

Appendix 9

Residential “economic refill” study: 2001 to 2006

(DRAFT: August 11, 2009)

Introduction

This report presents the fourth residential refill study conducted by Metro for the Portland metropolitan area. These studies are generally conducted every three to five years to examine the historical residential refill rate by looking at actual residential development in the recent past. The most recent prior refill study collected data from 1997 to 2001 and found an average residential refill rate of 30.4% for the period. The current study collected data from 2001 to 2006 and estimated an average residential refill rate of 33.0% over the five year period with wide variation from year to year.

Background

What is refill?

Refill is composed of two types of development: redevelopment and infill. Redevelopment means demolishing an existing structure to build a new dwelling. An example of redevelopment would be tearing down an old house to build four townhouses in its place. Infill means building on land that is classified as developed, but does not require tearing down an existing structure to build a new one. For example, a homeowner owns a half acre lot with one house built on it and the lot is classified as developed in RLIS. Zoning allows the lot to be split into two lots so the homeowner divides the property and builds a second house on the vacant land. This is infill because the original house is still standing.

What is the refill rate?

The “refill rate” is the percentage of new dwelling units that are built on land that is already considered to be developed, instead of on vacant land. It is important to note here that we are comparing the number of refill units to the total of all new units built over a particular time period. So the refill rate is a proportion of new development, not a proportion of some land base.

Why is the refill rate important?

Metro accounts for a “refill” factor when estimating the residential land supply available within the Urban Growth Boundary in the urban growth report (UGR). For instance, if the residential refill rate is estimated at 20% and Metro’s 20-year growth is assumed to be 215,000 dwelling units, this means 20% of 215,000 units (43,000) will be built on land Metro considers previously developed. If the refill rate were 100%, all residential development would occur on developed land and Metro would require no

additional vacant land for housing. Conversely, if the refill rate were 0%, all future residential development would require vacant land. Clearly, estimates of the present residential refill rate and projections of its future value strongly influence calculations of how much residential land will need to be included within the Urban Growth Boundary.

How is the refill rate used?

The focus of this study is the historical residential refill rate over the period from 2001 to 2006. Building permit data, information about the regional land inventory, aerial photographs and site visits are used to identify where refill is actually happening on the ground. This historical information can help to inform assumptions about future refill rates. However, these historical rates may not be exactly the same as the refill rates that are assumed for projections of future housing needs. The ongoing documentation of historic refill rates provides a better understanding of the factors that may influence refill rates in the future.

Differences between the results of this study and refill rates reported in the UGR

Refill is defined differently in the UGR and in this “economic refill” study. It is important to note that these two different definitions produce different numeric results. The UGR refill rate is used in conjunction with the Regional Land Information System (RLIS), which returns land to the vacant land inventory if an existing structure is torn down and the land remains vacant for a period of time. The economic refill rate is used with a land inventory that classifies previously developed land to be developed, even if the land was scraped clean and remained vacant for several years before being redeveloped. This type of inventory will have a higher proportion of developed land than the UGR refill methodology, so the associated refill rate is usually slightly higher. Which refill rate is used depends on which land accounting system is being used, however the two systems are perfectly consistent and great care is always taken not to double count any type of land or development in either case. Both measures are still in use because the land use forecasting model Metroscope relies on the economic refill rate and the associated land inventory, while we must use a refill rate with a different definition in the context of the UGR.

UGR Refill:

Some prior refill studies, and the Urban Growth Report (UGR), have relied on a “UGR” definition of refill and the resulting refill rates. This definition was driven by the need for a technical definition of refill in terms of the Regional Land Information System (RLIS) that did not require any value judgments. UGR infill and redevelopment are defined as follows:

- **Infill:** Residential development (denominated in dwelling units) on a parcel without a pre-existing physical structure where Metro considers the parcel developed in the fiscal year (or years) prior to the fiscal year for which the building permit is issued. For instance a single family residential building permit issued between July 03 and June 04 for a parcel classed as developed in RLIS as of June 30, 2004 would be classified as infill provided no previous structure occupied it.

- **Redevelopment:** Same as above except that a structure or the identifiable remains of a structure were visible on the parcel in the fiscal year prior to the issuance of the residential building permit.

Economic Refill:

This appendix reports an “economic refill” rate. By virtue of reducing the classification exercise to a 99.9% mechanical operation in the context of the UGR, a limited number of building permits are classified in a somewhat counter-intuitive fashion. In order to address this issue, an “economic” classification system was developed. For example, in some fast growing suburban subdivisions on vacant land, a few building permits are assigned to parcels that Metro had classed as developed in the previous year. Since these parcels are no longer in the vacant land inventory, they are properly classed as infill in the UGR. While consistent with the Regional Land Information System (RLIS) accounting framework, this classification is somewhat misleading in an economic sense and would be classified as development occurring on vacant parcels according to the economic definition of refill. Conversely, in some instances on developed land, buildings are demolished and the land held vacant for a number of years. In many of those instances RLIS detects the vacant land and restores it to the vacant land inventory. Subsequently, when the land is redeveloped it is accounted for as development on vacant land according to the land accounting system. From an economic and historical perspective it is clearly redevelopment and would be classified as such under the economic definition of refill.

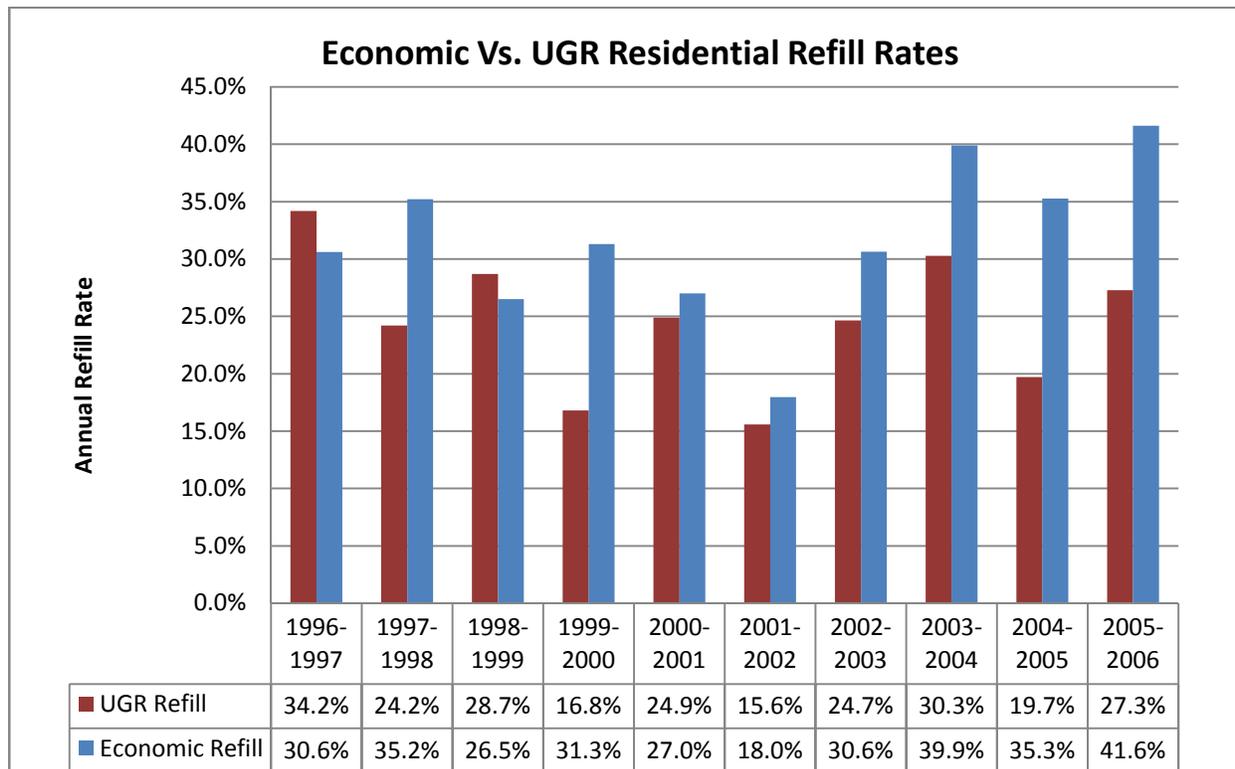
Economic refill definitions

Building permit data were used to identify new dwelling units built in the region over the period from 2001 to 2006. In order to identify each permit as being infill, redevelopment or occurring on vacant land, these classifications are defined as follows:

- **Vacant:** Residential development (denominated in dwelling units) on a taxlot, or portion of a taxlot, that is identified in the Regional Land Inventory System (RLIS) as vacant and has never had any development on it. This land is generally at least 90% vacant and the historical records show no evidence of any prior development.
- **Infill:** Residential development on land without a pre-existing physical structure where Metro considers the taxlot to be developed. For example, a homeowner owns a half acre taxlot with one house built on it and RLIS classifies the whole lot as developed. Zoning allows the property to be split into two smaller lots, so the homeowner divides the property and builds a second house on the vacant land. This is infill because the original house is still standing.
- **Redevelopment:** Same as above except that there was an existing structure at the site of the new development at some point in the past. An example of redevelopment would be tearing down an existing house to build four townhouses in its place. Another example would be building condos on a lot where the existing structure had been torn down years earlier and the land remained vacant for a period of time before being redeveloped.

Figure 1 compares historical UGR and economic refill rates and clearly indicates that the two measures have diverged in recent years. The five year average UGR refill rate for 1996 to 2001 was 26.5% and the average economic refill rate was 30.4%. For 2001 to 2006, the average UGR refill rate was 23.5% and the average economic refill rate was 33.0%. Between the two periods, the average UGR refill rate declined by 3 percentage points and the average economic refill rate increased by 2.6 percentage points.

Figure 1. Ten year comparison of economic and UGR refill rates



This gap between the different measures of refill can largely be attributed to how redevelopment is identified under the two systems. From 2001 to 2006, redevelopment accounted for about 77% of observed refill. For 2005-2006, nearly half of the single-family dwelling (SFD) units identified as economic redevelopment were classified as UGR vacant and almost a third of multi-family dwelling (MFD) units classified as economic redevelopment were called UGR vacant. In most cases this is because the redevelopment took place on land where the prior existing development was torn down years before the site was redeveloped, and so it was returned to the vacant lands inventory in RLIS but not in Metroscope’s land accounting system. The UGR definition of refill leads to sensitivity to the timing of observations. For example, if an existing house was torn down in January 2006, then an aerial photograph from July 2005 would show the lot as developed and an aerial photograph from July 2006 would show the lot as vacant. If a building permit for a new house were filed for the lot in June 2006, it

would be classified as UGR redevelopment. On the other hand, if the permit was filed in August 2006, it would likely be classified as occurring on vacant land according to RLIS.

Urban renewal areas are a significant driver of redevelopment, so increased urban renewal activity could contribute to this discrepancy between the UGR and economic refill rates. Currently, urban renewal areas account for about 8.3% of acreage within the UGB while nearly 36% of MFD units classified as redevelopment were built in urban renewal areas from 2001 to 2006. Almost 63% of these redevelopment MFD units were misidentified as occurring on vacant land using the UGR definition of refill. By contrast, about 23% of redevelopment MFD units outside of urban renewal areas were misidentified as vacant development.

Economic refill study procedures

The new dwelling units that were identified in the permit data were classified into one of the three definitions above (vacant, infill or redevelopment) using a series of procedures. First, the new dwelling unit permits were divided into SFD and MFD for analysis. In order to reduce the workload required by the classification process, the SFD permits were sampled at a rate of one in five using geographic weights to ensure a representative distribution across the region. The pool of SFD permits is fairly homogenous as most SFD permits represent a single dwelling on a single residential lot. By contrast, every MFD permit was evaluated, since there are fewer permits of this type and each multi-family development is unique in type, number of units and lot size. The SFD sample findings were then scaled by five so that the tables in this report represent the proper distribution of SFD to MFD units.

For both subsets, SFD and MFD, the following steps were taken:

1. Geo-code the permit based on address and find the taxlot that it falls on.
2. Check the Regional Land Information System (RLIS) database and aerial photos both before and after the date of the permit to classify the development as vacant, infill or redevelopment.
3. If these steps could not clearly identify the type of development, a site visit was conducted to try to classify the permit into the most appropriate category.

The following three figures show some examples of how these types of development were identified using the geo-coded permit location, tax lots from RLIS and aerial photographs before and after the development. More examples and descriptions can be found in Attachment 1.

Figure 2. Example of building permit identified as infill development

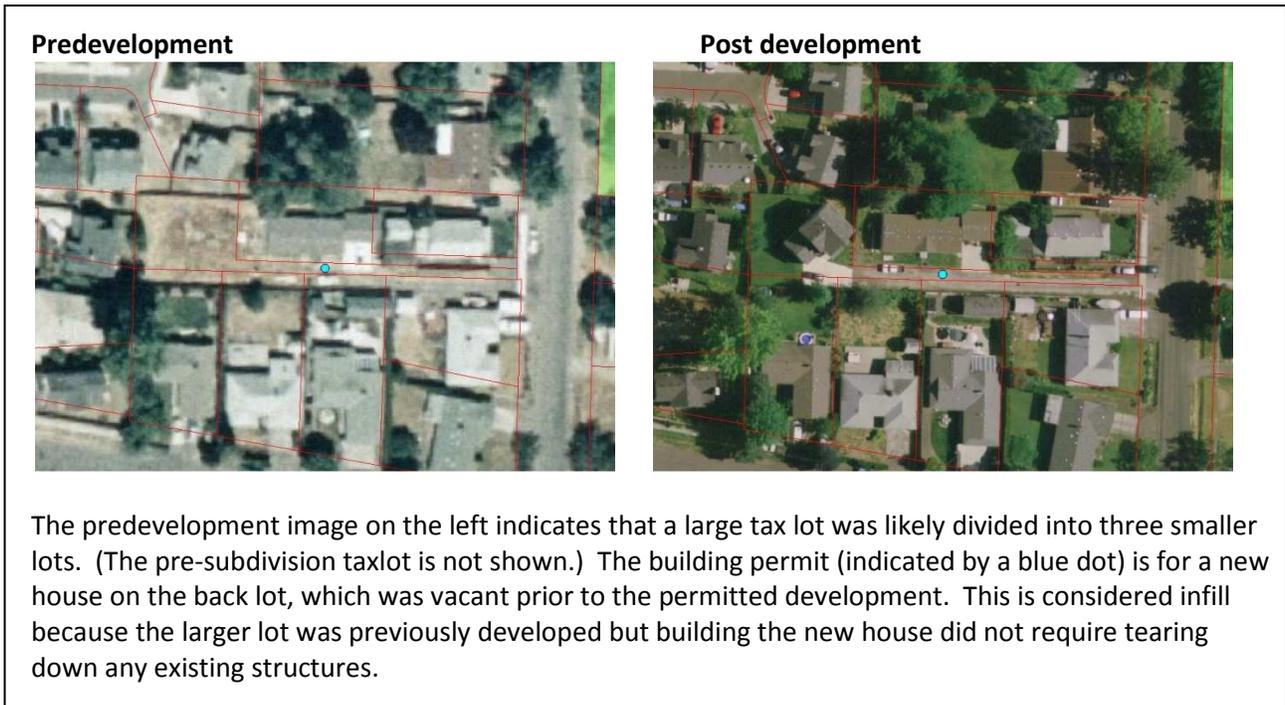


Figure 3. Example of building permit identified as redevelopment



Figure 4. Example of vacant and redevelopment on the same lot

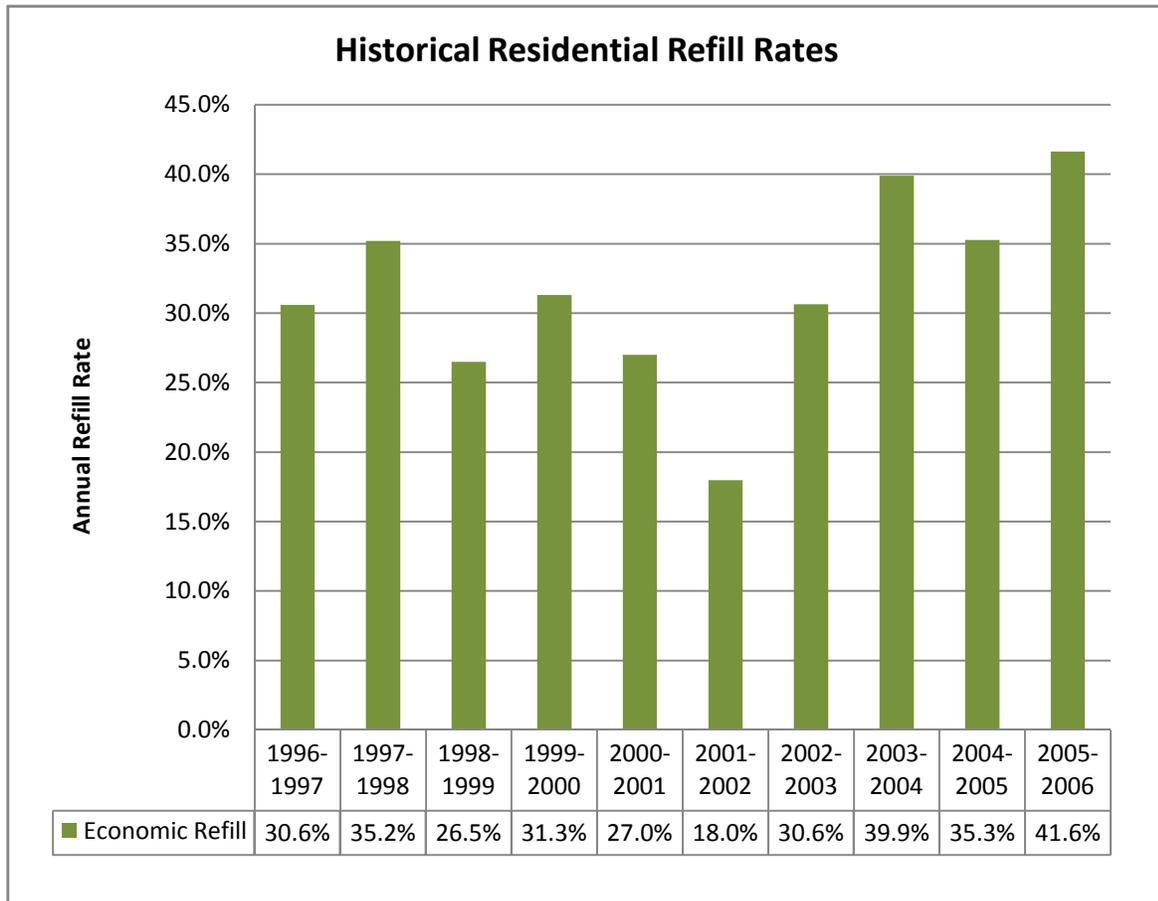


Economic refill study results

Regional Results

Results from the current study (2001-2002 to 2005-2006) and the most recent prior residential refill study (1996-1997 to 2000-2001) are shown in Figure 5. From 2001 to 2006, the annual residential refill rate ranged from a low of 18.0% in the first year to a high of 41.6% in the final year. The overall refill rate for the five year period was 33.0%, compared to 30.4 % for the previous five years.

Figure 5. Historical economic refill rate



Multifamily developments accounted for about 39% of new dwelling units built from 2001 to 2006 while single family dwellings made up 61% of new residential units (Table 1). The refill rate for multifamily dwelling units was much higher than single family, at 46% compared to 25%. Accordingly, the overall residential refill rate is sensitive to the proportional distribution of MFD and SFD development. If the long term share of multifamily dwelling units compared to single family dwellings were higher in the future than that observed over the study period, we could expect a higher overall residential refill rate. If the multifamily share were lower, we would expect a lower overall residential refill rate over the long term. Table 2 shows the impact that various proportional allocations of multifamily and single family dwelling units might have on the residential refill rate in the future, given the current MFD and SFD refill rates.

Table 1. Distribution of new dwelling units by permit type

Dwelling Unit Type	Total Units	Proportion of Development	Vacant Units	Refill Units	Refill Rate
Multi Family	16,940	39%	9,170	7,770	45.9%
Single Family	26,515	61%	19,945	6,570	24.8%
Total	43,455	100%	29,115	14,340	33.0%

Table 2. Theoretical impact of shares of MFD and SFD development on the overall residential refill rate

Proportion multifamily	Proportion single family	Refill Rate
20%	80%	29%
30%	70%	31%
40%	60%	33%
50%	50%	35%
60%	40%	37%

Subarea Results

The subarea data for MFD permits in Table 3 show a wide range of refill rates throughout the region. The City of Portland accounted for nearly half of all new MFD units from 2001 to 2006 and 71.5% percent of those were refill units. The highest MFD refill rate occurred in Oregon City – Milwaukie, at 87.8%, however this subarea accounted for less than 1% of MFD development. The overall MFD refill rate of 45.9% was driven largely by the MFD development observed in Portland.

Table 3. New multi-family dwelling units from 2001-2006, by subarea

MFD combined jurisdictions (2001-2006) ¹	MFD Vacant Units	MFD Refill Units	MFD % Refill
Oregon City - Milwaukie	19	137	87.8%
Portland	2,287	5,740	71.5%
Gresham - Troutdale - Fairview - Wood Village	797	681	46.1%
Forest Grove - Cornelius	51	39	43.3%
Hillsboro	1,818	691	27.5%
Beaverton	931	282	23.2%
Lake Oswego - West Linn	57	16	21.9%
Clackamas Unincorp - Happy Valley - Wilsonville	432	62	12.6%
Washington County Unincorp	2,107	93	4.2%
Tualatin - Tigard - Sherwood - King City	671	29	4.1%
Totals	9,170	7,770	45.9%

Note: Jurisdictions with fewer than 500 new dwelling units will exhibit much more variability than jurisdictions with more than 1,000 units.

The City of Portland also exhibited a high refill rate for single family dwellings, as shown in Table 4. More than 21% of new SFD permits were issued in Portland and 53.2% of those were considered refill. The lowest SFD refill rate was observed in the Tualatin - Tigard - Sherwood - King City area. The area accounted for about 13% of new single family dwelling units with a refill rate of 10.4%.

¹ These subareas were defined based on the availability of the building permit data. The building permits are classified by the issuing jurisdiction, so these jurisdictions were collapsed down to larger subareas for this report.

Table 4. New single family dwelling units from 2001-2006, by subarea

SFD combined jurisdictions (2001-2006)	SFD Vacant Units	SFD Refill Units	SFD % Refill
Portland	2,625	2,980	53.2%
Lake Oswego - West Linn	550	235	29.9%
Hillsboro	3,435	1,010	22.7%
Clackamas Unincorp - Happy Valley - Wilsonville	1,755	400	18.6%
Washington County Unincorp	3,825	870	18.5%
Forest Grove - Cornelius	655	115	14.9%
Beaverton	1,200	200	14.3%
Oregon City - Milwaukie	875	135	13.4%
Gresham - Troutdale - Fairview - Wood Village	1,960	270	12.1%
Tualatin - Tigard - Sherwood - King City	3,065	355	10.4%
Totals	19,945	6,570	24.8%

Note: Jurisdictions with fewer than 500 new dwelling units will exhibit much more variability than jurisdictions with more than 1,000 units.

Figures 6 and 7 are illustrative examples of how refill rates vary across the region and how they might change in the future given a particular set of assumptions. These maps are based on a Metroscope scenario that uses the same assumptions that were used for the current UGR. However, in this case, only the results for the medium growth scenario are presented. A detailed description of the scenario assumptions can be found in Appendix 2.

Figure 6 compares the historical MFD refill rates observed from 2001 to 2006 with the Metroscope projected MFD refill rates for 2005 to 2030. Multifamily dwelling refill rates are generally expected to increase across the region, potentially reaching an overall MFD refill rate of nearly 70% for the region given current policies. This change is largely driven by a lack of infrastructure on newly urbanized land within the projected time period as well as increasing demand for dwelling units closer to the city center and other concentrations of jobs, retail and services. Changing demographics and preferences are increasing the housing demand in existing urban areas, where development is already fairly dense. Accordingly, new dwelling units in these areas must be created through refill development, and multifamily dwellings are particularly well suited for this purpose. Oregon City – Milwaukie is the only subarea where the future MFD refill rate is expected to fall in comparison to the historical data. However, since so little MFD development occurred for the subarea from 2001 to 2006 the estimated historical MFD refill rate of 87.8% should be interpreted with caution. The MFD refill rate is expected to increase dramatically in the Lake Oswego – West Linn area, from 21.9% to 79.9% since the model is anticipating no new vacant land for MFD development in this area by 2030.

Figure 6. Comparison of historical and projected (medium growth scenario) MFD refill rates by subarea

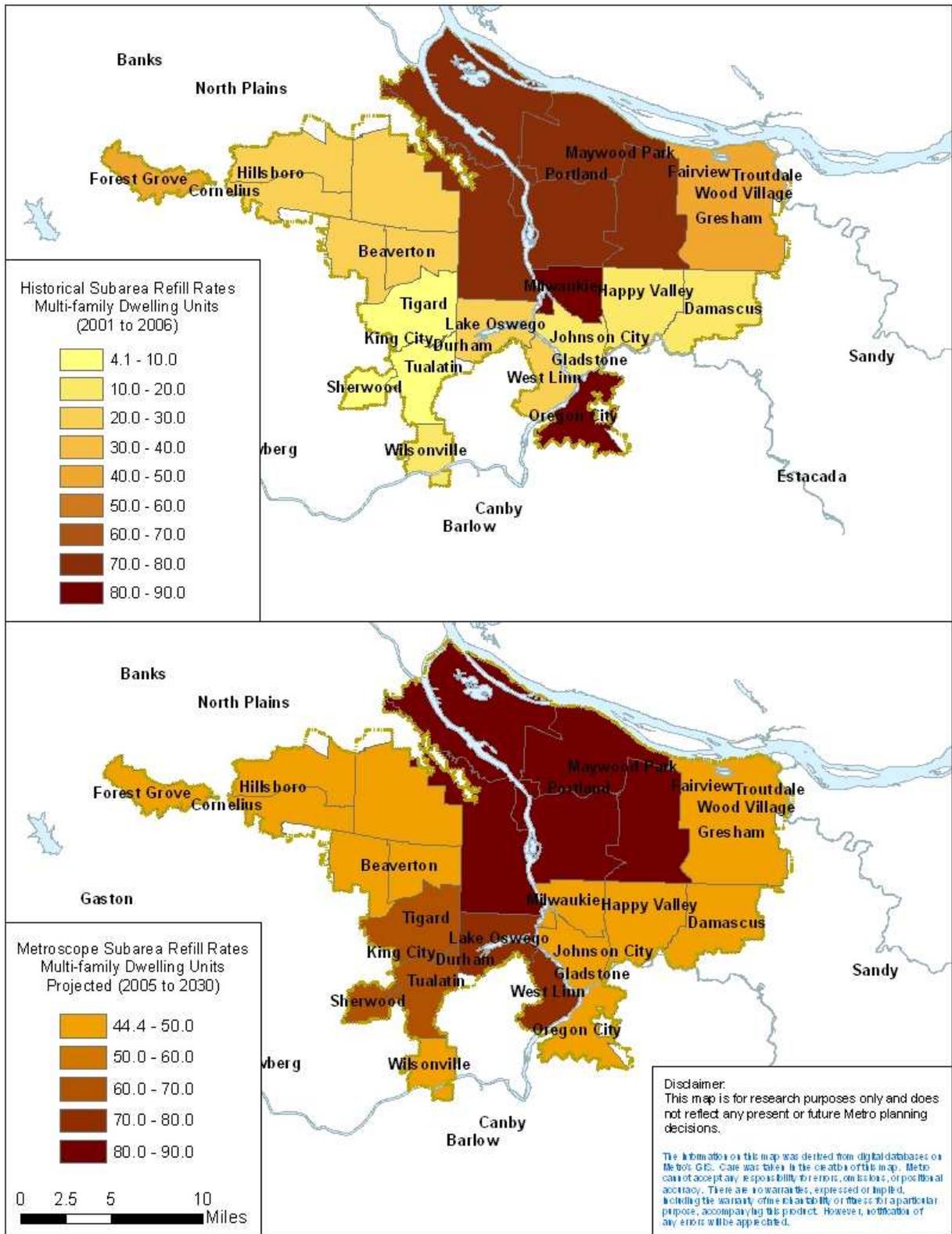
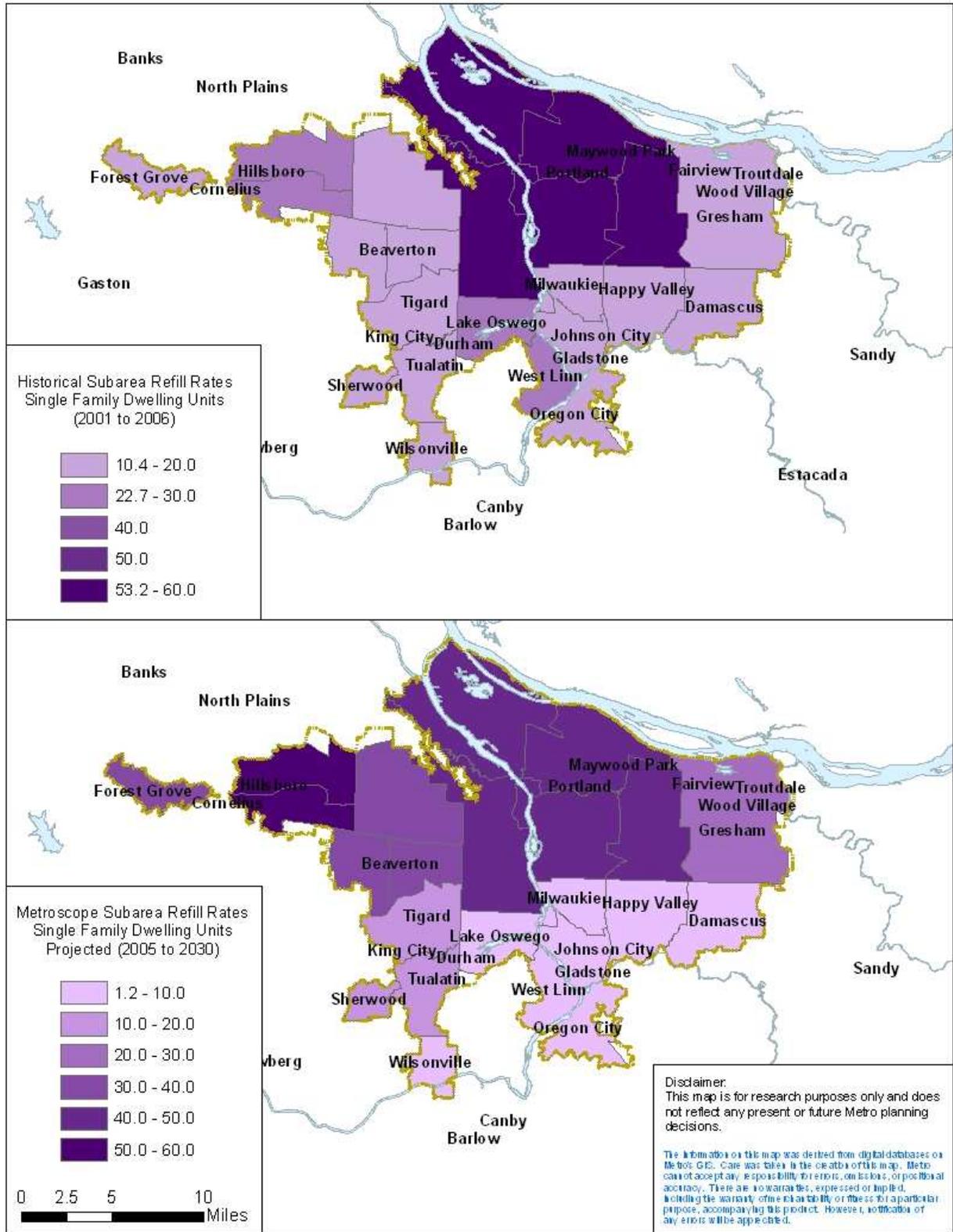


Figure compares the historical SFD refill rates observed from 2001 to 2006 with the Metroscope projected refill rates for 2005 to 2030. The future expectations for SFD refill are more varied than for MFD, with both increases and decreases in the subarea SFD refill rates across the region. In five of the nine subareas the SFD refill rate is expected to increase, with the largest increases projected to occur in the Beaverton, Hillsboro and Forest Grove – Cornelius areas. In four subareas, (Portland, Lake Oswego - West Linn, Oregon City - Milwaukie and Clackamas Unincorporated – Happy Valley – Wilsonville), the SFD refill rate is expected to fall over the period 2005 to 2040. However, this decline is not so much an indication that refill is going to slow down significantly as it is an indication that refill in these areas is expected to shift more toward multifamily instead of single family development. In fact, in these four subareas, multifamily dwelling units are projected to account for between 82% and 92% of the refill residential development in terms of units.

The overall residential refill rate is expected to increase in most subareas in the region. The two exceptions are Clackamas Unincorporated – Happy Valley – Wilsonville, where refill is projected to decline from 17.4% to 11.6%, and Lake Oswego – West Linn, where refill is projected to decline from 29.3% to 9.4%. These results are consistent with the land supply situation in the region and the assumptions for land availability and UGB expansions used for this scenario. In places like the city of Portland, existing vacant supply is being used up and little additional vacant land is anticipated in the area over the forecast period. In contrast, vacant land within the current UGB and new UGB additions are assumed to become available in areas adjacent to the Clackamas Unincorporated – Happy Valley – Wilsonville and Lake Oswego – West Linn subareas. Therefore single family development is projected to take place on new vacant land in these areas, which reduces the residential refill rate. These UGB and land availability assumptions may change with the designation of urban and rural reserves, which would produce different scenario results.

Figure 7. Comparison of historical and projected single family dwelling refill rates by subarea



ATTACHMENT 1: Classifying development as vacant, infill or redevelopment

This section describes, in detail, the steps to classify building permit data into both an economic refill category and a UGR refill classification.

1. Review Taxlot, Vacant Land and Photo Layer for the year prior to the building permit. Use the following definitions to identify the permit as vacant, infill or redevelopment.
2. Definitions
 - a. **UGR Vacant** is development on a taxlot that is designated as vacant in RLIS prior to the date the building permit is issued. A portion of a taxlot may also be considered vacant in RLIS if it meets the following criteria:
 - i. The entire taxlot is at least one acre in size
 - ii. Zoning would allow for the creation of a new lot
 - iii. There is at least half an acre of undeveloped land on the taxlot

If the land is considered vacant in RLIS, then new development would be considered UGR vacant regardless of whether it is located on a fully vacant taxlot or the vacant portion of a partially developed taxlot.

- b. **UGR Refill** is a term that includes UGR Infill and UGR Redevelopment, defined below:
 - i. **UGR Infill** is the addition of dwelling units to a developed taxlot while preserving the existing structure. By definition, UGR infill should only occur on taxlots that are smaller than one acre since development on larger taxlots would properly be considered development on partially vacant land.
 - ii. **UGR Redevelopment** is the removal of existing structures and replacement with a net increase in dwelling units. If existing structures are removed years prior to the redevelopment, the land may be returned to the RLIS vacant land inventory, in which case the new development would be classified as occurring on vacant land.
 - c. **Economic Vacant** is development on a taxlot that has never been developed. Once developed, the taxlot (or developed portion, if the tax lot is large) is permanently removed from the economic vacant category, even if it is subsequently cleared of improvements.
 - d. **Economic Refill** is a term that includes Economic Infill and Economic Redevelopment, defined below:
 - i. **Economic Infill** is building additional dwelling units on a lot that is not considered vacant in RLIS, without the removal of an existing building. If the land where the permit is located is classified as vacant in RLIS (even if only a portion of the taxlot is vacant), the development is not considered Economic Infill.

- ii. **Economic Redevelopment** is the removal of existing structures and replacement with a net increase in dwelling units. Economic redevelopment includes taxlots that were at one point developed but were cleared and held vacant for years prior to redevelopment (regardless of whether RLIS returns them to the vacant lands inventory.)

Using these definitions, each building permit receives an economic classification (vacant, infill or redevelopment) and a UGR classification (vacant, infill or redevelopment). There are two reasons that a building permit might receive different classifications under the two systems. The first reason is the conceptual difference between the definitions above, particularly in how redevelopment is identified. However, discrepancies between UGR and economic classifications may also arise from mistakes (or inconsistencies) in how land is classified in RLIS, as some of the examples in this section will show.

Other notes:

3. When recording lot sizes for building permits, the new lot size is used if the property was subdivided.
4. Parking lot conversion is considered redevelopment since something was there prior to the building permit being issued.

Examples

1. In the pictures below, the old lot is partially vacant (as identified by the green shading). The blue dot shows the location of a permit application on the vacant portion of the land. This is an example that shows development on vacant land on a partially vacant lot. The permit identified by the blue dot would be considered UGR Vacant and Economic Vacant.

Before



After



2. UGR Redevelopment/Infill and Economic Redevelopment/Infill – In regards to the tear down of a SFD and the rebuilding of skinny houses in its place, if the permit falls on the house itself it would be classified both UGR and Economic Redevelopment. However, if the permit falls on the vacant yard it would be classified UGR Infill and Economic Infill.

Before



After



3. In this picture the blue dot falls on property that should have been classified as partially vacant in RLIS. Since it was not, the blue dot would be considered UGR Infill and Economic Vacant. This is an example of a discrepancy that arises due to an error in RLIS. The pink dots on the green space are on land that was properly identified as partially vacant and would be considered both UGR and Economic Vacant.



4. The blue dot below shows UGR Infill, because the taxlot was not considered vacant in RLIS but building a new house did not require the teardown of an existing structure. Since the lot is in a fully developed neighborhood, it may have been overlooked in the vacant lands inventory and never returned to UGR Vacant status. Since there are no existing buildings visible in previous year photos, it was classified as Economic Vacant for this study.

This example is a judgment call that depends on the context of the lot and building permit under consideration. This lot looks like it might have been part of the developed lot next to it before it was sold off for a new house. In that case, it would be considered Economic Infill because it was part of a developed lot and there was less than half an acre of vacant land available for development. In the future, this type of example would more likely be classified as Economic Infill, however development of this type was consistently classified as Economic Vacant for this study.

Pre-Development

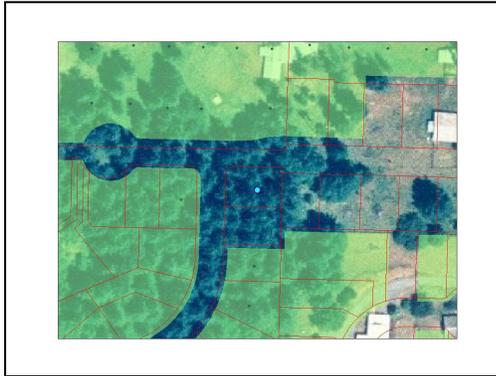


Post-Development



5. Below is another example of how errors can influence the classification of a building permit. This is UGR Infill, Economic Vacant due most likely to surveyor error when checking new development status. The lot with the blue dot on it was probably deemed developed along with the surrounding developing lots before its individual permit was approved. Or it may have been missed in the vacant land layer update.

1996



Pre-Development



Post-Development



6. The following photos show a case where the existing lot is a partially vacant lot, with an existing house that also gets redeveloped. The blue dot on the left is UGR and Economic Vacant, on a partially vacant lot. The blue dot on the right side shows development that is both UGR and Economic Redevelopment. It is possible that another building permit not on the site of the original house, but not on the green vacant land area, could be considered both UGR and Economic Infill.

Pre-Development

Post-Development



7. This is an example of UGR Redevelopment (due to an error in RLIS) and Economic Redevelopment. The blue dot shows the address of the building permit. The year the building permit was issued, 2003, the lot was empty (but not considered vacant), however the 1996 photo shows that there was a house on the lot. This is considered Economic Redevelopment because there once was a building on the lot, even though a significant amount of time passed between the tear down and the replacement (approximately 7 years). More correctly the lot should have been assessed as a vacant lot on the green vacant lot layer in 2003. Then this building permit would correctly be considered UGR Vacant, Economic Redevelopment.

1996

2003 – Permit year

Post Development



8. With condos, the permit may not divulge how many units the application is for, and when geocoded, the permit address will not link to a specific address. General rules created for consistent evaluation are as follows:



When looking at the permit description for the pink dots, each states that the permit is for a five unit condo development. So it can be assumed that each permit is for an entire row of condos. If there is not a description like that, an educated guess can be made by checking the permit value (in these cases, between \$400,000 & \$500,000), and then checking Portland maps for sale price of an individual condo (\$180,000). Because of the higher permit cost (which is based on estimated construction cost), one can assume the permit was for a row of condos.

For instances like the blue dot above, where there is no apparent connection to a specific condo or group of condos, the best reference is to look at surrounding examples. Several things to compare are

1. The permit value – Review the permit value for one of the pink dots. If the blue dot value is comparable, it is most likely the same situation.
2. Street names – Look to see if the street names changed. In the blue dot case, the permit was for the old street name before the development changed a street name. Once this was established, it was easier to find a corresponding house number, and thus the corresponding row of condos.

Data Sources

Regional Land Information System (RLIS) and other data collected and/or maintained by Metro:

- Current and historical taxlots
- Current and historical aerial photographs
- Vacant lands
- Streets

Construction Monitor (<http://www.constructionmonitor.com/>):

- Building permit data available by subscription service