0%	0%	76%	9%	15%	2.5%	0.3%	0.5%
Renton	2%	25%	46%	2%	9%	16%	5%	34%	62%	0.2%	1.1%	2.1%
SeaTac	5%	44%	31%	1%	9%	10%	6%	53%	41%	0.2%	1.8%	1.4%
Seattle	1%	32%	22%	3%	28%	14%	3%	60%	36%	0.1%	2.0%	1.2%
Tacoma*	3%	60%	37%	0%	0%	0%	3%	60%	37%	0.1%	2.0%	1.2%
Tukwila	4%	24%	43%	1%	15%	13%	6%	39%	55%	0.2%	1.3%	1.8%
Study Area	15%	24%	38%	8%	7%	9%	23%	30%	47%	0.8%	1.0%	1.6%

* Parcel data used for determining public versus private lands was not readily available for Pierce County, all lands were considered Private

4.0. DISCUSSION

The method used for estimating future projections of development that will be mitigated as a result of initiating stormwater guidelines versus retrofitting development without mitigation is likely only applicable to the specific data used for this analysis. For example, one of the key assumptions in this analysis was that stormwater mitigation would be required when development intensity increase by one or more categories (e.g., light urban to medium urban). However, a definitive, quantifiable direct link between the stormwater guidelines and the land use land cover categories defining the landscape was not identified in this study and the ratios of mitigated development versus unmitigated development is likely to be variable based on thresholds used to trigger stormwater mitigation. While an increase in development intensity by one category is expected to trigger stormwater mitigation in the vast majority of situations, some situations may require a two category increase in development intensity for stormwater mitigation to be required. This less stringent requirement would substantially decrease the area expected to have stormwater mitigation due to redevelopment.

Similarly, including other types of information in the analysis will influence forecasted ratios of mitigation. Forecasted population growth for King County is estimated to increase at a rate ranging from 0.4 to 1.5 percent per year over a 30 year time span (Washington State 2012). Given this projected increase in population, it is possible that parts of the heavy urban development that is primarily commercial in 2007 would become a mixed use of commercial and residential. This type of change in land use would suggest a larger ratio of new stormwater mitigation versus retrofitting unmitigated land use with stormwater facilities to accommodate population growth in 2040.

Another interesting output of the University of Washington's future land use land cover projections used in this analysis is the projected conversion of a large amount of agriculture lands to grasslands. The land cover change model results project that approximately 90-percent (15.8 square miles, 5.7% of the study area) of the agriculture lands in the study area are projected to convert to grasslands and lawns by 2040. If this conversion from agricultural to other developed uses were to occur as projected, it would likely exceed minimum thresholds for construction of stormwater infrastructure. However, given the current policy to maintain, and possibly increase, agriculture production in King County, this outcome from the simulation projection seems unlikely at this time. It is therefore possible that the area where redevelopment would trigger construction of stormwater infrastructure has been slightly overestimated in this instance.

Aside from stating the obvious uncertainties in projecting population growth explicitly over time and space, these simulated outputs from landscape modeling are based on current land use regulations and growth management policies remaining consistent into the future. It is likely that regulations will continue to evolve influencing when/where/how development might occur. Thus depending on the pressures accommodating future development, this could result in either increasing or decreasing retrofit of unmitigated development over time.

Sanborn Mapping Solutions⁶ conducted a land cover change analysis over western Washington State evaluating changes in land use and land cover between 1991 and 2001. Keeping consistent with the hierarchical approach applied in this report, the amount of change that occurred between 1991 and 2001 is approximately 6 percent of the study area during that time period. Types of change in this quantification include forested landscapes converted to scrub/shrub and grasslands. Thus if 6 percent of the study area experiences land cover change, this translates into an annual rate of change (0.6-percent) similar to the rate of change projected in this study.

Identified development in this report that will be mitigated either because of new and redevelopment or unmitigated does not acknowledge investments in existing stormwater infrastructure. There are numerous facilities in the project area designed using current or close to current stormwater guidelines (e.g., Sea-Tac International Airport) that should be considered part of the final mitigation. A complete analysis of stormwater mitigation needs should account for these existing facilities.

⁶ Sanborn Mapping Solutions. 2005. Western Washington Land Cover Change Analysis- 1991 to 2001 Change Detection.

<http://www5.kingcounty.gov/sdc/raster/landcover/WWLCCChangeAnalysis1991to2001Metadata.html>

5.0. CONCLUSIONS

Current growth estimates show the project area population will increase from 510,000 in 2010 to about 638,000 in 2040, an increase of about 25 percent. Expansion of the regions housing stock, commercial capacity, and industrial capacity are all also expected to expand to accommodate this increase. As described by the Puget Sound Regional Council's Vision 2040, and in compliance with the Washington State Growth Management Act, the vast majority of the population increase is planned to occur in the urban areas, with far lower growth in the rural area of unincorporated King County.

Analysis of measured land use and land cover in 2007 and modeled land use and land cover in 2040 show:

- about 63 square miles (23 percent of the project area) of undeveloped landscape is projected to remain undeveloped in 2040,
- about 35 square miles (13 percent of the project area) of undeveloped landscape is anticipated to have new development in the project area,
- about 95 square miles (34 percent of the project area) of already developed land in 2007 is projected to be sufficiently redeveloped by 2040 to shift to a higher development category, with the amount of high intensity developed land increasing from 40 square miles in 2007 to 86 square miles by 2040,
- about 20 square miles (7 percent of the project area) of high intensity developed land is projected to become even more intensively developed by 2040, and
- 85 square miles (30 percent of the project area) of already developed land is projected to remain in its current use without major changes by 2040.

It is assumed that new development, redevelopment substantial enough that it results in a shift in land use and land cover classification, and substantial increase in high intensity development all result in the construction of stormwater BMPs and facilities to mitigate stormwater impacts. This suggests that about 130 square miles (47 percent) of the project area is forecasted to undergo stormwater mitigation resulting from new development or redevelopment. This is equivalent to an annual rate of 1.6 percent of the project area receiving stormwater mitigation over the next 30 years based on existing stormwater management requirements.

Future conditions for this project are based on projected 2040 conditions. As population continues to grow in the region after 2040, additional redevelopment to higher development intensity is anticipated, especially in urban areas. This intensity will likely manifest itself in residential and commercial development increasing inwards and upwards within the urban growth boundary. Aside from public open spaces such as parks and ball fields, few undeveloped areas are likely to remain by 2040 on the urban side of the urban growth boundary. Similarly, the rate of conversions of pervious vegetative cover to impervious land surfaces in the rural areas in the region will likely decrease substantially to maintain compliance with the Washington State Growth Management Act. The

distribution and overall total cost may be substantially different if development intensity and/or rates are significantly different than simulated projections for this study.

Extreme caution is recommended when extrapolating these results to other Puget Sound regions. King County is one of the most developed counties in the state, thus leaving less potential for future conversion of undeveloped lands. Other counties in the lower Puget Sound region are projected to have a greater rate of population growth (but less in total) between 2010 and 2040. The projected distribution of how growth will occur is unknown, but will result either in new development progressing towards current GMA boundaries and/or infill with redevelopment in urban centers. If more redevelopment were to occur, then new stormwater mitigation would occur in previously existing areas of unmitigated development resulting in less stormwater needs. If more of the population growth were to progress outwards, then unmitigated existing development projected in 2040 would require more retrofit with stormwater mitigation infrastructure.

6.0. REFERENCES

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APPENDIX A. TABLE 15

*Analysis of Stormwater Mitigation Projected to be Constructed by 2040 as Part of New and
Redevelopment in WRIA 9*

Table 15 Summary of undeveloped, developed without mitigation, and developed with mitigation areas by catchment

Catchment	Private Lands (acres)			Public Lands (acres)			Area (acres)			Fraction	
	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
BLA001	19.33	108.98	299.43	15.59	41.3	136.12	620.75	150.28	435.56	24%	70%
BLA010	4.71	38.98	62.1	4.07	13.96	24.03	147.85	52.93	86.13	36%	58%
BLA020	1.06	64.32	106.96	0.44	7.01	21.4	201.19	71.33	128.37	35%	64%
BLA030	2.27	51.74	183.08	0.69	23.27	42.31	303.36	75.01	225.38	25%	74%
BLA040	1.32	24.48	56.74	7.92	12.67	60.32	163.46	37.15	117.06	23%	72%
BLA050	0	40.85	74.36	2.31	7.18	19.07	143.78	48.03	93.44	33%	65%
BLA060	4.7	95.89	140.29	6.33	43.23	58.46	348.91	139.13	198.75	40%	57%
BLA070	0	58.15	160.98	0	62.59	102.53	384.26	120.75	263.51	31%	69%
BLA080	3.26	187.49	354.42	0.44	51.91	90.39	687.91	239.4	444.81	35%	65%
BLA090	16.58	121.87	202.19	9.01	122.22	82.05	553.91	244.09	284.24	44%	51%
BLA100	0	127.54	139.47	0.67	26.2	12.55	306.43	153.73	152.02	50%	50%
BLA110	24.02	333.22	304	59.99	99.43	272.68	1093.34	432.65	576.67	40%	53%
BLA120	4.13	93.74	72.65	0.21	8.25	6.19	185.18	101.99	78.84	55%	43%
BLA130	0	215.69	186.78	0	17.86	14.02	434.35	233.55	200.8	54%	46%
BLA140	0	44.62	21.2	0	7.45	4.07	77.33	52.07	25.26	67%	33%
BLA150	0	49.65	89.16	0	1.68	9.05	149.54	51.33	98.21	34%	66%
BLA160	8.77	636.48	399.02	6.08	95.46	73.22	1219.03	731.94	472.24	60%	39%
BLA170	2.74	36.12	30.14	0.23	19.1	13.32	101.65	55.22	43.46	54%	43%
BLA180	0.65	20.31	27.27	0.21	2.76	5.97	57.18	23.08	33.24	40%	58%
BLA190	0.46	27.03	17.74	0.23	9.86	7.18	62.49	36.89	24.92	59%	40%
BLA200	1.08	163.16	295.28	1.49	41.91	80.19	583.12	205.07	375.47	35%	64%
BLA210	0.19	50.92	52.43	0	17.31	19.62	140.47	68.23	72.05	49%	51%
BLA220	8.06	63.93	104.18	2.2	13.4	22.96	214.73	77.34	127.14	36%	59%
BLA230	9.1	231.27	217.08	2.21	61.81	66.11	587.58	293.08	283.18	50%	48%
BLA240	6.69	84.27	124.83	9.98	26.03	53.71	305.5	110.29	178.53	36%	58%
BLA250	16.08	146.62	226.83	1.11	33.08	44.06	467.77	179.7	270.88	38%	58%

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	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
BLA260	32.93	578.12	462.16	3.8	108.09	126.43	1311.53	686.21	588.59	52%	45%
BLA270	31.77	226.73	279.99	14.96	56.83	92.5	702.79	283.56	372.49	40%	53%
BLA280	0	2.27	22.05	0	0.14	10.37	34.83	2.41	32.42	7%	93%
BLA290	6.77	76.47	114.42	0.46	16.75	22.48	237.36	93.23	136.9	39%	58%
BLA300	0.21	8.16	65.19	1.54	9.94	10.86	95.89	18.1	76.05	19%	79%
BLA310	0.27	46.51	21.8	1.15	2.61	8.93	81.26	49.12	30.72	60%	38%
BLA320	3.6	24.5	53	19.03	17.59	15.39	133.1	42.08	68.4	32%	51%
BLA330	7.06	35.3	110.99	1.66	12.32	28.9	196.23	47.63	139.89	24%	71%
BLA340	0	0.26	107.7	0	2.36	17.81	128.14	2.62	125.51	2%	98%
BLA350	56.53	71.36	140.23	1.1	20.99	21.3	311.52	92.36	161.53	30%	52%
BLA360	23	280.06	285.91	2.44	70.86	71.12	733.39	350.92	357.03	48%	49%
BLA370	2.52	43.04	24.16	3.18	19.47	15.06	107.42	62.5	39.21	58%	37%
BLA380	12.66	137.21	131.58	31.54	49.59	85.92	448.5	186.81	217.5	42%	48%
BLA390	14.99	306.18	390.72	1.54	99.51	99.82	912.75	405.69	490.53	44%	54%
BLA400	0	10.15	113.96	0	0.95	13.66	138.72	11.1	127.63	8%	92%
BLA410	2.17	8.84	84.96	0.75	5.14	20.25	122.11	13.98	105.21	11%	86%
BLA420	0.23	48.34	165.02	27.33	51.53	43.9	336.35	99.87	208.92	30%	62%
BLA430	1.62	5.34	24.7	0	1.66	4.58	37.9	7.01	29.28	18%	77%
BLA440	6.31	1.15	32.99	11.28	3.66	24.06	79.46	4.81	57.05	6%	72%
BLA450	0	0.06	35.23	0	0	6.39	41.69	0.06	41.63	0%	100%
BLA460	0.06	0.05	10.12	0	0	0.11	10.35	0.05	10.24	0%	99%
BLA470	2.16	23.64	113.09	0	18.32	53.87	211.08	41.96	166.95	20%	79%
BLA480	1.57	10.95	41.71	0	7.57	41.54	103.34	18.52	83.25	18%	81%
BLA490	0	91.13	202.97	0	35.47	58.31	387.88	126.6	261.28	33%	67%
BLA500	0.23	24.26	75.31	0	0.44	16.82	117.05	24.7	92.13	21%	79%
BLA510	13.09	81.58	188.26	7.19	116.07	186.03	592.21	197.65	374.28	33%	63%
BLA520	0.95	38.76	18.2	0.59	3.04	5.31	66.85	41.8	23.51	63%	35%
BRN001	0.31	0.15	0	4.56	0	0	5.02	0.15	0	3%	0%

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BRN002	176.33	159.96	118.07	159.5	20.04	15.09	649	180	133.16	28%	21%
CHR001	16.12	24.83	112.37	11.19	2.96	8.55	176.02	27.79	120.93	16%	69%
CHR002	6.17	8.23	25.98	11.19	2.41	17.08	71.06	10.64	43.06	15%	61%
CHR003	2.86	1.32	2.89	22.04	0	16.13	45.23	1.32	19.02	3%	42%
CHR004	26.62	30.31	60.92	16.29	12.21	61.06	207.4	42.52	121.98	21%	59%
CHR005	16.7	97.11	221.82	20.69	13.89	49.31	419.52	110.99	271.13	26%	65%
CHR006	250.94	233.71	403.38	8.31	24.49	38.77	959.6	258.2	442.15	27%	46%
CHR007	17.76	86.9	314.83	0	3.99	11.46	434.94	90.89	326.29	21%	75%
CRI001	7	64.74	24.24	3.95	5.47	2.2	107.59	70.2	26.44	65%	25%
CRI002	72.78	105.4	141.53	49.25	30.58	95.91	495.45	135.98	237.43	27%	48%
CRI003	386.04	20.89	166.24	12.35	1.54	10.29	597.35	22.43	176.53	4%	30%
CRI004	340.51	123.52	292.56	6.85	8.14	11.8	783.37	131.66	304.36	17%	39%
CRI005	130.23	99.8	96.92	9.64	9.19	19.22	365	108.99	116.14	30%	32%
CRI006	103.88	104.51	83.34	6.92	7.25	10.34	316.24	111.75	93.69	35%	30%
DEM001	7.37	62.62	88.59	5.85	36.71	58.49	259.62	99.33	147.08	38%	57%
DEM002	2.69	52.71	93.23	0	19.32	31.16	199.1	72.03	124.39	36%	62%
DEM003	71.15	38.4	130.46	20.9	10	49.74	320.65	48.4	180.2	15%	56%
DEM004	0.21	20.46	12.92	0.19	7.36	5.56	46.69	27.82	18.48	60%	40%
DEM005	25.1	115.61	85.06	18.3	10.21	51.8	306.08	125.82	136.85	41%	45%
DEM006	9.75	117.88	201.08	4.38	22.6	75.92	431.62	140.48	277.01	33%	64%
DEM007	3.47	45.04	215.65	3.26	20.98	53.89	342.29	66.02	269.53	19%	79%
DEM008	8.5	364.83	347.44	0.01	39.47	75.69	835.94	404.3	423.12	48%	51%
DEM009	0	168.25	12.84	0	5.24	0.6	186.93	173.49	13.44	93%	7%
DEM010	0	293.06	2.61	0	0	0	295.67	293.06	2.61	99%	1%
DEM011	0	186.74	2.15	0	0	0	188.89	186.74	2.15	99%	1%
DEM012	0	107.35	4.51	0	0	0	111.86	107.35	4.51	96%	4%
DEM111	0	1.14	0	0	0	0	1.14	1.14	0	100%	0%
DEM113	3.69	7.76	4.87	0	0	0	16.32	7.76	4.87	48%	30%

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DEM114	0	1.21	0	0	0	0	1.21	1.21	0	100%	0%
DEM115	0	3.98	0.03	0	0	0	4	3.98	0.03	100%	1%
DEM116	0	1.91	0	0	0	0	1.91	1.91	0	100%	0%
DEM117	0	2.72	0	0	0	0	2.72	2.72	0	100%	0%
DEM118	0	6.5	0	0	0.02	0	6.52	6.52	0	100%	0%
DEM119	0	0.47	0.2	0	0	0	0.67	0.47	0.2	70%	30%
DEM120	0	26.51	0	0	0	0	26.51	26.51	0	100%	0%
DEM121	0	0.88	0	0	0	0	0.88	0.88	0	100%	0%
DEM122	0	1.11	0	0	0	0	1.11	1.11	0	100%	0%
DUB001	3.59	25.04	35.92	14.62	17.48	29.69	126.34	42.52	65.61	34%	52%
DUB003	2.39	4.15	5.64	0.87	2.42	4.56	20.03	6.57	10.2	33%	51%
DUB005	1.73	4.87	3.16	0	0.89	1.29	11.94	5.76	4.45	48%	37%
DUB006	14.8	120.97	187.98	46.6	30.62	58.21	459.18	151.59	246.19	33%	54%
DUB007	15.03	45.31	62.2	2.41	5.15	9.89	139.99	50.46	72.09	36%	51%
GRE013	8.78	2.04	0.44	1353.31	67.81	57.49	1489.87	69.84	57.93	5%	4%
GRE023	309.6	59.26	65.66	1234.74	115.87	89.04	1874.17	175.13	154.7	9%	8%
GRE033	499.9	76.11	125.01	875	81.99	83.2	1741.22	158.1	208.21	9%	12%
GRE043	702.16	210.96	193.88	600.64	68.4	143.71	1919.75	279.36	337.59	15%	18%
GRE053	151.47	114.67	50.24	274.2	43.55	11.96	646.08	158.22	62.2	24%	10%
GRE063	365.61	159.08	65.76	520.31	52.58	68.17	1231.5	211.66	133.93	17%	11%
GRE073	752.16	258.25	162.26	429.72	50.33	46.04	1698.76	308.58	208.3	18%	12%
GRE083	645.55	123.35	149.13	725.72	95.84	63.66	1803.24	219.19	212.79	12%	12%
GRE093	330.12	27.53	149.35	0.26	0	1.49	508.76	27.53	150.84	5%	30%
GRE103	573.97	139.61	106.11	513.48	85.48	52.39	1471.05	225.1	158.5	15%	11%
GRE113	141.39	74.83	104.58	326.44	18.04	50.32	715.61	92.87	154.9	13%	22%
GRE119	1074.92	114.69	193.36	1057.11	29.07	105.27	2574.41	143.76	298.63	6%	12%
GRE120	1705.45	65.71	232.61	352.99	21.78	66.02	2444.55	87.49	298.63	4%	12%
GRE121	409.64	44.51	108.44	0	0.15	0.62	563.37	44.66	109.07	8%	19%

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GRE122	1112.64	678.05	985.67	31.44	29.86	14	2851.66	707.91	999.66	25%	35%
GRE123	224.07	67.54	88.01	4.76	0.69	0.52	385.59	68.23	88.53	18%	23%
GRE130	824.39	39.82	207.08	0	0	0.03	1071.31	39.82	207.1	4%	19%
GRE131	589.3	63.37	94.03	44.98	23.93	14.09	829.7	87.29	108.12	11%	13%
GRE132	246.75	164.55	105.08	43.33	22.04	11.04	592.79	186.59	116.12	31%	20%
GRE133	79.97	15.76	13.2	79.51	6.56	3.37	198.37	22.32	16.57	11%	8%
GRE143	178.63	24.59	28.95	33.69	1.97	12.79	280.62	26.56	41.74	9%	15%
GRE153	259.62	159.79	204.69	290.43	42.06	88.31	1044.9	201.85	293	19%	28%
GRE163	315.22	112.59	270.24	223.58	26.7	64.82	1013.15	139.29	335.06	14%	33%
GRE174	180.1	22.79	133.72	222.02	122.09	122.52	803.24	144.88	256.24	18%	32%
GRE184	142.14	184.76	146.83	27.78	31.54	24.07	557.11	216.3	170.89	39%	31%
GRE204	114.68	291.89	339.2	34.83	14.12	24.26	818.98	306.01	363.46	37%	44%
GRE214	30.49	44.55	67.17	120.76	19.44	59.36	341.78	63.99	126.53	19%	37%
GRE224	96.94	159.8	155.27	228.93	46.03	123.83	810.81	205.82	279.11	25%	34%
GRE234	12.39	19.36	13.72	35.16	4.7	7.91	93.23	24.06	21.63	26%	23%
GRE244	231.93	329.31	659.69	17.13	24.34	60.09	1322.49	353.65	719.78	27%	54%
GRE254	147.17	372.12	638.59	158.54	24.06	70.18	1410.66	396.18	708.77	28%	50%
GRE264	128.43	133.17	539.92	1.09	8.3	30.12	841.04	141.48	570.05	17%	68%
GRE274	2.96	7.48	30.86	4.65	2.29	3.11	51.35	9.77	33.97	19%	66%
GRE284	247.66	393.3	773.14	104.03	71.05	95.62	1684.8	464.35	868.76	28%	52%
GRE294	184.93	200.54	531.6	5.66	5.42	13.4	941.56	205.96	545	22%	58%
GRE304	185.47	495.05	660.79	44.74	61.91	96.39	1544.35	556.96	757.18	36%	49%
GRE314	115	356.07	342.35	56.15	124.32	194.38	1188.27	480.39	536.72	40%	45%
GRE325	0.16	189.53	277.97	0	77.34	122.93	667.93	266.87	400.9	40%	60%
GRE335	47.18	183.03	248.83	19.17	45.07	95.15	638.43	228.09	343.99	36%	54%
GRE345	11.52	121.52	105.27	0.56	22.81	24.97	286.66	144.33	130.24	50%	45%
GRE355	29.58	137.01	249.39	3.71	17.63	29.48	466.8	154.64	278.87	33%	60%
GRE365	5.08	55.57	107.22	3.89	13.97	22.36	208.09	69.54	129.58	33%	62%

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GRE375	11.94	69.66	46.43	6.1	27.79	31.17	193.08	97.45	77.6	50%	40%
GRE385	20.67	52.04	44.86	58.94	122.66	63.83	363	174.69	108.69	48%	30%
GRE395	3.37	110.95	192.23	1.12	38.4	89.19	435.25	149.35	281.41	34%	65%
GRE405	17.19	33.7	160.78	1.32	7.27	23.71	243.96	40.96	184.49	17%	76%
GRE415	16.44	38.69	141.31	1.74	8.52	18.14	224.85	47.21	159.45	21%	71%
GRE425	19.59	62.74	126.25	5.66	13.24	18.33	245.8	75.98	144.58	31%	59%
GRE435	9.04	1.6	2.63	7.05	14.27	14.21	48.79	15.87	16.83	33%	34%
GRE445	50.86	45.45	69.06	97.2	83.86	85.29	431.71	129.31	154.35	30%	36%
GRE455	11	269.24	285.13	19.89	87.77	84.72	757.75	357.01	369.85	47%	49%
GRE465	3.99	233.83	51.15	0.75	29.39	8.28	327.4	263.23	59.43	80%	18%
GRE475	0.59	100.94	178.62	0.21	49.07	42.24	371.66	150.01	220.86	40%	59%
GRE485	13.1	113.33	80.53	2.3	33.04	9.45	251.75	146.37	89.98	58%	36%
GRE495	5.69	123.81	140.45	3.02	27.52	20.13	320.63	151.33	160.59	47%	50%
GRE505	8.73	52.08	47.37	10.96	42.96	58.52	220.62	95.05	105.89	43%	48%
GRE515	9.47	3.11	4.46	4.51	22.29	11.37	55.22	25.4	15.84	46%	29%
GRE525	14.58	66.42	95.75	9.72	53.85	35.19	275.5	120.27	130.94	44%	48%
GRE535	0.19	12.38	25.94	0.69	51.22	24.54	114.96	63.6	50.48	55%	44%
GRE545	1.57	26.53	57.47	5.81	72.58	62.13	226.08	99.1	119.6	44%	53%
GRE555	1.16	0.33	0.71	7.29	21.21	28.33	59.03	21.54	29.04	36%	49%
GRE565	24.4	170.2	113.16	40.32	67.5	104.1	519.68	237.7	217.26	46%	42%
GRE575	121.19	206.67	642.99	11.58	155.35	151.54	1289.33	362.02	794.54	28%	62%
GRE576	111.35	158.81	170.63	1.8	27.94	42.34	512.86	186.75	212.97	36%	42%
GRE585	41.56	688.94	1411.02	25.56	343.32	428.3	2938.7	1032.26	1839.32	35%	63%
GRE596	227.04	1052.75	1055.28	50.17	749.05	415.92	3550.21	1801.8	1471.2	51%	41%
GRE606	5.85	137.45	127.16	0.64	66.22	34.85	372.18	203.67	162.02	55%	44%
GRE615	148.52	575.51	1264.9	22.98	236.73	345.87	2594.52	812.23	1610.78	31%	62%
GRE616	5.44	28.3	53.34	1.69	14.97	22.45	126.18	43.27	75.78	34%	60%
GRE617	1.18	30.27	85.07	0	19.29	21.22	157.03	49.56	106.29	32%	68%

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GRE618	0	21.99	44.72	0	48.44	20.55	135.7	70.43	65.28	52%	48%
GRE619	6.15	109.89	118.04	0.21	29.52	36.09	299.89	139.41	154.13	46%	51%
GRE625	18.11	51.92	98.92	2.71	24.47	43.48	239.61	76.39	142.4	32%	59%
GRE626	0.93	12.96	47.94	0	2.94	15.34	80.11	15.9	63.28	20%	79%
GRE627	0	32.54	42.61	0	6.92	7.99	90.06	39.46	50.6	44%	56%
GRE628	0.19	5.17	8.06	0.23	3.65	8.65	25.94	8.82	16.71	34%	64%
GRE629	0	28.76	35.18	0	4.94	8.17	77.05	33.7	43.35	44%	56%
GRE630	0.23	26.33	40.29	0.23	4.43	5.74	77.25	30.76	46.03	40%	60%
GRE635	15.08	427.86	263.64	18.71	145.54	84.96	955.8	573.4	348.6	60%	36%
GRE636	0.14	1.24	28.51	0	0.51	3.9	34.31	1.75	32.41	5%	94%
GRE637	0.21	23.75	60.96	0	8.7	14.66	108.29	32.45	75.63	30%	70%
GRE638	0	34.6	38.8	0	10.01	6.92	90.34	44.62	45.73	49%	51%
GRE639	0	45.45	51.18	0	10.15	11.93	118.72	55.6	63.11	47%	53%
GRE645	6.91	15.64	40.07	3.51	4.91	16.86	87.9	20.55	56.93	23%	65%
GRE655	12.03	106.12	104.81	14.03	122.43	94.51	453.93	228.55	199.32	50%	44%
GRE666	1.48	49.84	16.3	0	14.25	8.98	90.85	64.09	25.28	71%	28%
GRE675	0	9.54	43.4	5.81	39.21	74.8	172.76	48.75	118.2	28%	68%
GRE685	3.69	25.95	14.94	0.68	9.15	5.04	59.46	35.1	19.99	59%	34%
GRE695	11.42	20.62	23.46	6.92	39.95	53.37	155.74	60.57	76.83	39%	49%
GRE705	3.55	37.53	26.97	3.77	10.63	13.54	96	48.17	40.51	50%	42%
GRE715	12.02	48.97	31.49	26.71	32.72	42.3	194.21	81.69	73.79	42%	38%
GRE725	7.83	126.56	162.89	2.57	20.85	34.23	354.94	147.42	197.12	42%	56%
GRE735	2.61	46.1	25.58	0.46	8.63	4.74	88.11	54.72	30.31	62%	34%
GRE745	0	126.27	226.76	0.65	55.47	101.45	510.59	181.74	328.2	36%	64%
GRE755	0	4.53	55.29	0	39.63	35.88	135.34	44.17	91.18	33%	67%
GRE765	0.23	75.01	53.39	0	8.64	11.51	148.78	83.65	64.9	56%	44%
GRE775	2.16	190.52	209.73	0	41.96	57.8	502.16	232.48	267.53	46%	53%
GRE785	6.08	85.96	121.05	0.21	36.11	23.35	272.77	122.08	144.4	45%	53%

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	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
GRE795	0	15.17	22.85	0.64	4.4	8.88	51.94	19.57	31.72	38%	61%
GRE805	1.12	118.17	202.69	0.44	18.21	34.86	375.48	136.37	237.55	36%	63%
GRE815	0	39.34	68.43	0	2.34	6.54	116.65	41.68	74.97	36%	64%
GRE825	14.59	65.14	131	9.37	13.69	32.52	266.32	78.83	163.52	30%	61%
GRE835	1.4	54.45	54.34	0.23	8.31	5.5	124.24	62.77	59.84	51%	48%
GRE845	7.09	29.57	71.31	0.23	8.31	16.19	132.69	37.88	87.49	29%	66%
GRE855	1.08	70.37	118.14	1.52	15.8	44.12	251.03	86.17	162.26	34%	65%
GRE865	21.01	202.79	212.39	9.21	81.38	75.53	602.3	284.16	287.91	47%	48%
GRE875	13.85	94.36	109.81	1.2	19.32	22.19	260.74	113.68	132	44%	51%
GRE885	37.51	185	261.35	1.05	25.09	21.84	531.84	210.09	283.18	40%	53%
GRE895	37.76	81.21	104.23	0.51	22.66	22.63	269	103.88	126.86	39%	47%
GRE905	5.6	45.24	69.57	0.23	10.33	13.97	144.94	55.57	83.54	38%	58%
GRE915	16.77	129.57	162.66	38.77	70.64	102.9	521.32	200.21	265.56	38%	51%
GRE925	25.1	82.52	67.3	22.6	28.13	24.33	249.96	110.65	91.62	44%	37%
GRE935	1.33	70.3	79.39	0	2.95	0.14	154.11	73.25	79.53	48%	52%
HAM010	0.2	27.08	4.38	0.55	26.02	23.13	81.37	53.1	27.52	65%	34%
HAM015	7.44	117.29	202.38	0.44	20.45	30.5	378.49	137.74	232.88	36%	62%
HAM020	0	40.04	87.87	0	19	13.9	160.82	59.05	101.77	37%	63%
HAM030	2.64	48.89	73.09	3.14	37.8	38.74	204.3	86.69	111.83	42%	55%
HAM040	1.52	68.16	87.86	0.23	12.55	15.83	186.14	80.71	103.69	43%	56%
HAM050	1.31	68.31	112.04	0.85	19.68	24.85	227.04	87.99	136.89	39%	60%
IWS001	0	76.64	0.27	0	0.23	0	77.13	76.86	0.27	100%	0%
JOE010	17.91	98.76	153.35	2.71	16.43	35.99	325.15	115.19	189.34	35%	58%
JOE020	20.62	62.21	84.06	0	15.53	19.71	202.13	77.74	103.77	38%	51%
JOE030	10.44	82.68	108.49	1.35	15.02	23.43	241.4	97.7	131.92	40%	55%
JOE040	4.87	141.01	101.37	0	0	0.15	247.4	141.01	101.52	57%	41%
JOE050	0.44	172.91	219.12	3.86	48	72.05	516.37	220.91	291.17	43%	56%
LGR101	0	32.58	2.97	0	6.19	1.62	43.37	38.77	4.6	89%	11%

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	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
LKO010	3.39	16.68	27.24	0.44	6.48	7.75	61.97	23.15	34.99	37%	56%
LKO020	10.48	26.79	30.76	0.67	6.2	6.55	81.44	32.99	37.3	41%	46%
LKO030	1.5	4.96	20.1	0.44	1.12	3.95	32.06	6.08	24.04	19%	75%
LKO035	0.23	18.7	35.41	0	2.93	6	63.26	21.62	41.4	34%	65%
LKO040	2.71	64.25	68.48	0	16.21	18.34	169.99	80.46	86.83	47%	51%
LKO050	0	6.95	12.84	0	2.54	6.99	29.32	9.49	19.83	32%	68%
LKO051	0	17.72	29.64	0	2.1	2.89	52.36	19.82	32.53	38%	62%
LKO052	0	1.24	2.11	0	0.4	0.44	4.19	1.64	2.55	39%	61%
LKO053	0	6.91	13.35	0	3.28	5.97	29.51	10.19	19.32	35%	65%
LKO054	0	9.04	10	0	2.77	4.18	25.99	11.81	14.17	45%	55%
LKO055	0	10.75	15.99	0	2.86	5.35	34.95	13.61	21.34	39%	61%
LKO060	4.53	36.94	87.55	0	5.66	20.45	155.12	42.59	108	27%	70%
LKO070	4.21	87.87	111.67	11.74	36.39	61.23	313.1	124.26	172.9	40%	55%
LKO080	1.74	48.89	103.65	0.19	16.37	30.07	200.9	65.25	133.73	32%	67%
LKO090	0.67	3.5	13.42	0.23	0.88	1.19	19.88	4.38	14.61	22%	73%
LKO099	4.87	98.94	153.73	1.1	47.88	55.62	362.15	146.82	209.36	41%	58%
LKO100	2.6	96.74	159.46	6.87	24.54	53.6	343.8	121.28	213.06	35%	62%
LKO110	21.61	51.33	84.67	0	11.99	13.87	183.47	63.33	98.54	35%	54%
LKO120	1.61	20.29	30.14	3.35	9.14	12.45	76.98	29.43	42.59	38%	55%
LKO130	0.85	114.5	77.49	8.31	39.04	47.47	287.66	153.53	124.96	53%	43%
LPS001	3.54	17.08	6.01	10.12	3.75	4.89	45.38	20.82	10.9	46%	24%
LPS002	3.39	13.68	14.88	20.16	4.7	22.05	78.85	18.37	36.93	23%	47%
LPS003	0.03	4.2	2.88	4.37	18.82	2.02	32.31	23.02	4.9	71%	15%
LPS004	7.3	46.06	62.75	24.32	23.87	45.49	209.79	69.93	108.23	33%	52%
LPS005	40.15	251.73	229.21	7.19	57.92	48.54	634.73	309.65	277.74	49%	44%
LPS006	18.41	120.87	208.64	2.71	47.52	59.51	457.67	168.39	268.15	37%	59%
LPS007	1.49	51.38	46.97	0.83	14.08	15.43	130.19	65.47	62.4	50%	48%
LPS008	26.11	184.66	253.68	2.65	73.51	79.89	620.5	258.17	333.58	42%	54%

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LPS009	0.66	47.92	56.15	0.34	13.56	19.51	138.15	61.48	75.66	45%	55%
LPS010	0.19	22.05	33.17	0.04	4.7	5.42	65.56	26.75	38.59	41%	59%
LPS011	1.24	26.56	33.74	0	4.27	3.57	69.39	30.83	37.31	44%	54%
LPS012	0	0.17	0.1	0	0	0	0.27	0.17	0.1	63%	37%
LPS013	0.95	26.52	64.84	0.23	3.19	12.15	107.88	29.71	76.99	28%	71%
LPS014	0	7.19	2.21	0	2.53	0.38	12.31	9.72	2.59	79%	21%
LPS016	0.22	15.38	2.12	3.76	13.01	1.26	35.75	28.39	3.39	79%	9%
LPS017	10.47	68.24	68.76	2.59	17.67	16.69	184.43	85.91	85.45	47%	46%
LPS019	24.69	175.07	211.87	8.88	39.59	64.51	524.62	214.66	276.38	41%	53%
LPS020	2.26	96.36	129.37	0.14	20.84	27.92	276.89	117.2	157.29	42%	57%
LPS100	3.89	81.95	102.19	1.1	16.2	24.61	229.94	98.16	126.8	43%	55%
LPS101	63.06	365.25	527.42	16.01	94.13	156.57	1222.45	459.38	683.99	38%	56%
LPS116	40.39	53.9	85.3	11.83	17.88	23.91	233.2	71.78	109.21	31%	47%
MAS010	1.87	77.46	88.06	0.17	33.25	22.34	223.15	110.71	110.39	50%	49%
MAS020	0.23	15.28	31.02	0.11	3.75	7.87	58.26	19.03	38.88	33%	67%
MAS030	4.62	72.74	100.09	0.74	18.27	31.3	227.75	91.01	131.38	40%	58%
MAS040	4.42	95.8	79.32	1.12	17.32	17.59	215.58	113.12	96.91	52%	45%
MAS050	0.09	17.5	55.09	0	6.52	23.14	102.34	24.02	78.23	23%	76%
MAS060	0	49.59	35.8	0.23	11.43	10.76	107.8	61.02	46.55	57%	43%
MAS070	0	2.18	35.36	0	1.09	10.55	49.18	3.27	45.91	7%	93%
MAS080	1.95	22.97	35.22	3.69	9.95	21.8	95.58	32.92	57.01	34%	60%
MAS090	0.21	27.98	33.99	3.08	19.97	33.53	118.76	47.96	67.52	40%	57%
MAS100	1.73	80.92	125.05	0	22.51	40.59	270.8	103.44	165.64	38%	61%
MCS010	4.72	97.83	82.84	54.45	53.06	26.78	319.68	150.89	109.62	47%	34%
MCS020	3.1	66.66	106.56	5.12	26.96	46.79	255.19	93.62	153.35	37%	60%
MCS030	0.64	52.84	92.36	0.44	40	99.01	285.29	92.85	191.37	33%	67%
MCS040	6.8	68.88	108.66	2.77	19.46	36.61	243.19	88.34	145.27	36%	60%
MCS050	19.93	97.76	182.99	11.48	80.56	111.89	504.62	178.32	294.88	35%	58%

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MCS060	5.56	151.94	158.15	0.75	56.94	46.3	419.63	208.87	204.45	50%	49%
MIL001	9.28	45.61	90	1.81	8.64	12.38	167.72	54.25	102.37	32%	61%
MIL002	5.98	34.76	105.62	5.92	7.82	26.29	186.38	42.58	131.91	23%	71%
MIL003	4.44	72.66	82.82	1.28	20.05	21.26	202.51	92.71	104.08	46%	51%
MIL004	0.37	59.14	81.32	0	16.5	19.28	176.62	75.65	100.61	43%	57%
MIL005	43.84	71.88	89.98	0	26.79	32.39	264.87	98.67	122.37	37%	46%
MIL006	1.21	89.98	132.22	0.23	55.09	63.08	341.8	145.07	195.3	42%	57%
MIL007	0	44.74	204.49	0.23	22.39	72.47	344.32	67.13	276.96	19%	80%
MIL008	0	6.34	6.43	0.46	2.2	3.56	18.99	8.54	9.99	45%	53%
MIL009	0	15.29	19.28	0	1.88	3.59	40.04	17.17	22.87	43%	57%
MIL010	0	43.41	9.81	0	1.52	2.1	56.83	44.92	11.91	79%	21%
MIL011	0.69	59.53	41.31	0	2.32	1.95	105.79	61.84	43.26	58%	41%
MIL012	0.67	47.54	26.54	0	0.19	0	74.94	47.73	26.54	64%	35%
MIL013	0	14.73	5.71	0	11.23	6.98	38.65	25.96	12.69	67%	33%
MIL014	4.89	70.9	33.77	0	10.01	4.18	123.75	80.91	37.95	65%	31%
MIL015	4.02	11.62	12.64	0	4.37	0.85	33.5	15.99	13.49	48%	40%
MIL016	9.78	26.66	8.79	0.04	7.63	6.84	59.74	34.3	15.63	57%	26%
MIL017	1.22	5.48	1.33	0	12.15	1.94	22.12	17.62	3.27	80%	15%
MIL018	1.68	49.91	18.21	0.38	12.14	6.13	88.44	62.05	24.34	70%	28%
MIL019	2.81	27.65	41.29	0	4.85	2.98	79.58	32.5	44.27	41%	56%
MIL020	22.58	86.16	116.19	0.48	22.58	20.9	268.89	108.74	137.09	40%	51%
MIL021	0.31	28.95	55	0	7.03	9.4	100.69	35.98	64.4	36%	64%
MIL022	0.23	23.67	24.93	0.23	8.33	13.8	71.19	32	38.73	45%	54%
MIL023	0.67	82.82	144.23	0.21	11.94	20.67	260.53	94.76	164.9	36%	63%
MIL024	0	97.42	130.74	0	41.13	55.72	325.01	138.55	186.46	43%	57%
MIL025	0.9	98.93	117.51	0	20.94	19.16	257.44	119.88	136.66	47%	53%
MIL026	0	57.53	82.48	0	16.13	19.28	175.43	73.66	101.77	42%	58%
MIL027	0.23	82.74	102.21	0	40.5	40.31	265.98	123.24	142.52	46%	54%

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MIL028	3.31	89.71	115.35	3.17	23.47	37.11	272.11	113.18	152.46	42%	56%
MIL029	1.59	7.05	17.82	0	1.58	3.03	31.07	8.64	20.84	28%	67%
MIL030	0	5.43	21.01	0	4.5	7.88	38.82	9.94	28.89	26%	74%
MIL031	2.67	12.45	75.73	1.07	0.97	12.86	105.76	13.42	88.6	13%	84%
MIL032	1.73	56.07	122.06	0	11.26	35.09	226.22	67.34	157.15	30%	69%
MIL033	3.47	19.17	85.19	7.14	18.81	32.9	166.68	37.97	118.09	23%	71%
MIL034	0	0.49	0	0	6.04	2.55	9.08	6.53	2.55	72%	28%
MIL109	0	47.1	2.24	0	0	0	49.34	47.1	2.24	95%	5%
MIL120	0	22.32	4.5	0	0	0	26.82	22.32	4.5	83%	17%
MIL130	0.44	79.29	105.59	5.07	47.99	44.71	283.09	127.28	150.3	45%	53%
MIL200	0	0.22	0	0	0	0	0.22	0.22	0	100%	0%
MIL201	0	0.87	0	0	0	0	0.87	0.87	0	100%	0%
MIL202	0	0.62	0	0	0	0	0.62	0.62	0	100%	0%
MIL203	0	1.54	0	0	0	0	1.54	1.54	0	100%	0%
MIL204	0	0.76	0	0	0	0	0.76	0.76	0	100%	0%
MIL205	0	1.21	0	0	0	0	1.21	1.21	0	100%	0%
MIL206	0	3.72	0.11	0	3.01	0.43	7.27	6.73	0.54	93%	7%
MIL207	0	0.56	0	0	0	0	0.56	0.56	0	100%	0%
MIL208	0	0.57	0	0	0	0	0.57	0.57	0	100%	0%
MIL209	0	1.7	0	0	0	0	1.7	1.7	0	100%	0%
MIL210	0	1.24	0	0	0	0	1.24	1.24	0	100%	0%
MIL211	0	0.57	0	0	0	0	0.57	0.57	0	100%	0%
MIL212	0	5.04	0	0	0.5	0	5.54	5.54	0	100%	0%
MIL213	0.44	8.81	15.35	0	8.75	3.79	37.14	17.56	19.14	47%	52%
MIL214	0	4.2	0	0	0	0	4.2	4.2	0	100%	0%
MIL215	0	33.49	0.1	0	0	0	33.59	33.49	0.1	100%	0%
MIL216	0	1.76	0.14	0	0.56	0	2.45	2.31	0.14	94%	6%
MIL217	0	42.25	5.11	0	0	0	47.36	42.25	5.11	89%	11%

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MIL218	0	15.5	0.67	0	0.01	0.07	16.25	15.51	0.74	95%	5%
MIL219	0	30.38	2.25	0	0	0	32.63	30.38	2.25	93%	7%
MIL220	0	33.29	4.02	0	0.13	0	37.44	33.42	4.02	89%	11%
MIL221	0	2.66	0.29	0	0	0	2.95	2.66	0.29	90%	10%
NEW011	876.38	46.3	231.2	4.89	1.35	3.6	1163.74	47.66	234.81	4%	20%
NEW021	51.82	0.59	28.19	0	0	0	80.59	0.59	28.19	1%	35%
NEW031	53.14	165.17	138.01	1.15	6.22	3.84	367.53	171.39	141.85	47%	39%
NEW041	622.25	26.45	204.83	0	0	0	853.53	26.45	204.83	3%	24%
NEW051	79.63	133.54	147	0	0.33	0.31	360.81	133.87	147.3	37%	41%
NEW061	184.48	29.65	95.48	0	0	0	309.61	29.65	95.48	10%	31%
NEW071	64.15	101.12	122.83	1.12	1.37	4.87	295.45	102.48	127.7	35%	43%
NEW081	335.13	429.75	701.57	5.44	37.38	35.43	1544.69	467.13	737	30%	48%
NEW091	10.85	67	149.91	0	4.66	15.37	247.78	71.66	165.27	29%	67%
NEW101	20.71	120.64	359.33	5.48	89.49	87.47	683.12	210.13	446.8	31%	65%
NEW111	119.87	402.2	731.76	10.5	82.04	69.55	1415.92	484.24	801.31	34%	57%
NEW121	16.09	41.22	165.2	0.67	0.85	3.4	227.44	42.08	168.6	19%	74%
NEW131	12.41	173.61	492.08	0.43	6.42	11.23	696.17	180.03	503.3	26%	72%
NEW141	19.06	113.03	216.08	0	14.9	19.22	382.3	127.94	235.3	33%	62%
NEW151	0	54.81	106.13	0	26.37	42.15	229.46	81.18	148.28	35%	65%
NEW161	0.23	10.3	20.56	0	1.45	3.2	35.73	11.74	23.76	33%	66%
NEW171	4.79	107.37	456.89	1.58	24.04	60.61	655.28	131.41	517.5	20%	79%
NEW181	18.84	132.75	459.62	18.04	25.11	51.41	705.76	157.85	511.03	22%	72%
NEW191	30.58	258.24	262.79	40.97	33.77	43.81	670.16	292.02	306.6	44%	46%
NEW201	2.07	60.35	88.42	0	2.23	1.07	154.14	62.58	89.49	41%	58%
NEW211	50.99	373.07	484.83	0.54	28.58	7.93	945.95	401.66	492.76	42%	52%
NEW221	19.42	205.8	283.23	0.46	21.97	24.03	554.91	227.77	307.27	41%	55%
NEW231	117.05	291.66	357.01	1.79	11.65	7.62	786.78	303.31	364.63	39%	46%
NEW241	45.56	247.1	486.35	21.04	12.66	51.16	863.87	259.76	537.51	30%	62%

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	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
NEW251	23.94	81.84	128.45	0	1.33	0	235.55	83.17	128.45	35%	55%
NEW261	176.09	187.7	494.55	0	3.92	0.91	863.17	191.62	495.45	22%	57%
NEW271	50.74	158.85	508.27	2.55	14.23	25.22	759.86	173.09	533.49	23%	70%
NEW281	69.5	60.6	145.08	24.49	8.77	23.67	332.11	69.37	168.75	21%	51%
NEW291	56.88	18.23	33.85	10.37	0.08	7.27	126.67	18.3	41.11	14%	32%
SAL001	0.16	10.76	7.2	0	3.25	2.8	24.18	14.02	10	58%	41%
SAL002	2.83	20.61	24.66	18.29	13.7	21.39	101.48	34.31	46.05	34%	45%
SAL003	1.95	11.53	29.59	0	2.34	5.89	51.31	13.87	35.48	27%	69%
SAL004	1.56	1.23	3.34	3.75	0.6	4.94	15.42	1.83	8.28	12%	54%
SAL005	1.06	20.48	20.77	0.87	2.3	3.3	48.78	22.78	24.07	47%	49%
SAL006	0.28	47.41	41.4	0	16.2	13.75	119.04	63.61	55.15	53%	46%
SAL007	6.06	14.25	17.17	20.5	4.29	20.82	83.09	18.54	37.99	22%	46%
SAL008	0	16.1	39.05	0	1.65	8.27	65.07	17.75	47.32	27%	73%
SAL009	0	102.29	53.48	6.73	51.1	27.27	240.86	153.38	80.75	64%	34%
SAL010	0.69	12.5	14.11	2.3	7.56	2.98	40.14	20.06	17.09	50%	43%
SAL011	0	10.61	16.43	0	1.07	3.9	32.01	11.68	20.33	36%	64%
SAL012	0	27.04	60.14	0.47	16.08	17.24	120.97	43.12	77.38	36%	64%
SAL013	0	19.15	8.02	0	11.04	6.6	44.8	30.19	14.62	67%	33%
SAL014	0	20.78	7.93	0	7.87	3.7	40.28	28.65	11.63	71%	29%
SAL015	0	11.19	3.51	0	1.93	0.38	17.01	13.12	3.89	77%	23%
SAL016	0	11.9	3.45	1.66	7.48	1.4	25.89	19.38	4.85	75%	19%
SAL017	0	0.07	0.59	0	0.85	0.64	2.15	0.92	1.23	43%	57%
SAL019	0	54.23	34.23	0	23.81	11.77	124.05	78.04	46	63%	37%
SAL020	0	45.04	34.78	3.45	30.01	31.14	144.42	75.05	65.92	52%	46%
SOO012	42.96	278.01	491.94	31.14	61.12	150.6	1055.77	339.13	642.54	32%	61%
SOO022	25.68	311.85	617.49	37.08	98.84	215.48	1306.42	410.69	832.97	31%	64%
SOO032	59.53	82.21	340.87	506.66	43.74	55.65	1088.66	125.95	396.52	12%	36%
SOO042	33.39	116.96	239.4	11.4	43.39	87.71	532.25	160.34	327.11	30%	61%

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	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
SOO052	29.85	38.93	235.56	0.26	1.11	6.69	312.4	40.03	242.26	13%	78%
SOO062	37.22	63.18	171.75	46.23	28.3	72.43	419.1	91.48	244.18	22%	58%
SOO072	30.96	52.16	334.08	0.52	2	17.05	436.78	54.16	351.14	12%	80%
SOO082	20.26	76.39	171.79	28.76	30.21	89.52	416.93	106.6	261.31	26%	63%
SOO092	27.57	566.69	745.14	67.27	192.67	306.28	1905.63	759.37	1051.41	40%	55%
SOO102	31.98	197.01	301.01	37.54	66.35	140.81	774.7	263.36	441.82	34%	57%
SOO112	105.69	140.26	635.25	227.2	30.04	71.98	1210.42	170.3	707.23	14%	58%
SOO122	18.89	33.37	147.92	0	0.42	3.47	204.07	33.79	151.39	17%	74%
SOO132	40	38.32	163.64	0.44	7.11	12.08	261.58	45.43	175.72	17%	67%
SOO142	11.92	206.92	259.97	1.35	75.79	63.19	619.15	282.7	323.16	46%	52%
SOO152	11.85	55.41	136.34	2.62	19.78	42.08	268.08	75.19	178.42	28%	67%
SOO162	1.31	63.22	82.86	0.23	16.86	24.36	188.84	80.08	107.22	42%	57%
SOO172	162.33	93.39	138.47	5.1	23.25	32.63	455.17	116.64	171.1	26%	38%
SOO182	9.47	82.28	130.59	6.26	26.14	57.47	312.21	108.42	188.07	35%	60%
SOO192	5.3	24.83	86.37	1.35	3.41	6.37	127.64	28.25	92.74	22%	73%
SOO202	37.93	81.15	223.73	53.78	17.93	30.99	445.51	99.07	254.72	22%	57%
SOO212	16.3	171.64	241.58	12.02	113.17	105.66	660.37	284.81	347.24	43%	53%
SOO222	70.77	70.56	64.53	22.94	37.93	65.12	331.85	108.49	129.65	33%	39%
SOO232	0.67	38.88	65.39	53.16	53.29	46.29	257.68	92.17	111.68	36%	43%
SOO242	333.18	450.22	1728.65	79.43	136.38	283.08	3010.93	586.59	2011.73	19%	67%
SOO252	112.16	50.53	312.62	4.08	4.09	27.33	510.81	54.61	339.95	11%	67%
SOO262	72.64	86.24	417.07	22.34	21.2	40.35	659.84	107.44	457.42	16%	69%
SOO272	9.49	89.38	222.33	14.98	65.96	78.17	480.31	155.34	300.51	32%	63%
SOO282	51.35	200.11	271.8	12.33	77.71	107.08	720.39	277.82	378.89	39%	53%
SOO292	44.54	238.92	368.15	47.97	144.42	124.14	968.15	383.34	492.3	40%	51%
SOO302	80.2	168.49	448.89	1.34	37.49	54.7	791.1	205.98	503.59	26%	64%
SOO312	14.09	129.65	284.98	11.66	27.2	54.53	522.11	156.85	339.51	30%	65%
SOO322	21.7	63.33	168.5	23.25	14.36	59	350.13	77.68	227.5	22%	65%

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	Undev.	Dev	Mitigated	Undev.	Dev	Mitigated	Total	Total Dev	Total Mitigated	Total Dev	Total Mitigated
SOO332	36.21	155.95	377.59	20.88	83.36	93.29	767.3	239.31	470.89	31%	61%
SOO342	0.08	8.72	18.21	0	1.26	2.65	30.93	9.98	20.86	32%	67%
SOO352	92.46	157.78	525.81	0.2	5.78	21.73	803.76	163.57	547.54	20%	68%
SOO362	293.37	178.32	112.19	0.92	1.8	2.72	589.31	180.12	114.91	31%	19%
SOO372	140.47	138.14	53.06	1.1	5.81	3.79	342.38	143.95	56.85	42%	17%
SOO382	98.87	132.76	283.35	1.6	21.57	46.17	584.3	154.33	329.51	26%	56%
SOO392	676.8	142.24	442.94	6.2	8.31	29.81	1306.3	150.55	472.75	12%	36%
SOO402	444.06	203.87	573.18	31.13	21.87	52.16	1326.27	225.75	625.33	17%	47%
SOO412	566.87	119.63	58.79	106.16	31.51	22.64	905.59	151.14	81.43	17%	9%
SOO422	249.33	155.62	106.98	204.83	206.42	86.59	1009.77	362.04	193.57	36%	19%
SOO432	50.83	23.19	25.44	71.06	13.45	42.53	226.49	36.63	67.96	16%	30%
SOO442	528.78	291.83	492.81	122.22	106.25	163.26	1705.15	398.08	656.07	23%	38%
SOO452	567.61	668.32	1485.4	14.06	59.16	138.46	2933.01	727.48	1623.86	25%	55%
SOO462	49.83	141.95	429.67	13.42	21.49	77.42	733.77	163.44	507.08	22%	69%
SOO472	74.38	209.75	671.1	2.18	29.66	61.64	1048.7	239.4	732.74	23%	70%
SOO482	85.86	29.76	142.62	0	3.81	15	277.05	33.57	157.61	12%	57%
SOO492	14.22	27.67	190.12	0.35	1.69	6.61	240.66	29.36	196.73	12%	82%
SOO502	1.79	12.61	36.38	0.11	1.15	3.36	55.4	13.75	39.75	25%	72%
SOO512	9.24	46.8	161.78	0.23	2.72	7.56	228.33	49.51	169.35	22%	74%
SOO522	73.39	152.15	463.31	9.61	18.43	68.38	785.28	170.58	531.69	22%	68%
SOO532	57.68	266.4	333.76	18.59	15.5	48.83	740.76	281.9	382.59	38%	52%
SOO542	3.93	175.03	234.28	1.52	45.07	77.43	537.25	220.1	311.71	41%	58%
SOO552	19.61	162.87	203.62	0.23	44.31	56.8	487.44	207.19	260.42	43%	53%
SOO562	42.35	169.05	377.28	7.09	56.83	84.2	736.79	225.88	461.48	31%	63%
SOO572	10.45	145.39	342.7	0.81	30.89	46.87	577.11	176.28	389.58	31%	68%
SOO582	103.71	254.66	563.22	17.8	114.58	146.38	1200.34	369.23	709.61	31%	59%
SOO592	25.46	37.21	70.38	0.41	4.56	10.61	148.63	41.77	80.99	28%	54%
SOO602	16.7	81.96	121.81	24.99	54.31	52.64	352.4	136.27	174.45	39%	50%

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Study Area	26311	41867	66843	13931	12303	16507	177763	54170	83350	30%	47%