THE VALUE OF RESIDENTIAL PROPERTY IN EAST BATON ROUGE PARISH

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EXECUTIVE SUMMARY

This report summarizes a study of the total value of residential property in East Baton Rouge parish and taxes collectable within the parish. This study also provides some general results measuring the accuracy of current assessments. However, it is important to note that our study focuses on estimating the total value of residential real estate over regions, such as census blocks or the parish as a whole. Thus, this study's intent is not to provide a tool for assessing the value of individual homes.

The key findings are:

- The data provided by the Assessor's office to the Louisiana Tax Commission appears to fail to capture many sales within the parish and is in general incomplete.

- Assessment ratios generally suggest that assessments undervalue the total value of residential property in East Baton Rouge Parish.

- An initial examination of self-reported Census data on home values within the parish suggests that the total value of residential property in the parish is substantially higher then the total value implied by the assessor's data.

- Excluding properties with assessed values frozen due to exemptions, the preferred model suggests total taxes collectable of roughly $200 million in 2011, almost $41 million above the taxes collected based on current assessments for the properties considered.

- Results of the preferred model suggest cumulative revenue foregone of just over $270 million from 2005-2011 due to underassessment.

- Because 2012 data on sales was very incomplete, our models cannot be estimated. However, it should be noted that the assessor's 2012 reassessments led to an increase of just under $13 million in taxes collectable on the properties of interest. This implies $28 million in additional taxes collectable if housing prices were unchanged from 2011.

1. Introduction

This study investigates assessments of residential property in East Baton Rouge parish. In particular, the goal of the study is to provide some quantitative measures of the degree to which current valuations accurately reflect the value of residential property in East Baton Rouge Parish. The project also seeks to estimate the degree to which property tax collections would change with more accurate estimates of residential property for taxation purposes.

Though our results may provide some insights into horizontal and vertical equity of the current valuations, a full examination is beyond the scope of this study. Multiple methodologies are employed to assess the sensitivity of results to the choice of methodology and data limitations.

This study begins with a brief review of the literature. Section 3 examines the limitations facing the East Baton Rouge (EBR) Tax Assessor. Section 4 turns to some general data issues. Section 5 outlines the data sources and data development. Section 6 presents the evaluation of current assessments. Section 7 outlines the results from five statistical models using data from 2005 to 2011. Section 8 concludes.

2. A Brief Review of the Literature

Perhaps the most basic way of evaluating the accuracy of assessments is to simply compare prices from actual sales to the appraised value of the property prior to the sale. The tool used for this comparison is the assessment ratio – the ratio of the appraised value of a property relative to the market value. An assessed valuation is the value of a property as determined by a municipality for tax purposes. The market value is the amount for

which one can sell a property on the current market. For example, if the assessed valuation of a property is $180,000 and its market value is $200,000, its assessment ratio is 0.90, or 90%. Looking at the assessment ratio can be useful, however, because the assessment ratio is calculated using only properties that have sold, there is a limited number of properties being used.

Progressing to methods that estimate market values for properties that have not sold during our study period is more complicated. This study combines a hedonic pricing model that incorporates GIS information with a repeat sales application. The limitations imposed by the data restrict our modeling to traditional, straight-forward methods of mass appraisal. A large literature supports this hybrid approach.

We combine the hedonic pricing model using GIS data with Repeat Sales modeling. Repeat Sales models are time series indexes using a data sample where all homes have sold at least twice. The observed data allow an annualized percentage growth in sales price to be calculated for the property. This method does not give information on the value of an individual house. However, the advantage is that this method is based on actual transactions prices.

Repeat sales methods have a number of advantages that are appealing for this study. First, our dataset contains information on transaction prices and the dates when these transactions occur. The data available for this study lacks specificity in individual home characteristics, however, we have ample amount of geographic detail on the properties.

The repeat sales method has a number of shortcomings as well. Even at its best, the method only yields estimates of price changes. No information on price levels, or place-to-place price indexes is derivable from a pure repeat sales method. Because only a few units

transact twice over a given time period, the repeat sales method tends to utilize only a fraction of potential information on the housing market. Another issue is that units that transfer often may be systematically different than the average housing stock in its market. The approach assumes that there is no change in the characteristics of the housing unit between periods. Some of these unavoidable assumptions may be violated. Unfortunately, the data used in this study does not allow for a more detailed examination of these issues. Green and Malpezzi (2002) give an example of a repeat sales model.

The repeat sales method can be combined with other methods to correct for some of its shortcomings. Hybrid models take advantage of strengths while attempting to minimize weaknesses. The spirit of hybrid models is to 'stack' repeat sales and hedonic models, and then to estimate the two models imposing a constraint that estimated price changes over time are equal in both models. In effect, such methods are weighted averages of the hedonic and repeat sales, and have the advantage of making use of all available information. Case and Quigley (1991), Quigley (1995), and Hill, Knight and Sirmans (1997) represent good examples of hybrid models.

Hedonic pricing models are a method to decompose a property price so that values for other homes in different places can be predicted and compared. A hedonic price equation is a multiple regression where the transaction value is regressed on housing characteristics. The independent variables are typically individual characteristics of the dwelling which usually include structural characteristics, neighborhood characteristics, the time the house value is observed, the location within the market and contractual conditions. The regression coefficients estimate the implicit values of each of the

characteristics. Our data from the Tax Assessor is limited, however we use aggregated characteristics from Geographic Information Systems software by Census Block groups, timing of sales transactions and market price in an effort to blend traditional methods like repeat sales and the hedonic pricing model.

Adding Geographic Information Systems (GIS) technology to improve appraisal analysis is common in the practice of mass appraisal. Its inclusion improves traditional hedonic models. Rodriguez, Sirmans and Marks (1995) find statistically significant relationships between residential sales prices and GIS-created variables. Clapp and Rodriguez (1995) show that real estate market analysis can be significantly enhanced by using GIS.

Our study employs GIS information from Census blocks where transactions have occurred. Marks, Stanley and Thrall (1994) note that the GIS technology can then be used to create many variables that can be used in hedonic and repeat sales hybrid models. Although there are many GIS variables available to use, we determine that using the median year built and median household income of inhabitants within the block group produces the best fit model.[1]

More advanced methods of appraisal apply neural network (NN) technology. NNs often work as pattern classifiers. However, NNs perform best when problem solutions are complex and difficult to specify and where there is an abundance of data. One

[1] Although GIS data improves the performance of the model, a problem to consider when using GIS data is aggregation bias (Ball, 1973). Aggregation bias is a problem only if standard errors of model parameters are of interest.

advantage is that neural networks do not require a priori knowledge (Tay and Ho, 1992). Neural networks in real estate appraisal models the relationship between the property value and independent variables describing the property's characteristics. Neural networks have definite inputs and outputs but they reveal little of their processing logic. The ability to furnish users with explanations is an important feature of any model. We eliminate this method from our study for this purpose.

3. Limitations Facing the East Baton Rouge Tax Assessor

The East Baton Rouge Tax Assessor determines the fair market value of all property subject to taxation with the exception of public service properties. East Baton Rouge Parish and the State of Louisiana define real property as land and all buildings, structures, improvements, and mobile homes. The state defines Fair Market Value as the price for property which would be agreed upon between a willing and informed buyer and seller under usual and ordinary circumstances. Fair market value is the highest price estimated in terms of money which property will bring if placed for sale on the open market with reasonable time allowed to find a purchaser who is buying with knowledge of all the uses and purposes to which the property is best adapted and for which it can be legally used.

The Assessors is charged with valuing property at 100% Fair Market Value. Residential property is assessed at 10% of its estimated property value less any exemptions. The East Baton Rouge Parish Tax Assessor's web site notes a number of exemptions that property owners may qualify. The state requires that fair market value

must be applied uniformly and throughout the State. The Louisiana Tax Commission adopts uniform guidelines, procedures and rules and regulations.

The fair market value of real property must be determined by at least one of the following methods: The market approach, the cost approach, and/or the income approach. The market approach requires the assessor to use an appraisal technique where the market value estimates are based upon prices paid in actual market transaction and current listings. The cost approach requires the assessor to use a method in which the value of a property is determined by estimating the replacement cost of the property; deducting the estimated depreciation; and then adding the market value of the land. Finally, the income approach requires the assessor to use an appraisal technique where the anticipated net income is discounted to determine the investment value of the property.

The East Baton Rouge assessor is allowed to use self-reporting forms to gather data necessary to determine fair market value. The assessor may also use aerial photography, building permits, CAMA and/or mapping records, conveyance records, city directories, deed fax records, demolition permits, inspection of books and accounts of taxpayers, insurance liability policy levels, legal news publications, newspaper publications, 911 Emergency Response System records, occupational licenses, occupancy permits, physical Inspections, real estate firms' including multiple listings reports, taxpayer reports, utility records and voter registrations. There is no mention on the Tax Assessor's web page concerning the use of Global Information System (GIS) Software or Census data. However, the web site mentions that the assessor is not limited to the aforementioned sources for appraisal.

The East Baton Rouge tax assessor must reappraise at least every four years. However, the assessors' office may reappraise property based on transfers more often than every four years, if transfers indicate that property in all or a part of the assessing district, or within a certain classification, was appraised inaccurately or was not uniformly appraised during the prior reappraisal. The reappraisal is not applied on a parcel by parcel basis. The reappraisal is across the board in a given geographical area. Values determined from recent transfers would then be indexed to the date of the last reappraisal date.

Before leaving the discussion of constraints facing the assessor, two important issues should be noted. First, this study focuses on estimating the total value of residential property in East Baton Rouge Parish. The techniques employed do not attempt to value individual properties, just groups of property. Thus, this study does not seek to provide an individual property assessment model. Second, the most important constraint faced in creating an assessment model is data availability. Improvements in the quality of assessments depend on gathering or recording better data on property in the Parish.

4. General Data Issues

Before turning to a detailed description of the data set, a broad discussion of the data and limitations created by this data is warranted. Though we were able to use public reports of total sales by Multiple Listing Service (MLS) to assess data quality, the full MLS dataset was not permitted in this study. The EBR Assessor noted that the number of sales in his data set was larger than that implied by the data submitted to the Louisiana Tax Commission. However, the EBR Tax Assessor's office declined to provide that data.

Thus, data submitted by the EBR Assessor's office to the Louisiana Tax Commission is the primary data source for our study. Unfortunately, a comparison of the total number of sales in public MLS reports (which generally excludes sales not involving realtors) greatly exceeds the total sales suggested by the data submitted to the Tax Commission by the EBR Tax Assessor's office. For 2012, the assessor's data submitted to the Tax Commission reports transfer dates during the year and transfer prices for 513 residential property transactions compared to 4,183 sales reported by the MLS.

This implies that the EBR assessor's Louisiana Tax Commission submission reported price and date for only 12.3% of total MLS sales. For reference sake, the Lafayette parish data contained this information for 3,667 sales or 140% of the MLS sales. The value greater than 100% is to be expected since total sales will include transactions not processed by the MLS system (transactions not listed with realtors). The Livingston Parish data shows that both price and date information was available for 59% of MLS transactions in 2012.

Though there is substantial missing data in the EBR Assessor's data submitted to the Louisiana Tax Commission, a model for the aggregate value of residential real estate is possible. However, the econometric model implicitly assumes that the data submitted is a random sample from the larger population of all residential real estate sales in the Parish. `An assessment of the accuracy of this assumption would require a dataset on **all** sales which we have been unable to obtain. The next section summarizes construction of the dataset itself. This section also discusses additional data from the Parish and city

governments and U.S. Census was merged to this data to provide a richer picture of East Baton Rouge Parish residential real estate.

5. Data

In order to create a model to predict residential home values in East Baton Rouge Parish, the first step is to obtain a dataset of unique information on each single family residential property in the Parish. An ideal dataset would at minimum contain historical transaction prices and dates, detailed characteristics of the home such as square footage and number of bathrooms, and location information. To compare these price estimates to assessed home values generated by the tax assessor, the data would also need to include assessed values, homestead exemption and frozen assessment flags, and millage rates for each property. To create such a model, we sought to compile official data from the Louisiana Tax commission, as well as demographic data from the U.S. Census Bureau, historical sale information from the East Baton Rouge Multiple Listing Service (MLS), and GIS information on land use by location from local planning commissions. In some cases, the data proved readily available whereas in other cases virtually no reliable information exists at the housing unit level. Moreover, even in cases where the data field was available, the data encountered was sometimes plagued with a substantial number of missing observations.

The goal of the data construction is to obtain the most complete and reliable data possible on residential property in East Baton Rouge Parish. The primary data used for this

report was obtained from the Louisiana Tax Commission, specifically from the tax rolls submitted by the East Baton Rouge Parish assessor's office from the years 2005 to 2012. These tax rolls included a series of text files of the Parish information, assessment information, assessment value information, property class code information, assessment millage information, millage group information, parcel information, and legal description information.

The data was cleaned and files were merged using the assessment number as a unique identifier to make one large panel dataset. The final dataset included the following variables: assessment number, tax year, homestead exemption status, last transfer price, last transfer date, assessment type, assessment status, total assessed value, and assessed value to be paid by taxpayer. Table 1 shows the number of parcels assessed along with the total number of parcels in each tax year.

Table 1: Parcels Assessed and Total Parcels by Year

Tax Year	Total Assessments in Tax Roll	Total Parcels in Tax Roll
2005	215,492	215,780
2006	219,870	220,014
2007	224,564	224,868
2008	227,980	228,288
2009	217,302	217,408
2010	214,633	214,739
2011	212,929	213,032
2012	212,417	212,763

The panel dataset was reshaped so as to include only one entry for each parcel rather than yearly entries. We then compared the number of parcels to census estimates of owner-occupied and detached one-unit housing units for the Parish, as seen in Table 2a. The number of residential properties in East Baton Rouge Parish should be comparable to

both the number of owner-occupied units and detached one-unit structures. However, there was nearly double the number of assessed parcels as estimated residential properties. Using the census estimates as well as the Louisiana Tax Commission annual reports, we realized that the East Baton Rouge Parish assessment data includes both residential and commercial properties. Geographic information from the East Baton Rouge Parish planning commission, as well as from the planning commissions of Baker, Central, and Zachary were merged into the tax rolls to assign a land use to each parcel. By utilizing the existing land use field in the planning commission data we were able to limit our study to parcels where the existing land use was classified as "low density residential" or "medium density residential." The city of Zachary did not have an existing land use field, so for parcels in Zachary we limited our study to areas zoned as low or medium density residential. Finally, we eliminated any property which was associated with a business name in the planning commission data.

Table 2a: 2011 5-Year Census American Community Survey Housing Estimate

Year	Existing Land Use/Zoning as LDR or MDR
2005	109,725
2006	111,368
2007	112,995
2008	113,956
2009	115,379
2010	115,536
2011	115,722
2012	115,637

Table 2b shows the number of parcels each year where existing land use is classified as low or medium density residential. Not only did this methodology serve to remove commercial properties from our data, but it also removed lots with no structures. The GIS

and other data work also succeeded in bringing the tax roll totals closer into line with estimates from the U.S. Census Bureau.

Table 2b: EBR Parish Existing Land Use by Year

2011 Census ACS	Estimate
Owner-occupied	103,356
1-Unit, Detached	119,808

After removing parcels of commercial properties and vacant lots, we removed parcels classified with an assessment type of "personal property" or "public service" in the tax roll data in any year while keeping parcels classified as "real estate." We also dropped parcels that had an assessment status of "adjudicated" or "tax exempt" in any year while keeping parcels with an assessment status of "active." Finally, as tax assessments are frozen regardless of change in home value after the age of 65 or in case of disability, we flagged any parcel with a homestead exemption status of "over 65 freeze" in any year, as for these parcels the assessment would no longer be a reflection of true market value. Table 3 shows that about 12% of homes each year were given an assessment freeze and therefore were omitted when calculating measures to assess the accuracy of assessments.

Table 3: Homestead Exemptions by Year

Year	No Homestead Exemption	Homestead Exemption	Frozen	Missing exemption status
2006	14,573	36,871	7,577	56,707
2007	18,357	39,935	8,172	49,264
2008	30,531	68,455	14,971	1,771
2009	8,900	16,691	3,602	86,535
2010	8,838	16,810	3,545	86,535
2011	8,885	16,843	3,465	86,535
2012	17,465	44,085	9,405	44,770

As the final step of data cleaning, we made some logical assumptions about the coding of the data that should be noted. First, if a transfer price was listed as "0", that parcel's transfer price was recoded as missing. Next, there was the issue of missing data. Several crucial fields in the tax assessor's data were missing a substantial number of values. Table 4a shows the number of missing values in the last transfer date and last transfer price fields. The reduction in the number of missing values in 2008 and 2012 corresponds to reassessment years.

Table 4a: Missing values of Last Transfer Price and Last Transfer Date by Year

Year	Last Transfer Date Missing Values	Last Transfer Price Missing Values
2006	48.4%	55.4%
2007	42.5%	55.5%
2008	2.4%	55.5%
2009	75.3%	55.8%
2010	75.3%	55.6%
2011	75.3%	55.5%
2012	39.6%	55.3%

To increase the number of usable observations, we carried forward values from proceeding tax years when there was not a known sale. For example, a parcel could have a value in the last transfer date field in 2010, but could be missing the value in 2011, while the last transfer price did not change in either year, implying that no sale occurred. Table 4b shows the number of missing values of last transfer price and last transfer date before and after carry forward.

Table 4b: Missing values of Last Transfer Price and Last Transfer Date with Carry Forward

	Transfer Date		Transfer Price	
Year	Missing Before Carry Forward	Missing After Carry Forward	Missing Before Carry Forward	Missing After Carry Forward
2006	48.4%	5.3%	55.4%	52.3%
2007	42.5%	2.7%	55.5%	50.9%

2008	2.4%	2.3%	55.5%	50.9%
2009	75.3%	2.9%	55.8%	51.5%
2010	75.3%	2.7%	55.6%	51.6%
2011	75.3%	2.3%	55.5%	51.7%
2012	39.6%	2.2%	55.3%	51.6%

It should be the case that if a property was sold in any given year, the value in the last transfer date and last transfer price fields should change, and also the last transfer date value would be within the last year. As there was no variable indicating whether or not a property was sold, we used the logic described above to flag properties that have sold within each tax year. Table 5 shows the total number of sales recorded by the MLS in the Parish in each year, the number of sales determined by changes in transfer date in the tax rolls both before and after carry forward, as well as the number of sales after carry forward which included purchase price information and therefore were usable in the study. The expectation is that the MLS data would have fewer recorded sales than the assessor's data, as the MLS does not take into account properties that were transferred without use of the Multiple Listing Service. It should also be noted that the MLS sales data is displayed from the one year period from March to March, while the tax rolls are a one year period from October to October. While the difference in measurement may account for slight changes from year to year, it does not account for the entire discrepancy; the discrepancy between the tax roll data and the MLS data is more likely attributable to missing values in the tax assessor's data. The number of flagged home sales in 2012 that include purchase price is noticeably low, and thus we did not feel that 2012 had a large enough sample size to use in our analysis.

Table 5: Home sales flagged in LA Tax Rolls vs. home sales recorded in MLS

Year	Total MLS Home Sales	Flagged Home Sales Before Carry Forward	Flagged Home Sales After Carry Forward	Flagged Home Sales with Purchase Prices After Carry Forward
2005-2006	7,121	2,466	7,262	5,550
2006-2007	6,404	2,604	5,363	4,597
2007-2008	5,547	2,758	2,781	2,392
2008-2009	4,299	423	3,036	1,396
2009-2010	3,928	566	3,216	1,517
2010-2011	3,514	533	3,076	1,266
2011-2012	4,183	1,674	1,674	595

6. Evaluation of Current Assessments

Table 6 looks at the reappraisals made yearly by the assessor. Every fourth year is considered a reappraisal year, occurring in the periods ending in 2004, 2008, and 2012. In non-reappraisal years, it appears that about 90% of assessed values do not change. Finally, Table 7 looks at the total assessed value and taxable value by year. Both Tables 6 and 7 are referring only to homes classified as low or medium density residential in the planning commission data.

Table 6: Breakdown of appraisal change, 2006-2012

Year	Appraisal Increased	Appraisal Decreased	No Change	Total Properties
2005-2006	10,183	2,606	98,579	111,368
2006-2007	8,350	2,397	102,248	112,995
2007-2008	72,054	1,585	40,317	113,956
2008-2009	5,109	2,266	108,004	115,379
2009-2010	5,391	1,299	108,846	115,536
2010-2011	3,932	1,710	110,080	115,722
2011-2012	35,842	1,836	77,959	115,637

Table 7: Total Assessed Value by Year

Year	Total Assessed Value	Total Homestead Credits	Total Taxable Value
2006	$11,590,000,000	$517,400,000	$11,072,600,000
2007	12,350,000,000	527,300,000	11,822,700,000
2008	13,830,000,000	546,000,000	13,284,000,000
2009	14,310,000,000	544,900,000	13,765,100,000
2010	14,680,000,000	552,100,000	14,127,900,000
2011	14,950,000,000	555,500,000	14,394,500,000
2012	15,910,000,000	562,300,000	15,347,700,000

The best indicator of the true market value of a property is its sale price. To determine the accuracy of each assessment, we calculated an assessment ratio for each newly sold property, defined as the ratio of the last assessed value to the true sale price. For example, if a house sold in 2007 for $165,000, but the last assessment value was in 2006 at $111,500, the assessment ratio would be calculated as 111,500/165,000, or 67.6%. This implies that in 2006, the assessed value of the property in the example above was 67.6% of the true market value. A ratio of 1 implies a perfect assessment while a ratio under 1 implies that the tax assessor undervalued the property. A ratio over 1 implies that a property is overvalued.

After calculating these assessment ratios for every sold property, we calculated a 98% trimmed mean of the assessment ratios in each year. A trimmed mean was used to remove the influence of outliers in the purchase price data that may not be a true reflection of market value. These trimmed average assessment ratios can be found in Table 8. The number of observations in each year is slightly less than the number of sales in that year due to the calculation of the trimmed me

Table 8: Yearly Average Assessment Ratios

Year	Average Assessment Ratio	Observations
2005-2006	0.841	5,126
2006-2007	0.837	4,338
2007-2008	0.717	2,784
2008-2009	0.820	1,282
2009-2010	0.872	1,368
2010-2011	0.941	1,141

While the average assessment ratio gives us a good idea of overall accuracy of the assessments, it is also important to think about the distribution of assessments. There are two ways to do this. First, a look at ratios weighted by sale price can help us determine if underassessment is more common in higher income or lower income areas. Table 9 displays the weighted average assessment ratios. The weighted ratios are lower than the unweighted ratios implying that higher value properties are more highly undervalued on average than lower value properties.

Table 9: Weighted Yearly Average Assessment Ratios

Year	Weighted Average Assessment Ratio	Observations
2005-2006	0.775	5,126
2006-2007	0.755	4,338
2007-2008	0.707	2,784
2008-2009	0.791	1,282
2009-2010	0.835	1,368
2010-2011	0.863	1,141

The second way to look at the distribution of assessments is to find the average assessment ratios in smaller areas than parish-wide. To do this, we chose the geographic area of a census block group, which is defined by the census bureau as an area containing between 200 and 500 households with similar demographic characteristics. East Baton Rouge Parish contains 297 block groups with low or medium density residential housing, and Table 10 shows the distribution of average assessment ratios by block group. A block group was considered to have too few observations if there were not at least 2 homes sold in that year within the boundaries of that block group. Properties within a block group were considered to be overvalued by the assessor if the assessment ratio was above 1.10,

accurately valued if the assessment ratio was between 1.10 and 0.90, slightly undervalued if the ratio was between 0.90 and 0.80, moderately undervalued if the ratio was between 0.80 and 0.66, and highly undervalued if the ratio was under 0.66.

Table 10: Percentage of Block Groups by Assessment Ratio

Year	2006	2007	2008	2009	2010	2011
Over 1.10	10.1%	9.1%	1.2%	1.9%	6.3%	15.4%
1.10 to 0.90	15.1%	16.4%	1.2%	12.2%	24.1%	32.1%
0.90 to 0.80	35.7%	22.8%	12.8%	42.3%	39.9%	31.4%
0.80 to 0.66	30.6%	38.0%	57.4%	32.1%	23.4%	19.2%
Under 0.66	8.5%	13.7%	27.3%	11.5%	6.3%	1.9%

From this table, it is clear that the majority of homes values were under assessed in 2006, with underassessment peaking in 2008 at the height of the housing bubble and becoming more accurate as we move towards the present. However, even in 2011 only 32.1% of block groups had accurately assessed properties on average. Figure 1 shows a map of block groups shaded by assessment ratio in 2006, while Figure 2 shows block groups shaded by assessment ratio in 2011. As is evident from the map, the variance of average ratios is quite high.

Figure 1: 2006 East Baton Rouge Parish Assessment Ratios by Block Groups

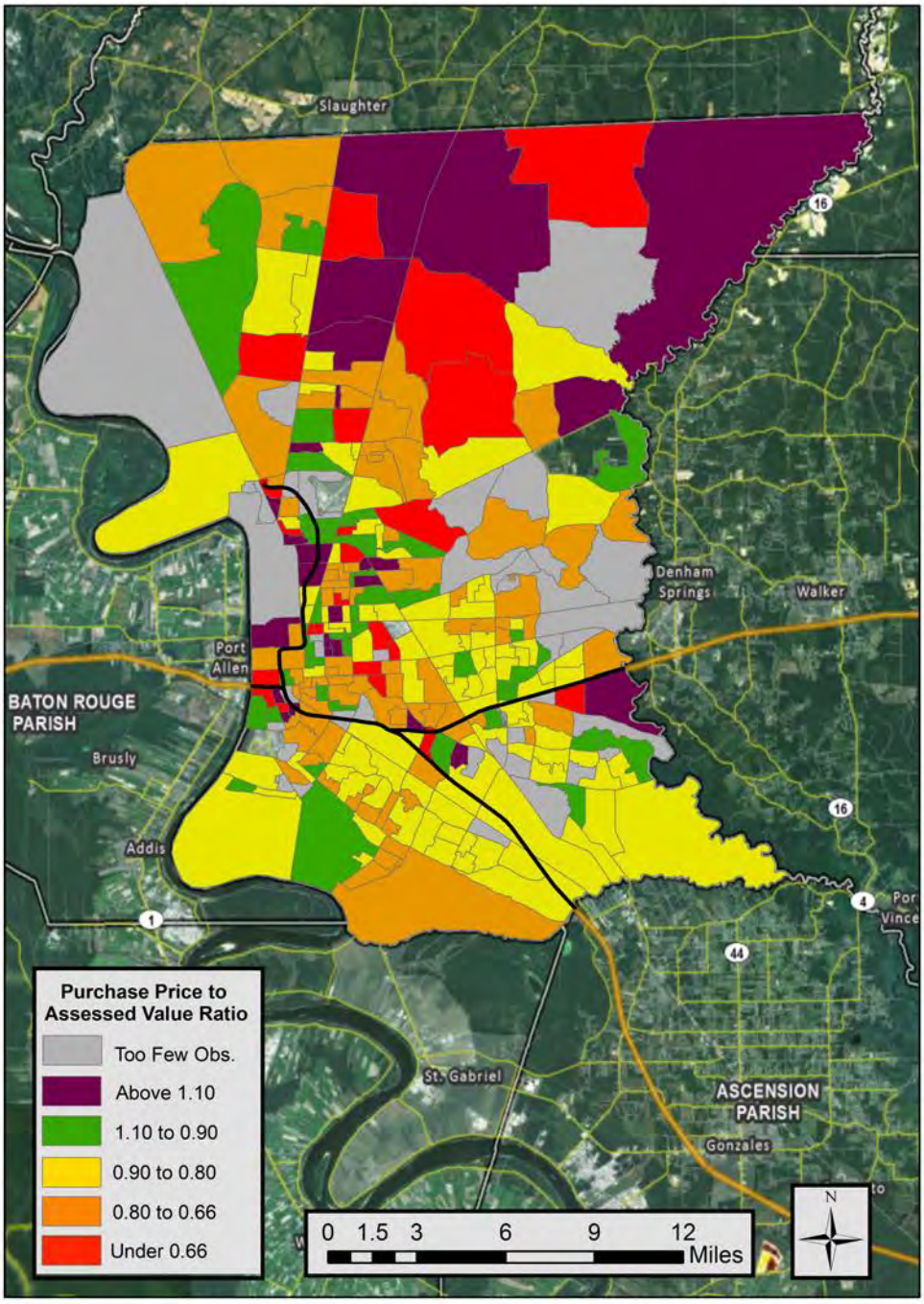
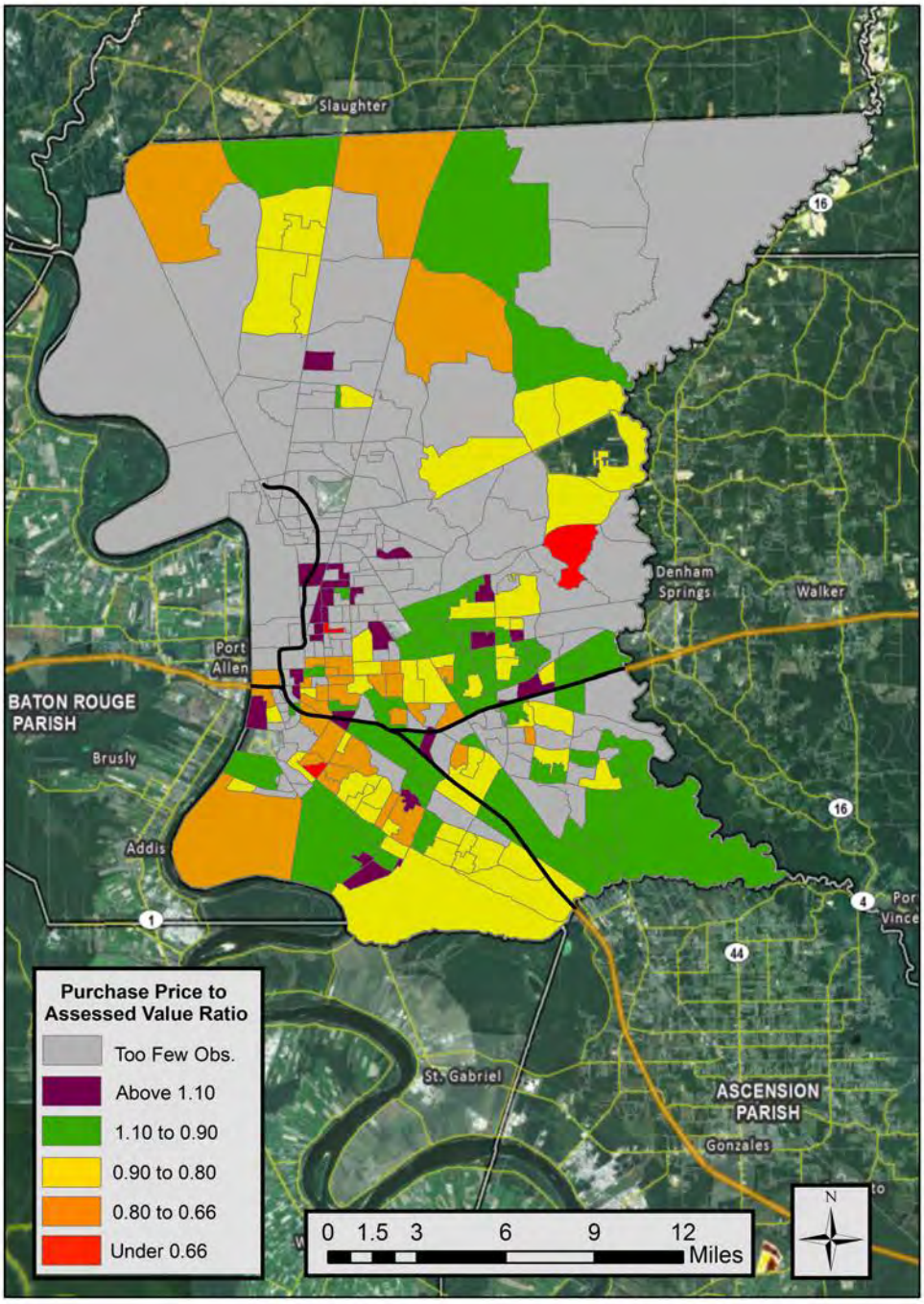


Figure 2: 2011 East Baton Rouge Parish Assessment Ratios by Block Groups



7. Results

As the yearly assessment ratios show that housing values were under assessed on average, this implies that there was some amount of property tax revenue foregone each year. To predict the amount of revenue foregone each year, we created several models to estimate the true value of low and medium density residential housing. We then determined total revenue foregone by subtracting the total assessed value from the total predicted value.

We employed five different methods to estimate revenue foregone, with the idea that several different corroborating models provide stronger evidence than just one. Each model estimates taxes collectable based on a subsample of the data, and then scales appropriately by dividing taxes collectable in the subsample by the coverage percentage to estimate total taxes collectable for all low and medium density residential properties in the Parish. The coverage percentage was defined as the dollar value of homes covered by the model, calculated as the total assessed value of the sample over the total assessed value of all low and medium density residential properties. Homestead exemptions were taken into account when calculating the estimated total taxes collectable and revenue foregone.

Before we began modeling, to get a rough sense of total estimated home values, we found median home values by block group from the 2011 5-year Census American Community Survey (ACS). We multiplied the median value of all low and medium density residential homes in each block group by the number of homes in the block group and totaled the results, subtracted the homestead exemptions, multiplied by the millage rate, and scaled up to 100% of market value to find an estimate for taxes collectable in the

Parish. We then used the same process to total the taxes collectable of the assessed values for those same properties and compared the results, which can be found in Table 11. While the census estimates are a good rough indicator of the value of housing, there are two problems with using census-based median housing values. First, home values in the census are self-reported. Individuals may overvalue their own home when self-reporting. This suggests some caution is warranted in interpreting ACS data. However, the second problem is that the census reports the median housing price rather than the mean. A more accurate measure of the total housing value would be to multiply the mean housing value in each block group by the number of homes. The distribution of housing prices exhibits positive skewness and appears roughly log-normal as one would expect in plots. This implies that the mean will typically be higher than the median, and therefore the calculated total ACS home values may underestimate the true value of residential property.

Table 11: Comparison of Census ACS Taxes Collectable and Assessed Taxes Collectable

Year	Estimated ACS Taxes Collectable	Assessed Taxes Collectable	Revenue Foregone
2006	$192,817,257	$121,900,582	$70,916,676
2007	$196,284,325	$130,277,832	$66,006,493
2008	$195,977,044	$144,916,584	$51,060,460
2009	$198,896,715	$150,170,013	$48,726,702
2010	$200,052,527	$154,835,724	$45,216,803
2011	$201,069,589	$158,332,416	$42,737,173

One basic way to estimate the total taxes collectable for low and medium density residential housing is to denote properties which have sold as the subsample for each year, total the transfer prices and assessed values within the subsample, and divide by the

coverage rate. Table 12 shows a comparison of the total estimated taxes collectable and the total assessed taxes collectable, as well as the revenue foregone.

Table 12: Comparison of Assessment Ratio Taxes Collectable and Assessed Taxes Collectable

Year	Estimated Taxes Collectable	Assessed Taxes Collectable	Revenue Foregone
2006	$187,468,647	$123,965,318	$63,503,330
2007	$202,344,140	$132,768,942	$69,575,198
2008	$244,629,739	$147,586,168	$97,043,572
2009	$210,991,992	$153,010,312	$57,981,680
2010	$198,744,850	$157,067,459	$41,677,391
2011	$196,227,589	$161,040,468	$35,187,122

Another way of performing this same calculation is to calculate the assessed value divided by the assessment ratio, and total the result as estimated taxes collectable. There are a few problems with this method, however. First, there is an assumption underlying this method which implies that homes which have sold are undervalued by the same amount as homes which have not sold, which is not likely to be the case. Moreover, the coverage percentage on this model is between 1.5% and 7% and thus less reliable.

To increase the coverage percentage while still using this method, we calculated the yearly average assessment ratio in each block group with at least 2 sales. We then calculated an estimated price for most properties by taking the assessed price and dividing by block group assessment ratio and scaling up by the coverage percentage. This method has a much better coverage percentage, of between 76% and 93%. The estimated total taxes collectable and assessed total taxes collectable are found in Table 13.

Table 13: Comparison of Block Group Assessment Ratio Taxes Collectable and Assessed Taxes Collectable

Year	Estimated Taxes Collectable	Assessed Taxes Collectable	Revenue Foregone
2006	$150,125,008	$122,032,665	$28,092,344
2007	$161,978,334	$130,395,150	$31,583,183
2008	$205,095,624	$145,058,132	$60,037,492
2009	$188,832,723	$150,757,614	$38,075,109
2010	$185,427,158	$155,430,195	$29,996,963
2011	$181,400,334	$158,876,892	$22,523,442

The third model we tested was a repeat sales model. In this model, we calculated the annualized appreciation rate for properties which had sold at least one time. By block group, we then calculated the average appreciation rate for each year with at least 4 observations. Finally, we used these average yearly appreciation rates in each block group to estimate a current price for each property. However, due to missing data in the last transfer price and last transfer date fields, our coverage percentage was between 47% and 50%. As with the previous models, we totaled the estimated taxes collectable and the assessed taxes collectable, and scaled by the coverage percentage. The results of the repeat sales model are found in Table 14, while a map of the distribution of assessments is found in Figures 3 and 4 respectively. The large amount of green in the map suggests a relatively accurate model.

Table 14: Comparison of Repeat Sales Taxes Collectable and Assessed Taxes Collectable

Year	Estimated Taxes Collectable	Assessed Taxes Collectable	Revenue Foregone
2006	$180,590,539	$122,506,267	$58,084,273
2007	$201,587,657	$130,860,258	$70,727,398
2008	$214,856,824	$145,502,764	$69,354,061
2009	$225,997,386	$150,719,000	$75,278,386
2010	$200,995,148	$155,390,613	$45,604,535
2011	$214,554,806	$158,900,888	$55,653,917

Figure 3: 2006 East Baton Rouge Parish Repeat Sales Model Ratios by Block Groups

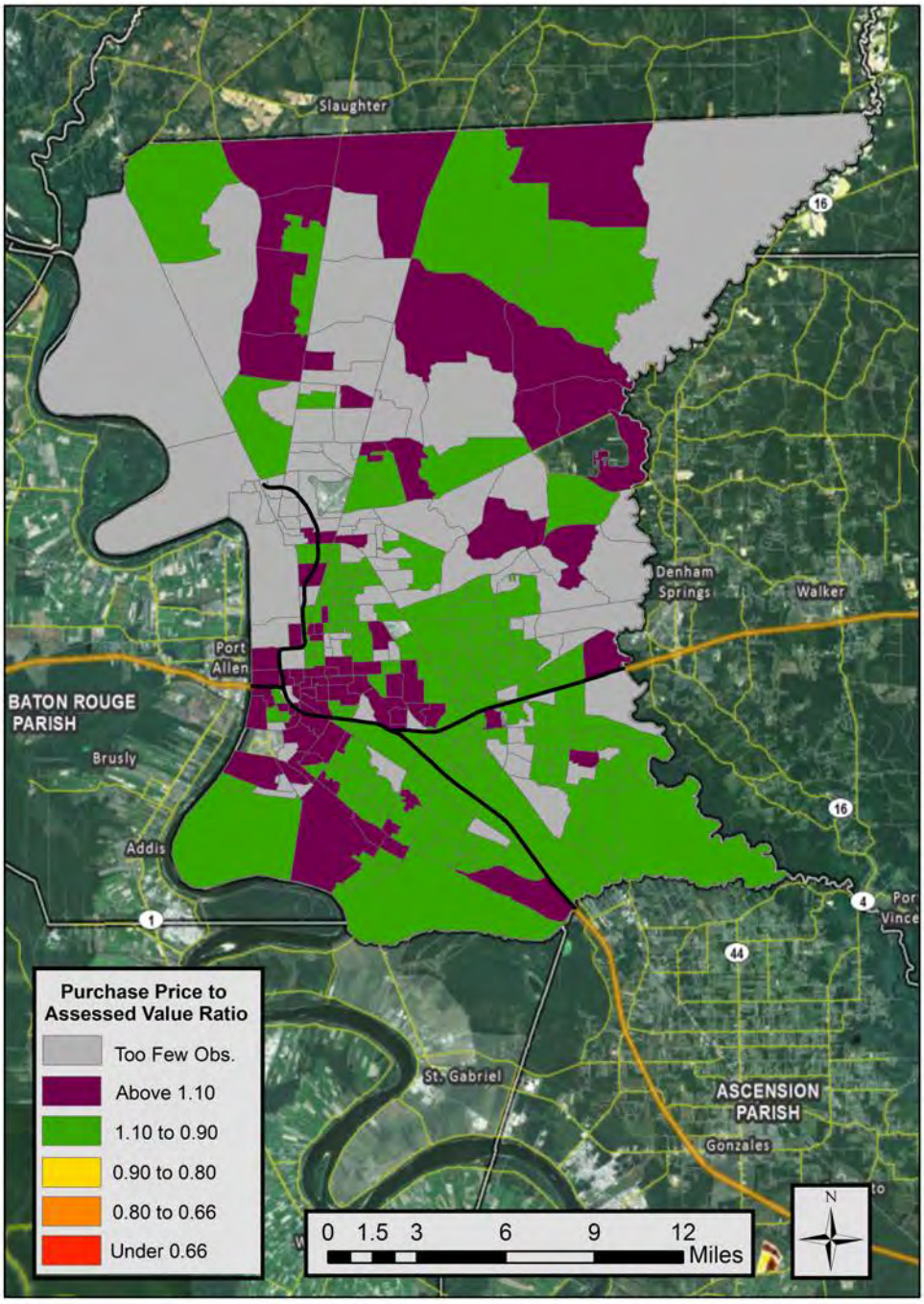
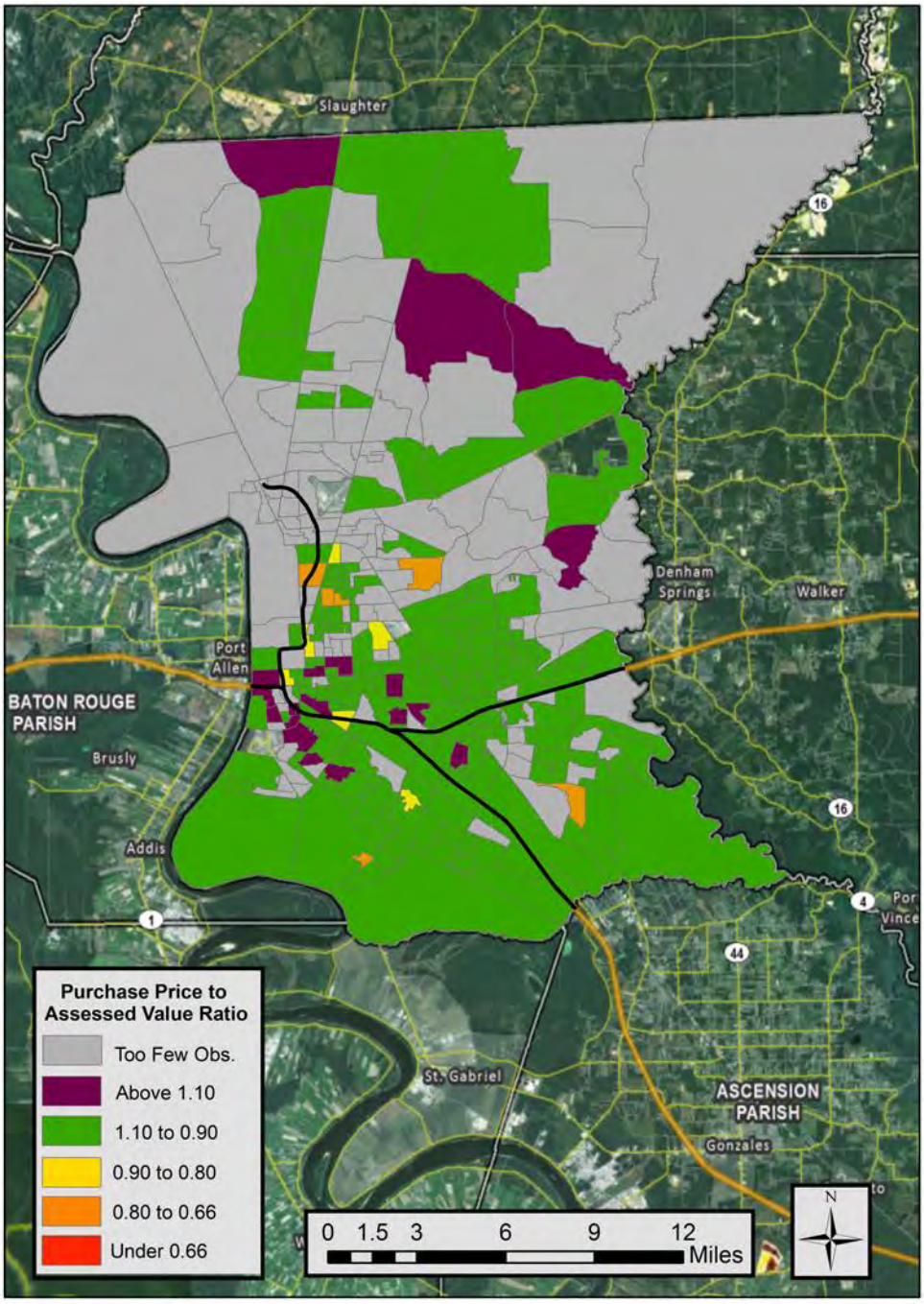


Figure 4: 2011 East Baton Rouge Parish Repeat Sales Model Ratios by Block Groups



One advantage of using block groups is that it allows for the use of census demographic information by location. The fourth model runs a separate linear regression in each year on the sample of houses sold in that year, with last transfer price as the dependent variable. The independent variables include the repeat sales price estimate, the previous year repeat sales price estimate, the median year homes were built in the block group, and the median household income in the block group. As we ran the yearly regression only on homes which had sold in that year, we then use the results to predict a purchase price for homes which had not sold in the year, totaled the estimated taxes collectable and assessed taxes collectable, and scaled up the results by the coverage percentage. The results can be found in Table 15. The coverage percentage for this model is between 47% and 50%, the same as the coverage percentage for the repeat sales model as the repeat sales model price estimate is one of the variables in the regression. The distribution of the accuracy of the linear model can be found in Figures 5 and 6.

Table15: Comparison of Repeat Sales Linear Regression Taxes Collectable and Assessed Taxes Collectable

Year	Estimated Taxes Collectable	Assessed Taxes Collectable	Revenue Foregone
2006	$164,960,692	$122,466,049	$42,494,643
2007	$184,851,721	$130,818,758	$54,032,963
2008	$195,976,678	$145,500,579	$50,476,099
2009	$207,685,029	$150,715,431	$56,969,598
2010	$188,077,819	$155,390,743	$32,687,077
2011	$201,543,441	$158,902,205	$42,641,236

Figure 5: 2006 East Baton Rouge Parish Linear Model Ratios by Block Groups

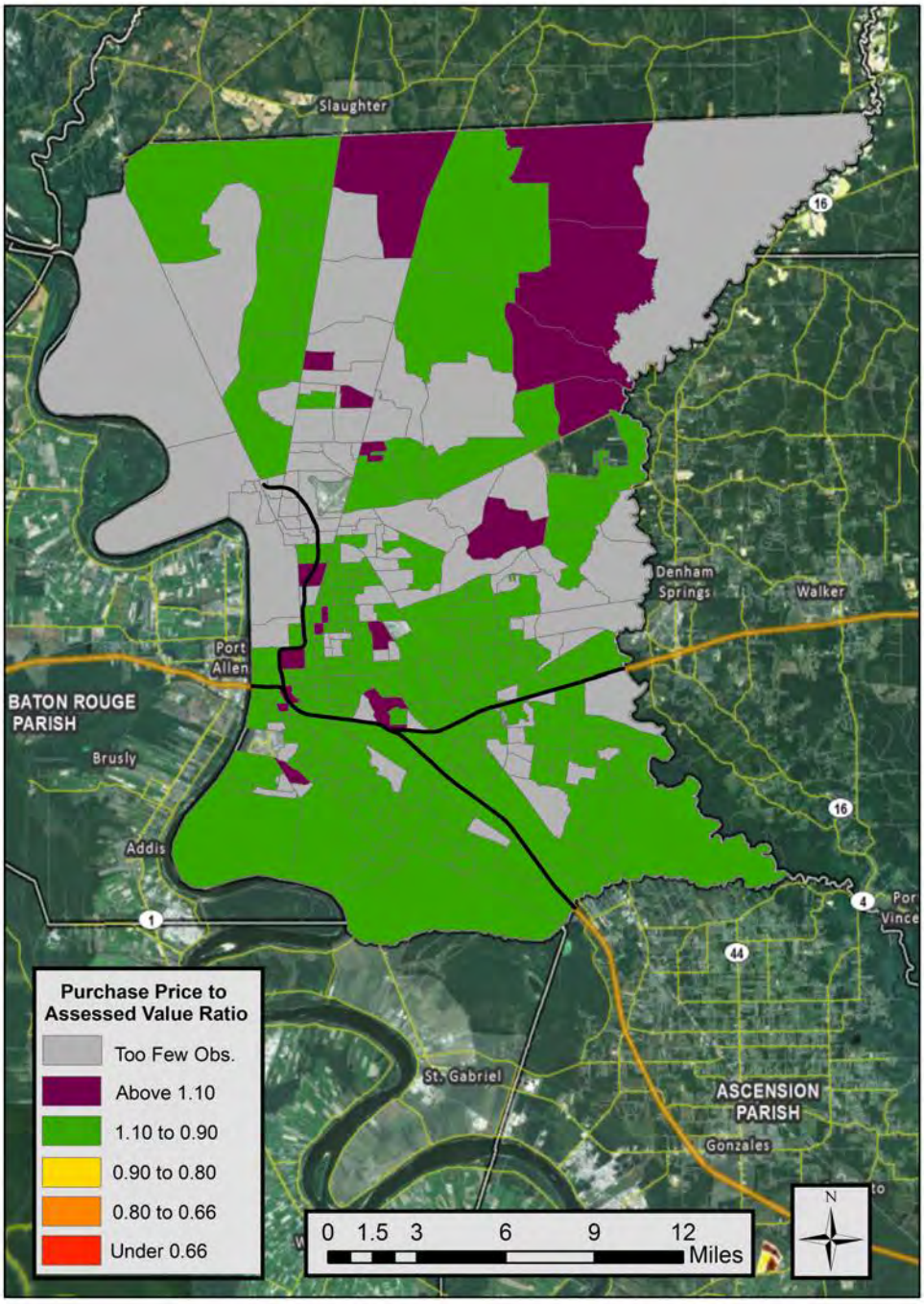
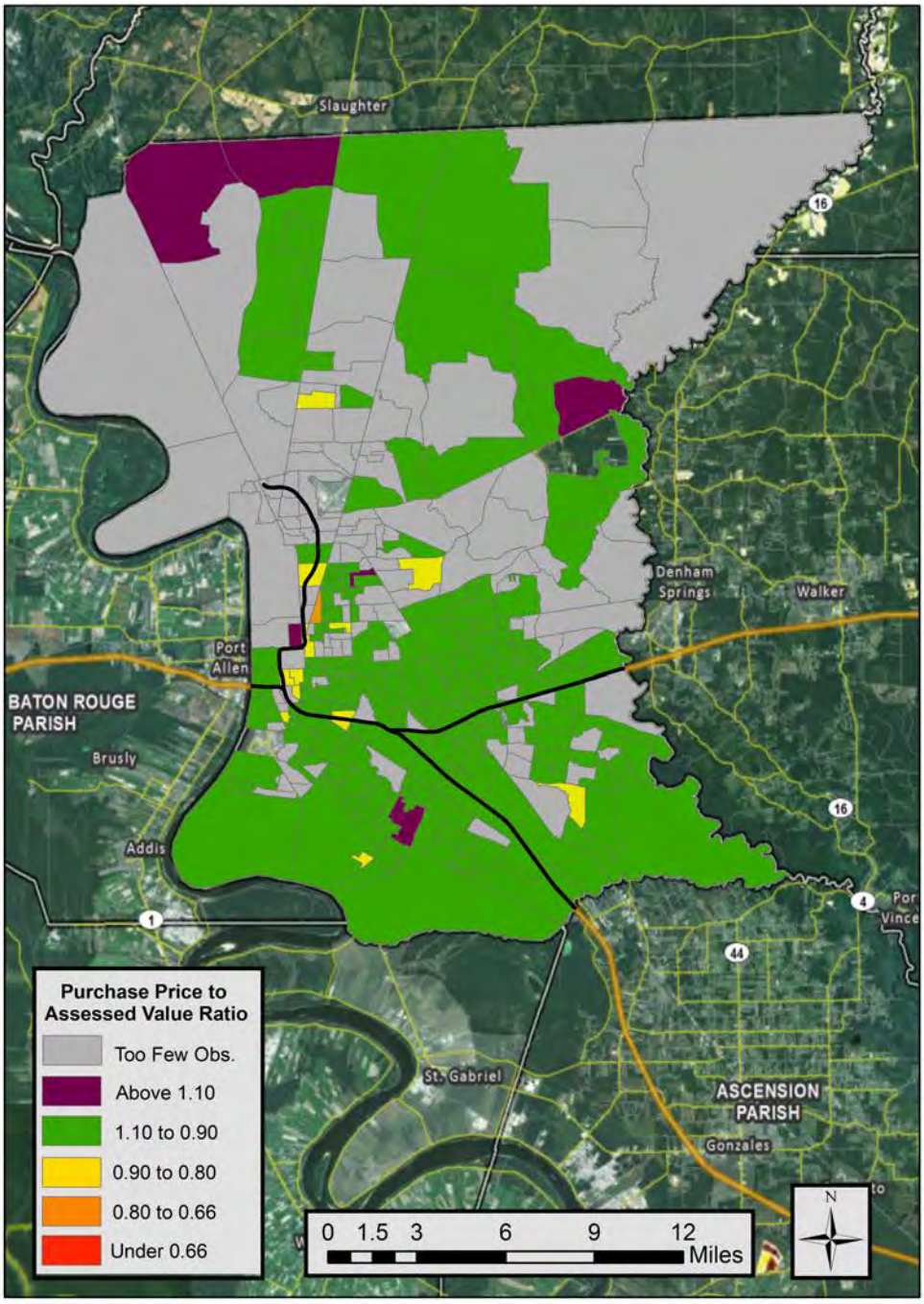


Figure 6: 2011 East Baton Rouge Parish Linear Model Ratios by Block Groups



The fifth and final model we tested was similar to the linear regression, but instead of creating a separate regression for each year, we used a random effects panel regression instead. The dependent and independent variables used are the same as in the linear regression in model 4, but with a time and a time squared variable in place of the previous year's repeat sales estimate. Again, as this model uses the repeat sales estimate as an independent variable, the coverage percentage is constrained to between 47% and 50%. The scaled results for the panel regression model can be found in Table 16, while the distribution of the accuracy of the panel model can be found in Figures 7 and 8. Appendix A uses millage rate information for various jurisdictions to allocate these potential lost revenues to their respective revenue funds.

Table 16: Comparison of Repeat Sales Panel Regression Taxes Collectable and Assessed Taxes Collectable

Year	Estimated Taxes Collectable	Assessed Taxes Collectable	Revenue Foregone
2006	$162,985,758	$122,506,267	$40,479,491
2007	$183,070,753	$130,860,258	$52,210,495
2008	$196,043,641	$145,502,764	$50,540,878
2009	$206,935,574	$150,719,000	$56,216,574
2010	$188,590,714	$155,390,613	$33,200,102
2011	$199,856,404	$158,900,888	$40,955,515

Figure 7: 2006 East Baton Rouge Parish Panel Model Ratios by Block Groups

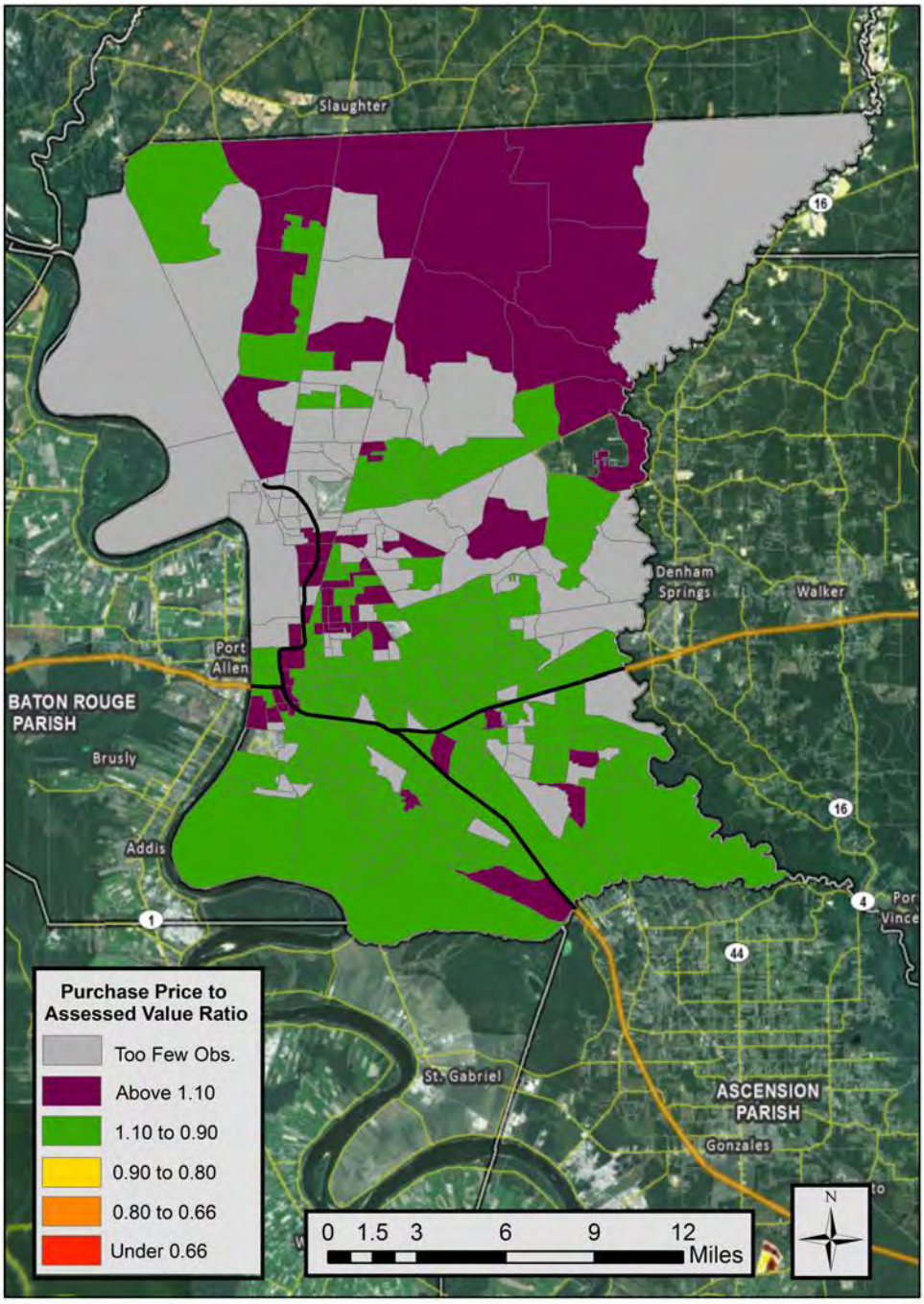


Figure 8: 2011 East Baton Rouge Parish Panel Model Ratios by Block Groups

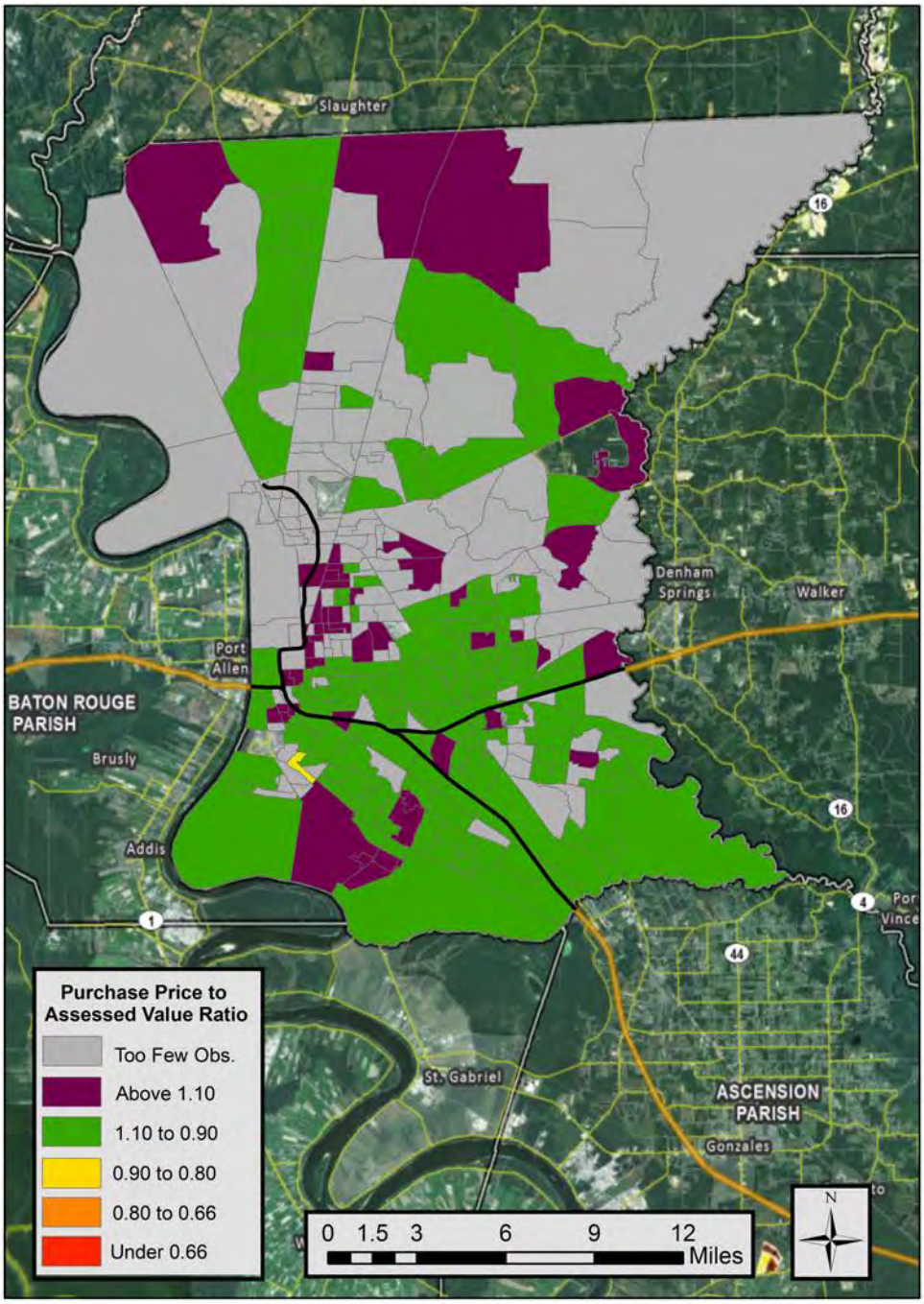


Figure 9 and Table 17 below show the cumulative revenue foregone by model. Over the six year period from 2006-2011, we estimate that the total revenue foregone was between $200,000,000 and $370,000,000. Our model predicts about $275,000,000 in revenue foregone from 2006-2011.

Figure 7: Cumulative Revenue foregone by Model

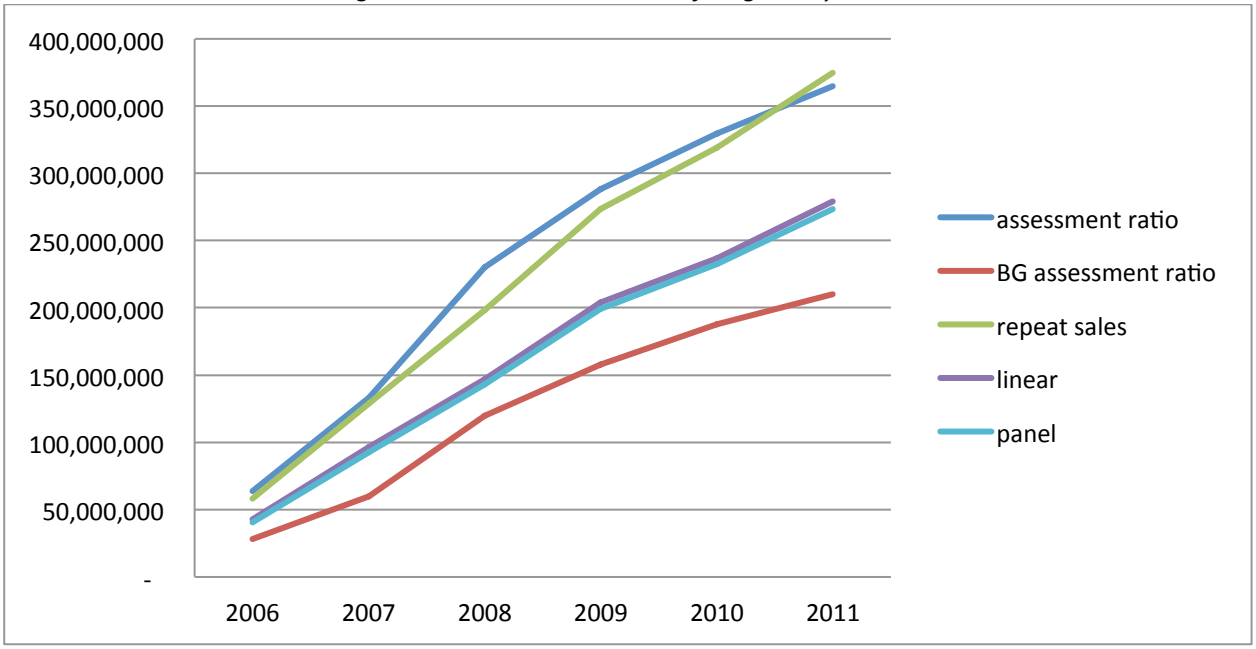


Table 17: Cumulative Revenue foregone by year by model

year	assessment ratio	BG assessment ratio	repeat sales	linear	panel
2006	$63,503,330	$28,092,344	$58,084,273	$42,494,643	$40,479,491
2007	$133,078,528	$59,675,527	$128,811,671	$96,527,606	$92,689,986
2008	$230,122,100	$119,713,019	$198,165,731	$147,003,705	$143,230,864
2009	$288,103,780	$157,788,128	$273,444,117	$203,973,303	$199,447,437
2010	$329,781,170	$187,785,091	$319,048,653	$236,660,380	$232,647,539
2011	$364,968,292	$210,308,532	$374,702,570	$279,301,616	$273,603,054

8. Conclusion

This report summarizes a study of the total value of residential property in East Baton Rouge Parish and taxes collectable within the Parish. This study also provides some general results measuring the accuracy of current assessments made by the EBR Tax Assessor.

The data maintained by the Assessor's office and provided by the Louisiana Tax Commission appears to fail to capture many sales within the Parish and is in general incomplete. Assessment ratios generally suggest that assessments undervalue the total value of residential property in East Baton Rouge Parish. An initial examination of self-reported Census data on home values within the Parish suggests that the total value of residential property in the Parish is substantially higher then the total value implied by the assessor's data. Excluding properties with assessed values frozen due to exemptions, the preferred model suggests total taxes collectable of roughly $200 million in 2011, almost $41 million above the taxes collected based on current assessments for the properties considered. Results of the preferred model suggest cumulative revenue foregone of just over $270 million from 2005-2011 due to underassessment.

The preferred panel data model suggests just under $41 million of potential additional revenues from residential taxes if assessments were consistent with the model's predictions. Appendix A uses information about 2011 millage rates for various jurisdictions to break these potential revenues into uses.

Because 2012 data on sales was very incomplete, our models cannot be estimated. However, it should be noted that the assessor's 2012 reassessments led to an increase of just under $13 million in taxes collectable on the properties of interest. This implies $28 million in additional taxes collectable if housing prices were unchanged from 2011.

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Appendix A

ESTIMATED REVENUE LOST BY MILLAGE GROUP

millage name	millage	estimated property tax revenue foregone 2011
ADDITIONAL AID TO PUBLIC SCHOOLS	6.50	$ 2,021,000
ADDITIONAL SPECIAL LAW ENFORCEMENT2	3.73	1,361,000
ADDITIONAL SPECIAL LAW ENFORCEMENT3	6.90	2,518,000
ADDITIONAL TEACHERS	2.78	864,000
ALSEN FIRE PROTECT. DIST. NO. 9 (1)	10.00	14,000
ALSEN FIRE PROTECT. DIST. NO. 9 (2)	4.97	7,000
ASSESSOR'S SALARY & EXPENSE FUND	1.38	504,000
B. R. MUNICIPAL FIRE SAL. & BENEFIT	6.00	1,152,000
BAKER - GENERAL FUND	6.22	67,000
BAKER CONSTITUTIONAL SCHOOL	5.00	54,000
BAKER SCHOOL MILLAGE	38.20	410,000
BREC CAPITOL IMPROVEMENTS2	4.10	1,496,000
BREC MAINTENANCE & OPERATIONS1	2.10	766,000
BREC MAINTENANCE & OPERATIONS3	3.96	1,445,000
BREC MAINTENANCE & OPERATIONS4	0.42	153,000
BREC MAINTENANCE & OPERATIONS5	0.63	230,000
BREC MAINTENANCE & OPERATIONS6	3.25	1,186,000
BROWNSFIELD FIRE DISTRICT NO. 3 (1)	5.00	33,000
BROWNSFIELD FIRE DISTRICT NO. 3 (2)	10.00	66,000
BROWNSFIELD FIRE DISTRICT NO. 3 (3)	10.00	66,000
CENTRAL CONSTITUTIONAL SCHOOL1	4.58	112,000
CENTRAL FIRE DISTRICT NO. 4 (1)	10.00	255,000
CENTRAL FIRE DISTRICT NO. 4 (2)	5.00	128,000
CENTRAL SCHOOL BOND PROP #2	9.25	225,000
CENTRAL SCHOOL BOND PROP #3	14.40	351,000
CENTRAL SCHOOL MILLAGE2	35.21	858,000
CHANEYVILLE FIRE DISTRICT	10.00	35,000
CITY OF ZACHARY	3.17	43,000
COMITE RIVER DIVERSION CANAL	2.65	370,000
CONS. ROAD LIGHTING DISTRICT NO. 1	4.00	87,000
CONSTITUTIONAL SCHOOL	5.25	1,632,000
DOWNTOWN DEVELOPMENT DISTRICT	10.00	26,000
EAST SIDE FIRE DISTRICT NO. 5 (1)	10.00	108,000
EAST SIDE FIRE DISTRICT NO. 5 (2)	5.00	54,000
EAST SIDE FIRE DISTRICT NO. 5 (3)	7.50	81,000

EMERGENCY MEDICAL SERVICES	3.13	1,142,000
GENERAL FUND	6.48	1,244,000
HOOPER ROAD FIRE DIST. NO. 6 (1)	10.00	106,000
HOOPER ROAD FIRE DIST. NO. 6 (2)	10.00	106,000
HOOPER ROAD FIRE DIST. NO. 6 (3)	5.00	53,000
HOOPER ROAD FIRE DIST. NO. 6 (4)	15.00	160,000
MOSQUITO ABATEMENT DISTRICT1	0.30	109,000
MOSQUITO ABATEMENT DISTRICT2	1.15	420,000
PARISH LIBRARY	11.10	4,050,000
PARISH TAX	3.54	1,292,000
PONTCHARTRAIN LEVEE DISTRICT	3.52	68,000
PRIDE FIRE DISTRICT NO. 8	10.00	39,000
SCHOOL - REPLACING REDUCED PAYMENTS	4.98	1,549,000
SCHOOL EMPL SALARIES & BENEFITS 1	1.86	578,000
SCHOOL EMPL SALARIES & BENEFITS 2	7.14	2,220,000
SCHOOL EMPL SALARIES & BENEFITS 3	7.19	2,236,000
SPECIAL - EMP. SALARIES & BENEFITS	5.99	1,863,000
SPECIAL - SCHOOL MAINTENANCE	1.04	323,000
SPECIAL - SUPPORT ADAPP	0.72	224,000
SPECIAL LAW ENFORCEMENT1	4.36	1,591,000
ST. GEORGE FIRE DISTRICT NO. 2 (1)	6.00	464,000
ST. GEORGE FIRE DISTRICT NO. 2 (2)	4.00	309,000
ST. GEORGE FIRE DISTRICT NO. 2 (3)	1.25	97,000
ST. GEORGE FIRE DISTRICT NO. 2 (4)	1.50	116,000
ST. GEORGE FIRE DISTRICT NO. 2 (5)	1.25	97,000
THREE-PLATOON POLICE SYSTEM	0.94	181,000
ZACHARY CONSTITUTIONAL SCHOOL	5.00	94,000
ZACHARY FIRE DISTRICT NO. 1	9.00	48,000
ZACHARY SCHOOL BOND (1)	13.08	247,000
ZACHARY SCHOOL BOND (2)	13.08	247,000
ZACHARY SCHOOL BOND (3)	9.84	186,000
ZACHARY SCHOOL MILLAGE	38.20	720,000