Draft Working Paper

Developing Land Market Data for Use in a State Wide Land Use and Transportation Model

Transportation and Land Use Model Integration Program
Phase II, Task 2.2

Prepared for

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1.0 Introduction

This working paper describes the process used to develop land market variables for use by TRANUS in the Transportation and Land Use Model Integration Program (TLUMIP). One of the key variables developed during this phase of the project is the mean land cost for each land market sector. This paper discusses other variables and addresses other issues but its focus remains the cost of land in the 122 model zones used by the model.

The land market was initially segmented into four sectors; Single Family Residential Dwellings (SFD), Multiple Family Residential Dwellings (MFD), Commercial Uses (COM) and Industrial Uses (IND). As the data analysis proceeded it became rapidly apparent that a second single family dwelling sector was need and the Rural Residential (RUR) category was included in the analysis. The RUR sector can be differentiated from the SFD by the large rural lots and low levels of public infrastructure service that are provided to these dwellings. In Oregon, this sector is also located outside of urban growth boundaries and land that are classed as exception lands. That is to say lands that have been “excepted” from the resource preservation goals (agriculture land and forest land) of the state wide planning process. Two rural resource land sectors were also identified - Agriculture (AGR) and Forest Land (FOR).

Data was collected and analyzed for two time periods 1990 and 1995. The 1990 data is the basis for the cross sectional model calibration of the activity model that is undertaken by TRANUS in the LCAL module. The 1995 data will be use to check the results of the first iteration of TRANUS for the time period 1990 - 1995 and identify factors that need to be adjusted prior to the development of model scenarios.

The final results of the land cost estimation process behaved in a manner that is generally consistent with the values expected in a land rent model. Land values tended to decrease with distance from the CDB of the largest metropolitan areas. Land extensive uses consumed larger amounts of land area and had lower units costs for land. Social and economic factors related directly to land prices for single family housing. Rural resource lands that could not be developed for other uses had very low land values as a reflection of the economic value of the return from a small areas of land. It is possible that additional work on the data will refine or improve the actual estimates of land values, but such work will do little to change the over all relation between the individual zone values.

2.0 Data Availability / Lot Sizes

The availability of data is the major challenge faced in this portion of the TLUMIP project. Some type of land and building value data is available at the County level for the entire state. However, this data is not always available in a digital form or in a consistent format. There are several counties where digital data is not available for use by other agencies or researchers. These counties are generally the smaller rural counties located in eastern Oregon. Digital county assessor data is also not available for 1990 from County Assessor or the Department of Revenue. There are a variety of reasons for this including changes to county computer systems that occurred during the early 1990's.

Despite the data availability problems in specific geographic areas and for specific time periods, there is adequate data available for most of the model zones to allow land values to be calculated and to allow the missing values to be estimated for the remaining zones using methods that are discussed later in this paper. The available land sales and county assessor data is structured in such a manner that is it possible to produce sector estimates of land costs by general using the methods discussed in this paper.

It should be noted that nearly all of the variables in the land sales data set and the assessor data set have one tailed distributions.

2.1 Sales Data - (Land or Land and Improvements)

Sales data is the preferred data for estimating the cost of land because it provides a record of market value transactions. County Assessors and several commercial data providers were contacted regarding the extent of their land sales records in digital form. It was determined that sales data is not widely available in a digital format in Oregon. Several commercial data services were contacted and they had data primarily for the three metropolitan areas (Portland, Salem and Eugene) in the Willamette Valley. The sales record generally contained the site address, land use type, sale price and date, zoning, building square footage, number of bedrooms, baths and rooms and lot size. The value most likely to be missing was the lot size. This problem is discussed further in Section 2.2.

Approximately 167,000 sales records were purchased for from DataQuick the years 1989, 1990, 1994 and 1995. The geographic distribution of this data is shown in the following table.

Table 1

Distribution of Sales Records

County	Metropolitan Area	Number of Records for 1989 and 1990	Number of Records for 1994 and 1995
Multnomah	Portland	15,832	29,440
Washington	Portland	10,215	22,091
Clackamas	Portland	9,259	16,949
Clark (Washington)	Portland	8,210	17,474
Yamhill	Portland	2,945	6,313
Marion	Salem	7,203	12,393
Polk	Salem	3,094	4,621
Lane	Eugene	8,136	11,850
Jackson	Medford	0	2,935
Benton		22	4,982
Linn		0	1,756
Total		**61,971**	**130,804**

The sales records contain site address for most of the lots and/or buildings. These addresses were used to allocate records to individual mode zones using GIS address matching procedures. A portion of the available records were not matched to individual address within zones and these records dropped out of the pool of records available for the land cost estimation process. This reduction in the number of records is only a problem in the more rural zones where some general land use categories have few if any records to begin with.

Sales data for vacant land is the preferred source of land costs. There were not enough vacant land sales records to estimate the average land cost at the county level by land sector. The majority of these sales records were for land that would be used for single family homes.

In order to have enough records to estimate the land cost for all sectors is was necessary to use the sales records for land and improvements. Once again the majority of land sales records are for the sales of single family homes. While these land and improvement sales records contain a land value field , the data in that field is the land value assigned to a parcel by the County Assessor and not a sale price of the land determined by a market transaction or estimated from a market transaction.

2.2 County Assessor Records

Copies of the County Assessor rolls were obtained from the Department of Revenue for 31 of the 36 counties in Oregon for FY 94-95. The assessor records provided information on the type of land use, real market value of land and improvements as determined by the assessor and in many cases the lot area. Lot area was the most common missing variable. This is discussed further in Section 2.3. The assessor records generally did not include building size.

The assessor records are the basis of the land cost estimates for those counties where no land sales data was readily available. Unfortunately, a couple of these files did not contain usable cost information.

Most of the individual assessor records contained a property class code that described the general land use type for the particular record. The P Class system was established by the Department of Revenue and is used by the assessors in more or less the manner proscribed by DOR. The land uses are generally classified as listed below:

100's	Single Family Residential
200's	Commercial Uses
300's	Industrial Uses
400's	Residential Tracts - (Generally Rural Residential)
500's	Agriculture
600's	Forest
700's	Multifamily Residential
800's	Recreation
900's	Public Uses

This classification system allowed the assessor records to be segmented into the sectors used by the model. The assessor records did not have site addresses which could be used to assign individual records to model zones when a county contained more than one zone. They did however have tax code districts which are polygons that represent unique combinations of taxing jurisdictions. These districts are normally based on school districts and the polygons tend to cluster around urban areas where local governmental districts are the most numerous. Using the tax code maps obtained from the county assessors, it was possible to allocate the assessor records to individual model zone for further processing.

The lack of assessor records for 1990 presented a larger problem to the project goal of developing land values for 1990 and 1995. While 1990 tax rolls were not available, individual county assessors had hard copies of their annual tax code summary of total assessed value by jurisdiction for both FY 89-90 and FY 94-95. Using these total assessed values it is possible to estimate what the 1990 values were given the 1995 values. The 1990 data was developed using the following methodology .

- First, 1995 land values were estimate using the methodology described in Section 3.5.
- The next step was to remove all new taxable construction that occurred between 1990 and 1995, as described in FW Dodge construction summary, from the total change in assessed value from FY 89-90 to FY 94-95 to remove any growth in the assessed value associated with new construction.
- The next step was to convert FY 94-95 total assessed value in to 1990 dollars by using the GDP deflator to remove any growth in the assessed value associated with inflation.
- Finally, the average annual real growth in assessed value was calculated.
- This real growth factor was then used to deflate the 1995 land costs by sector to 1990 values.

2.3 Missing Land Area in Land Sales Data and Assessor Records

The data collected for this project represents several hundred thousand records. A substantial portion of these records are lacking one critical piece of information that limits their usefulness to the project, there is no land area data.

This situation is the result of a process that county assessor have historically used to track the land area in tax lots. The assessor is required to estimate the area of an individual tax lot when it is not known. All lot is platted subdivisions have a legal lot area that is defined by the subdivision plat. The assessor relies on the areas supplied by these plats if there is any question concerning the area of a platted lot. But for lots outside of platted subdivision, the assessor is required to estimate the lot area. This is not an easy process and it is subject to challenge by land owners who may disagree with the assessor results. Since the assessor is not required to tract the area of subdivision lots they are commonly not entered into the assessor rolls and hence are not available in the digital copies of the assessor rolls. The assessor roll is one of the primary sources of land areas for the land sales data As such both the land sales data and the assessor records have a substantial number of records that do not have a lot area.

This problem can be clearly in the tables in Section 2.4. Over one third of the single family lots do not have an lot acreage in the county assessor records. Generally speaking, lots outside urban subdivisions are larger that lots in platted subdivisions. According, the lot used to estimate land cost in this project tend to have larger average lot areas than would be the case if the platted subdivision lots would to be include in these estimates. Based on this assessment it is assumed that the land values developed though the process described in Section 3 will tend to be lower on a cost per square foot basis than they would have been if all of the lots had a land area. The biases in the land value appears to occur in all land sector values in all zone and is assumed to have a fairly uniform impact on the estimated land values.

2.4 Data Distribution of Records by Tranus Land Sector

Metro's Regional Land Information System (RLIS) contains the largest single land parcel data set in Oregon with more than 460,000 parcel level records for 1996. This data set is a convenient place to look at the distribution of lot sizes and the magnitude of the missing lot data problems.

The RLIS data set has undergone considerable review in recent years and should be considered to be one of the best data sources of current data in the Oregon. The RLIS data set is primarily based on County Assessor data from Clackamas, Washington and Multnomah counties. Metro has access to the assessor and GIS information in Clark County Washington, but this data is not routinely provide with the RL:IS data. The RLIS project began about 1990. These original Metro parcels data records are not readily available and are of unknown condition.

.The data in all of the table has been categorized by the same set of lots size categories to provide a consistent distribution of data in all land sector.. Each of the following land use sector tables contain two sets of estimates of average lot size The first mean lot size estimate is based on the land area listed by the County Assessor. The second mean lot size estimate is based on the area of the map polygons in the RLIS base map. In many cases the polygon lot area is larger than the assessor lot area.

The Single Family Residential land market (Table 2) in the Portland area has a substantial number of lots (38.06%) with missing lot sizes. Analysis of RLIS polygons estimate that these lots have an average area of 12,884 square feet, which is 22% larger than the average lots area for SFD RLIS lots as a whole. The mean area for all SFD RLIS lots is slightly larger than the typical lot size (10,000 sq. ft.) expected for conventional single family development.

The RLIS SFD lots have a mean lots size that is 54% larger than the assessor mean lost size of 6,882 square feet. Generally speaking the average lot size in each category is approximately equal for the assessor records and the RLIS records. Assuming that this relationship hold for all assessor records, the assessor data should produce a over estimate of the SFD land price in those area where not land sales data is not available. The comparison of the RLIS data and the assessor data in the Portland metropolitan area shows a lots size relationship that is contrary to the expected relationship discussed in the previous section (Section 2.3). It is not known if this is a consistent data pattern through out the state or just the data pattern for the Portland metropolitan area.

Table 2
Distribution of Lots Sizes for
Single Family Residential Land Use
in Metro 1996

Single Family Dwellings (SFD) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	122,904	***38.06%***	0	12,884
0 - 2,499	1,360	***0.42%***	1,738	3,075
2,500 - 4,999	62,208	***19.26%***	4,526	4,750
5,000 - 6,999	40,839	***12.65%***	6,155	6,197
7,000 - 9,999	44,149	***13.67%***	8,198	8,245
10,000 - 14,999	20,944	***6.49%***	12,158	12,212
15,000 - 19,999	7,640	***2.37%***	17,250	17,844
20,000 - 24,999	5,244	***1.62%***	21,941	22,025
25,000 - 43,499	2,165	***0.67%***	33,615	46,832
Greater than 1 Acre	15,491	***4.80%***	223,489	182,932
Total Records	**322,944**			
Mean Lot Size			**6,882**	**10,584**
Median Lot Size			**4,791**	**7,637**
Standard Deviation			**42,515**	**27,012**

The Rural Residential (RUR) land sector (Table 3) is dominated by the development of single family houses or mobile homes on lots that are larger than one acres. With in the Oregon land use planning framework this development is limited to small areas outside of UGB’s. More commonly these lots tend to be in the 2 to 5 acre range and are served by minimal level of public infrastructure services such as sewer and water. While the number of lots in this land sector is relatively small in the metropolitan Portland area, this land use is a more significant portion of the single family housing market in many other areas of the state.

The mean lot size for the assessor data and the RLIS data are approximately equal. The average RLIS lots size for lots that are missing assessor land areas is approximately 30% smaller that the average lot size for an assessor lot. Based on the data in this table land cost estimates base on assessor data are expected to be similar to those estimate from land sales records.

Table 3
Distribution of Lots Sizes for
Rural Residential Land Use
in Metro 1996

Rural Residential (RUR) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	1,077	***22.43%***		186,476
0 - 2,499	2	***0.04%***	1,307	83,381
2,500 - 4,999	1	***0.02%***	4,356	6,281
5,000 - 6,999	1	***0.02%***	5,663	5,647
7,000 - 9,999	1	***0.02%***	8, 712	7,925
10,000 - 14,999	3	***0.06%***	11,182	25,643
15,000 - 19,999	0	***0%***	-	-
20,000 - 24,999	3	***0.06%***	23,666	25,983
25,000 - 43,499	13	***0.27%***	37,562	37,011
Greater than 1 Acre	3,701	***77.07%***	311,332	272,611
Total Number of Records	**4,802**			
Mean Lot Size			**260,619**	**251,957**
Median Lot Size			**158,816**	**162,626**
Standard Deviation			**530,996**	**467,007**

The Multiple Family dwelling land sector (Table 3) consumes substantially less land that the single family land market in most urban areas. But it can be home for as much as half the population of a given urban area. This is especially true for some of the jurisdiction the have large colleges or a large scale suburban multiple family development patterns. Large MFD development, more than 300 units on a site, are still a relatively rare phenomena in Oregon.

The multifamily sector has the second highest percentage (28.81%) of lots with missing assessor lot areas. The average lots size of the MFD lots with missing assessor values is relatively small (7,201 sq. ft.) which is in keeping with the expected values discussed in Section 2.3. These small lots are expected to support small scale MFD projects that are more typical of older development patterns. The mean lot area for an RLIS polygon is approximately 10% less that the mean for an assessor polygon.

Table 4
Distribution of Lots Sizes for
Multiple Family Residential Land Use
in Metro 1996

Multiple Family Residential (MFD) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	4,860	***28.81%***		7,201
0 - 2,499	668	***3.96%***	1,681	1,655
2,500 - 4,999	4,384	***25.99%***	4,395	4,649
5,000 - 6,999	1,463	***8.67%***	5,933	5,980
7,000 - 9,999	1,905	***11.29%***	8,276	8,253
10,000 - 14,999	996	***5.90%***	12,415	12,326
15,000 - 19,999	419	***2.48%***	17,324	17,027
20,000 - 24,999	330	***1.96%***	22,020	21,947
25,000 - 43,499	596	***3.53%***	33,572	33,036
Greater than 1 Acre	1,247	***7.39%***	191,368	144,014
Total Number of Records	**16,868**			
Mean Lot Size			**19,664**	**17,746**
Median Lot Size			**4,791**	**5,098**
Standard Deviation			**102,540**	**58,313**

The Commercial land sector (Table 5) presents an interesting problem. For lots with an area of less than one acre, the mean values are comparable. However for lots greater than one acre, the mean assessor lot area is approximately 65% larger than the RLIS lot area for the same lots. This difference is made more interesting by the fact that on the whole the sale prices for commercial land in the north Willamette Valley tends to be higher than the total assessed value for this land.

Commercial land contains a substantial percentage of lots without land area and the RLIS lot area for this lots averages just over one acres (46,739 sq. ft.) Mean lots size for lots with assessor land areas are approximately 30% greater than the lots size for the RLIS polygons. If this distribution is match in other parts of the state, values based on assessor records will tend to be lower the expected is sales data were available.

Table 5
Distribution of Lots Sizes for
Commercial Land Use
in Metro 1996

Commercial (COM) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	3,323	***19.44%***		46,739
0 - 2,499	475	***2.78%***	1,555	2,190
2,500 - 4,999	2,961	***17.32%***	4,147	4,452
5,000 - 6,999	1,223	***7.16%***	5,998	6,357
7,000 - 9,999	1,518	***8.88%***	8,520	10,744
10,000 - 14,999	1,734	***10.15%***	12,667	14,769
15,000 - 19,999	1,088	***6.37%***	17,441	17,505
20,000 - 24,999	946	***5.53%***	21,972	22,667
25,000 - 43,499	661	***3.87%***	33,707	39,138
Greater than 1 Acre	3,163	***18.51%***	456,474	275,785
Total Number of Records	**17,092**			
Mean Lot Size			**73,485**	**56,496**
Median Lot Size			**10,018**	**10,976**
Standard Deviation			**580,524**	**339,563**

The Industrial Land (Table 6) has a lot values that aver very comparable regardless of the source of the land area. The average lots sizes are approximately equal to each other. This is to be expected given the fact that substantial amount of industrial land uses occur outside of subdivisions.

This urban land sector have the highest proportion of lots that are large that one acre - 49.06%. It also has the smallest percentage of missing lot area values (15.73%). The average lot size for lots with missing land areas is just under 3 acres (112,255 sq. ft.).

Table 6
Distribution of Lots Sizes for
Industrial Land Use
in Metro 1996

Industrial (IND) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	766	***15.73%***		112,255
0 - 2,499	72	***1.48%***	1,612	2,283
2,500 - 4,999	608	***12.49%***	4,295	4,536
5,000 - 6,999	197	***4.05%***	6,033	8,910
7,000 - 9,999	255	***5.24%***	8,433	8,296
10,000 - 14,999	330	***6.78%***	12,698	18,222
15,000 - 19,999	205	***4.21%***	17,446	18,146
20,000 - 24,999	295	***6.06%***	21,693	20,649
25,000 - 43,499	518	***10.64%***	31,408	43,316
Greater than 1 Acre	1,623	***33.33%***	285,401	230,350
Total Number of Records	**4,869**			
Mean Lot Size			**87,556**	**87,920**
Median Lot Size			**15,246**	**20,243**
Standard Deviation			**357,453**	**338,145**

The Agriculture Land sector (Table 7) and the Forest Land sector (Table 8) are generally not available for future urban develop in the Oregon land use planning system.   98% of the agriculture lots and98% of the forest lots have a lot size of greater than one acre. The average lots sizes for these two sectors are approximately equal when you compare the assessor data and the RLIS data..

Table 7
Distribution of Lots Sizes for
Agriculture Land Use
in Metro 1996

Commercial (COM) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	550	***8.67%***		723,286
0 - 2,499	1	***0.02%***	1,742	492,714
2,500 - 4,999	6	***0.09%***	3,411	44,594
5,000 - 6,999	3	***0.05%***	5,955	4,932
7,000 - 9,999	5	***0.08%***	8,538	34,572
10,000 - 14,999	11	***0.17%***	12,436	85,690
15,000 - 19,999	15	***0.24%***	17,716	182,790
20,000 - 24,999	15	***0.24%***	22,446	1,162,947
25,000 - 43,499	75	***1.18%***	35,096	353,202
Greater than 1 Acre	5,663	***89.27%***	1,122,532	990,715
Total Number of Records	**6,344**			
Mean Lot Size			**440,259**	**447,538**
Median Lot Size			**221,720**	**211,405**
Standard Deviation			**717,258**	**770,740**

Table 8
Distribution of Lots Sizes for
Forest Land Use
in Metro 1996

Forest (FOR) Lot Area in Square Feet	Number of Lot based on Assessor Lot Area from RLIS Data	***Percent of Total Number of Lots***	Average Assessor Lot Area in Square Feet	Average RLIS Polygon Lot Area in Square Feet
Missing Lot Values	43	***1.88%***		797,277
0 - 2,499	1	***0.04%***	1,742	296
2,500 - 4,999	2	***0.09%***	3,267	4,041
5,000 - 6,999	-		-	
7,000 - 9,999	7	***0.31%***	8,586	148,272
10,000 - 14,999	5	***0.22%***	13,242	412,662
15,000 - 19,999	10	***0.44%***	17,468	61,286
20,000 - 24,999	3	***0.13%***	22,072	182,341
25,000 - 43,499	16	***0.70%***	32,888	308,378
Greater than 1 Acre	2,203	***96.20%***	3,373,739	2,539,070
Total Number of Records	**2,290**			
Mean Lot Size			**277,738**	**282,881**
Median Lot Size			**183,170**	**209,157**
Standard Deviation			**256,481**	**247,028**

3.0 Land Cost Estimation Methodology

This phase of the TLUMIP project has focused in large part on the estimation of the price of land in each land market for each model zone. Several methods for estimating land values were considered and a number were tested before the final estimates of land prices were undertaken. The testing was conducted using the most numerous type of records, SFD, in 33 model zones representing four counties in the northern Willamette Valley. As the result of this testing, the Residual Land Value method was chose for as the land cost estimation methodology. All of the methods that were considered are discussed in the following sections.

One aspect of the land cost coefficients that should be remembered when reviewing the results of this process is the fact that land and improvement prices are the result of the interaction of numerous market factors. The price of single family land is determined by a number of factors that make up the housing bundle. These include the relative attractiveness of a particular location in terms of external factors such as schools, distance to work and shopping, neighborhood amenities, availability and quality of public infrastructure services (sewer, water, streets, and storm drainage), and distance to the CBD, and internal factors such as household size, household income, vehicle ownership etc. The final estimated land prices produced by this process are affected by all of these factors and more. A discussion of the determinant of property values written by Gerrit Knaap of the University of Illinois at Urbana - Champaign will be available at the peer review panel for any one who wishes to review it.

3.1 Vacant Land Sales

The first option explored for estimating land cost by land sector was the use of vacant land sales data. These records were expected to provide the cleanest estimate of the average cost of land by sector. This cost would be estimated by the use of the following formula:

$$LandCost = VacantLandCost / VacantLotArea$$

Unfortunately there were not enough records of vacant land sales to estimate land cost in most of the test zones. In addition most of the sales records were for single residential land and very few records were available for any of the other sectors. Consequently this method was dropped early in the process.

3.2 Residual Land Value

Several land cost estimation methodologies were developed after the vacant land method was dropped. The Residual Land Value method was eventually chosen as the preferred one for areas where there were an adequate number of sales records. The Residual Land Value method uses the following equation to estimate residual land values:

$$LandCost = \left(SalePrice - \left(BuildingSqFt * ConstCost - \left(\left(Age / 67 \right) * \left(BuildingSqFt * ConstCost \right) \right) \right) \right)$$

The intent of this equation is to base land value on sale prices of land and improvement less the replacement value of the improvements. The residual value of the land reflects the value of an improved lot ready for development.

The replacement value of the improvement, primarily the value of the building, is deducted from the sale price. The per square foot average cost of structures by land market sector was calculated from FW Dodge construction estimates for the state of Oregon for 1990 and 1994. The building area in square feet was derived from the sales records..

Building values are depreciated using a straight line (accounting) depreciation of 1.5% per year or an assumed life span of 67 years for the structure. Metro noted in its Housing Needs Analysis that the typical housing unit depreciates at a rate of between 1.0% and 1.5% per year. A non linear depreciation model was also explored but it did not substantially effect the land vales estimated using this method in the testing phase of the project.

The depreciation rate has the greatest impact on estimation of land values associated with buildings older than 50 years. Housing units listed in the US Census as older than 50 years account for approximately 25% of all building in all of the model zones. These older units are more numerous in rural area and in smaller counties and less numerous in the larger metropolitan areas where much of the states growth has occurred in the last 40 years and where most of the sales data records are located. Land values for lots with buildings older than 50 year may tend to be somewhat overestimated, depending on the nature of the local real estate market and the condition of the specific building.

3.3 Simple Hedonic Pricing (Regression)

A set of simple hedonic price models were tested at the zone level. The model used simple linear regression with Sale Price as the dependent variable and Building Age, Building Size in Square Feet and Lot Size in Square Feet as the independent variables. The general form of this equation is as follows:

$$Sale\,\mathrm{Pr}\,ice = b_1 + b_2 Age + b_3 BuildingSqFt + b_4 LotSize$$

The regression equations were estimated with and without a constant value. The variables' coefficients were interpreted as the cost for each of the factors that contribute to the estimation of the sale price.

The predictive power of the individual equations was generally low. However, regression coefficients were strongly correlated with the residual land values estimated (see Section 3.5) in the previously described methodology. The hedonic price methodology produced negative coefficients more frequently than the residual land value model.

3.4 Mortgage Equivalent

The discussion of alternate methodologies include the possibility of calculating an average monthly mortgage payment based on the average sale price. After some discussion, it was decided that the large number assumptions that would be necessary to estimate this value would increase the probably and the magnitude of any errors in the estimated land price. As a result this methodology was dropped from consideration.

3.5 Assessor Land Values

County assessor records had to be used in twenty two counties to estimate either 1990 land values or 1995 and 1990 land values for the land sectors in model zones. The assessor records collected from the Department of Revenue do not contain any building size data so the residual land value method could not be used to estimate land costs. Instead, a simpler estimation methodology use the following equation:

$$LandCost = TotalAssessedValue / LotArea$$

During the test phase of this process, assessor land values were estimated and them compared with the values calculated through the residual land value and simple hedonic model. The correlation between the assessor land values and the other two was not as strong as the correlation between residual land value and the hedonic values as shown below.

Pearson Correlation	Res Land Val	Assessor	Hedonic
Res Land Value	1.000		
Assessor Value	0.514	1.000	
Hedonic Value	0.883	0.300	1.000

The process for deflating the FY 94-95 values to FY 89-90 values has been previously described in Section 2.2.

3.6 Other Measure - Unit Pricing

A number of other methods for estimating land prices were discussed early in the process. Two of these method the continued to be options for future use. One method is Unit Prices. The Unit Price approach would use the prices for a housing / building unit instead of the cost of land on a per square foot basis. While the price of a unit of single family housing is fairly easy to explain,. it is harder to explain one unit of a commercial or manufacturing building.

The other method is the Combined Land and Improvement Price which is measured in total cost per square foot of land. This measure is easy to compute and combines the value of the land and the building into a single measure. These estimated values should be influenced by the size of the building as well as the size and the locational aspects of the lot.

3.7 Missing Values, Outliers and Other Data Problems

When the land price estimation process was completed, the results were reviewed to insure that they were reasonable. It was determined that a few of the land price values were not reasonable. Three distinct type of problems were identified. They were as follows:

- Negative Land Values
- Outlier Values
- Missing Values

Alternative value were substituted for the values derived from the model in each of these cases. The model zone and land sector cells that contain alternate values are identified in the individual excel spreadsheet by formatting them in ***BOLD and Italics***. The values that were substituted to solve these problems were calculated from the same data sets as the problem values. The value replacement process followed a specific sequence that is unique to each problem. The value substitutions were made using the following decision rules:

Negative Land Values - The Residual Land Value process can produce negative land values under the correct set of circumstances. This occurs when the replacement value of the building is greater that the price paid for the land and improvements. It is more likely to occur when there are a smaller number of case in an individual zone for a particular sector or when the sale prices in a zone is relatively low for a particular sector - i.e., that sector is not an attractive place for the particular land use. Replacement values were chosen for the negative land values in the following order:

1. Median Land Value for the Zone and Land Sector
2. County Mean Value for the Sector
3. Mean value for the Sector from an adjoining zone that is similar.

Missing Land Values - In some zones there were not sales in a particular sector or there was no data for a sector or zone. In these cases, the missing values were estimated by choosing in the following order

1. County Mean Value for the Sector
2. Mean Value for the Sector from an adjoining zone that is similar.

Estimated Value is an Outlier - In general the data sets use to estimate the land value have a one tailed distribution. It is possible for a small sample or a very skewed data distribution to produce estimated values that are outliers when compare to with all adjoining value. This occurred in 5 cases. An example was an estimate value of $63 per square foot for commercial land in a suburban metropolitan zone. Replacement values were chose using the following order:

1. Median Land Value for the Zone and Land Sector
2. County Mean Value for the Sector
3. Mean value for the Sector from an adjoining zone that is similar.

3.8 Estimated Land Prices By Sector

Copies of the estimated land values are in Appendix A at the end of this document.. Maps of the Model Zones will be available at the Peer Review meeting.

4.0 Land Consumption and Supply Issues

The last major data set that is need to finish the calibration the state wide model is land supply data. At the state wide model zone level land supply information is very generalized. It is possible to collect land information at the policy level, i.e., land that is zoned or planned for a particular use or model sector. This would require contacting 211 cities and 36 counties. 136 of the cities are smaller that 2,500 people and are not likely to have a planning staff to handle such a request.

Actual land use data is even harder to come by. In theory, this could be done by using the assessor P Class data field that has been discussed previously. However, it would be necessary to have a computer mapping system / GIS to allocate these land uses and to clean up the missing lot size data. These systems do not exit state wide. In fact, they do not exist in two of the eleven counties that will be in the sub-state mode; and two of the mapping systems that do exist are relatively new and only have limited amounts of data. There are other approaches that could be used to approximate this data, such as using the habitat “GAP” mapping for endangered species, but each of these data sets have there own sets of problems.

The method put forward in this section should provide a generalized land supply estimate by policy category that will be sufficient for the first efforts at model calibration. Substantial additional work could be undertaken to improve this data set at the state wide level, but it is probable that this effort would only result in a marginal improvement in the data developed using the method outlined in this section. If additional effort is to be undertaken to improve the land supply estimates, it should be done in conjunction with the Sub-state Model where the land supply estimates are more critical to the operation of the model.

4.1 Urban Growth Boundary (UGB) Constraints and Location of Land Available For Development

At the state wide model level urban land is only somewhat constrained at this point in time. HB 2709 requires that each city / urban area have an UGB that contains a twenty year supply of land given the current rate and pattern of development inside the UGB. The UGB's surrounding the 211 cities in the state generally meet this requirement. If a particular UGB does not have enough land to accommodate the projected growth for the next twenty years, the UGB must be expanded. Metro is going through this process at the moment. This process insure that there will always be adequate land for future urban development in Oregon urban area.

Under the policies set out in the Oregon planning system the first choice for expansion is “exceptions land' -- i. e., excepted from meeting the requirement of the resource preservation goals. These lands are generally denoted in the TRANUS model as the rural residential (RUR) sector. There is limited supply of non-residential land available in the exception areas. In general commercial and industrial uses are expected to stay within a UGB. It is also expected the UGB's will grow by the inclusion of lands that are adjacent to UGB's. The last choice for expansion is agriculture land (AGR) and forest land (FOR), but some of the land in these sectors may be included in a expansion if there are no other land sectors. For the purposes of the state wide model the urban land supply is unconstrained by the operation of state law and the urban land supply is expected to change to meet future growth requirements. It is possible to develop a constrained growth scenario as one of the future options tested by the model.

4.2 Land Supply By Plan Category

The land supply by sector used by the model in its first calibration will be derived from the 1:100,000 zoning map obtained from the State Service Center for GIS (SSCGIS). This map shows the land uses permitted by policy / zoning at a county level. The map was developed in the early 1980's when the first round of comprehensive plan acknowledgments had been completed. The maps were developed by local Planning Departments and represent the best readily available maps. Outside of the UGB there has not been substantial change in the types of permitted land use since these maps were drawn. There are some differences between this coverage and the SSCGIS coverage for the UGB's. Appropriate adjustment will be made to the urban land areas to reflect the updated UGB polygons.

Generally speaking the land polygon areas shown on the state wide zoning map can be divided into four categories - Forest, Agriculture, Rural Residential (with minor amounts of commercial and industrial) and Urban. The total land area for each use will be summarized for each zone. Then the urban land area will be divided between the four urban categories - SFD, MFD, COM, and IND. The RLIS parcel database will be analyzed in its entirety and average allocations of land in the urban polygon will be estimated. These allocation will then be compared with the housing unit and employee databases to develop a per unit and per employee allocation of gross acres of urban land. The average percentage of public land for schools, parks and public uses will also be estimated, as will a percentage for public rights-of-way. If there is no better information available, these percentages will be used to allocate the land in the urban polygons to the urban land use sectors.

It is recognized that there allocations are gross urban acres that include vacant developable land. This vacant land will be include in the total land allocated to each urban sector. The allocation will be completed before the peer review meeting.

Forest and Agriculture land are assumed to be not available for development. However Rural Residential Land is assumed to be developable.

4.3 Interior Urban Model Zones and Land Supply Constraints

There are a small number of metropolitan model zones that do not contain land outside the UGB. These Interior Urban zones have a limited growth capacity in terms of the amount of vacant developable land. These zones can experience growth through both the development of the remaining vacant land and through the redevelopment of existing developed lands at higher densities. LCOG has provided an estimate of the amount of vacant developable land in each of the interior zones for use in the model. It is possible to estimate similar information for the Oregon side of the Portland metropolitan area from the RLIS data. It will be necessary to obtain a similar estimate from MVCOG for the Salem area or to use the Eugene or Portland Values as appropriate.

4.4 Land Consumption Functions - Building Space Consumption Functions

The initial calibration of the state-wide model will use a global set of land consumption functions. For each land sector a minimum and a maximum land consumption function was estimated. The minimum land consumption function represents that minimum amount of land that will be consumed by one household or the amount that will be consumed to support one employee. The maximum function likewise represents an upper limit on the amount of consumption per household and per employee by land sector. Average land consumption estimates (average lot sizes) were calculated during the land price estimation process and are available to check the land consumption estimates produced by TRANUS in the base year (1990) and in 1995.

The minimum and maximum land consumption functions were estimated using two sources. The minimums were estimated by assuming the maximum density allow in the proposed Metro Regional Framework Plan for each land sector. The maximum land consumption was estimated using existing data on residential development in Oregon and employment density, FAR, and employee per square foot of building data from the State of Michigan as presented in Fiscal Impacts of Alternatives Land Development Patterns in Michigan: The Cost of Current Development Versus Compact Growth, March 1997 which was conducted for SEMCOG by Rutgers University.

Building floor space consumption was estimated in a similar manner from the same sources. Average building size data is only available for the counties where there is sales data. In 1995, sales data was available for 10 counties that contained 70 of the 122 internal model zones. The single family residential sector has the most numerous set of records in this data base.

The land and building consumption function are shown in the following table:

Table 9

Land and Building Space Consumption Functions

Urban Uses	Minimum Land Consumption per Household or Employee in Square Feet	Maximum Land Consumption per Household or Employee in Square Feet	Minimum Space Consumption per Household or Employee in Square Feet	Maximum Space Consumption per Household or Employee in Square Feet
SFD	3,500	90,000	1,000	50,000
MFD	750	10,000	500	3,000
COM	150	3,000	300	1,500
IND	1,000	5,000	500	2,500
Rural Uses				
RUR	40,000	900,000	1,000	50,000
AGR	850,000	28,000,000	500	2,500
FOR	850,000	28,000,000	500	2,500

An alternate set of six consumption function tables has been proposed that make adjustments to the land and space consumption functions to better reflect the differences in land and building market that exist in different parts of Oregon. As of this time no decision has been made concerning the use of the alternative consumption functions.

5.0 Additional Research

5.1 Lot Size and Building Size Data

Several model zones in the Sub-state model area have estimated land prices that are based on a relatively small data set. There are two possible sources for this problem. First there may only be a few records because there have on been a few sales of land in a particular sector in a particular zone. There is little that can be done to improve the estimate with this type of problem as long as land sales records are the preferred source of data although a review of the records that did not address match successfully may result in an increase in the number of records in a particular zone.

The second set of problems exists when there are a number of records but many records are missing the data for the lot areas. This data can be improved by reviewing local assessor records and determining the lot size for specific land sale records. This project is limited in magnitude and offers the strong probability of improved land price estimates. This work would also provide benefit to the sub-state model work.

Building area by land sector is a desirable data set for TRANUS modeling. No definitive data set exists for this model variable. It is possible to construct a rough estimate of the SFD building area by model zone from a combination of Census data (number of units by year built before 1990), sales data (average building size by year built) and Center for Population Research and Census at PSU building permit data by jurisdiction (number and type of building built since 1990). In addition, the Metro's RLIS data contains data on building square feet. This data base is being updated and improved by the Natural Hazards Section of the Growth Management Department and is expected to be available in December 1997.

The Metro data base appears to be the best source for building size information for the MFD, COM and IND land sectors. FW Dodge data, the and Center for Population Research and Census at PSU building permit data and other construction data will provide a method of checking this information.

It is possible to build a generalized approach to estimating the total building square footage for the model zones from the Metro data and the Census data and then apply this method to produce estimates of building area in the other area of the state.

The residual land cost estimation model used a straight line depreciation method. Some consideration should be given to the question of whether or not to use a different method of depreciation for estimating the land values.

5.2 Land Supply by Generalized Plan Category

The methodology for estimating the total land supply for the state wide model can be improved upon. The estimates should be revisited during the sub-state modeling process where the supply of land in each zone is a key variable. The process of collecting this data may be more appropriately undertaken by ODOT. It will require contacting the cities and counties to obtain estimates of the amount of land in each of the land sectors, both built upon and available for development. This process is expected to take a fair amount of follow up work to insure that data is gathered in a timely manner.

APPENDIX A

Land Values 1990

Land Cost in Mean $ / SQ Foot

Bold Italic Cells Indicate Alternative Value Method

Model_No	SFD	RUR	MFD	COM	IND	AGR	FOR
100	11.902		35.635	26.016	***18.353***		
101	1.044		5.176	2.562	1.793		
102	0.680	0.929	***1.126***	***4.075***	***0.854***	0.247	0.382
103	0.233	***0.233***	***8.395***	***1.237***	***2.200***	***0.021***	***0.023***
104	1.876	0.830	0.391	***4.075***	0.555	0.210	0.830
105	0.750	0.740	***1.126***	8.343	***0.854***	0.233	0.740
106	1.987	1.418	1.126	***4.075***	***0.854***	0.292	0.206
107	3.238	1.631	8.449	***4.075***	***0.854***	0.343	0.356
108	7.522		***13.278***	***12.025***	***9.628***		
109	7.933		16.783	10.202	8.738		
110	2.107		10.819	1.232	***2.200***		
111	1.232	***1.232***	4.643	0.603	***2.200***	***0.021***	***0.023***
112	0.161	***0.161***	***8.395***	***1.237***	***2.200***	***0.021***	***0.023***
113	2.522	1.510	***1.126***	3.865	1.969	0.427	0.687
114	1.746	1.243	***1.126***	***4.075***	0.336	0.195	0.302
115	4.460		***2.886***	***4.787***	***1.947***		
116	0.395	***0.246***	***2.886***	***5.524***	***1.947***	***0.021***	***0.023***
117	1.563		0.879	***3.052***	***1.947***		
118	0.789	***0.270***	***2.886***	***4.787***	***1.947***	***0.021***	***0.023***
119	1.522	***1.522***	***2.886***	***4.787***	1.282	***0.021***	***0.023***
120	0.246	***0.246***	***2.886***	***4.787***	***1.947***	***0.021***	***0.023***
121	0.270	***0.270***	***2.886***	***4.787***	0.212	***0.021***	***0.023***
122	1.887	***1.887***	***2.886***	***4.787***	0.170	***0.021***	***0.023***
200	9.810		***1.996***	***1.713***	***1.952***		
201	1.336	***0.565***	***1.996***	0.435	***0.594***	0.020	0.204
202	1.211	***0.390***	***1.996***	***1.713***	***1.952***	0.155	***0.070***

203	1.845	***0.390***	1.006	***1.713***	***1.952***	0.031	***0.070***
204	1.084	***0.565***	***1.996***	2.413	***0.594***	0.125	***0.086***
205	1.273	***0.390***	2.982	***1.713***	1.331	0.045	***0.070***
206	1.929	***0.390***	***1.996***	***1.713***	***1.952***	0.068	0.074
207	2.181	***0.390***	1.669	0.911	***1.952***	***0.098***	***0.070***
208	4.528	***0.390***	0.947	***1.713***	***1.952***	0.066	***0.070***
209	1.338	***0.390***	1.895	***1.713***	***1.952***	0.157	***0.070***
210	1.296	***0.390***	0.368	***1.713***	***1.952***	0.066	***0.070***
211	1.929	***0.390***	***1.996***	***1.713***	***1.952***	0.114	0.111
300	6.894		***3.467***	***0.949***	2.137		
301	***0.397***	***0.246***	***3.467***	***0.949***	2.067	0.070	***0.047***
302	1.421	***0.246***	***3.467***	***0.949***	0.923	0.010	***0.047***
303	1.342	***0.246***	***3.467***	***0.949***	***1.733***	***0.051***	***0.047***
304	0.425	***0.246***	***3.467***	***0.949***	***1.733***	0.062	***0.047***
305	0.937	***0.246***	***3.467***	***0.949***	0.016	0.020	0.083
306	3.025	***0.246***	1.955	***0.949***	***1.733***	0.005	0.002
307	1.244	***0.246***	***3.467***	***0.949***	1.006	***0.051***	***0.047***
308	***0.581***	***0.246***	***3.467***	***0.949***	1.090	0.037	0.083
400	0.541	0.280	1.229	1.368	0.351	0.035	0.052
401	0.227	0.102	0.434	0.404	0.022	0.008	0.015
402	0.260	0.208	0.907	0.768	0.227	0.029	0.026
500	2.101	0.193	1.480	1.831	0.393	0.015	0.009
501	7.032	0.276	4.525	7.935	0.909	0.017	0.008
502	0.404	0.193	0.000	0.779	0.244	0.030	0.002
503	0.384	0.228	0.453	0.986	0.423	0.044	0.004
504	0.441	0.160	0.000	0.808	1.142	0.021	0.004
505	4.781	0.948	1.231	2.642	1.051	0.022	0.010
506	1.515	0.322	2.310	1.934	1.449	0.018	0.011
507	1.860	0.237	1.355	1.987	0.230	0.019	0.017
508	0.149	***0.246***	***3.467***	***0.949***	***1.733***	0.005	0.024
509	0.787	0.028	0.638	1.316	0.313	0.011	0.002
510	0.768	0.027	1.387	1.791	0.714	0.017	0.001

511	0.829	0.026	1.573	1.764	0.275	0.017	0.001
512	***0.788***	***0.025***	***1.494***	***1.675***	***0.261***	***0.016***	***0.001***
513	***0.722***	***0.023***	***1.370***	***1.536***	***0.239***	***0.015***	***0.001***
600	1.126	0.250	0.484	0.589	0.099	0.023	0.066
601	0.571	0.190	0.190	0.250	0.132	0.028	0.022
602	1.550	0.566	1.140	0.951	0.244	0.093	0.061
603	1.282	0.460	0.429	1.036	0.177	0.079	0.271
604	0.307	0.261	***0.777***	0.150	0.192	0.016	0.011
605	0.479	0.372	0.749	0.841	0.334	0.039	0.041
606	0.128	0.271	***0.777***	0.280	0.015	0.018	0.009
607	0.501	0.382	1.786	0.688	0.280	0.024	0.034
608	0.369	0.337	***0.777***	0.525	0.057	0.028	0.072
609	2.818	***0.390***	1.635	***1.713***	**1.952**	0.187	***0.070***
610	0.805	***0.565***	***1.996***	0.511	***0.594***	0.040	0.086
611	2.363	***0.390***	0.895	3.317	3.817	0.067	0.028
612	0.463	***0.565***	***1.996***	2.475	***0.594***	0.037	0.086
613	***0.468***	***0.390***	1.687	***1.713***	**1.952**	0.059	0.033
614	0.515	0.391	0.271	0.265	0.038	0.017	0.003
615	1.607	0.291	1.075	1.720	0.564	0.028	0.017
616	0.819	0.238	0.480	1.058	0.309	0.020	0.026
617	0.753	0.195	0.534	0.843	0.147	0.016	0.011
618	0.832	0.231	0.000	0.731	0.060	0.015	0.013
619	0.637	0.164	0.183	0.496	0.114	0.012	0.008
620	0.542	0.215	0.372	0.835	0.121	0.021	0.006
621	1.656	***0.246***	1.508	***0.949***	1.723	0.109	0.037
622	0.576	***0.246***	***3.467***	***0.949***	***1.733***	0.034	0.086
623	***0.708***	***0.246***	***3.467***	***0.949***	***1.733***	***0.051***	0.061
624	***0.741***	***0.246***	***3.467***	***0.949***	1.239	0.033	0.037
625	1.333	***0.246***	***3.467***	***0.949***	2.862	0.065	0.045
626	0.934	***0.246***	***3.467***	***0.949***	1.698	0.034	0.028
627	0.380	0.039	0.339	0.978	0.133	0.015	0.004
628	1.225	0.051	1.058	2.172	0.462	0.024	0.003

629	0.330	0.038	0.378	0.692	0.185	0.016	0.002
630	2.536	1.204	1.230	2.108	1.013	0.098	0.079
631	0.309	0.138	0.961	0.358	0.185	0.019	0.019
632	0.494	0.167	0.277	0.434	0.403	0.022	0.030
633	0.966	0.249	0.760	1.031	0.191	0.060	0.069
634	0.360	0.161	0.326	0.559	0.304	0.021	0.023
635	0.587	0.285	1.292	1.175	0.213	0.033	0.030
700	0.202	0.072	0.070	0.133	0.540	0.006	0.003
701	0.178	0.063	0.061	0.117	0.475	0.005	0.003
702	1.344	0.080	1.579	2.047	0.446	0.018	0.009
703	0.587	0.049	0.884	0.516	0.093	0.002	0.001
704	***0.386***	***0.075***	***1.020***	***0.336***	***0.065***	***0.005***	***0.000***
705	0.080	0.079	0.905	0.065	0.019	0.005	0.000
706	0.281	0.122	0.847	0.395	0.108	0.005	0.001
707	***0.240***	***0.132***	***1.143***	***0.308***	***0.084***	***0.007***	***0.000***
708	0.796	0.027	1.487	2.420	0.924	0.018	0.001
709	0.796	0.158	0.971	0.819	0.380	0.032	0.006
710	0.475	0.143	1.223	1.403	0.758	0.014	0.007
711	***0.244***	0.097	0.667	0.774	0.023	0.011	0.004
712	0.290	0.061	0.431	0.237	0.101	0.009	0.004
713	0.314	0.023	0.659	0.812	0.804	0.006	0.001
714	***1.342***	***0.428***	***0.771***	***1.226***	***0.769***	***0.035***	***0.002***
715	0.370	0.179	0.551	1.306	0.804	0.025	0.002
800	0.047	0.142	0.002	0.013	0.034	0.105	0.002
801	0.638	0.189	0.792	1.018	0.198	0.011	0.001
802	0.691	0.219	0.984	0.738	0.206	0.012	0.001
803	0.711	0.593	0.852	1.069	0.370	0.073	0.001
804	***0.701***	***0.419***	***0.913***	***0.914***	***0.294***	***0.045***	***0.001***
805	***0.934***	***0.147***	***1.566***	***2.042***	***0.735***	***0.019***	***0.002***
806	***0.821***	***0.411***	***1.177***	***1.510***	***0.535***	***0.051***	***0.001***
807	2.372	0.843	0.820	1.571	0.652	0.063	0.002
808	***1.483***	***0.587***	***0.963***	***1.469***	***0.563***	***0.054***	***0.001***

Land Cost 1995
In 1990 dollars

Model_No	SFD	RUR	MFD	COM	IND	AGR	FOR
100	7.520	0.000	23.943	***28.065***	***16.327***	0.000	0.000
101	4.530	0.000	10.414	7.078	3.961	2.612	0.019
102	0.458	0.366	***2.891***	0.760	2.501	0.291	0.332
103	1.598	***0.366***	***5.279***	***0.760***	***2.501***	***0.291***	***0.332***
104	1.152	***0.510***	***2.891***	***3.372***	0.391	0.286	***0.333***
105	***1.209***	0.424	***2.891***	***3.372***	***0.582***	0.270	***0.333***
106	***1.088***	0.468	***2.891***	***3.372***	***0.582***	0.290	0.179
107	1.946	1.213	7.519	***3.372***	***0.582***	0.298	0.310
108	***10.734***	0.000	***17.588***	***6.990***	***4.606***	***0.000***	***0.000***
109	***9.023***	0.000	14.547	***6.990***	***4.606***	0.000	0.000
110	5.973	0.000	***9.990***	***6.990***	***4.606***	0.000	0.000
111	5.509	0.000	***9.403***	3.253	***3.135***	***0.030***	***0.010***
112	0.611	***0.611***	***9.403***	***3.253***	***3.135***	***0.030***	***0.010***
113	1.308	***0.510***	***2.891***	3.288	1.327	0.371	0.598
114	***0.979***	0.125	***2.891***	***3.372***	0.218	0.170	0.263
115	7.492	***1.536***	***7.505***	***7.865***	***1.099***	0.000	0.000
116	2.521	0.412	***7.505***	***7.865***	***1.099***	0.120	0.144
117	***5.340***	***1.536***	7.903	***9.299***	***1.099***	0.000	0.000
118	4.287	0.810	1.992	***7.865***	1.142	0.007	0.127
119	4.597	***1.536***	***7.505***	***12.314***	***1.099***	***0.030***	0.147
120	0.987	***0.987***	***7.505***	***7.865***	0.517	0.026	0.011
121	0.932	***0.932***	***7.505***	***7.865***	0.628	0.004	0.015
122	1.569	***1.569***	***7.505***	***7.865***	0.484	0.030	0.010
200	9.503	0.000	***6.738***	***4.950***	***0.409***	0.000	0.000
201	6.105	***0.830***	***6.738***	***4.492***	***0.298***	***0.083***	***0.077***
202	2.945	***1.289***	***6.738***	***4.950***	***0.409***	0.145	***0.054***
203	3.499	***1.289***	3.399	4.593	***0.409***	0.060	***0.054***
204	4.600	1.219	***6.738***	***4.492***	***0.298***	***0.054***	***0.077***
205	3.456	1.712	***6.738***	***9.087***	***0.409***	***0.242***	***0.054***
206	5.485	0.913	***6.738***	***4.950***	***0.409***	0.032	***0.054***

207	4.573	***1.289***	4.631	***4.950***	***0.409***	0.074	***0.054***
208	***6.434***	***1.289***	***6.738***	***4.950***	***0.409***	***0.106***	***0.054***
209	3.045	1.443	3.662	***4.950***	0.409	***0.106***	***0.054***
210	2.719	1.000	***6.738***	***4.950***	***0.409***	0.074	0.002
211	2.392	1.132	***6.738***	***4.950***	***0.409***	0.102	0.002
300	13.435	0.000	15.394	11.605	***1.753***	0.000	0.000
301	3.735	***0.533***	***1.669***	***2.598***	***1.389***	0.049	***0.037***
302	4.556	***0.533***	***1.669***	0.055	***1.389***	0.130	***0.037***
303	6.757	***0.533***	2.393	***2.598***	***1.389***	***0.048***	***0.037***
304	4.463	***0.533***	***1.669***	***2.598***	***1.389***	0.071	***0.037***
305	5.880	***0.533***	***1.669***	0.953	***1.389***	0.032	0.035
306	9.049	***0.533***	***1.669***	3.891	***1.389***	***0.048***	***0.037***
307	6.112	***0.533***	***1.669***	8.263	***1.389***	***0.048***	***0.037***
308	3.677	***0.533***	***1.669***	***2.771***	***1.389***	0.114	0.350
400	3.107	***1.215***	5.865	***10.774***	***0.478***	0.053	***0.073***
401	2.831	0.798	***6.870***	***4.447***	***0.478***	0.016	0.041
402	5.755	***0.811***	***6.870***	11.930	***0.478***	0.142	***0.090***
500	3.225	0.296	2.271	2.811	0.603	0.023	0.013
501	11.353	0.446	7.305	12.810	1.467	0.028	0.013
502	0.582	0.277	***0.652***	1.121	0.351	0.043	0.003
503	0.553	0.328	0.652	1.419	0.609	0.063	0.006
504	0.635	0.231	***0.652***	1.163	1.644	0.030	0.005
505	6.882	1.365	1.773	3.804	1.513	0.032	0.014
506	2.283	0.485	3.481	2.914	2.184	0.027	0.017
507	3.233	0.412	2.355	3.453	0.399	0.032	0.029
508	5.520	***0.533***	***1.669***	1.378	***1.389***	0.043	0.019
509	1.026	0.037	0.832	1.716	0.408	0.015	0.003
510	1.107	0.039	2.001	2.584	1.030	0.025	0.002
511	1.161	0.037	2.202	2.470	0.384	0.023	0.002
512	***1.161***	***0.037***	***2.202***	***2.470***	***0.384***	***0.023***	***0.002***
513	***1.161***	***0.037***	***2.202***	***2.470***	***0.384***	***0.023***	***0.002***
600	1.507	0.334	0.647	0.788	0.132	0.030	0.089
601	0.928	0.309	0.309	0.406	0.214	0.046	0.036
602	1.908	0.697	1.404	1.171	0.300	0.114	0.076

603	2.051	0.736	0.687	1.658	0.283	0.126	0.433
604	1.071	0.632	2.572	***0.899***	***0.311***	0.022	0.054
605	2.851	1.815	***1.164***	***0.899***	***0.519***	0.098	0.128
606	***2.085***	0.528	***0.901***	***0.899***	***0.022***	0.037	0.074
607	2.269	0.520	***0.901***	***0.899***	***0.418***	0.070	0.072
608	1.594	***0.931***	***0.901***	***0.899***	***0.088***	0.059	0.115
609	3.564	***1.289***	***6.738***	***1.748***	***0.409***	0.157	***0.054***
610	3.877	0.706	***6.738***	6.054	***0.298***	0.057	0.078
611	3.877	0.706	7.573	1.400	***0.409***	0.084	0.081
612	4.000	0.728	***6.738***	***5.558***	***0.298***	0.049	0.060
613	2.970	0.724	5.729	1.781	***0.409***	0.063	***0.081***
614	***2.338***	***0.632***	***1.260***	***2.604***	***0.071***	0.050	0.027
615	7.018	1.605	***7.751***	3.422	***0.999***	0.102	0.095
616	4.663	***0.632***	***1.260***	2.678	***0.612***	0.102	***0.020***
617	6.158	***0.690***	***1.260***	0.346	***0.269***	0.048	***0.020***
618	3.556	1.453	***7.751***	***3.422***	***0.090***	0.061	0.020
619	3.506	0.784	***1.260***	***2.604***	***0.202***	0.084	***0.020***
620	2.704	0.623	1.260	3.695	***0.171***	0.225	0.020
621	4.531	0.495	***1.669***	2.522	***1.389***	0.050	0.054
622	1.889	***0.533***	***1.669***	***2.598***	***1.389***	0.077	0.046
623	4.012	***0.533***	***1.669***	***2.598***	***1.389***	0.068	0.046
624	3.162	0.197	***1.669***	4.461	***1.389***	0.020	0.028
625	4.995	***0.533***	***1.669***	***2.598***	***1.389***	0.037	0.036
626	3.200	***0.533***	***1.669***	***2.598***	***1.389***	0.042	0.022
627	0.495	0.051	0.441	1.273	0.173	0.019	0.005
628	1.550	0.064	1.340	2.750	0.585	0.030	0.004
629	0.387	0.044	0.444	0.812	0.217	0.019	0.003
630	3.445	1.635	1.670	2.863	1.376	0.133	0.108
631	2.226	0.949	***6.870***	3.025	***0.478***	0.027	0.070
632	3.600	1.109	***6.870***	***4.447***	***0.478***	0.100	0.056
633	1.359	0.350	1.069	1.451	0.269	0.084	0.097
634	4.571	1.277	***6.870***	6.856	***0.478***	0.140	0.036
635	8.238	1.609	***6.870***	11.380	***0.478***	0.425	0.147
700	0.254	0.090	0.088	0.168	0.679	0.007	0.004

701	0.254	0.090	0.088	0.168	0.679	0.007	0.004
702	2.048	0.122	2.406	3.118	0.679	0.028	0.013
703	0.847	0.070	1.277	0.745	0.134	0.003	0.001
704	***0.483***	***0.094***	***1.277***	***0.421***	***0.081***	***0.006***	***0.001***
705	0.118	0.117	1.342	0.097	0.028	0.008	0.001
706	0.445	0.193	1.342	0.626	0.170	0.008	0.001
707	***0.281***	***0.155***	***1.342***	***0.361***	***0.099***	***0.008***	***0.001***
708	1.093	0.037	2.043	3.325	1.269	0.024	0.002
709	1.340	0.265	1.634	1.379	0.640	0.053	0.010
710	0.873	0.264	2.248	2.578	1.393	0.025	0.013
711	0.585	0.231	1.598	1.855	0.056	0.027	0.010
712	0.297	0.063	0.441	0.243	0.104	0.010	0.004
713	0.380	0.028	0.799	0.984	0.975	0.008	0.002
714	***1.458***	***0.465***	***0.838***	***1.332***	***0.836***	***0.038***	***0.002***
715	0.887	0.430	1.320	3.130	1.926	0.059	0.005
800	0.038	0.115	0.002	0.010	0.028	0.085	0.002
801	0.781	0.231	0.969	1.247	0.242	0.014	0.002
802	0.839	0.266	1.195	0.896	0.251	0.015	0.002
803	0.997	0.832	1.195	1.499	0.518	0.103	0.002
804	***0.918***	***0.549***	***1.195***	***1.197***	***0.384***	***0.059***	***0.002***
805	***0.966***	***0.152***	***1.619***	***2.110***	***0.760***	***0.020***	***0.002***
806	***0.981***	***0.492***	***1.407***	***1.805***	***0.639***	***0.061***	***0.002***
807	2.536	0.901	0.877	1.680	0.697	0.068	0.002
808	***1.759***	***0.696***	***1.142***	***1.742***	***0.668***	***0.064***	***0.002***