IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF LOUISIANA

DR. DOROTHY NAIRNE, JARRETT LOFTON, REV. CLEE EARNEST LOWE, DR. ALICE WASHINGTON, STEVEN HARRIS, ALEXIS CALHOUN, BLACK VOTERS MATTER CAPACITY BUILDING INSTITUTE, and THE LOUISIANA STATE CONFERENCE OF THE NAACP, *Plaintiffs*, v. R. KYLE ARDOIN, in his official capacity as Secretary of State of Louisiana, *Defendant*.	CIVIL ACTION NO. 3:22-cv-00178 SDD-SDJ

PLAINTIFFS' EXHIBIT LIST IN SUPPORT OF
MOTION TO EXCLUDE PROPOSED EXPERT TESTIMONY

In support of Plaintiffs' motion to exclude the proposed expert testimony of Sean Trende, Dr. Douglas Johnson, and Dr. Tumulesh K.S. Solanky, Plaintiffs attach the following exhibits:

- Exhibit A: Report of Sean Trende
- Exhibit B: Transcript of Deposition of Sean Trende
- Exhibit C: J. Chen & J. Rodden, *Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures*, 8 Quarterly Journal of Political Science 239–69 (2013)
- Exhibit D: Reply Report of Sean Trende
- Exhibit E: Surrebuttal Report of Dr. Douglas Johnson
- Exhibit F: Report of Dr. Douglas Johnson
- Exhibit G: Transcript of Deposition of Dr. Douglas Johnson
- Exhibit H: Rebuttal Report of Willliam Cooper
- Exhibit I: *Common Cause v. Lewis* Decision

- Exhibit J: *Covington v. North Carolina* Decision
- Exhibit K: Rebuttal Report of Dr. Craig Colten
- Exhibit L: Report of Willliam Cooper
- Exhibit M: Transcript of Deposition of Dr. Tumulesh Solanky
- Exhibit N: Report of Dr. Tumulesh Solanky
- Exhibit O: Rebuttal Report of Dr. Lisa Handley
- Exhibit P: Report of Dr. John Alford
- Exhibit Q: Report of Dr. Jeffrey Lewis
- Exhibit R: Rebuttal Report of Dr. Tumulesh Solanky
- Exhibit S: Report of Dr. Lisa Handley

DATED: October 10, 2023

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on October 10, 2023, a copy of the foregoing motion was filed electronically with the Clerk of Court via the CM/ECF system. Notice of this filing will be sent to all counsel of record by operation of the court's electronic filing system.

/s/ Sarah Brannon
Sarah Brannon*

Expert Report of Sean P. Trende

in *Nairne, et al. v. Ardoin, et al.*

July 28, 2023

Table of Contents

1 Expert Qualifications

1.1 Career

I serve as Senior Elections Analyst for Real Clear Politics. I joined Real Clear Politics in January of 2009 after practicing law for eight years. I assumed a fulltime position with Real Clear Politics in March of 2010. Real Clear Politics is a company of approximately 50 employees, with its main offices in Washington D.C. It produces one of the most heavily trafficked political websites in the world, which serves as a one-stop shop for political analysis from all sides of the political spectrum and is recognized as a pioneer in the field of poll aggregation. Real Clear Politics produces original content, including both data analysis and traditional reporting. It is routinely cited by the most influential voices in politics, including David Brooks of *The New York Times*, Brit Hume of Fox News, Michael Barone of *The Almanac of American Politics*, Paul Gigot of *The Wall Street Journal*, and Peter Beinart of *The Atlantic*.

My main responsibilities with Real Clear Politics consist of tracking, analyzing, and writing about elections. I collaborate in rating the competitiveness of Presidential, Senate, House, and gubernatorial races. As a part of carrying out these responsibilities, I have studied and written extensively about demographic trends in the country, exit poll data at the state and federal level, public opinion polling, and voter turnout and voting behavior. In particular, understanding the way that districts are drawn and how geography and demographics interact is crucial to predicting United States House of Representatives races, so much of my time is dedicated to that task.

I am currently a Visiting Scholar at the American Enterprise Institute, where my publications focus on the demographic and coalitional aspects of American Politics.

1.2 Publications and Speaking Engagements

I am the author of the 2012 book *The Lost Majority: Why the Future of Government is up For Grabs and Who Will Take It*. In this book, I explore realignment theory.

It argues that realignments are a poor concept that should be abandoned. As part of this analysis, I conducted a thorough analysis of demographic and political trends beginning in the 1920s and continuing through modern times, noting the fluidity and fragility of the coalitions built by the major political parties and their candidates.

I also co-authored the 2014 *Almanac of American Politics*. The *Almanac* is considered the foundational text for understanding congressional districts and the representatives of those districts, as well as the dynamics in play behind the elections. PBS's Judy Woodruff described the book as "the oxygen of the political world," while NBC's Chuck Todd noted that "Real political junkies get two *Almanacs*: one for the home and one for the office." My focus was researching the history of and writing descriptions for many of the newly-drawn districts, including tracing the history of how and why they were drawn the way that they were drawn. Because the 2014 *Almanac* covers the 2012 elections, analyzing how redistricting was done was crucial to my work. I have also authored a chapter in Larry Sabato's post-election compendium after every election dating back to 2012.

I have spoken on these subjects before audiences from across the political spectrum, including at the Heritage Foundation, the American Enterprise Institute, the CATO Institute, the Bipartisan Policy Center, and the Brookings Institution. In 2012, I was invited to Brussels to speak about American elections to the European External Action Service, which is the European Union's diplomatic corps. I was selected by the United States Embassy in Sweden to discuss the 2016 elections to a series of audiences there and was selected by the United States Embassy in Spain to fulfill a similar mission in 2018. I was invited to present by the United States Embassy in Italy, but was unable to do so because of my teaching schedule.

1.3 Education

I am currently enrolled as a doctoral candidate in political science at The Ohio State University. I have completed all my coursework and have passed comprehensive examinations in both methods and American Politics. As of this writing, my dissertation has been approved for defense by my committee, and awaits formatting review. Chapter 3 of the dissertation involves the use of communities of interest in redistricting simulations. In pursuit of this degree, I have also earned a Master's Degree in Applied Statistics. My coursework for my Ph.D. and M.A.S. included, among other things, classes on G.I.S. systems, spatial statistics, issues in contemporary redistricting, machine learning, non-parametric hypothesis tests and probability theory.

In the winter of 2018, I taught American Politics and the Mass Media at Ohio Wesleyan University. I taught Introduction to American Politics at The Ohio State University for three semesters from Fall of 2018 to Fall of 2019, and again in Fall of 2021. In the Springs of 2020, 2021, 2022 and 2023, I taught Political Participation and Voting Behavior at The Ohio State University. This course spent several weeks covering all facets of redistricting: how maps are drawn, debates over what constitutes a fair map, measures of redistricting quality, and similar topics.

1.4 Prior Engagements and Court Appointments

A full copy of all cases in which I have testified or been deposed is included on my c.v, attached as Exhibit 1. In 2021, I served as one of two special masters appointed by the Supreme Court of Virginia to redraw the districts that will elect the Commonwealth's representatives to the House of Delegates, state Senate, and U.S. Congress in the following decade. The Supreme Court of Virginia accepted those maps, which were praised by observers from across the political spectrum. *E.g.*, "New Voting Maps, and a New Day, for Virginia," *The Washington Post* (Jan. 2, 2022), *available at* https://www.washingtonpost.com/opinions/ 2022/01/02/virginia-redistricting-voting-mapsgerrymande Henry Olsen, "Maryland Shows How to do Redistricting Wrong. Virginia Shows How to Do it Right," *The Washington Post* (Dec. 9, 2021), *available at* https://www. washingtonpost.com/opinions/2021/12/ 09/maryland-virginia-redistricting/; Richard Pildes, "Has VA Created a New Model for a Reasonably Non-Partisan Redistricting Process," *Election Law Blog* (Dec. 9, 2021), available at https://electionlawblog.org/?p=126216.

In 2019, I was appointed as the court's expert by the Supreme Court of Belize. In that case I was asked to identify international standards of democracy as they relate to malapportionment claims, to determine whether Belize's electoral divisions (similar to our congressional districts) conformed with those standards, and to draw alternative maps that would remedy any existing malapportionment.

I served as a Voting Rights Act expert to counsel for the Arizona Independent Redistricting Commission in 2021 and 2022.

2 Scope of Engagement

I have been retained by the law firm of Nelson Mullins on behalf of Secretary of State Kyle Ardoin to evaluate Louisiana's legislative maps (”Enacted Maps” or ”Enacted Plan”) and the demonstration maps proposed by their expert, Mr. William Cooper (“Cooper Illustrative Maps” or “Illustrative Maps”). I am being compensated at a rate of $400.00 per hour to provide my expert analysis. I have been asked to explore the following questions in reference to the minority-majority districts that Mr. Cooper created, in addition to those contained in the Enacted Map:

- Whether the minority populations in the new minority-majority districts in the Illustrative Maps are compact?
- Whether the portion of the minority group that appears compact, if any, is sufficient to constitute a majority of the district?

3 Summary of Opinions

Based on the work performed as addressed in the following sections of the report, I hold to the following opinions to a reasonable degree of professional certainty:

- The newly created minority-majority districts in the Cooper Illustrative Map are not based upon compact minority populations. While some minority-majority districts using such populations are certainly possible in Louisiana, these new districts are created by aggregating geographically distant clusters of residents.
- Most (but not all) of these newly drawn districts do include a large, compact cluster of minority residents of voting age. However, the populations in these clusters are not large enough to constitute a majority of the district.

4 Data Relied Upon and Construction of Datasets

For purposes of this report, I reviewed and/or relied upon the following materials:

- Shapefiles for Louisiana political materials and demographic information at the block, precinct, and parish level, downloaded from the Redistricting Data Hub, available at https://redistrictingdatahub.org/;
- Data and maps provided by Plaintiffs' Experts;
- The computer code accompanying this report;
- Other documents referenced in this report.

In defining "Black Voting Age Population," or "BVAP" for purposes of this report, at the instruction of counsel I am using the "any part Black" definition based upon data from the United States Census. That is to say, if a person informs the census that they identify, in whole or in part, as Black, I will count that individual as Black. The voting age population is calculated by summing the members of ethnic groups over the age of 18. Residents are counted as White only if they identify themselves as being White, with no other racial or ethnic identity specified.

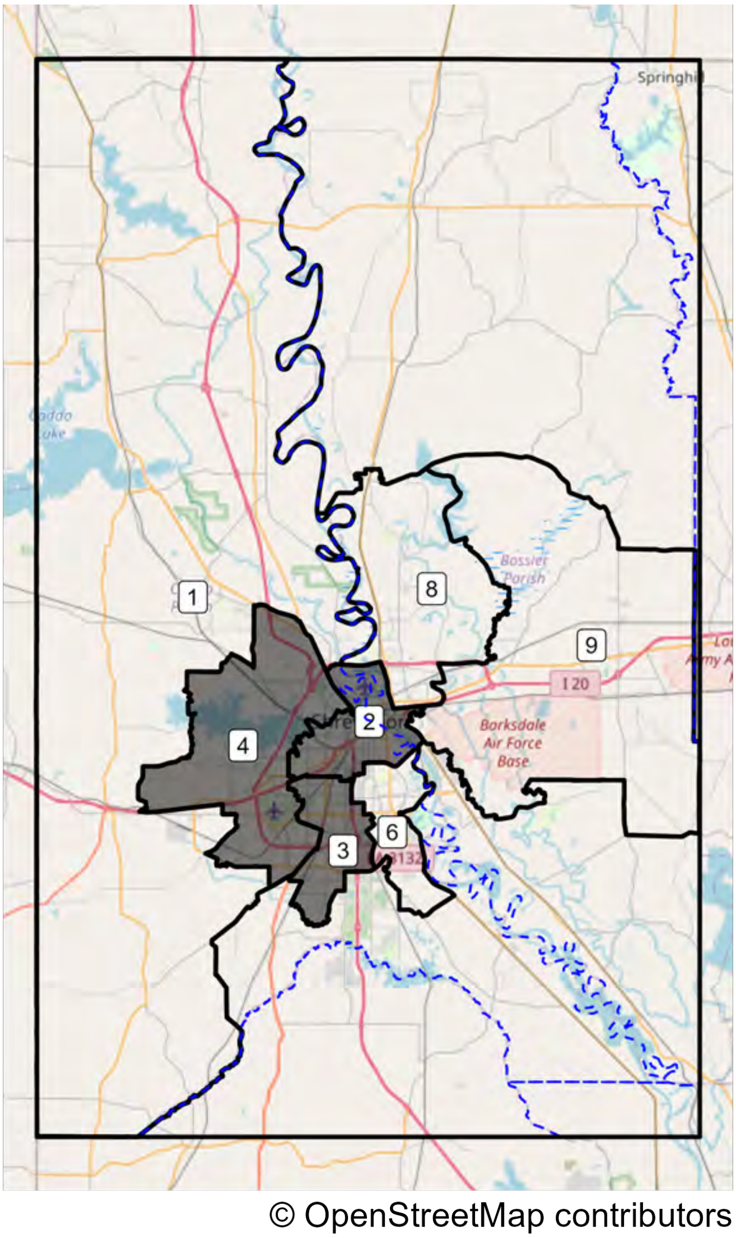
All shapefiles are projected using the WGS 84 projection. Calculations are performed using R, a computer programming package that is frequently used for data analysis in the statistics and political science disciplines.

5 Discussion of Additional Cooper House Districts

5.1 Shreveport Area

The Enacted Plan creates three majority Black districts in the Shreveport area: Districts 2, 3 and 4. District 2 is centered on downtown Shreveport and has a BVAP of 67.4%. District 3 is centered on southern Shreveport and has a BVAP of 73.9%. District 4 is located west of Shreveport and the areas around most of Cross Lake; the BVAP is 72.1%. They are depicted in Fig. 1 (Here, Black lines denote district boundaries, while dashed blue lines denote parish boundaries.

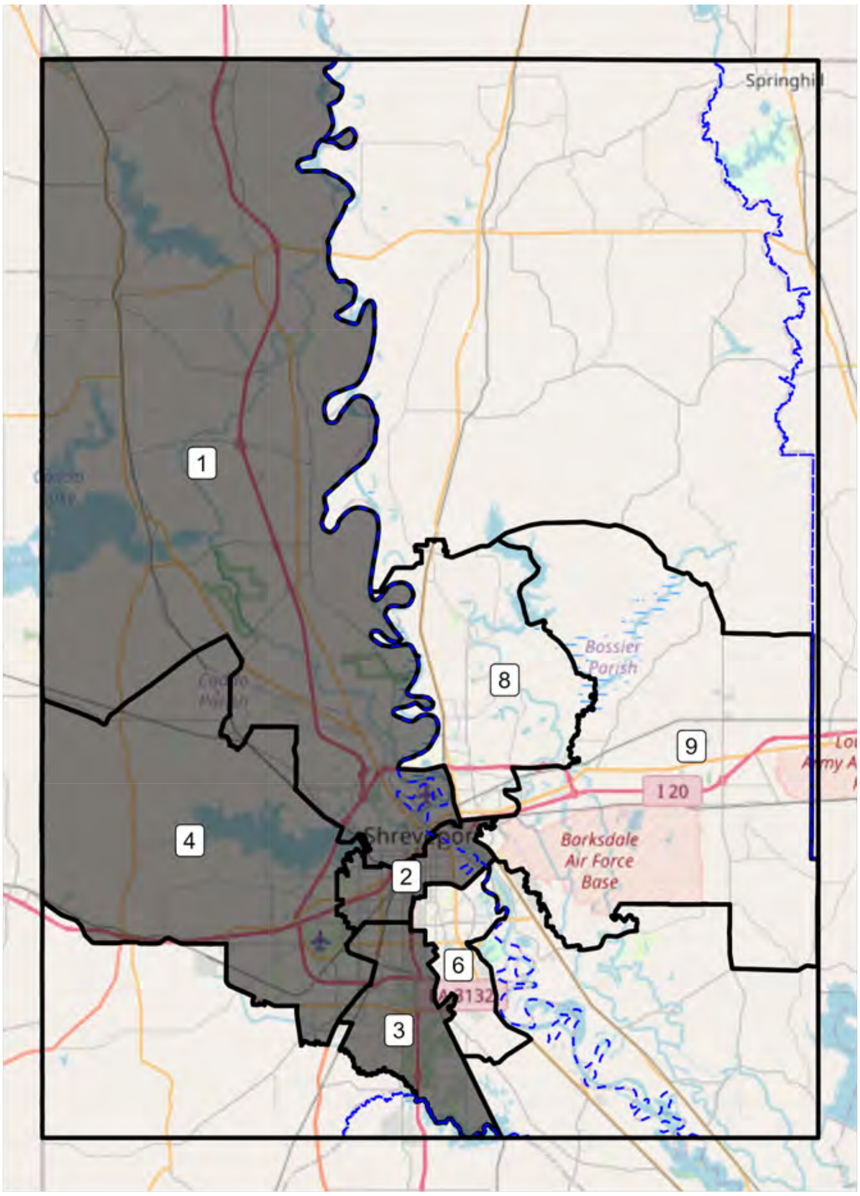
Figure 1: Black Majority BVAP Districts in the Shreveport Area, Enacted Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



Mr. Cooper's Illustrative Map, by contrast, creates four minority-majority districts in the Shreveport area: Districts 1, 2, 3 and 4 (Fig. 2). Illustrative Districts 2 and 3 are still centered on Shreveport, although they are pushed southward. Illustrative District 4 is pushed south and westward and extended to the Texas border. Illustrative District 1 is pushed into Downtown Shreveport relative to the Enacted Map, but still extends out to the Texas and Arkansas borders. The BVAPs of districts 1, 2, 3 and 4 are, respectively, 55.3%, 67.3%, 58.8%, and 57.5%.

An individual analysis of these districts reveals that the populations included in Cooper's districts were not reasonably compact. In this analysis, I employ two approaches. First, I utilize a qualitative approach, relying in part on Justice O'Connor's instruction that redistricting is one area where "appearances do matter." *Shaw v. Reno*, 509 U.S. 630 (1993). Second, I utilize a quantitative approach, described below.

Figure 2: Black Majority BVAP Districts in the Shreveport Area, Cooper Illustrative Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



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5.1.1 Cooper Illustrative District 1

Consider an example of a district that my analysis suggests does not contain a compact minority population that is capable of comprising a majority in a reasonably configured district: Illustrative District 1. Figure 3 depicts a map, referred to as a choropleth map, which shows the census blocks included in the Illustrative Map's version of District 1. Each block is color coded by its BVAP; empty blocks are shaded in white.

This map nicely illustrates the non-compact nature of the population enclosed by the new Black majority Illustrative districts. Heavily Black areas are separated by overwhelmingly White neighborhoods, as the district stretches from downtown Shreveport to the Arkansas border.

Of course, choropleth maps have their limitations, because we cannot readily see whether the geographic (or, to use the jargon from spatial analysis, "areal") units (here, census blocks) contain one Black resident, or 100; these are simply percentages. However, there are other types of maps that allow us to see the distribution of people more clearly. For example, dot density maps take a geographic unit, such as a precinct or census block, and then fill it not with colors, but with dots according to the number of residents. Figure 4 provides an example of such a map, where one blue dot represents 10 Black residents (rounded to the nearest 10). We can see that the Black population of the district is quite spread out. There is a large cluster around downtown Shreveport, and then another cluster just past I-220. Other clusters occur in the small towns between Caddo Lake and Black Bayou Lake, along with smattering of Black residents in the rural areas across the countryside.

In this type of map, however, the intervening spaces are not necessarily empty. For example, there may be White voters residing in those blocks. Figure 5 provides one solution to this problem, by placing an orange "x" for every 10 White residents of voting age (rounded to the nearest 10). As you can see, there are also strong concentrations of White voters, particularly west of I-49 near Shreveport, extending northward to Caddo Lake and beyond.

Figure 3: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 1. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

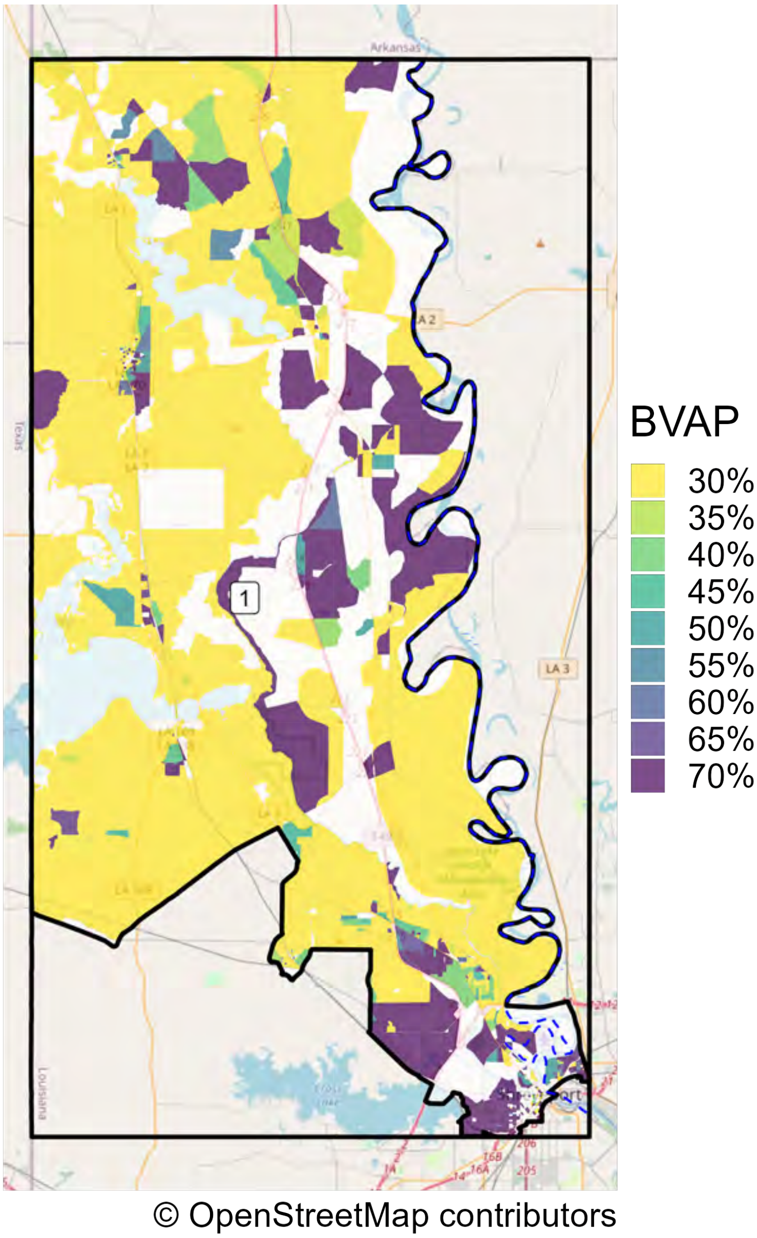


Figure 4: Location of Black population in Cooper Illustrative District 1. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

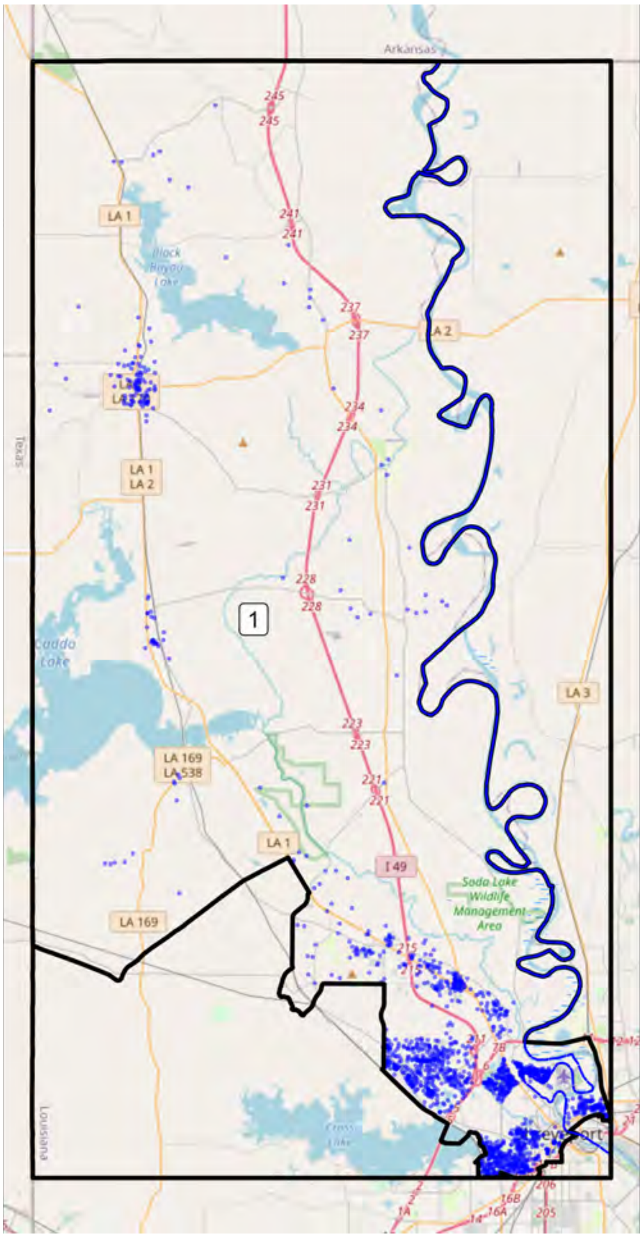
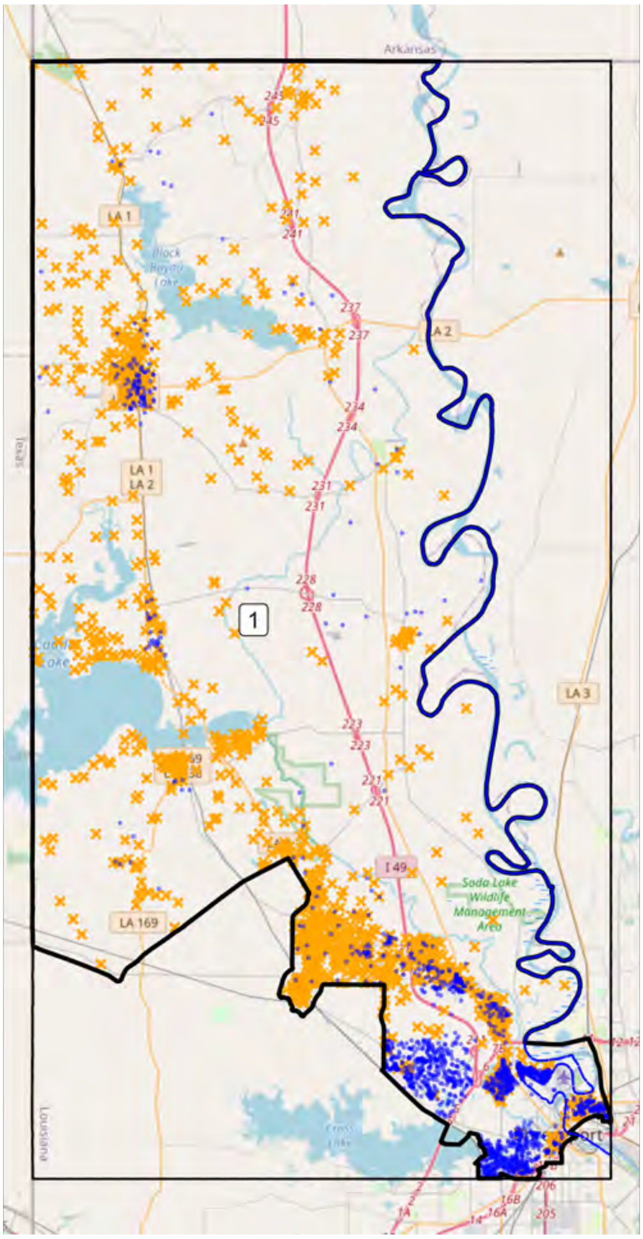


Figure 5: Location of Black and White populations in Cooper Illustrative District 1. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.



In other words, it is not necessarily the case that some fluke of geography is responsible for the dispersion of the Black population in this district. Much of the district is populated, but it is a mix of Black and White population centers.

Of course, we know that districts must comply with the one-person-one-vote constitutional requirement. It may be that there is a compact minority population sufficient to create a majority in a district in one discrete area, but that the district also extends out into neighboring areas simply to comply with constitutional requirements, capturing Black residents as a byproduct of geography. Put differently, it there were a Black population within, say, the boundaries of State Route I-220 in Shreveport, it would likely be irrelevant that there also happened to be a dispersed Black population included elsewhere in the district as it sought to comply with one-person-one-vote.

Illustrative District 1 has a VAP of 33,473, meaning that 16,737 residents are needed to constitute a majority. The area of greatest Black population concentration in the district – the portion of the district located within Shreveport south of I-220 and I-49 – contains only 11,556 Black residents of voting age. In other words, the portion of the district containing a compact Black population is well short of a majority, constituting just a third of the population of the district.

To create an additional district in the Shreveport area where the minority group is a numeric majority, Illustrative District 1 must extend well beyond the city limits, across heavily White areas to take in pockets of Black populations. This practice is colloquially known among redistricters as "baconmandering." The Illustrative Map doesn't do this because it must accumulate a sufficient number of residents; it does so because it must accumulate a sufficient number of *Black* residents.

I also explore this using a more quantitative approach. In particular, I utilize the moment of inertia method of calculating the compactness of a population. *See, e.g.*, Micah Altman, "Modeling the Effect of Mandatory District Compactness on Partisan Gerrymanders," 17 *Pol. Geog.* 8, 995 (1998). The moment of inertia metric is actually among the oldest of the redistricting metrics. See James B. Weaver & Sidney W. Hess, "A

Procedure for Nonpartisan Districting: Development of Computer Techniques," 73 *The Yale Law Journal* 228, 297-300 (Dec. 1963) (describing the moment of inertia metric and its use in redistricting); Isobel M.L. Robertson, "The Delimitation of Local Government Electoral Areas in Scotland," *33 Jrnl. Op. Rsrch. Soc.* 517, 518 (June 1982) (describing a redistricting algorithm employing the moment of inertia approach for population compactness); Henry F. Kaiser, "An Objective Method for Establishing Legislative Districts, 10 *Midwest Jrnl. Pol. Sci.* 200 (1966) (providing a lengthy mathematical description of the moment of inertia as applied to redistricting); S.W. Hess, et al, "Nonpartisan Political Redistricting by Computer," 13 *Op. Rsrch.* 998, 999 (1965).

The moment of inertia approach is defined as the "sum of squared distances from each person to [their] district's center." Hess et al., at 999. To find the most compact Black population in each proposed district, we first find the centroids of each individual precinct. We (really, a computer) pick a precinct to begin with and identify all adjacent precincts. We pick one of those adjacent precincts and determine what the population centroid would be if they were in the same district. Next, we calculate the distance from each precinct to the population centroid, square that distance, and multiply by the population of the precinct. The moment of inertia will be the sum of these weighted squared distances. We calculate this value for every adjacent precinct and select the smallest moment. These two precincts are then locked together in the same district, and the process then repeats, until the BVAP of the precincts equals half of the total population of the original district. We then perform the entire algorithm such that it begins once for every precinct in the proposed district and identify the district with the smallest moment of inertia as the most compact grouping of Black residents over the age of 18 in the district.

One problem with the moment of inertia approach is that after a heavily populated cluster is identified, it will tend to avoid other heavy population clusters. In this context, it is a relatively minor problem, as the entire point of the exercise is to see if multiple clusters separated by substantial distances are required to be combined in order to create a 50% + 1 BVAP district.

Regardless, counsel has also asked me to employ an area-based algorithm to identify compact population clusters. The algorithm employed here is similar to that utilized in some redistricting simulations. *See, e.g.*, Jowei Chen & Jonathan Rodden, "Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures," 8 Q. J. of Poli. Sci. 239 (2013). It is also consistent with the definition of "compact" as an area-based metric in some contemporary dictionaries. E.g., Webster's New Twentieth Century Dictionary, Unabridged 368 (2d ed. 1980) (defining the adjective version of compact as "1. Closely and firmly united, as the particles of solid bodies; solid; dense; as a compact mass of people; a compact body or substance. . . . 5. taking little space; arranged neatly in a small space. 6. Designating or of a relatively small, light, economical model of automobile. Syn. – close, condensed, hard, solid) (including other irrelevant definitions such as 2. Composed of, 3. Held together, 4. Brief, as in "compact discourse").

To identify this, I used the same basic algorithm as above, except that rather than using the BVAP to weight squared distances, I instead utilized the area of precincts. By favoring precincts with centroids that are near one another, and favoring smaller precincts over larger precincts, the algorithm will build groups that take up little area. Once again, the algorithm will repeat for every precinct until the BVAP of the grouping is equivalent to 50% + 1 of the overall population of the district. Note that I do not always provide results for both techniques in the interest of brevity, however either approach may be calculated from the provided computer code implementing these approaches.

Figures 6 - 7 show the results of both algorithms for District 1. The first map shows the most compact grouping of Black residents sufficient to constitute a majority of Illustrative District 1's population using the moment of inertia method, while the second map shows the most compact grouping using the areal/Chen & Rodden method. Note that the approach sometimes produces "holes" on the map. This is because we are searching for a minimally compact group; the contiguity requirement of redistricting may, in fact, require an even less compact group to be drawn into a district.

Figure 6: Most compact group of Black residents of voting age in Cooper Illustrative District 1 sufficient to constitute a majority of the population in the district, using the moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,737 Black residents of voting age this approach identifies within the boundaries of of Illustrative District 1.

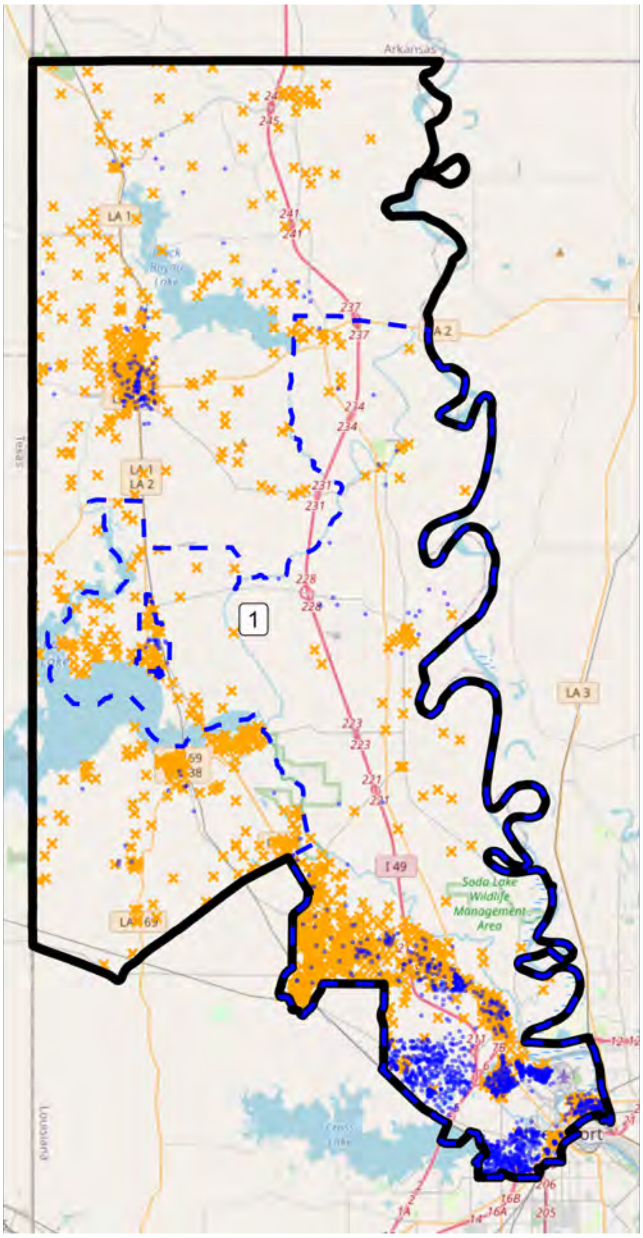
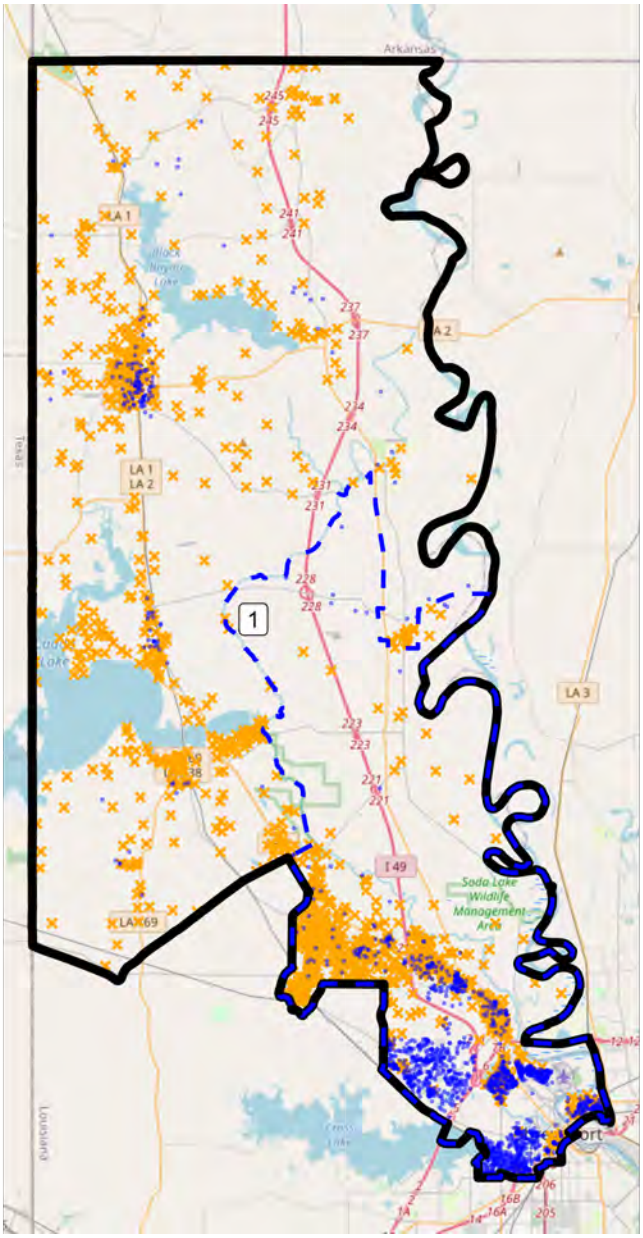


Figure 7: Most compact group of Black residents of voting age in Cooper Illustrative District 1 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,737 Black residents of voting age this approach identifies within the boundaries of Illustrative District 1.



These maps show that the most compact Black population in this district configuration that would be sufficient to constitute a majority of the district's population stretches beyond Shreveport, out to Caddo Lake, and to the outskirts of Mooringsport and Belcher, which are located almost halfway to the Arkansas border. In the process, the most compact configuration of Black residents in the district that would be sufficient to constitute a majority of the district also crosses heavily White areas and depopulated areas as well. The same is true using the areal method.

In other words, this analysis shows that the heavily White, rural precincts in this District are not just added to achieve population equality. They are added to join isolated Black residents with a more compact Black population in Shreveport in order to meet the minority-majority threshold.

That is to say, here, these isolated Black population pockets are not incidental to the 50%+1 district, they are needed to draw such a district in the configuration Mr. Cooper attempts to create while attempting to draw four Black majority districts in the Shreveport area. In short, while there appears to be a compact minority population near the Shreveport area that can support three Black majority districts, that population is not sufficient to constitute a majority of the population in the four majority Black districts drawn in the Illustrative Map.

5.1.2 Cooper Illustrative District 2

To be clear, this is not an approach that will intrinsically defeat a minority-majority district. Consider districts 2, 3 and 4 in the Shreveport Area. District 2 is a bit tricky, because the Black population exists in three clusters, separated by a heavily white area and the Red River. Nevertheless, there exists a sufficient number of Black residents on the western side of the river to create a majority of the population in the district, and most of the blocks separating the two clusters are at least diverse. Figures 8 - 9 illustrate this.

Whichever population compactness metric we employ, we come up with the same grouping of Black voters. The data show that there are a sufficient number of Black voters over the age of 18 in Cooper Illustrative District 2 to comprise a majority of residents in the district in a relatively compact group. In other words, the remaining residents of Cooper's Illustrative District 2, white or Black, would not have to be added to achieve a majority-BVAP district, but rather are added to meet the equal population requirement.

Figure 8: Most compact group of Black residents of voting age in Cooper Illustrative District 2 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,457 Black residents of voting age this approach identifies within the boundaries of Illustrative District 2.

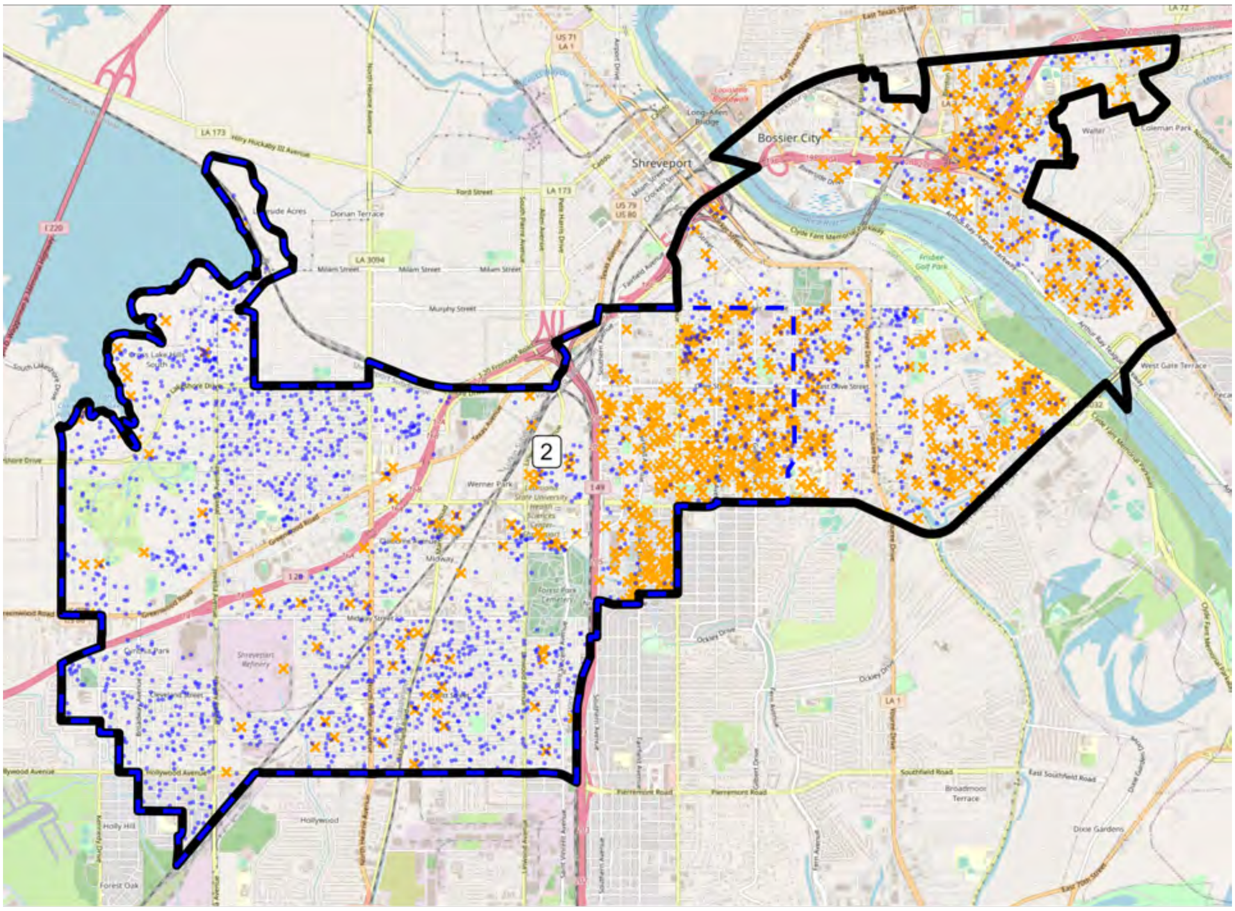
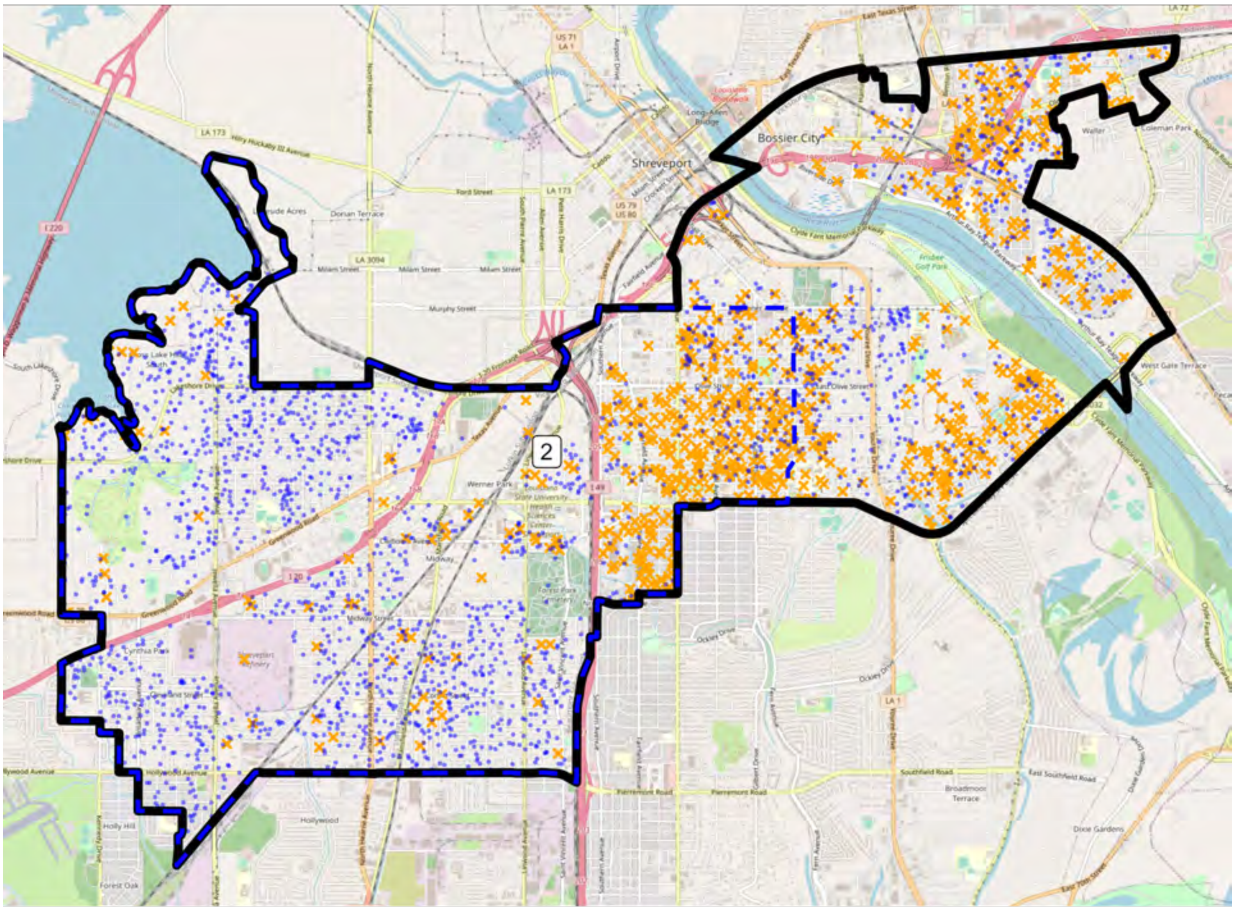


Figure 9: Most compact group of Black residents of voting age in Cooper Illustrative District 2 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,457 Black residents of voting age this approach identifies within the boundaries of Illustrative District 2.



5.1.3 Cooper Illustrative District 3

Likewise, Illustrative District 3 involves compact Black populations that comprise a majority of the voting age population of the district. As illustrated in figures 10 - 13, it contains a large Black population north of Louisiana Highway 3132 that is almost sufficient to constitute a majority on its own.

In Illustrative District 3, we see that the most compact grouping of Black voters over the age of 18 that would comprise a majority in the districts drawn by Mr. Cooper does extend out away past the most heavily Black precincts. But it is not as disparate a grouping as some of the districts that follow.

Figure 10: Percent BVAP in census blocks contained in Cooper Map, Illustrative District 3. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

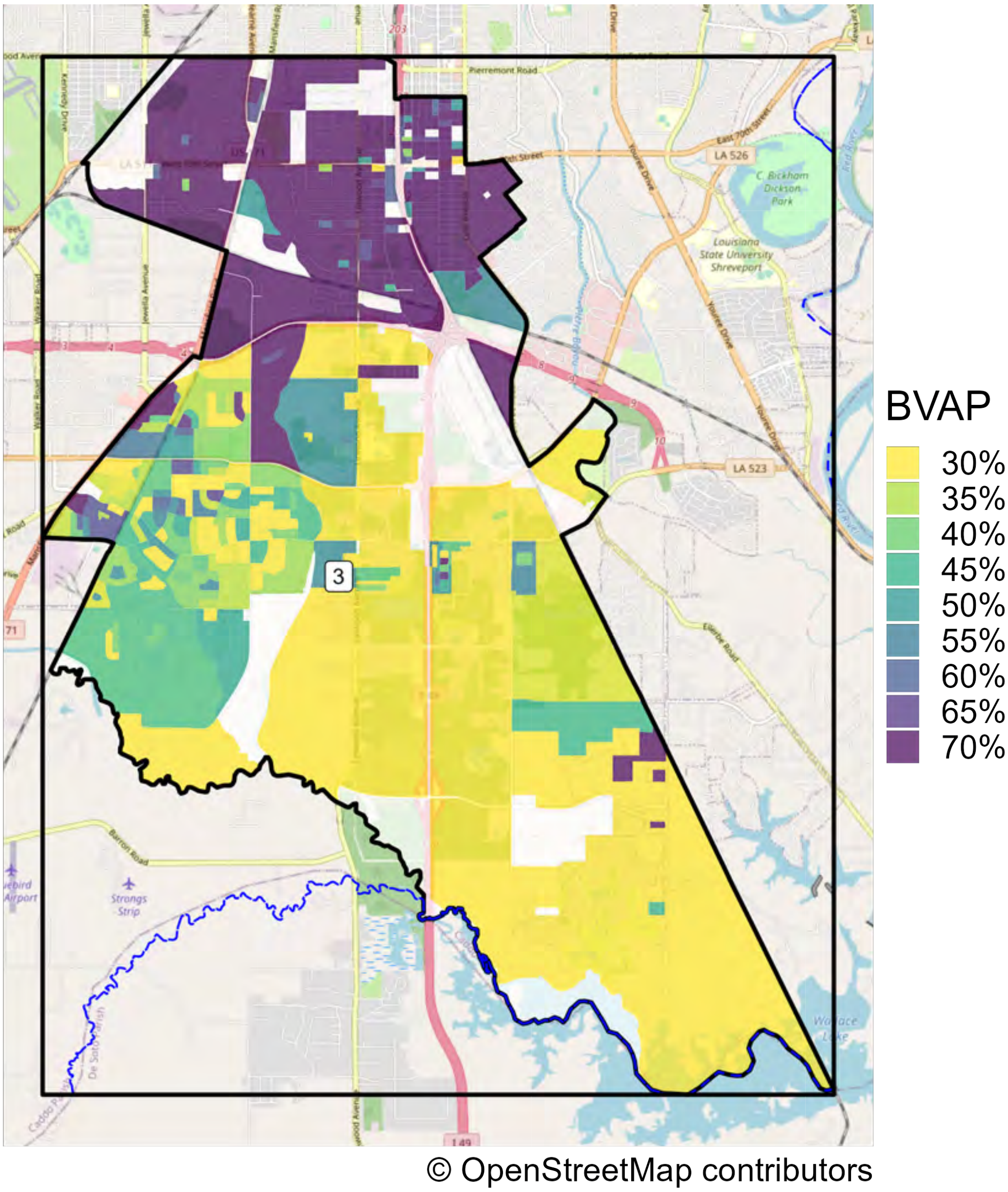


Figure 11: Location of Black and White populations in Cooper Illustrative District 3. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

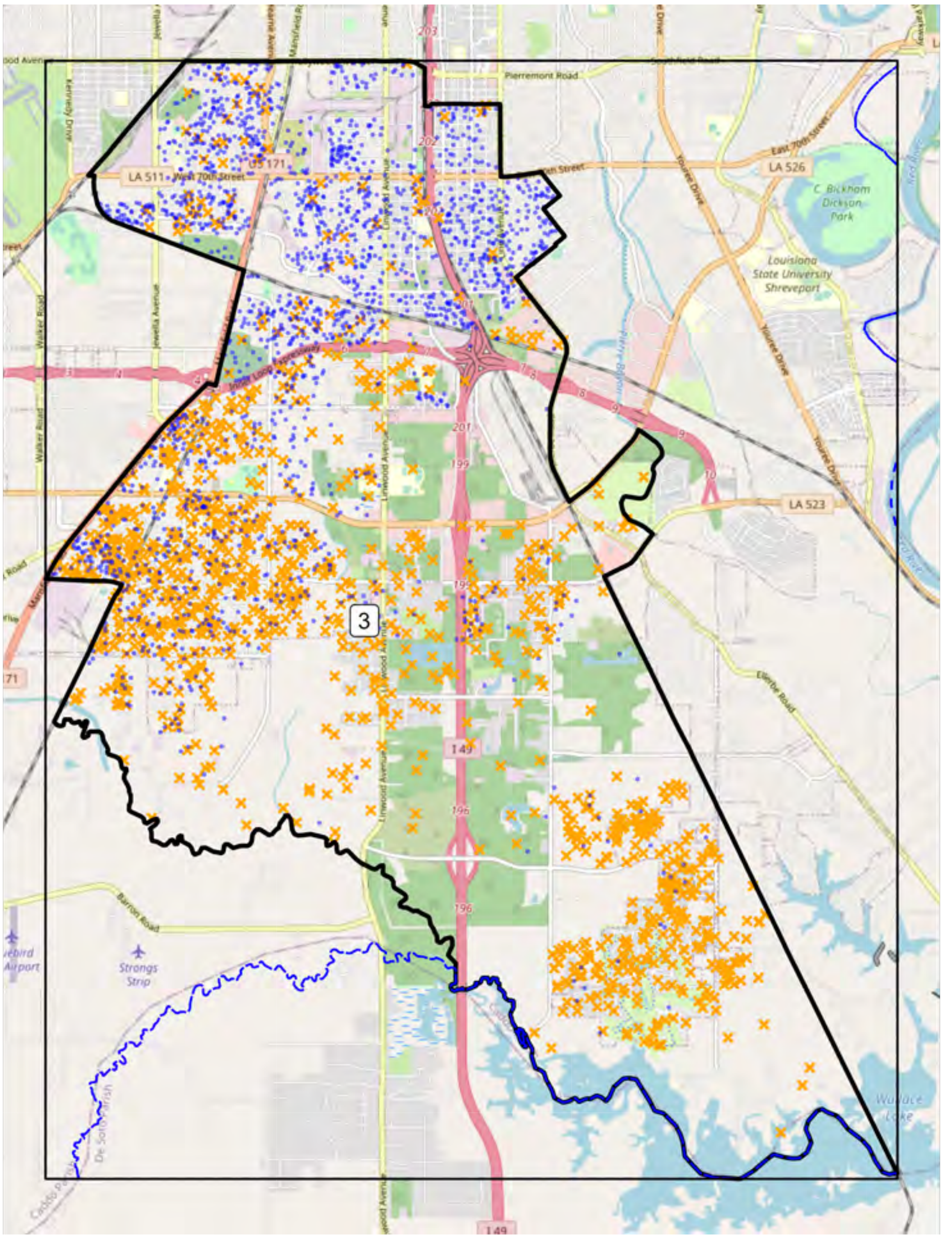


Figure 12: Most compact group of Black residents of voting age in Cooper Illustrative District 3 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,558 Black residents of voting age this approach identifies within the boundaries of Illustrative District 3.

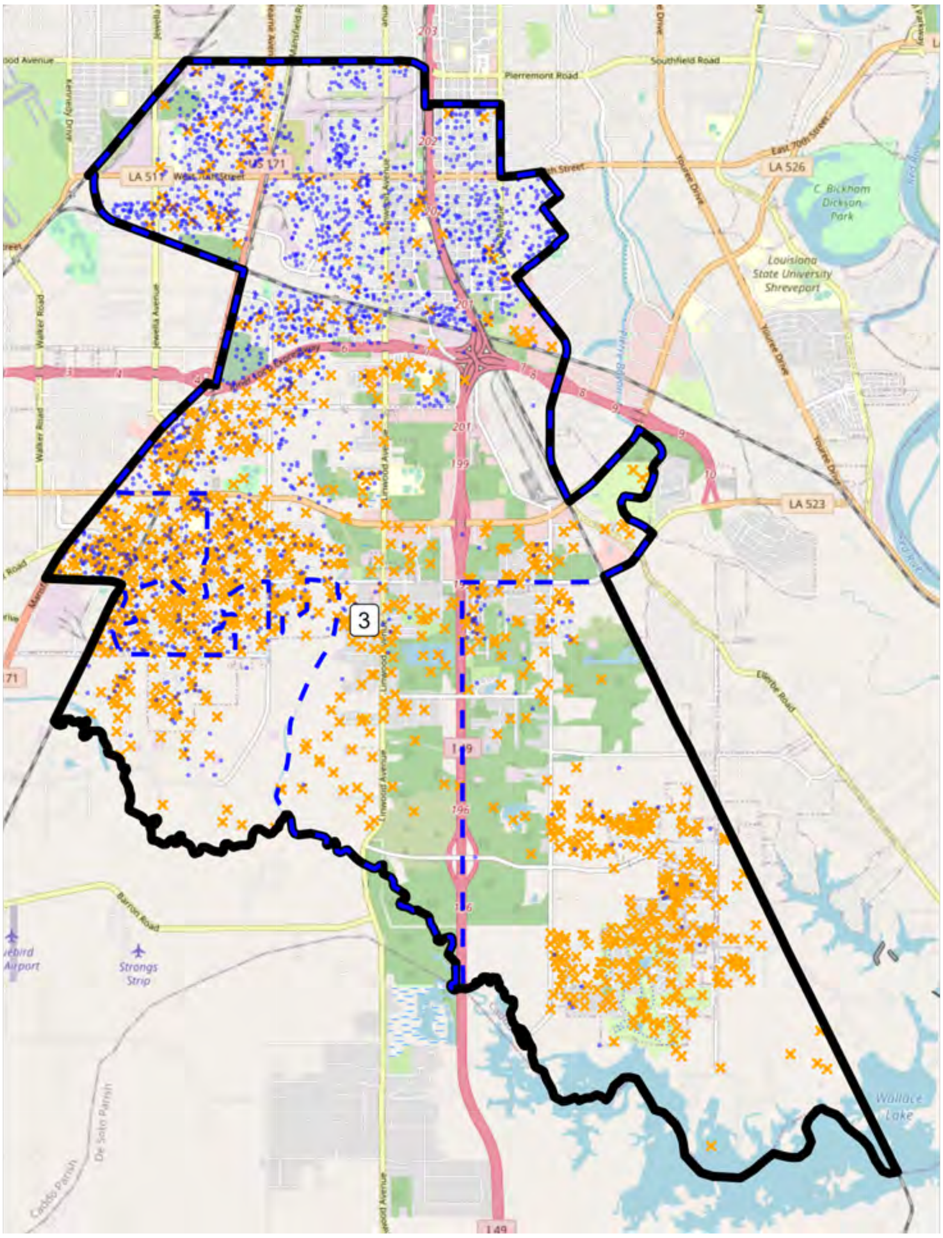
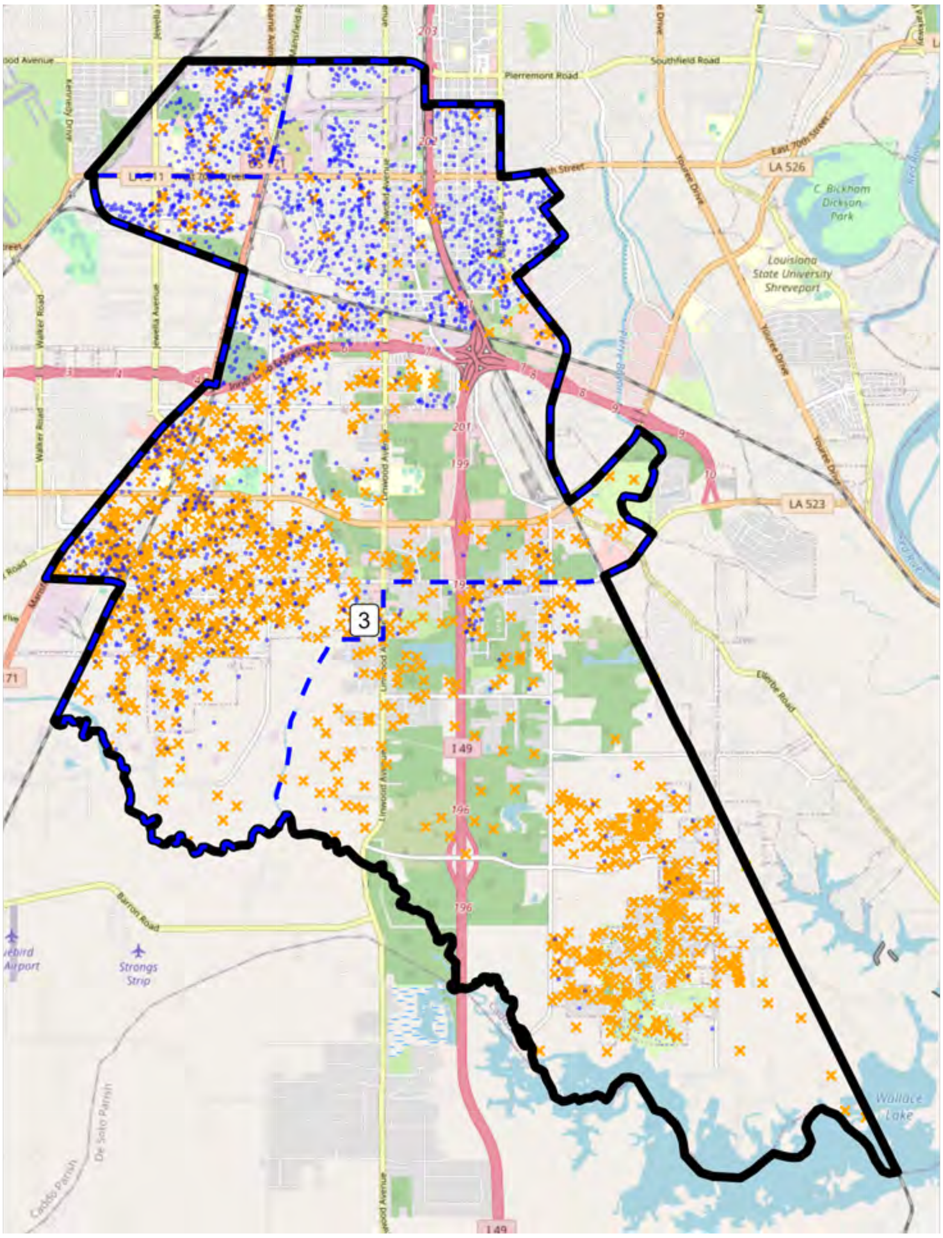


Figure 13: Most compact group of Black residents of voting age in Cooper Illustrative District 3 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,558 Black residents of voting age this approach identifies within the boundaries of Illustrative District 3.



5.1.4 Cooper Illustrative District 4

The same is true of Illustrative Map District 4 in this area. As you can see from the choropleth map and dotplot maps, the bulk of the district's Black population is contained in a single area in the southeastern portion of the district. The rest of the district is more rural and is heavily White.

But this heavily rural, White area is not added to the district to find disparate Black residents who can fill out a district at 50% + 1. While the moment of inertia (compact population) approach does reach out into those areas (because adding the heavily populated, heavily Black precinct southwest of Cross Lake would move the population moment of inertia considerably), the compact area/Chen & Rodden approach avoids them altogether.

Figure 14: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 4. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

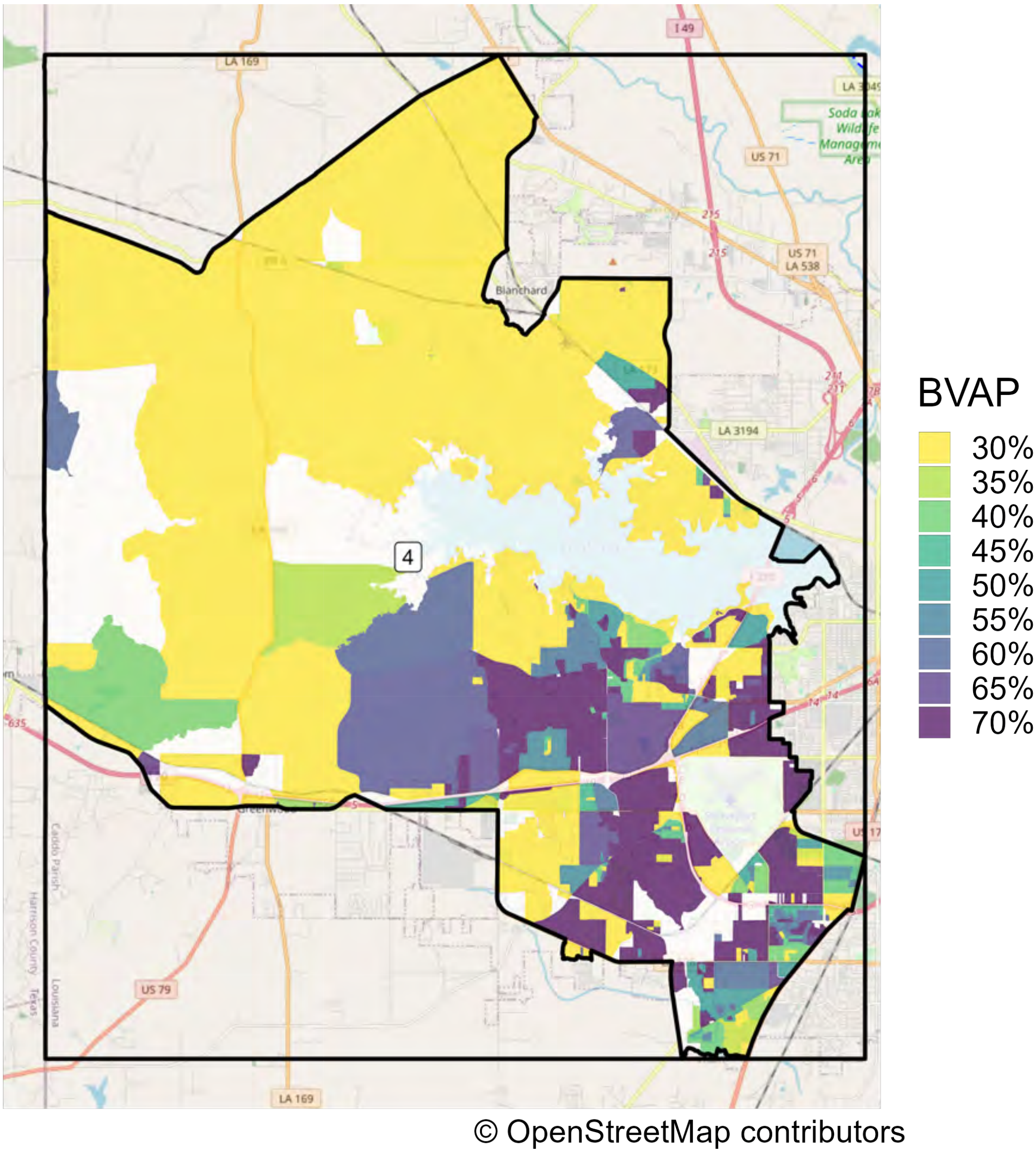


Figure 15: Location of Black population in Cooper Illustrative District 4. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

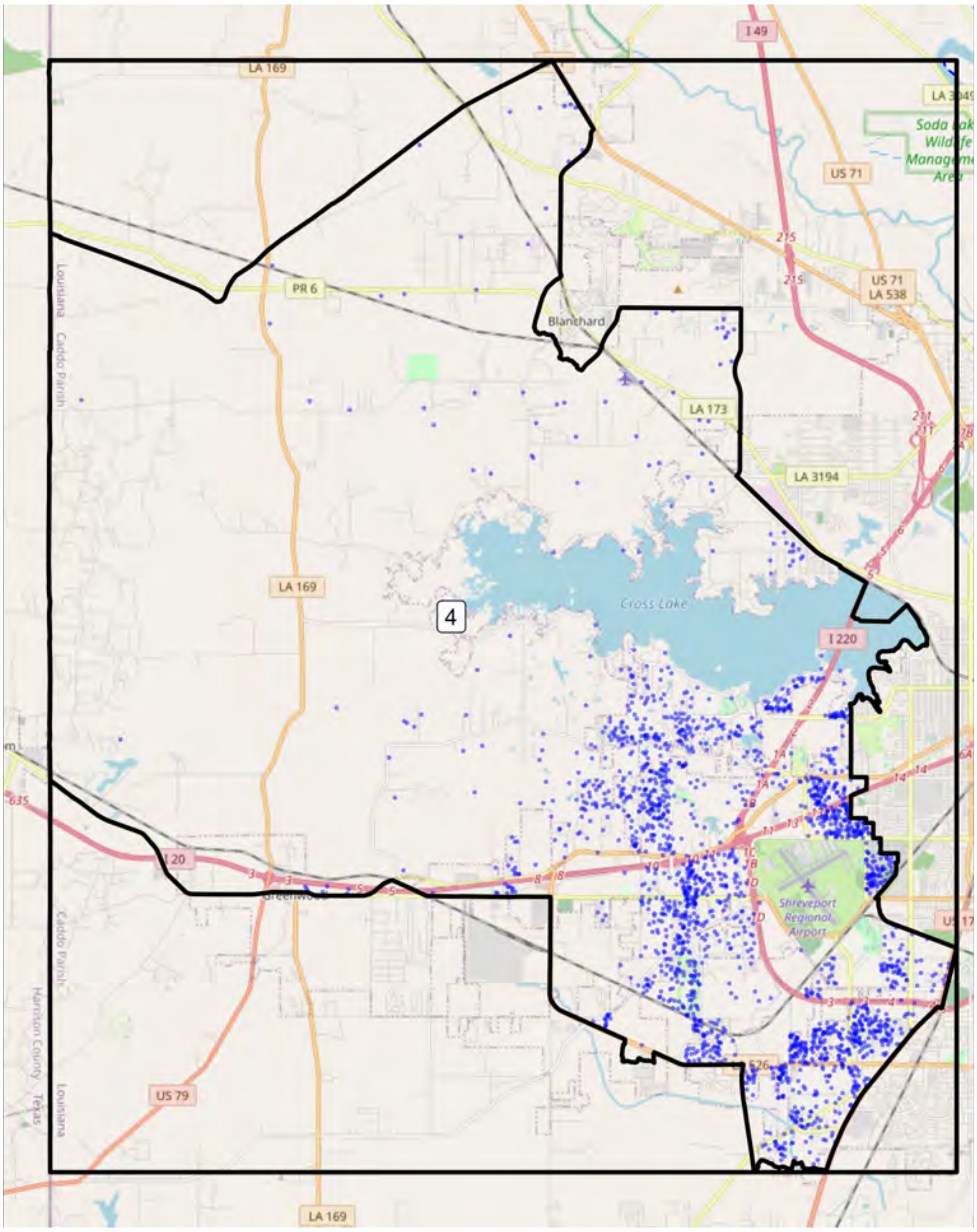


Figure 16: Location of Black and White populations in Cooper Illustrative District 4. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

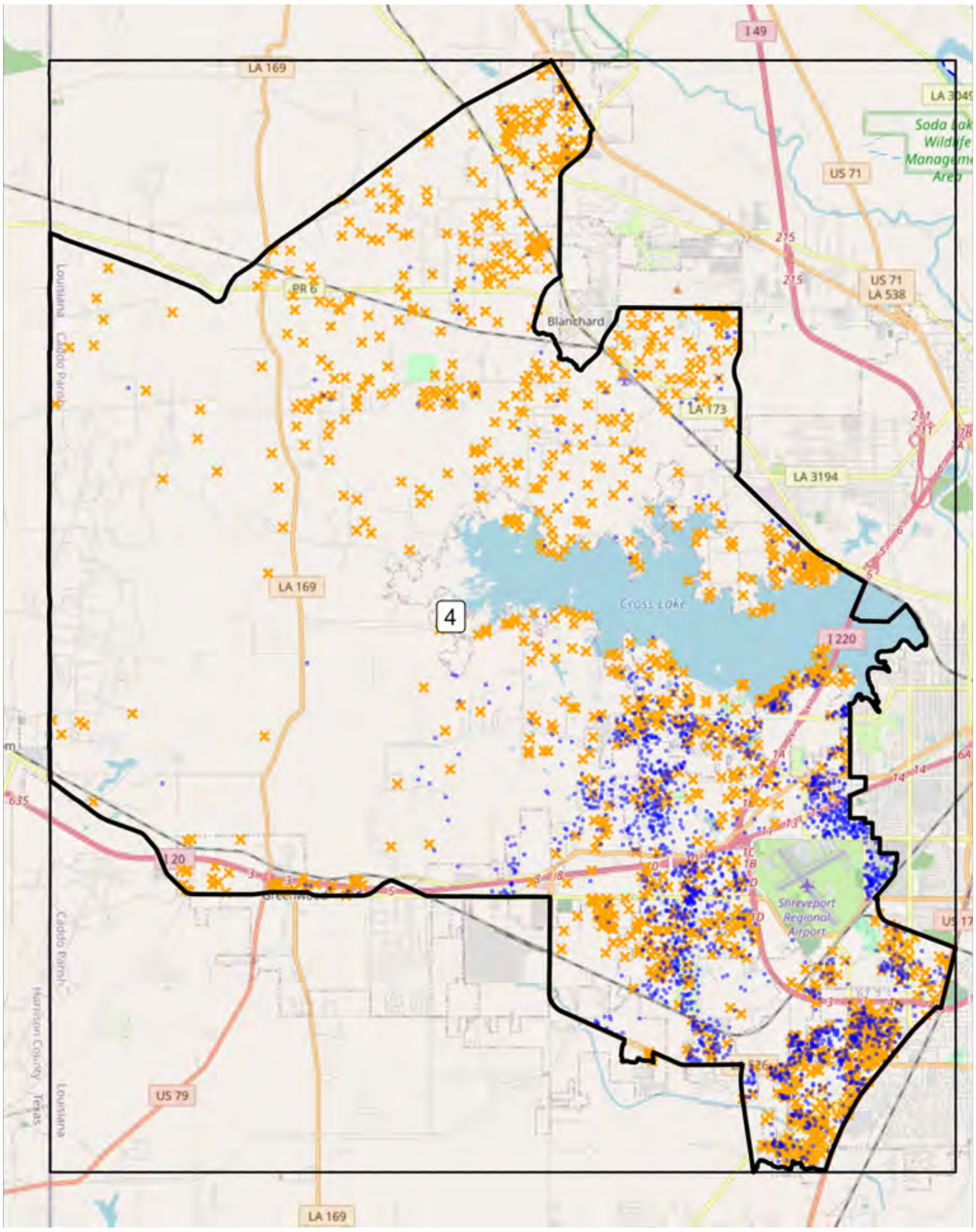


Figure 17: Most compact group of Black residents of voting age in Cooper Illustrative District 4 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,553 Black residents of voting age this approach identifies within the boundaries of Illustrative District 4.

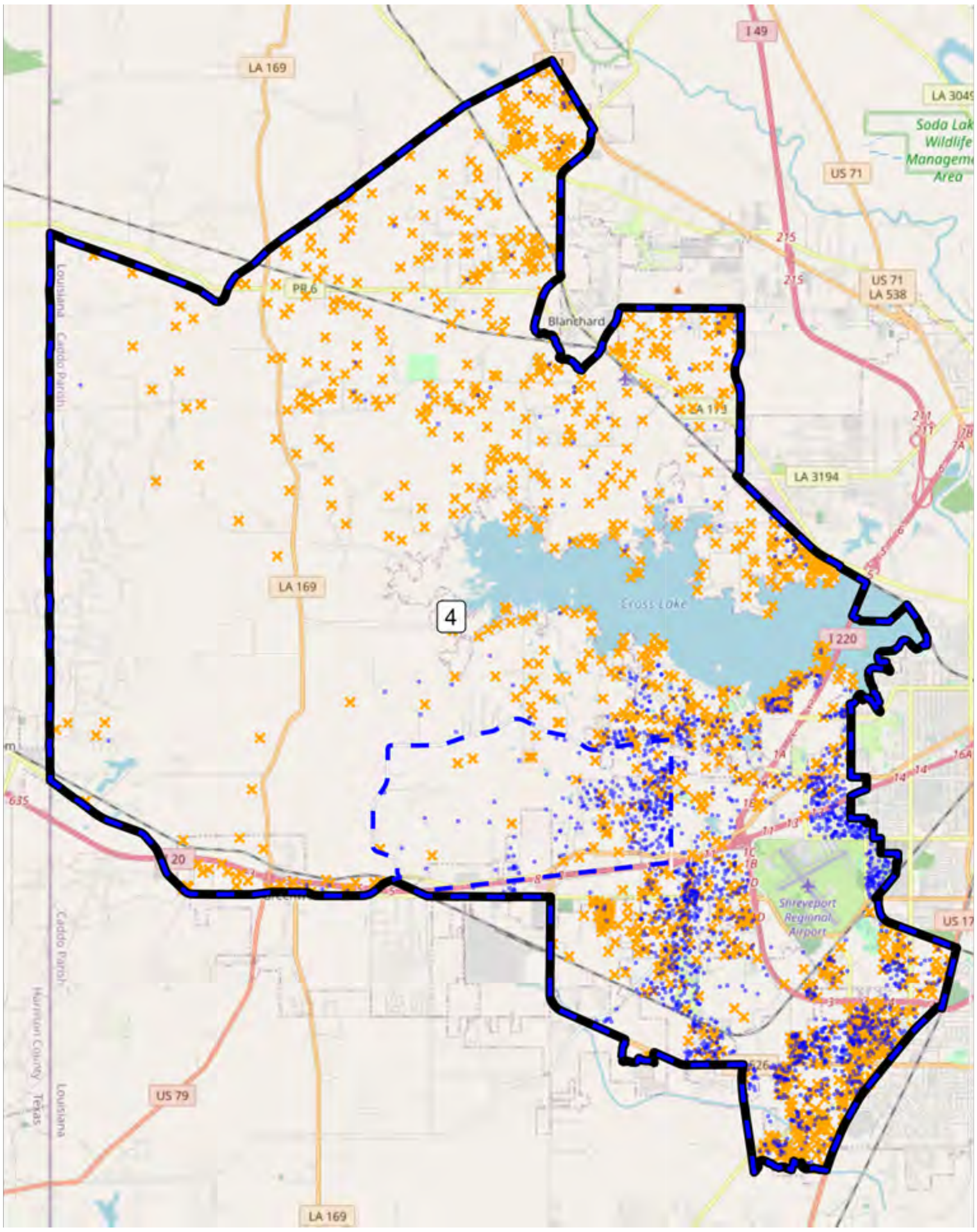
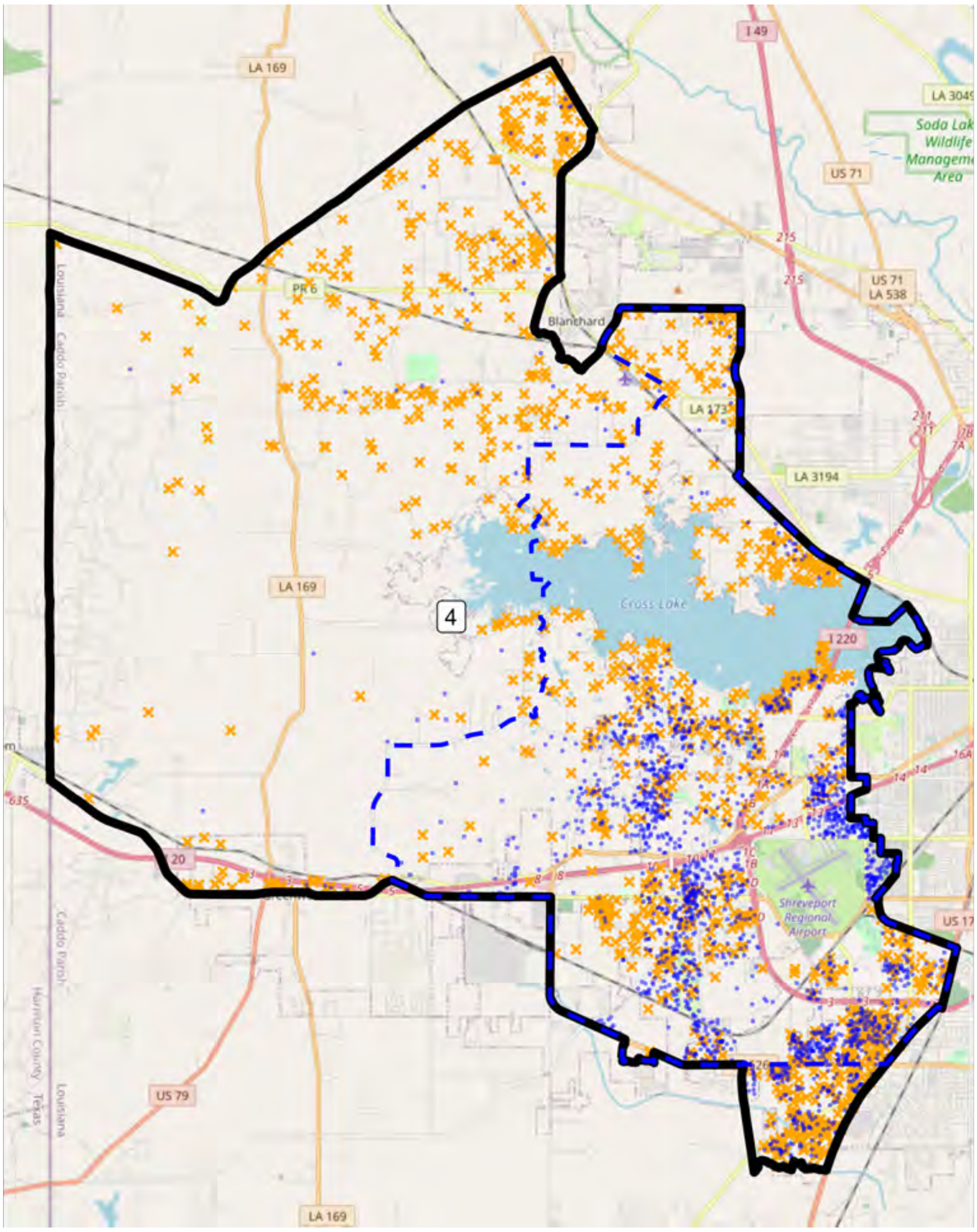


Figure 18: Most compact group of Black residents of voting age in Cooper Illustrative District 4 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,553 Black residents of voting age this approach identifies within the boundaries of Illustrative District 4.



5.2 Natchitoches Area

5.2.1 Cooper Illustrative District 23

Cooper's Illustrative House District 23 creates a Black majority district in northwestern Louisiana. It is 50.56% Black. The Enacted Map has no Black majority district in this area. This is because the district Mr. Cooper creates does not contain a compact minority population; no such district can be drawn here. Instead, it plucks geographically distant populations from Natchitoches and Campti in the southeast, Coushatta in the northeast, and Mansfield in the West, and collects them in a single district. The Voting Age Population of the district is 34,987, meaning that to consist of a majority of the VAP would require a group to have a population of at least 17,494 individuals; the BVAP of the district contained in the Illustrative Map is 17,690.

The precincts around Natchitoches and Campti have a Black population of 9,261; the precincts around Coushatta and Edgefield have a Black population of 1,825, and the precincts around Mansfield and South Mansfield have a BVAP of 4,246. Even aggregating these numbers is insufficient to push the district to minority-majority status. Achieving that requires picking up Black voters living in heavily White rural blocks east of Coushatta and north of Mansfield. We see this illustrated in Figures 19 - 23.

None of the disparate population clusters in the district come close to containing Black populations of 17,494, and even combined they fail to hit 50% + 1. In other words, there's no compact minority grouping in this district that can constitute a majority of the voting age population in the district; any minority-majority district in this area will necessarily sprawl across heavily White, rural precincts. Note that because the BVAP of the district is so close to the minimal BVAP required to draw a 50% + 1 BVAP district, the most compact Black population sufficient to constitute a majority in the district is contained in an area that is coterminous with the district boundaries; the blue dashed lines in the maps above overlap with the black district edge.

Figure 19: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 23. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

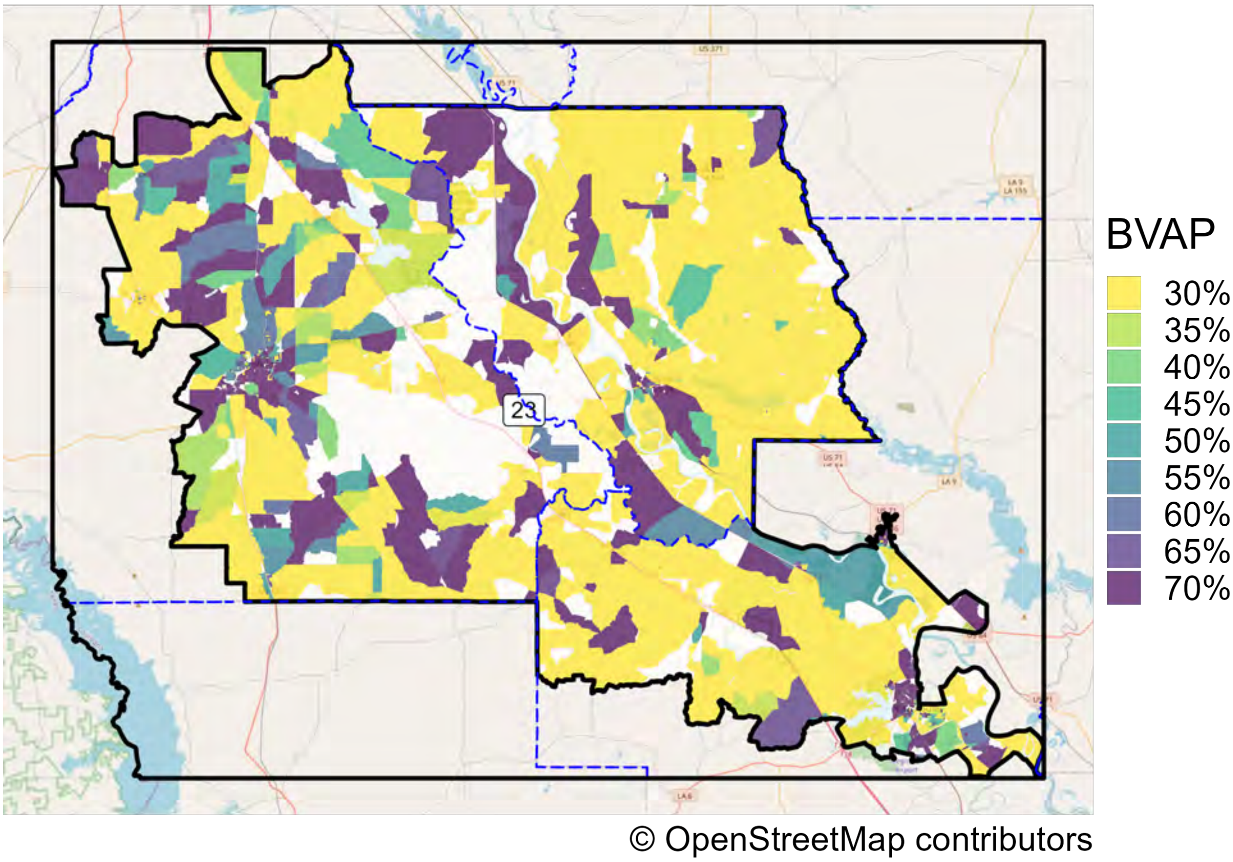


Figure 20: Location of Black population in Cooper Illustrative District 23. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

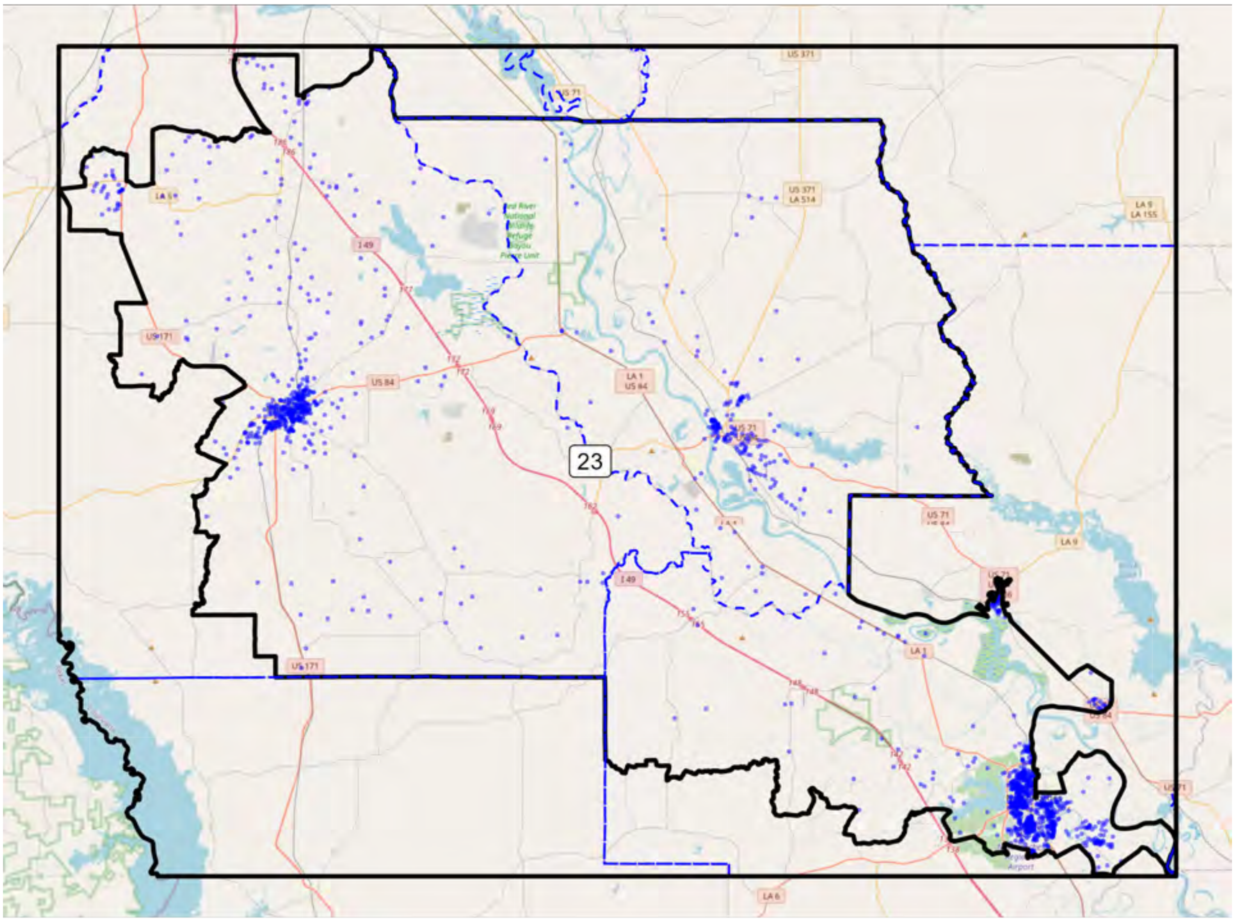


Figure 21: Location of Black and White populations in Cooper Illustrative District 23. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

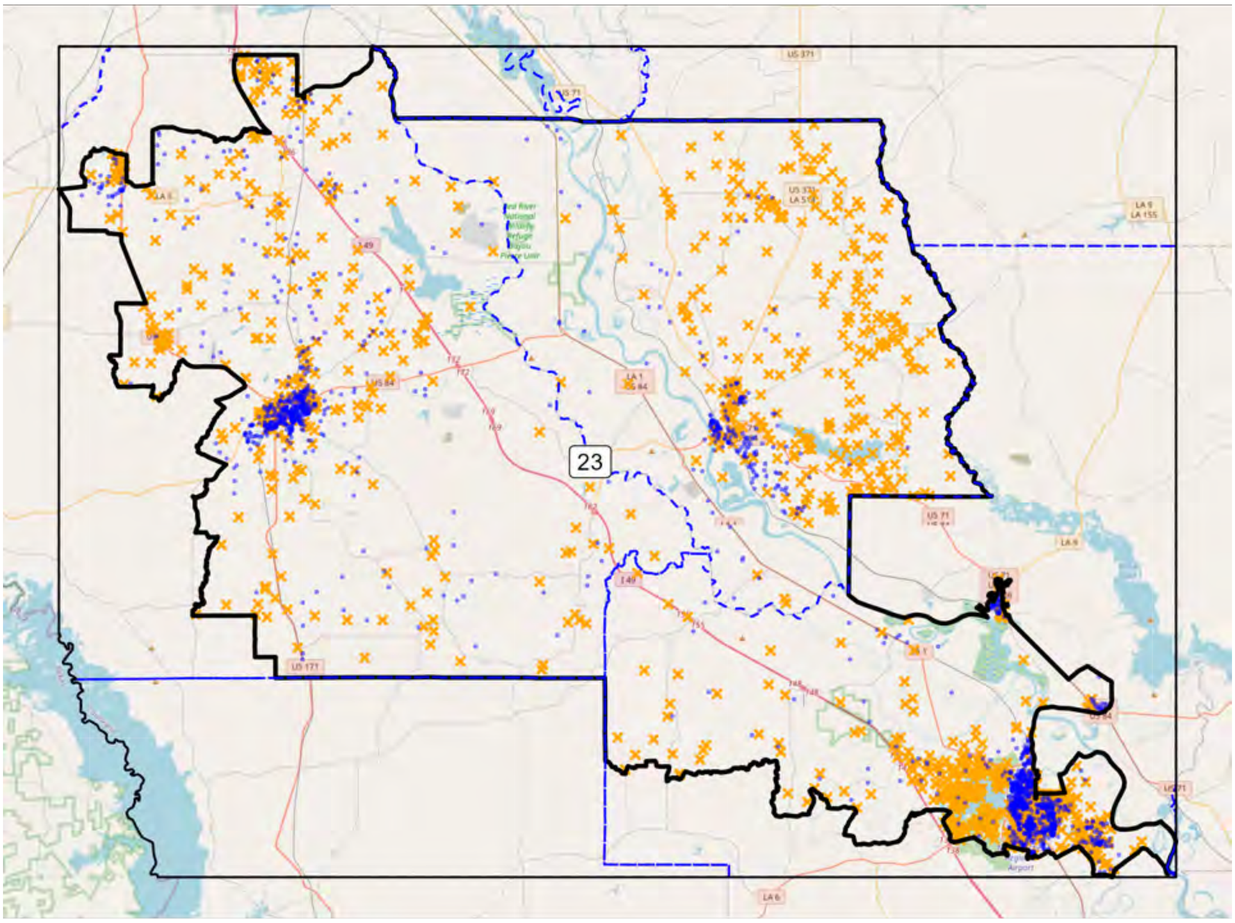


Figure 22: Most compact group of Black residents of voting age in Cooper Illustrative District 23 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,494 Black residents of voting age this approach identifies within the boundaries of Illustrative District 23. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

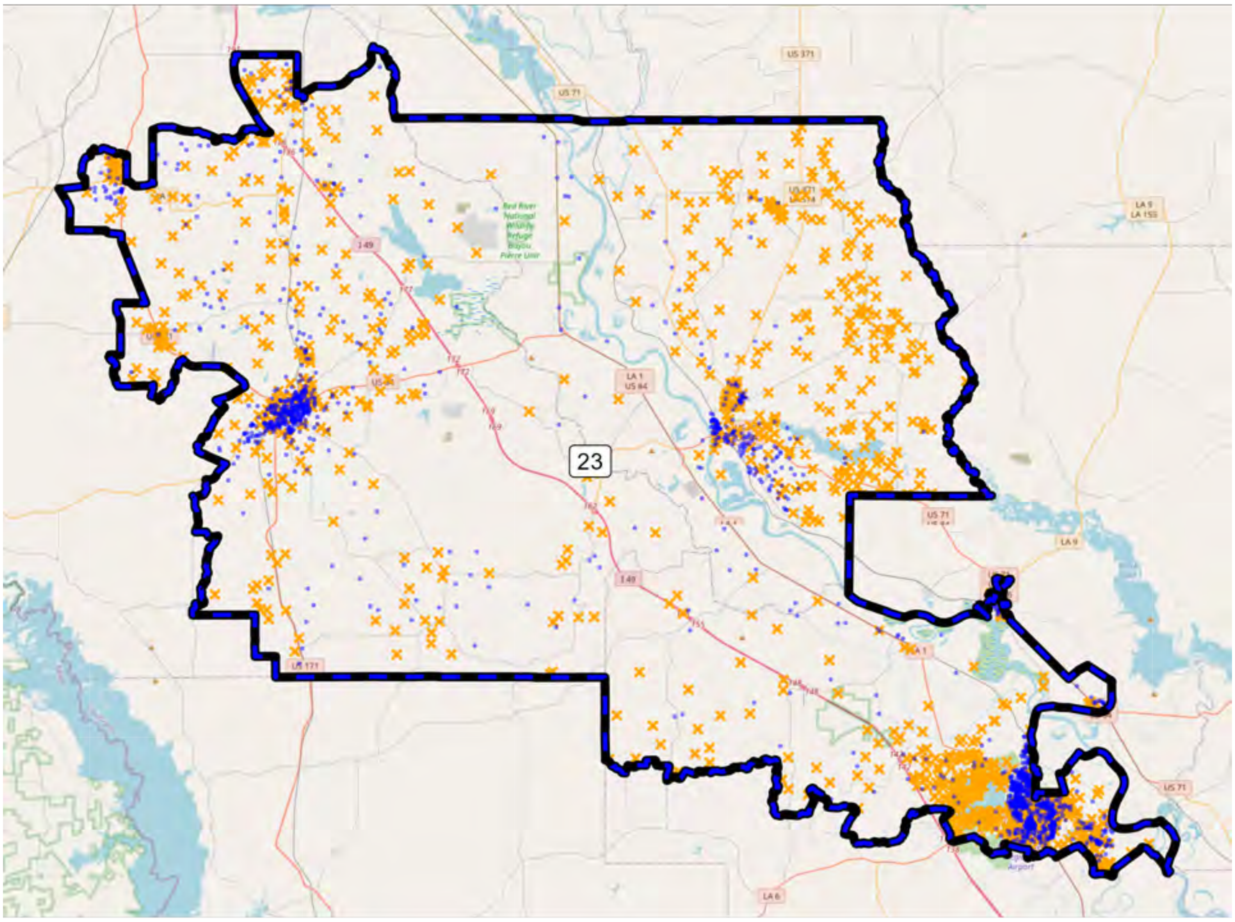


Figure 23: Most compact group of Black residents of voting age in Cooper Illustrative District 23 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,494 Black residents of voting age this approach identifies within the boundaries of Illustrative District 23. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

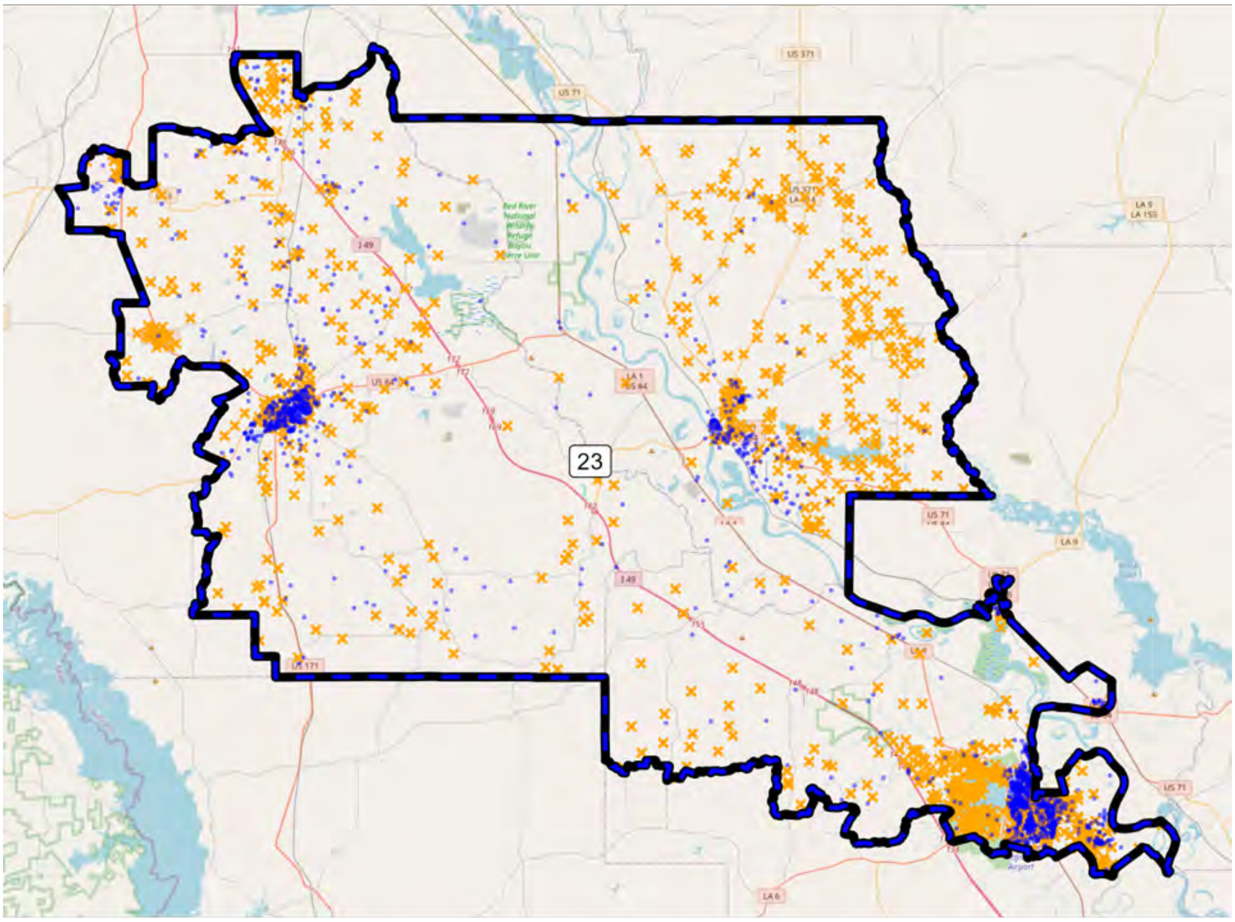
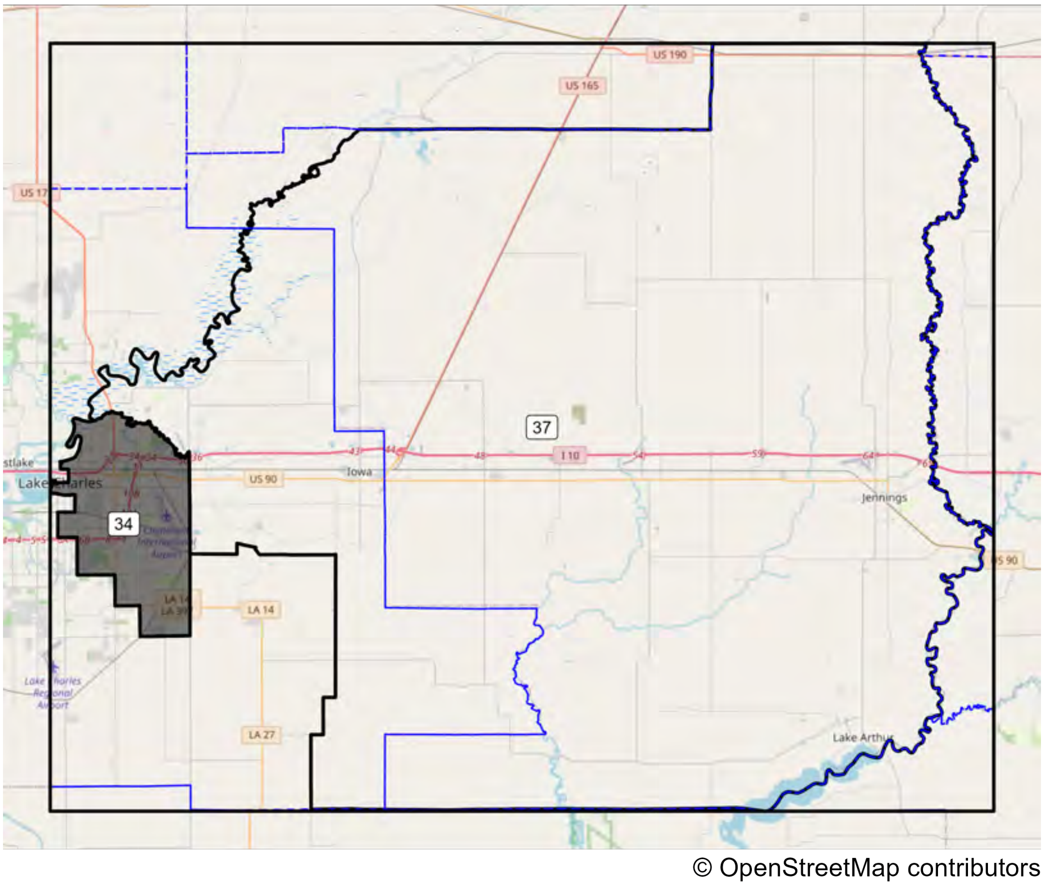


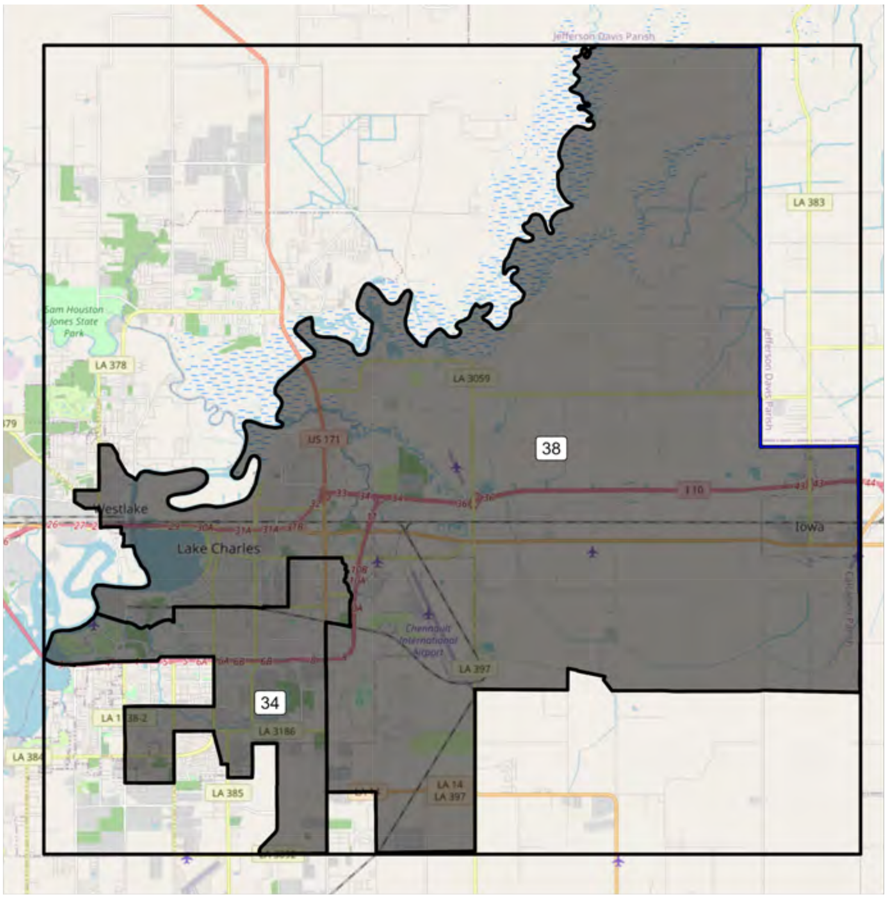
Figure 24: Black Majority BVAP Districts in the St. Charles Area, Enacted Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



5.3 St. Charles Area

The Enacted Plan creates one minority majority district in the Lake Charles area. As depicted in Figures 24 and 25, Mr. Cooper splits this district to create two minority majority districts: Districts 34 and 38.

Figure 25: Black Majority BVAP Districts in the St. Charles Area, Cooper Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



5.3.1 Cooper Illustrative Districts 34 and 38

Cooper's District 34 (Figs. 26 - 30, which looks like a pointer dog about to identify a duck), has a VAP of 32,241 and a BVAP of 16,131, meaning that it is majority Black by ten residents. District 38 has a VAP of 32,365, such that a group must have a population of 16,183 to constitute a numeric majority in the district. The district has a BVAP of 16,455. The minority population in District 34 is not particularly compact; to achieve his ten-person majority here Mr. Cooper has to scrape together Black residents from heavily white tendrils in the district. Moreover, because every precinct in the district has at least ten adult Black residents, all of these precincts are needed to achieve the minimum BVAP; the district in its entirety is the most compact group within the district of Black voters that gets to 50% + 1 of the population (hence, the blue dashed lines in those maps are coterminous with the black district boundary). There is no compact group of Black voters sufficient to constitute a majority of the Voting Age Population in this district.

District 38 (Figs. 31 - 38) fares even worse in terms of minority compactness. There is a cluster of Black residents of voting age around Lake Charles, but this cluster does not have the necessary population of 16,183. To achieve this, Mr. Cooper once again has to reach out into the surrounding countryside, and over to the town of Iowa. In fact, if one removes just the two (heavily White) Iowa precincts from the map, the BVAP of the district falls to 15,758. Likewise, if one removes the three (heavily White) rural precincts in the northern arm of the district, the district's BVAP falls to 16,055, short of a majority (removing two rural precincts here is how one draws the most compact district). In other words, Cooper's District 38 is more like District 1 than District 4: It ranges into rural, White areas not to pick up population, but to pick up isolated census blocks that happen to contain Black individuals, without which the map cannot reach a majority BVAP status.

There is a sufficiently compact Black population in the Lake Charles area to support one minority-majority district. There is not a compact Black population capable of sustaining two, at least given the Illustrative Maps. To draw two (barely) minority-

Figure 26: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 34. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

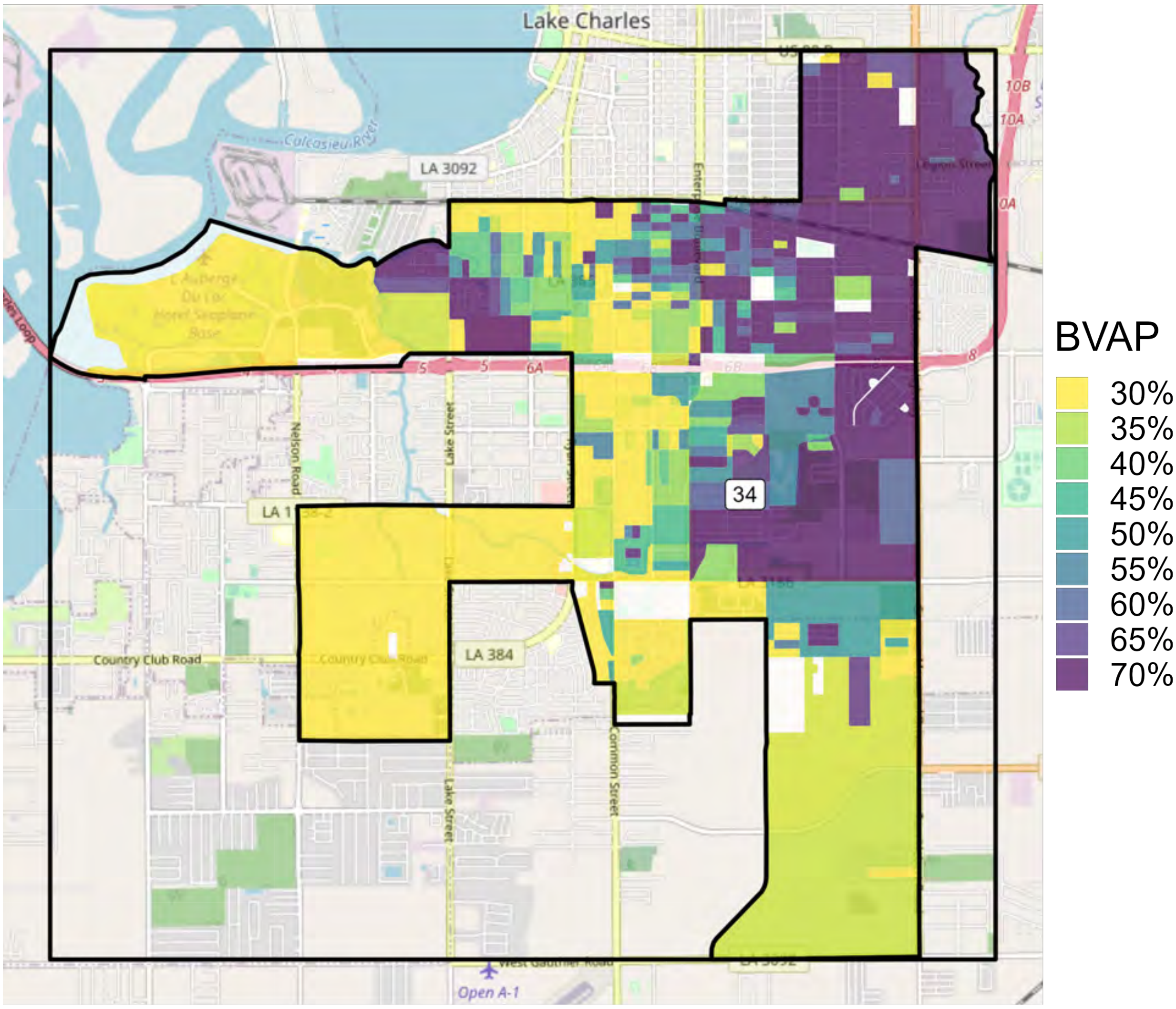


Figure 27: Location of Black population in Cooper Illustrative District 34. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

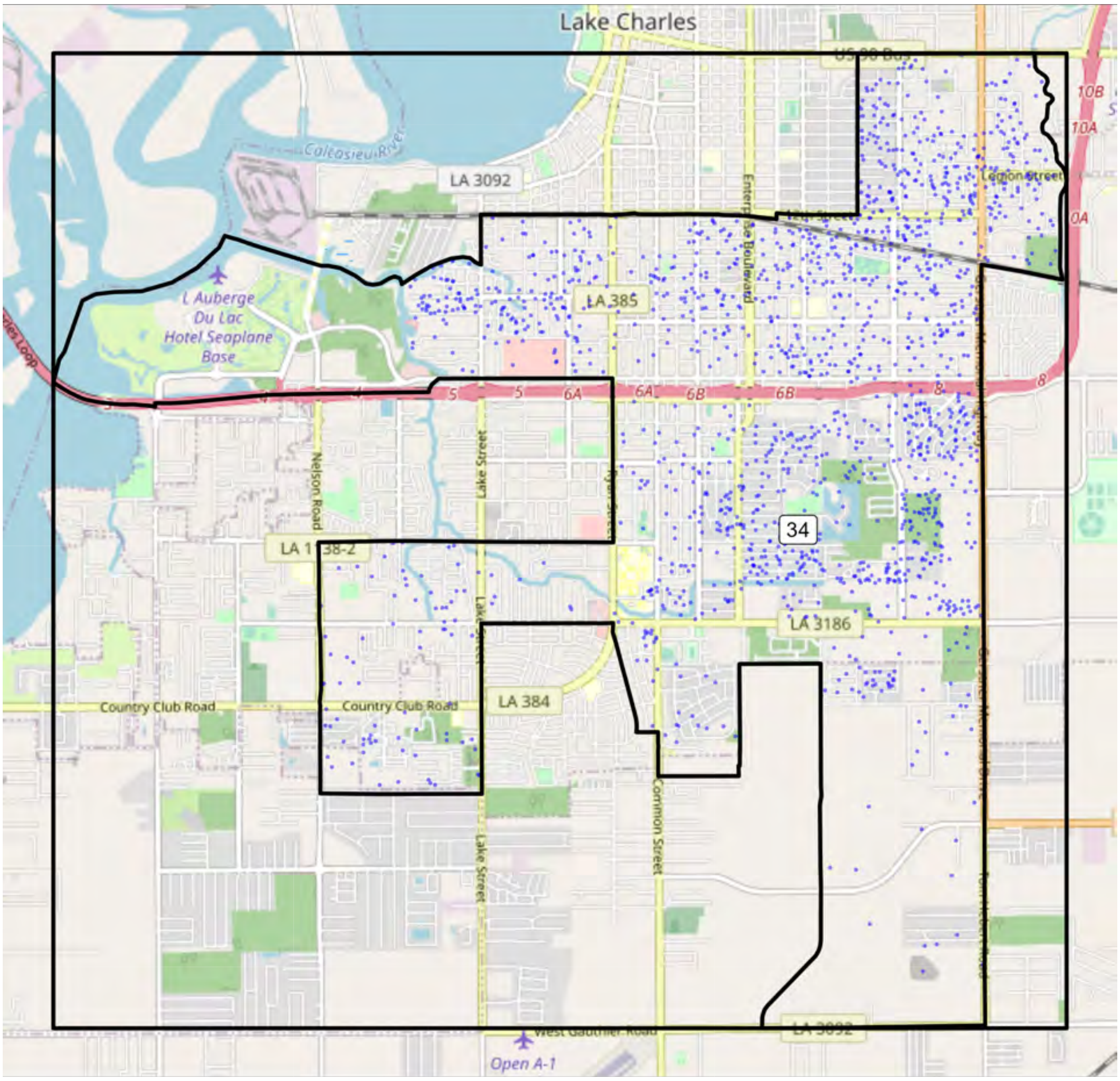


Figure 28: Location of Black and White populations in Cooper Illustrative District 34. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

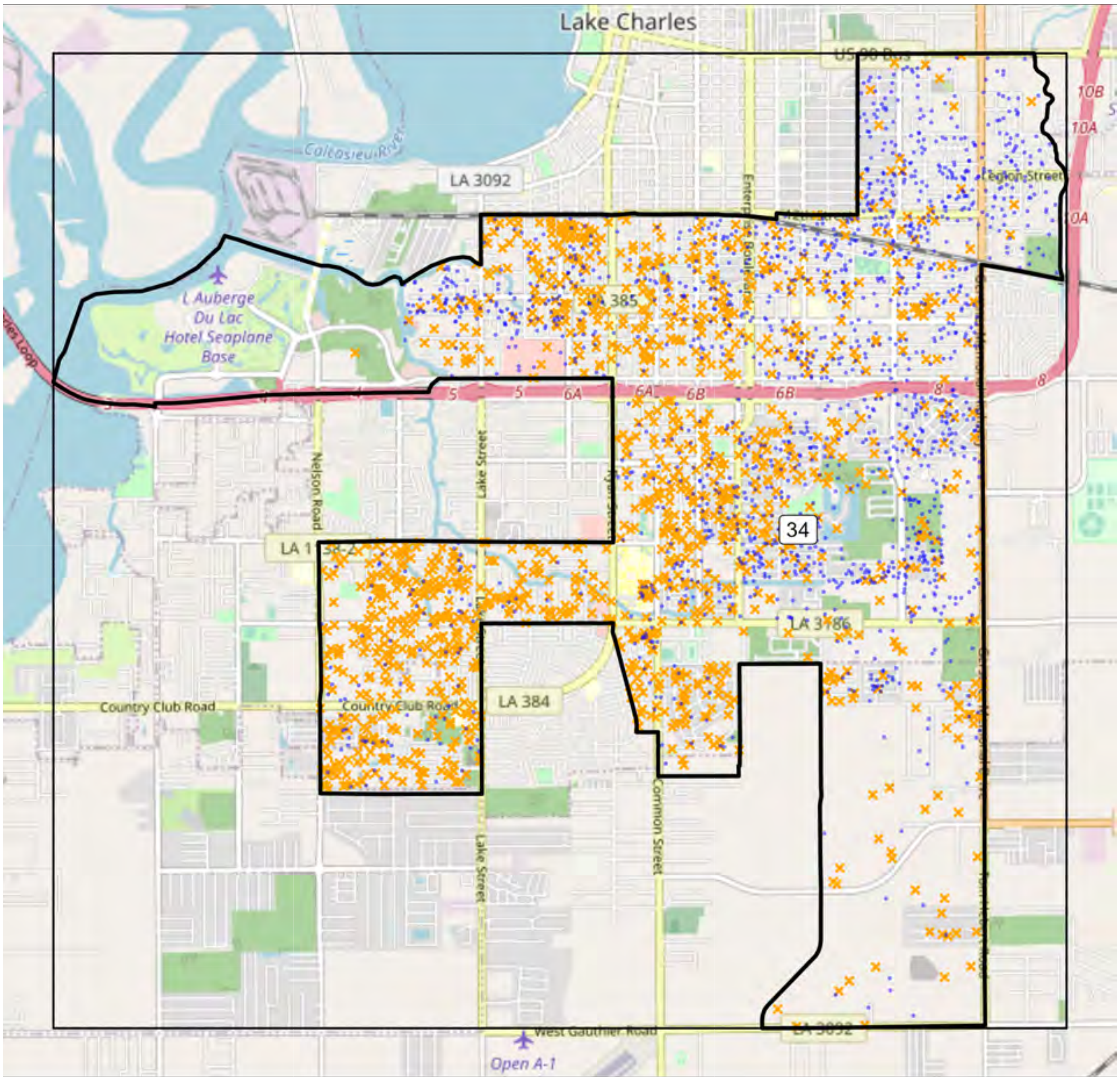


Figure 29: Most compact group of Black residents of voting age in Cooper Illustrative District 34 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,121 Black residents of voting age this approach identifies within the boundaries of Illustrative District 34. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

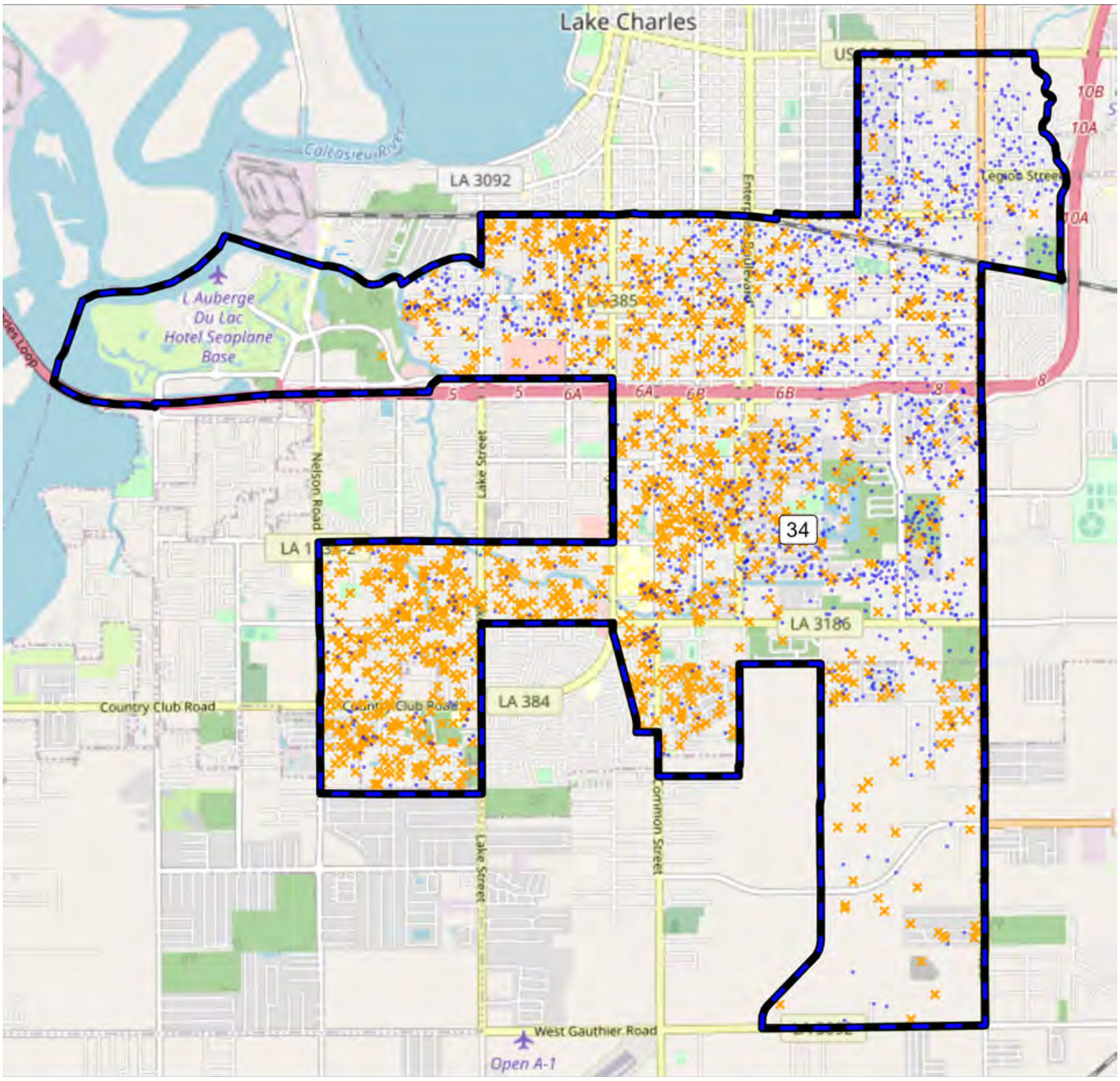


Figure 30: Most compact group of Black residents of voting age in Cooper Illustrative District 34 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,121 Black residents of voting age this approach identifies within the boundaries of Illustrative District 34. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

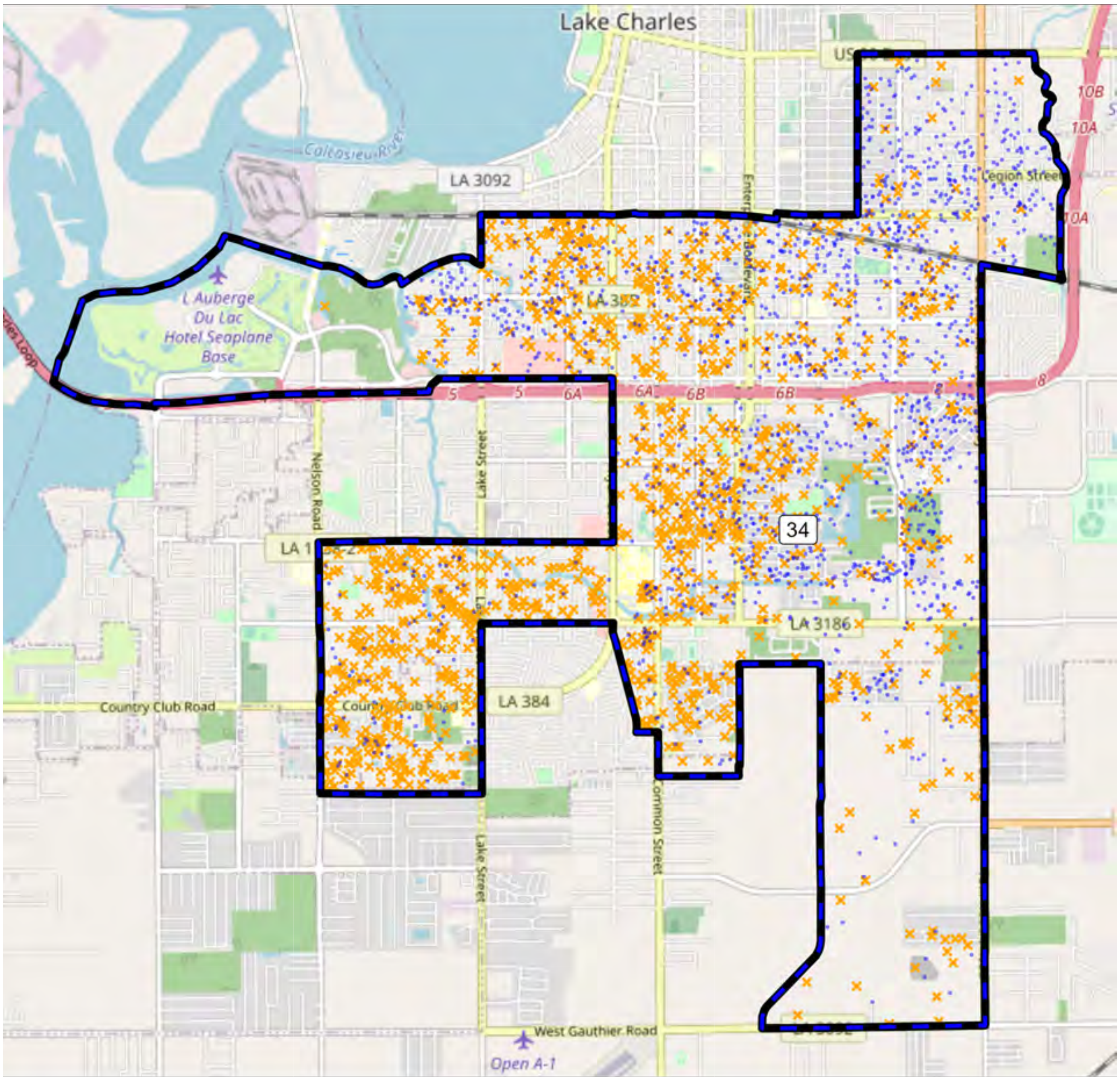


Figure 31: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 38. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

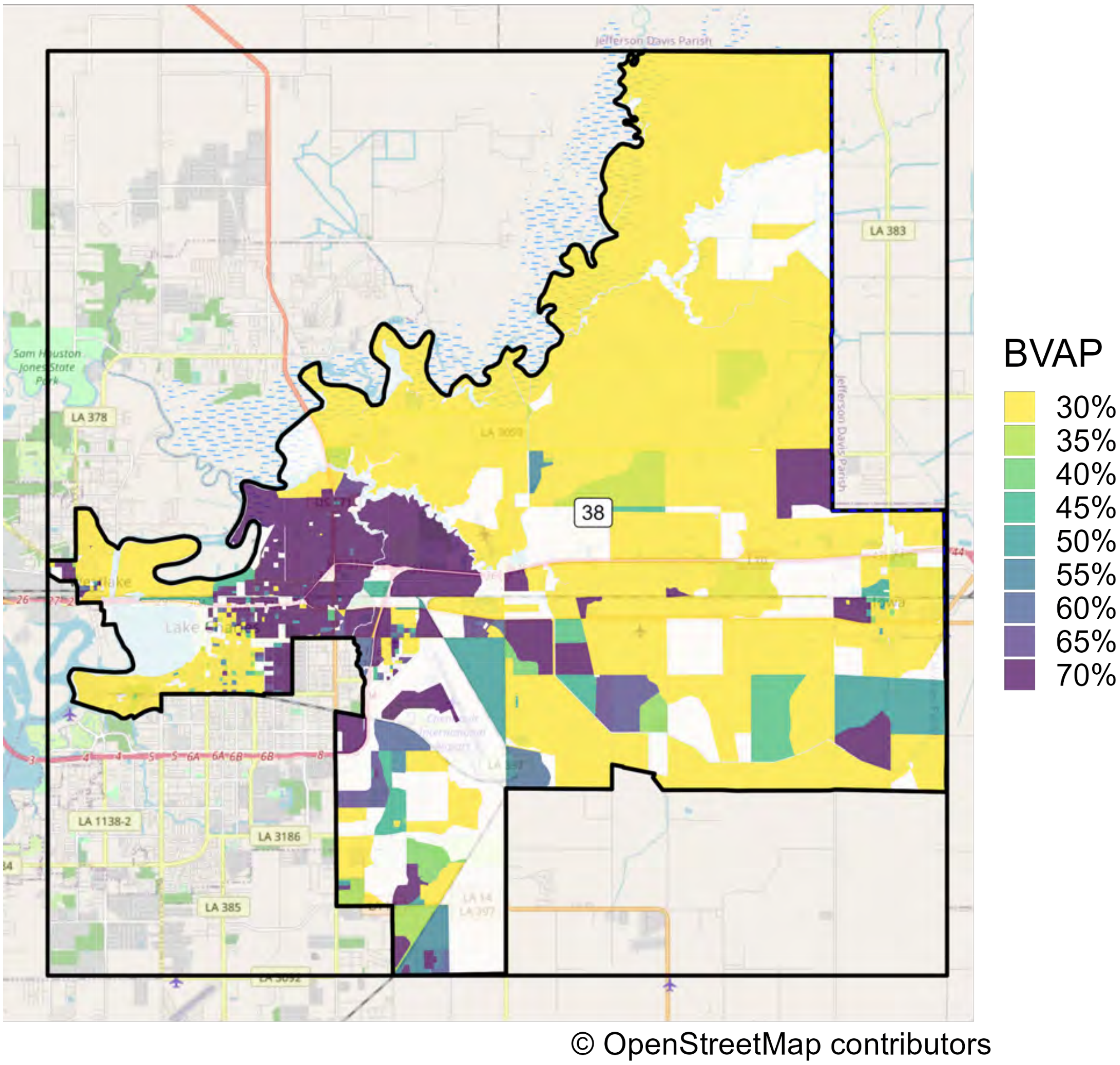


Figure 32: Location of Black population in Cooper Illustrative District 38. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

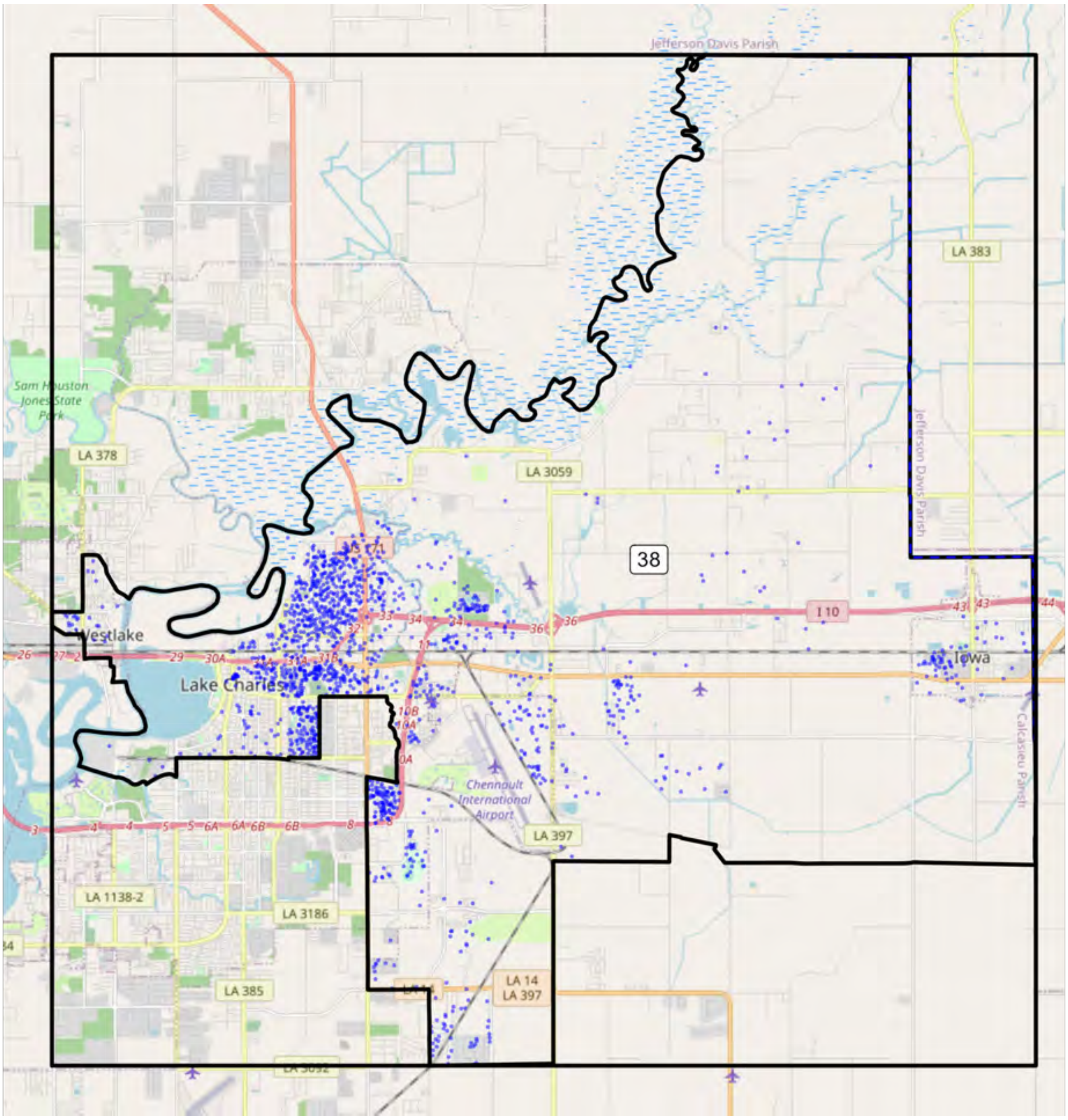


Figure 33: Location of Black and White populations in Cooper Illustrative District 38. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

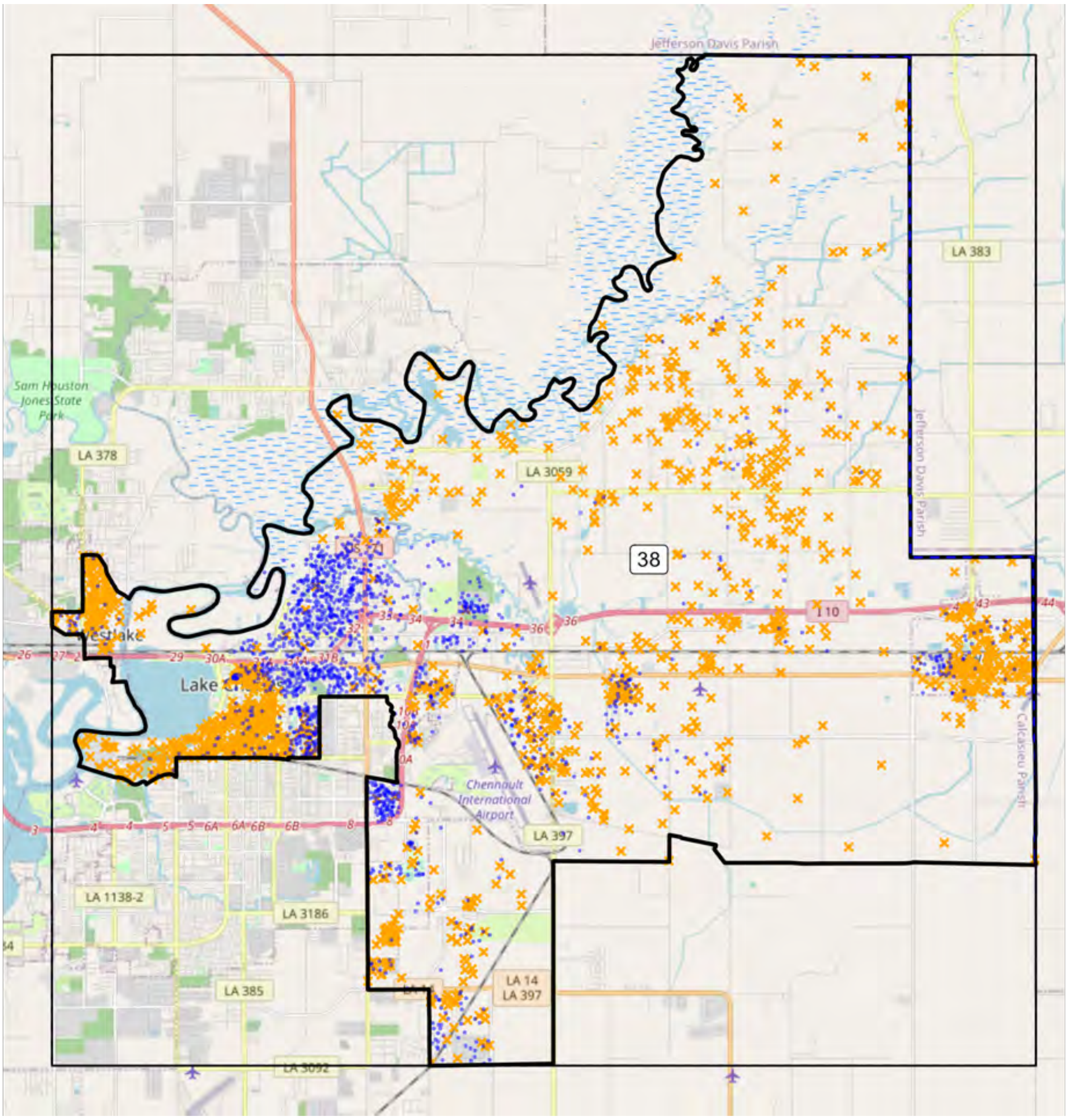


Figure 34: Most compact group of Black residents of voting age in Cooper Illustrative District 38 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,183 Black residents of voting age this approach identifies within the boundaries of Illustrative District 38. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

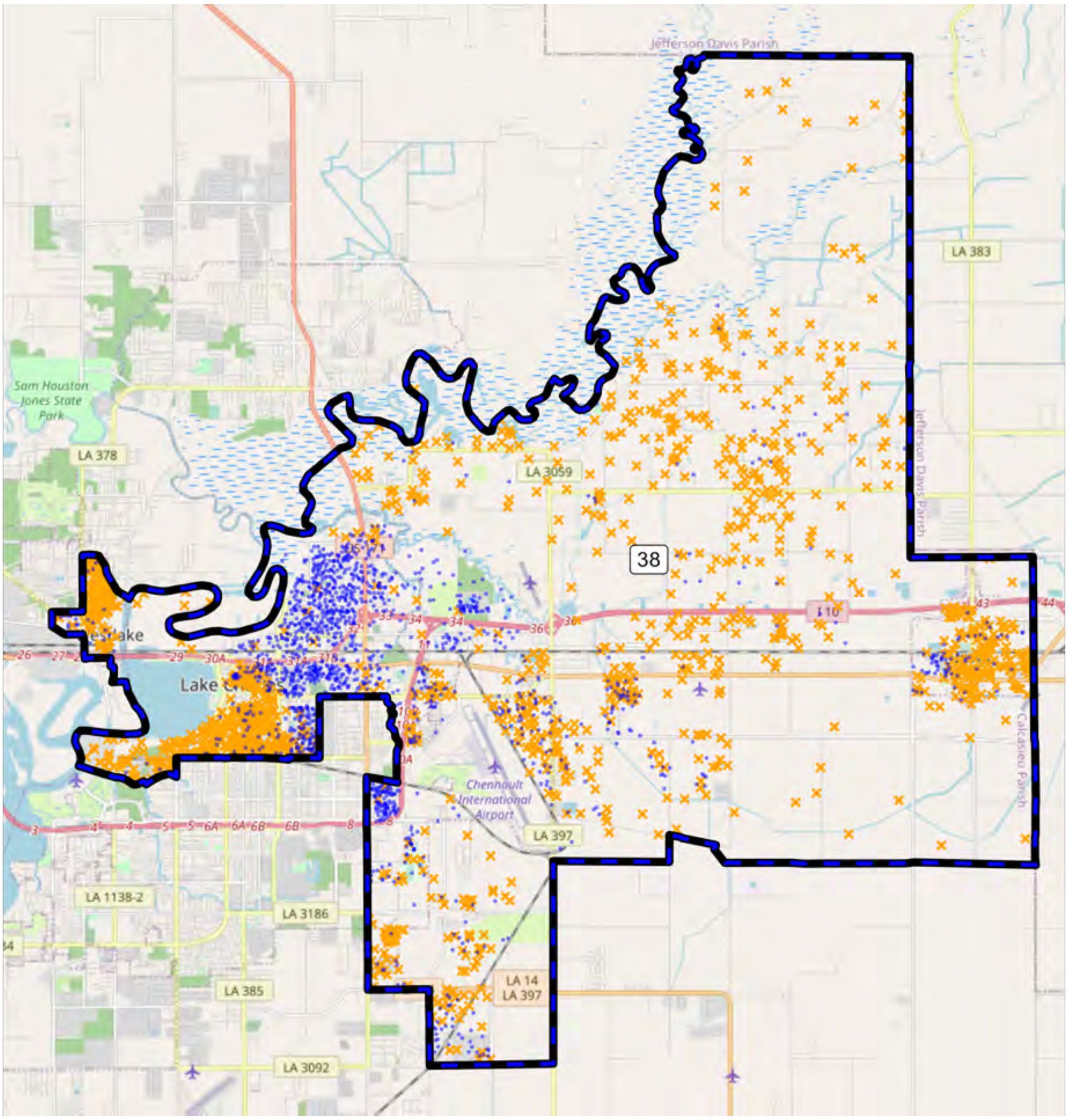
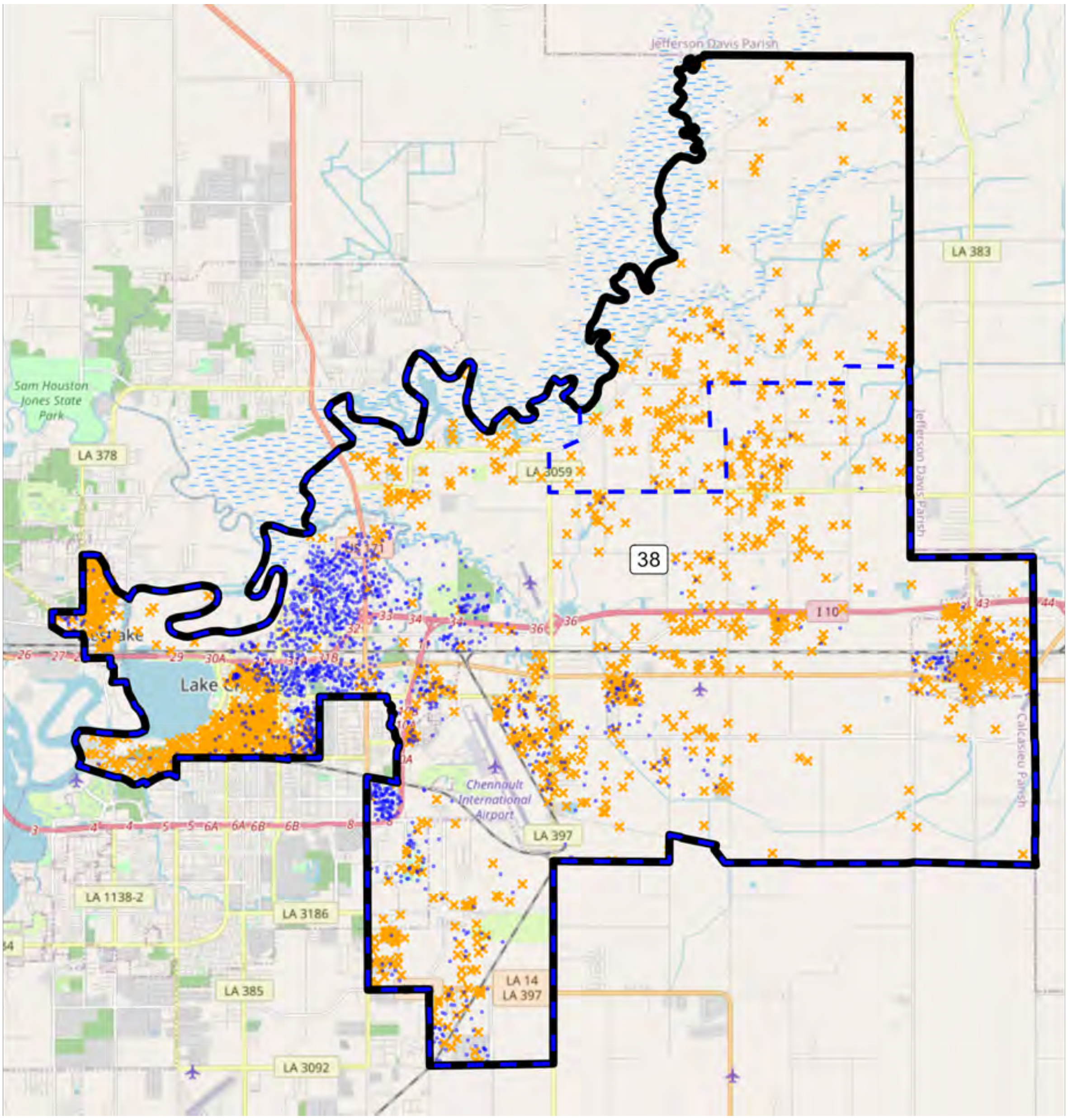


Figure 35: Most compact group of Black residents of voting age in Cooper Illustrative District 38 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,183 Black residents of voting age this approach identifies within the boundaries of Illustrative District 38. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.



majority districts, Mr. Cooper is forced to rely on Black populations in outlying towns or precincts, often in heavily White areas of the parish.

5.4 Baton Rouge Area

Mr. Cooper draws new majority Black districts in the Baton Rouge area with Illustrative Districts 60, 65, 68 and 69. (Compare Figure 36 with Figure 37). He then removes a minority-majority district that exists in the Enacted Plan: District 62. Illustrative Districts 60, 65, 68 and 69 have BVAP percentages of 52.8%, 56%, 54.2% and 50.2%, respectively. However, by splitting up the core of Black voters in Baton Rouge, he is forced to "baconmander" the remaining districts into far-flung areas of the map, creating several districts where the Black population is not geographically compact. Thus, the question is how Cooper accomplished the feat of drawing three additional minority-majority districts here.

Figure 36: Black Majority BVAP Districts in the Baton Rouge Area, Enacted Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.

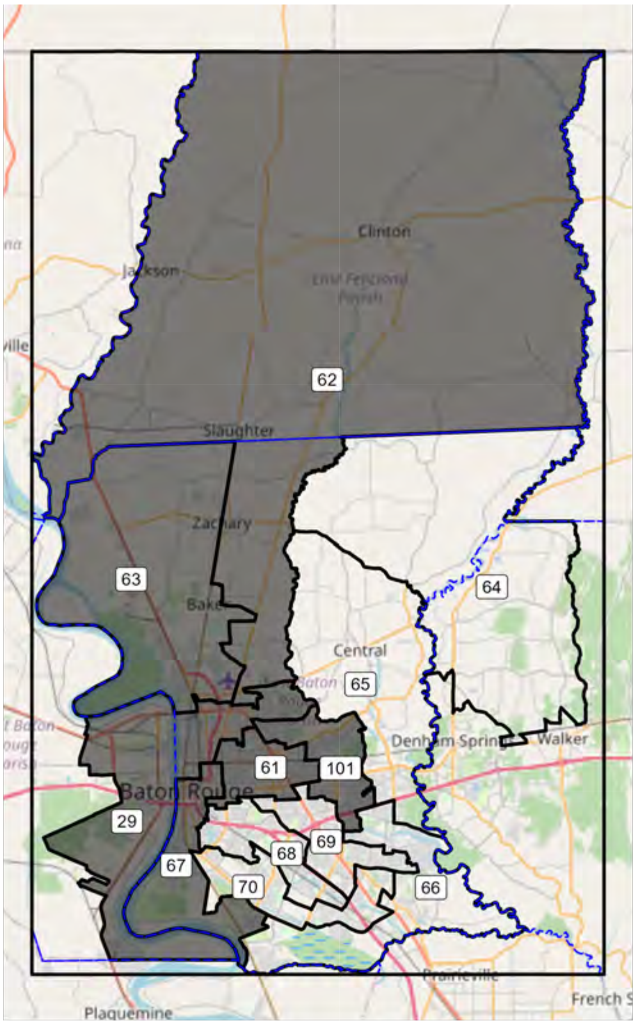


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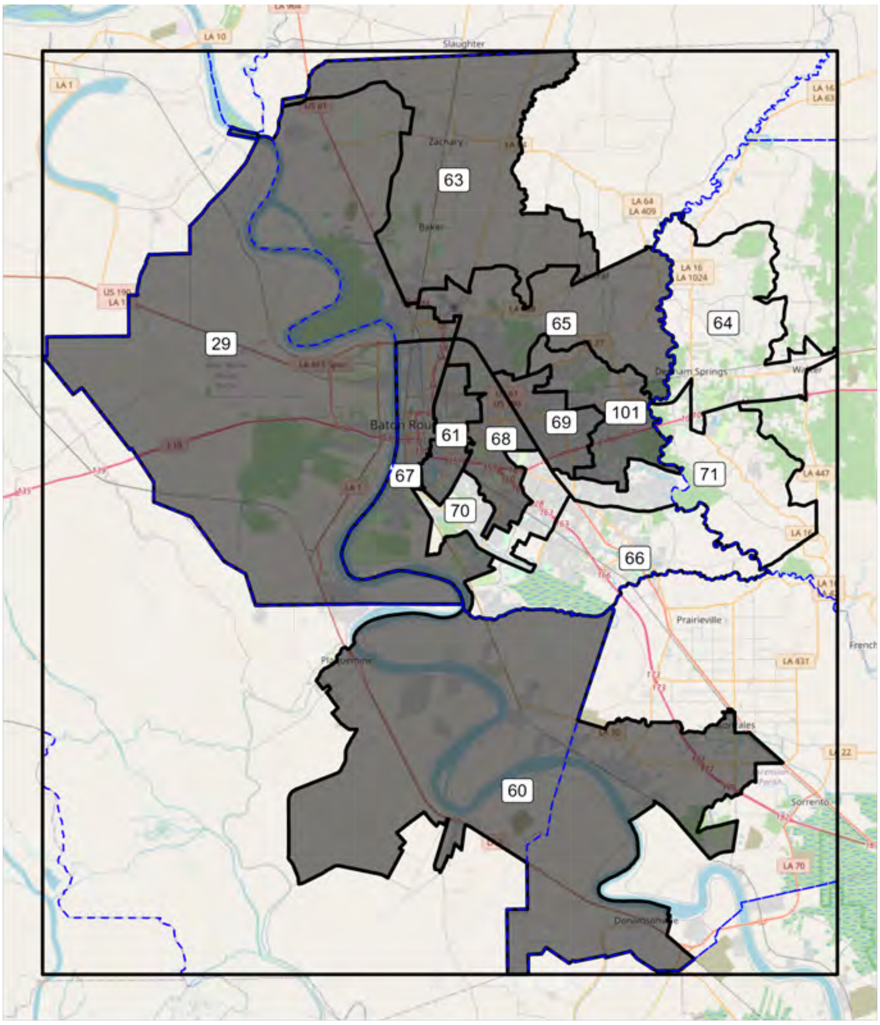
Figure 37: Black Majority BVAP Districts in the Shreveport Area, Cooper Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



5.4.1 Cooper Illustrative District 29

The resulting districts provide good contrasts that help explain what a compact minority group sufficient to constitute a majority in a district would look like. Thus, this report first compares three districts that Mr. Cooper redrew to their counterparts in the Enacted Map. Consider the Enacted District 29, in Figure 39.

Here, the district stretches through heavily White areas, meandering along the banks of the Mississippi River. However, there exists in the area on the East side of the Mississippi a geographically compact Black population that could be sufficient to constitute a majority in a district. The wanderings on the west side of the Mississippi River exist to meet the equal population requirement, and are not necessary for making the district one where Black voters are a majority of the voting age population.

Contrast that with the Illustrative Maps' version of District 29 (which resembles a guinea pig climbing up the side of the map), in Figure 40.

In this district there is also a geographically compact Black population east of the Mississippi River, but it is insufficient to constitute a majority of the population. To achieve this, the Illustrative Map must cross over into rural, White areas to pick up isolated Black residents.

Figure 38: Most compact group of Black residents of voting age in Enacted District 29 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,519 Black residents of voting age this approach identifies within the boundaries of Enacted District 29.

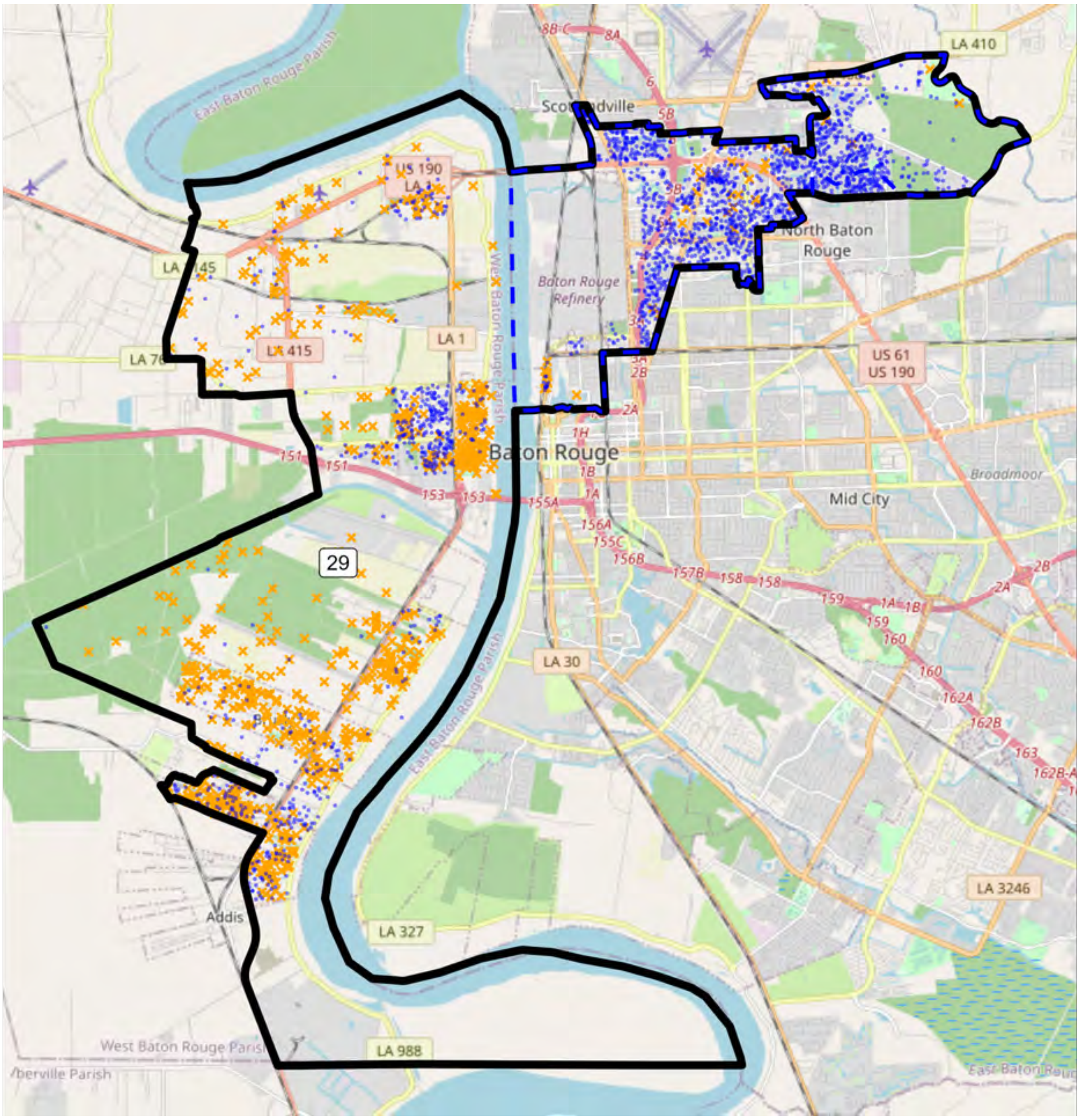


Figure 39: Most compact group of Black residents of voting age in Cooper Illustrative District 29 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,076 Black residents of voting age this approach identifies within the boundaries of Illustrative District 29.

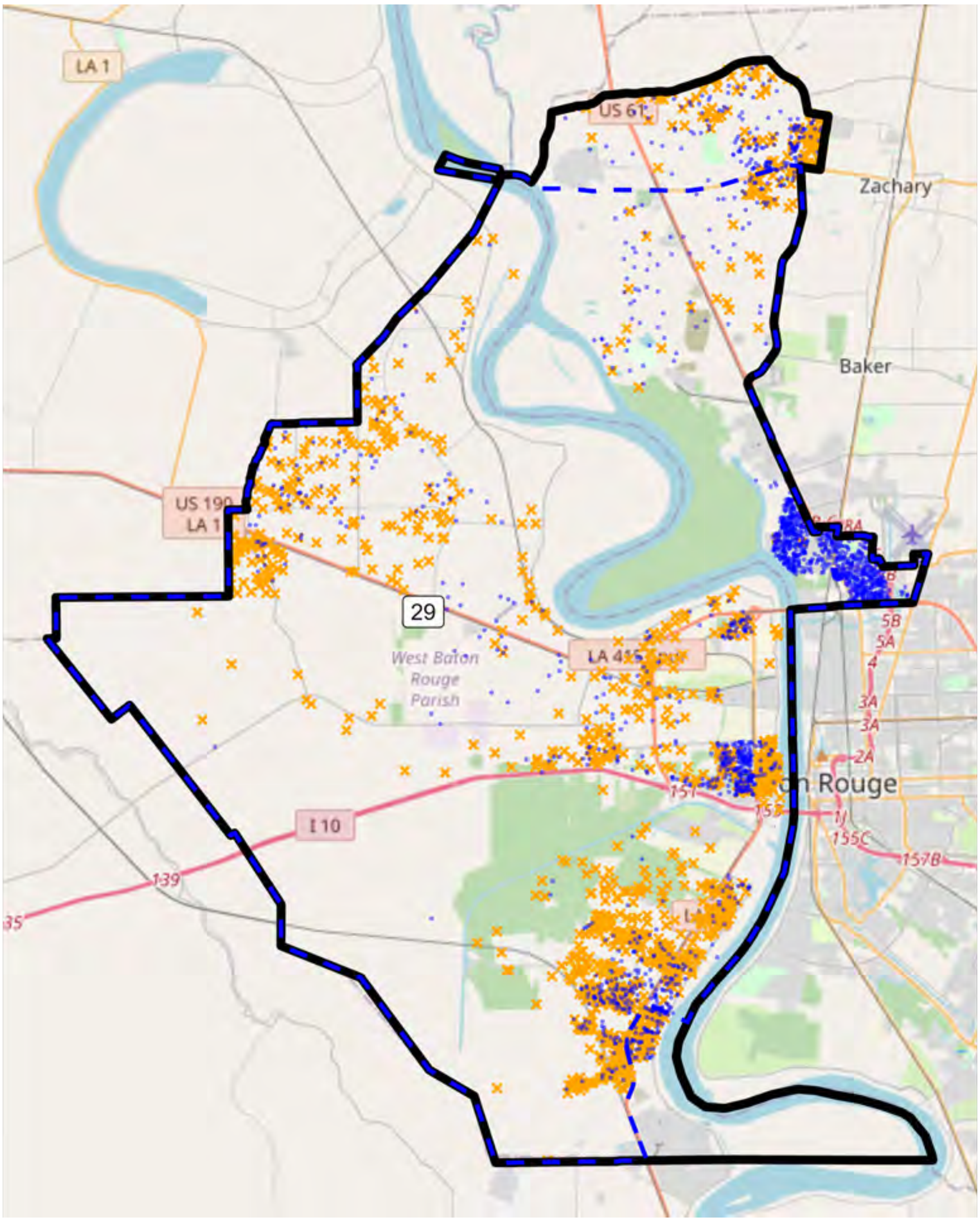
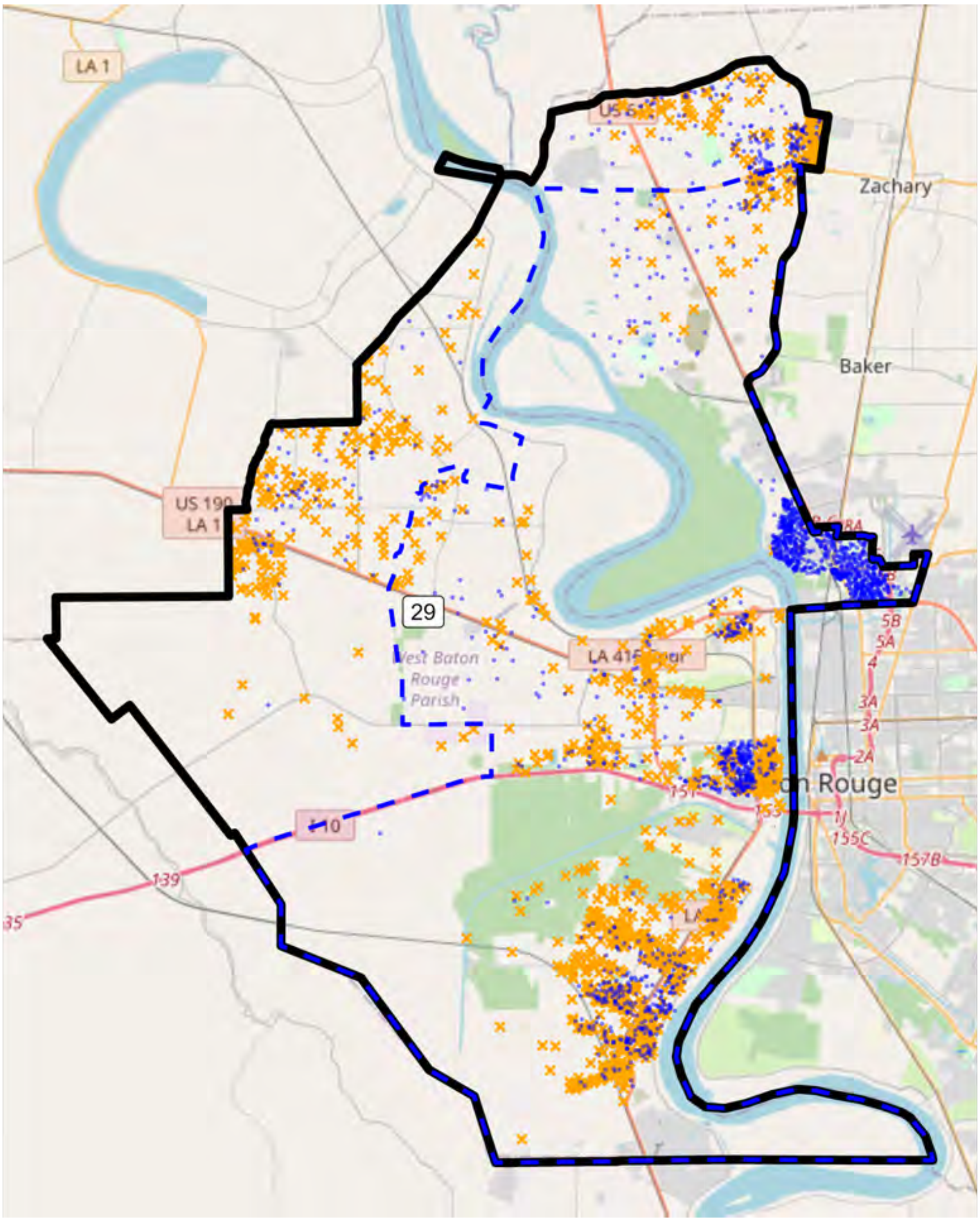


Figure 40: Most compact group of Black residents of voting age in Cooper Illustrative District 29 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,076 Black residents of voting age this approach identifies within the boundaries of Illustrative District 29.



5.4.2 Cooper Illustrative District 61

The Enacted and Illustrative versions of District 61 further illustrate this phenomenon. Compare Figure 41 with Figure 42.

Once again, the Black population in the Enacted version of District 61 is geographically distinct, and it is sufficient to constitute a majority of the population. It is true that there are heavily White areas and isolated Black residents included in the district, but they are not necessary to create a 50% + 1 BVAP district. They are necessary to create a district that complies with one-person-one-vote in this configuration.

The Illustrative Map's District 61, takes a very different approach (Figures 42 - 43).

Because this district is barely majority-minority (BVAP 50.2%) every Black resident in the district is needed to cross the majority threshold (it is 166 Black residents over the 50% + 1 threshold). Thus, unlike the Enacted Map, the Illustrative Map here ventures out into heavily White areas not simply to comply with one-person-one-vote, but to cross the 50% + 1 threshold under *Gingles*. In other words, the minority group that is sufficient to comprise 50% + 1 of the district is not compact under the Illustrative Map.

Figure 41: Most compact group of Black residents of voting age in Enacted District 61 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,812 Black residents of voting age this approach identifies within the boundaries of Enacted District 61.

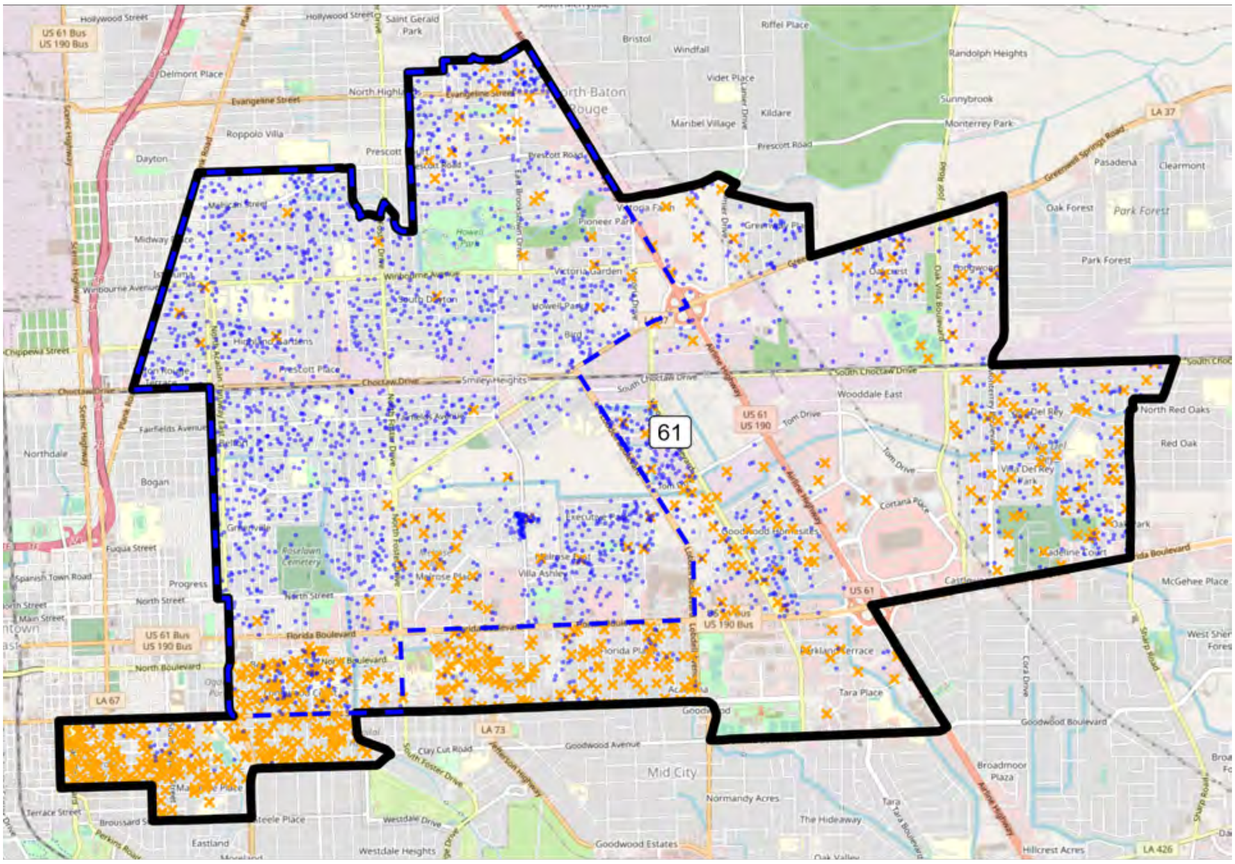


Figure 42: Most compact group of Black residents of voting age in Cooper Illustrative District 61 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,766 Black residents of voting age this approach identifies within the boundaries of Enacted District 61. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

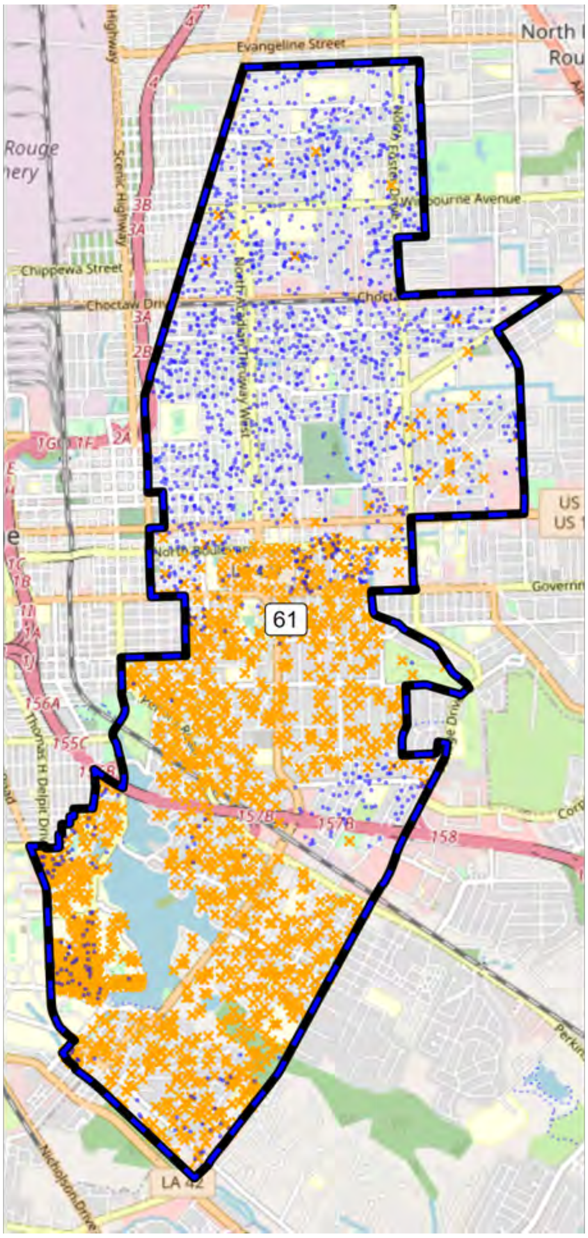
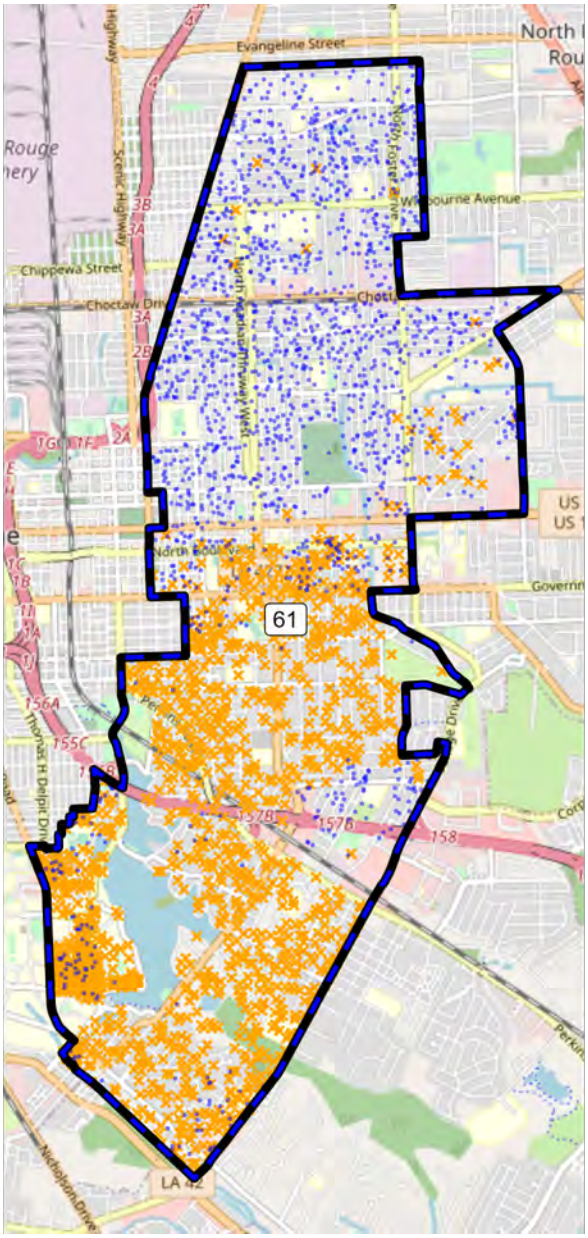


Figure 43: Most compact group of Black residents of voting age in Cooper District 61 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 17,766 Black residents of voting age this approach identifies within the boundaries of Enacted District 61. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line



5.4.3 Cooper Illustrative District 63

In the same vein, the Enacted Map's version of District 63, depicted in Figure 44, extends into lightly populated, rural areas, but there exists a heavily compact cluster of Black residents in the southeast of the map that constitutes a majority of the Voting Age population.

The Illustrative Map, however, Figures 45 - 46, ranges far and wide across the outskirts of East Baton Rouge Parish to collect isolated Black individuals to cross the 50% + 1 threshold. In other words, its most compact Black population that could comprise 50% + 1 of the district is necessarily less compact than in the Enacted Plan, and is non-compact in general.

Figure 44: Most compact group of Black residents of voting age in Enacted District 63 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,793 Black residents of voting age this approach identifies within the boundaries of Enacted District 63.

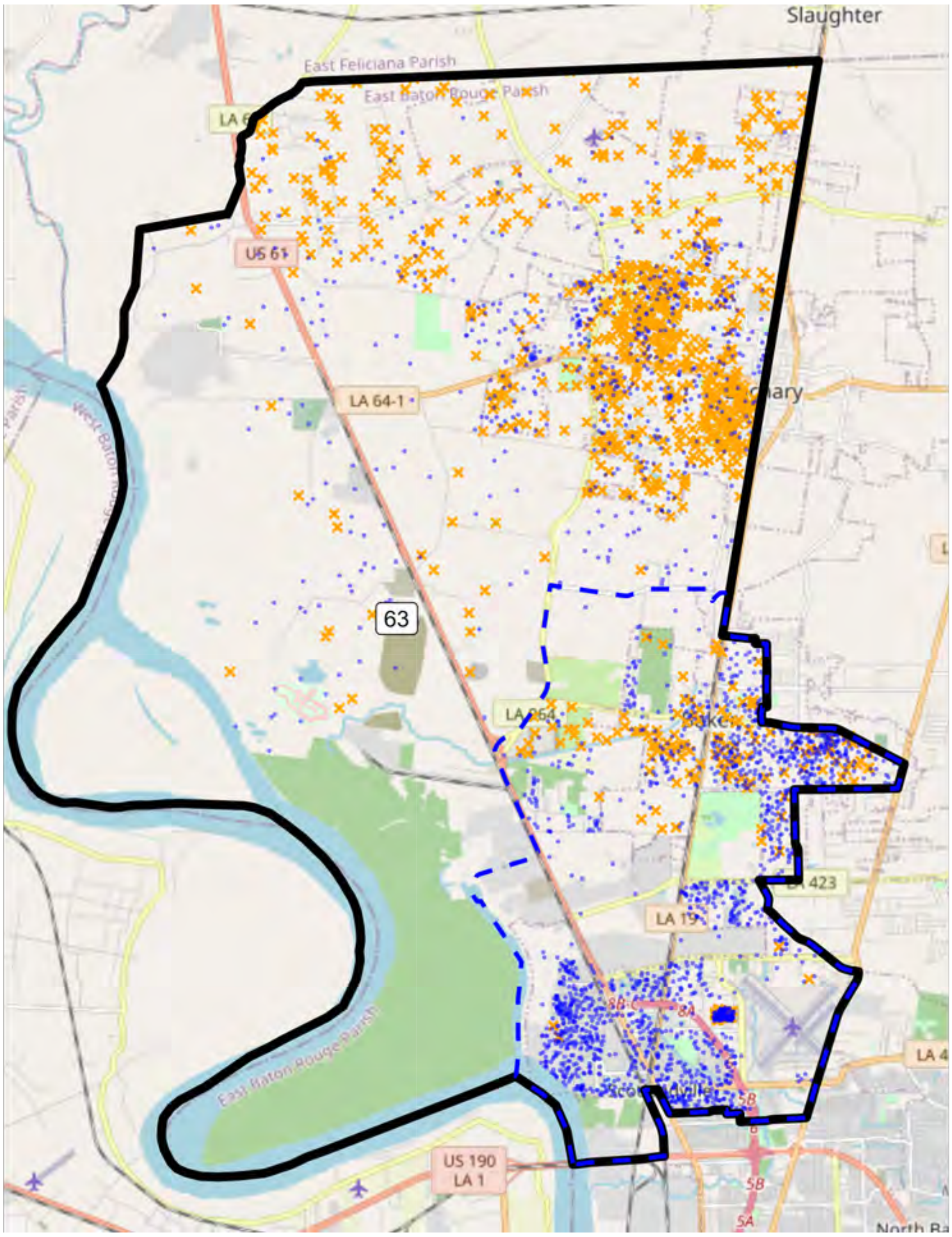


Figure 45: Most compact group of Black residents of voting age in Cooper Illustrative District 63 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,937 Black residents of voting age this approach identifies within the boundaries of Enacted District 63.

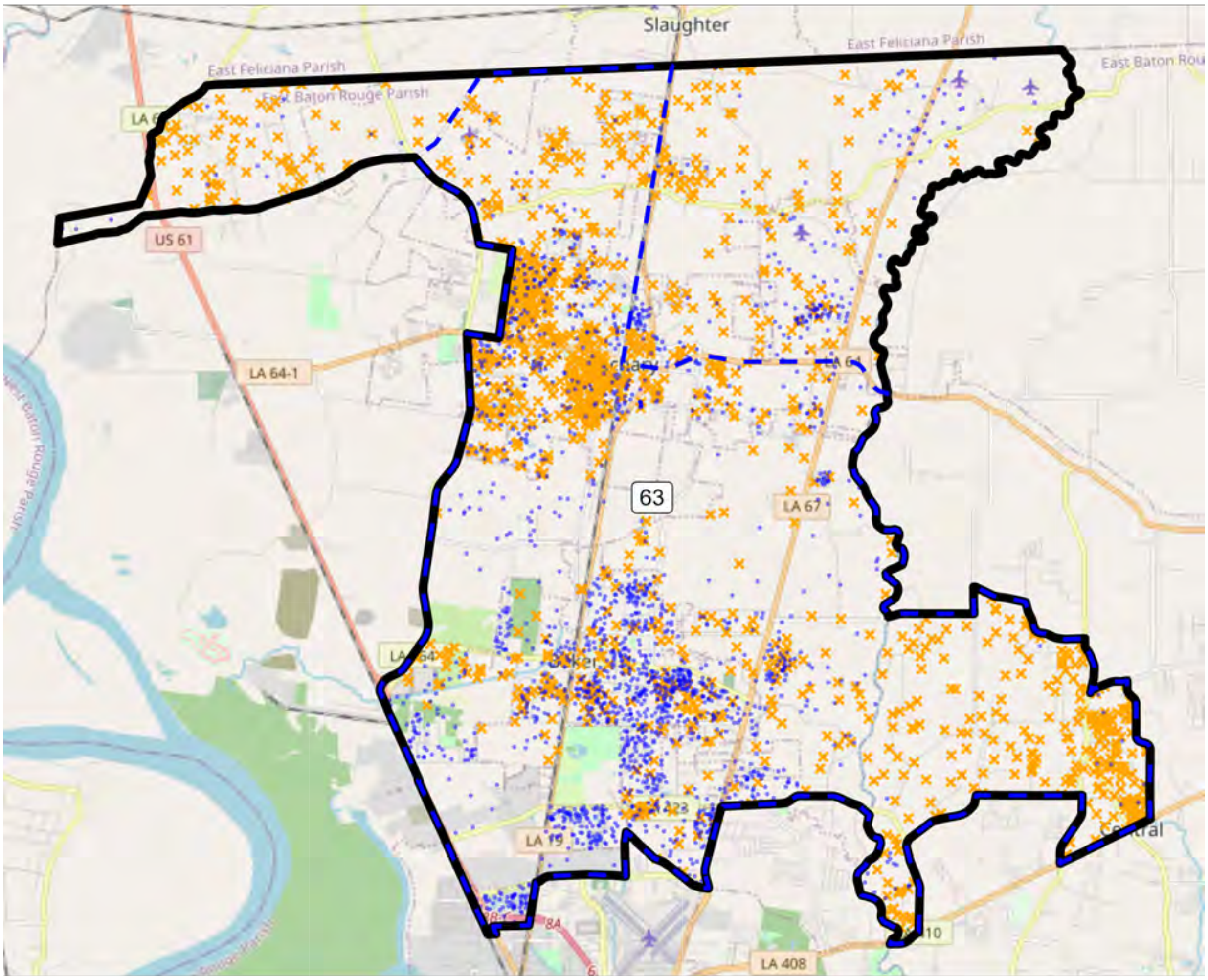
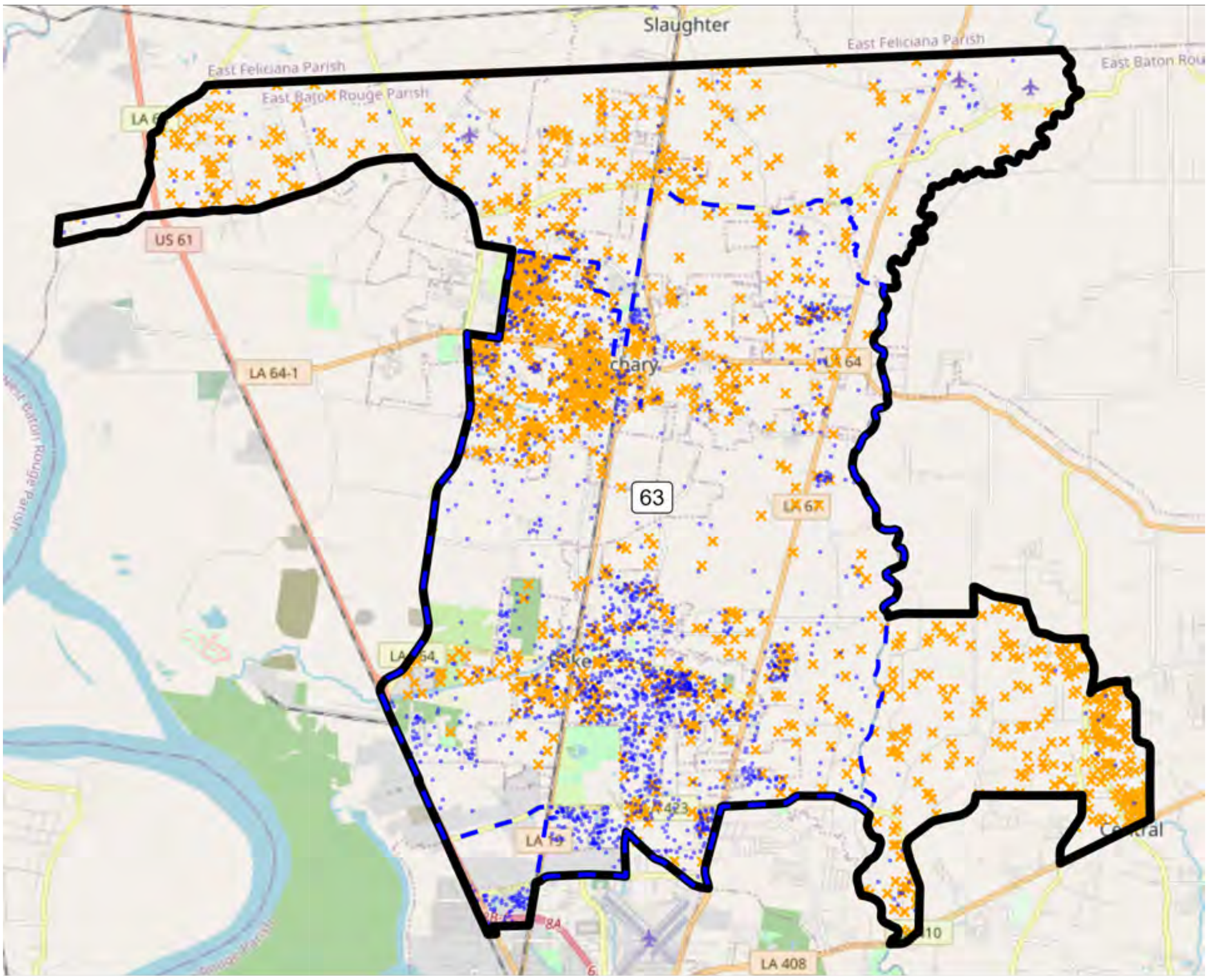


Figure 46: Most compact group of Black residents of voting age in Cooper Illustrative District 63 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,937 Black residents of voting age this approach identifies within the boundaries of Enacted District 63.



5.4.4 Cooper Illustrative District 60

The other districts that Mr. Cooper creates deploy the same techniques. The Illustrative Map's newly created District 60 relies on cobbling together minority groups from dispersed portions of the area, connecting Black voters in Gonzales, White Castle, and Plaquemine. These areas are not functionally contiguous – that is, one must travel outside of the district to go across the Mississippi River. As with District 23 above, none of these groups approaches 50% of the BVAP. The overall VAP of the district is 33,620. The cluster around Plaquemines has 3,760 Black residents of voting age, the precincts around White Castle have 1,307 Black residents of voting age, and the precincts around Gonzales have a BVAP of 5,531. Again, this is a district created by stitching together heavily Black clusters with mostly White areas with the occasional Black resident included. *See* Figs. 47 - 50.

Figure 47: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 60. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

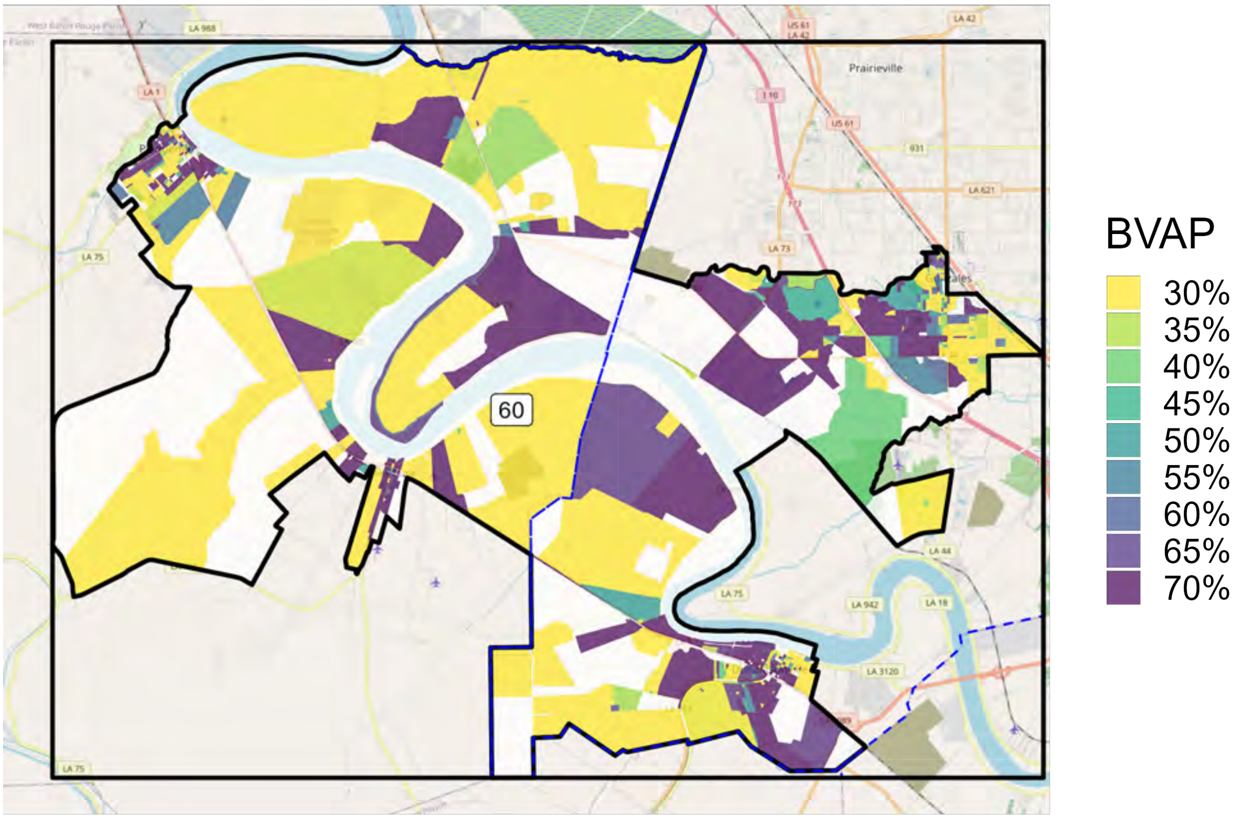


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Figure 48: Location of Black and White populations in Cooper Illustrative District 60. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

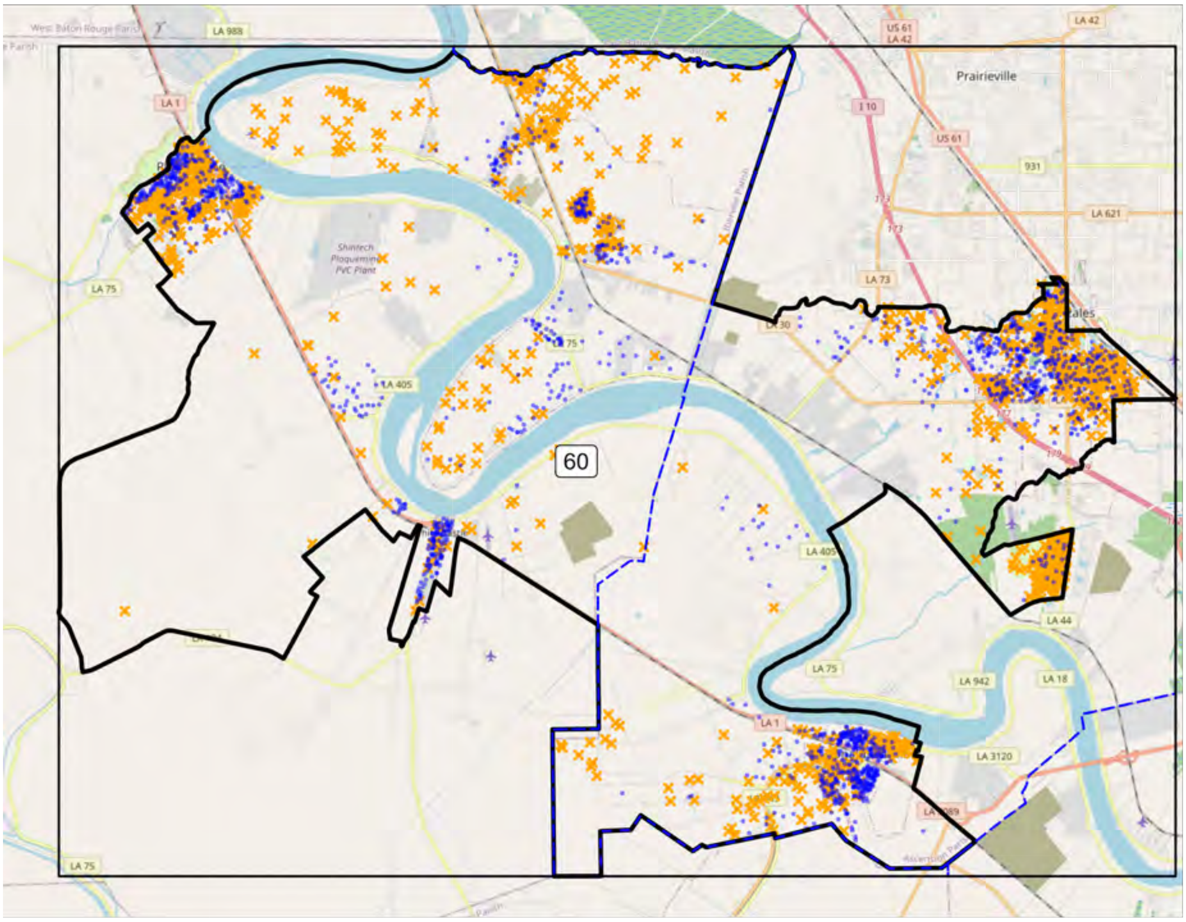


Figure 49: Most compact group of Black residents of voting age in Cooper Illustrative District 60 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,936 Black residents of voting age this approach identifies within the boundaries of Illustrative District 60. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

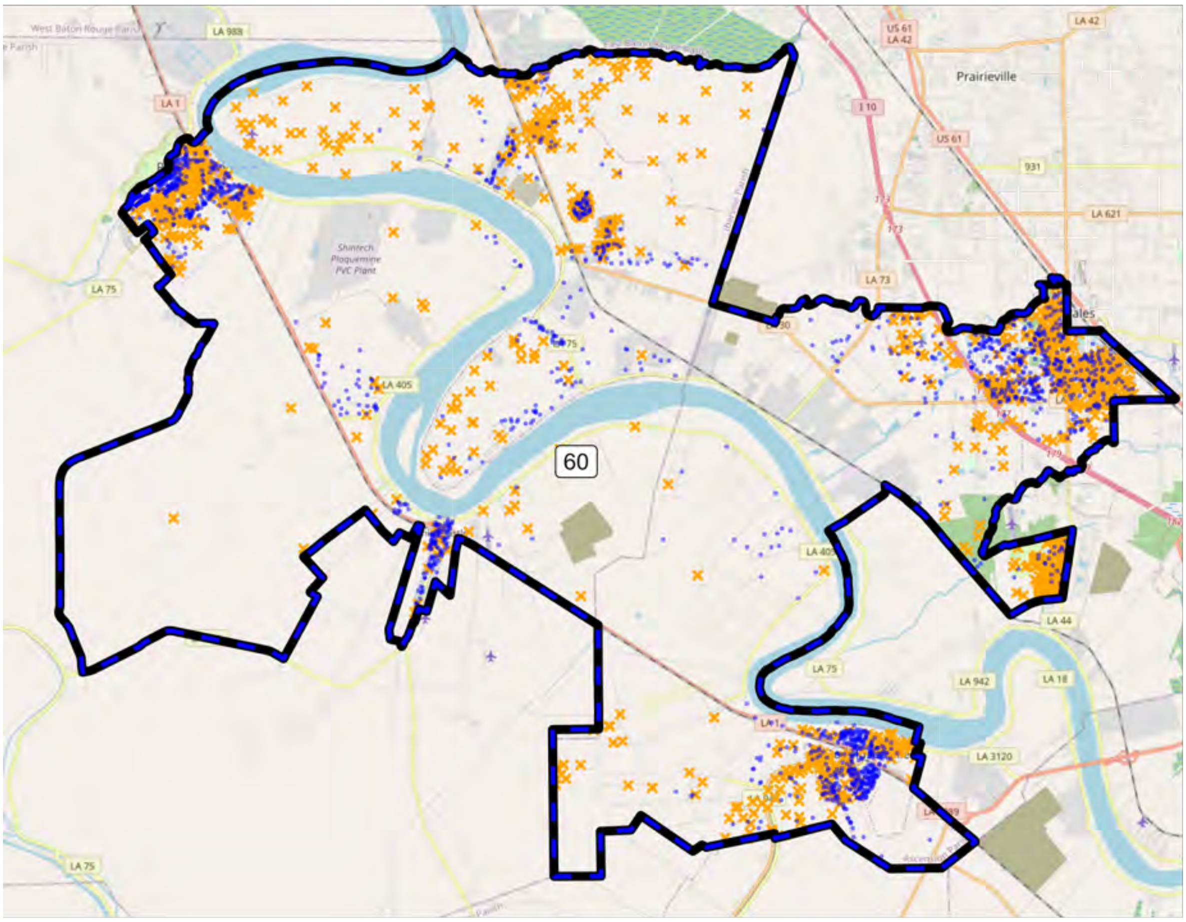
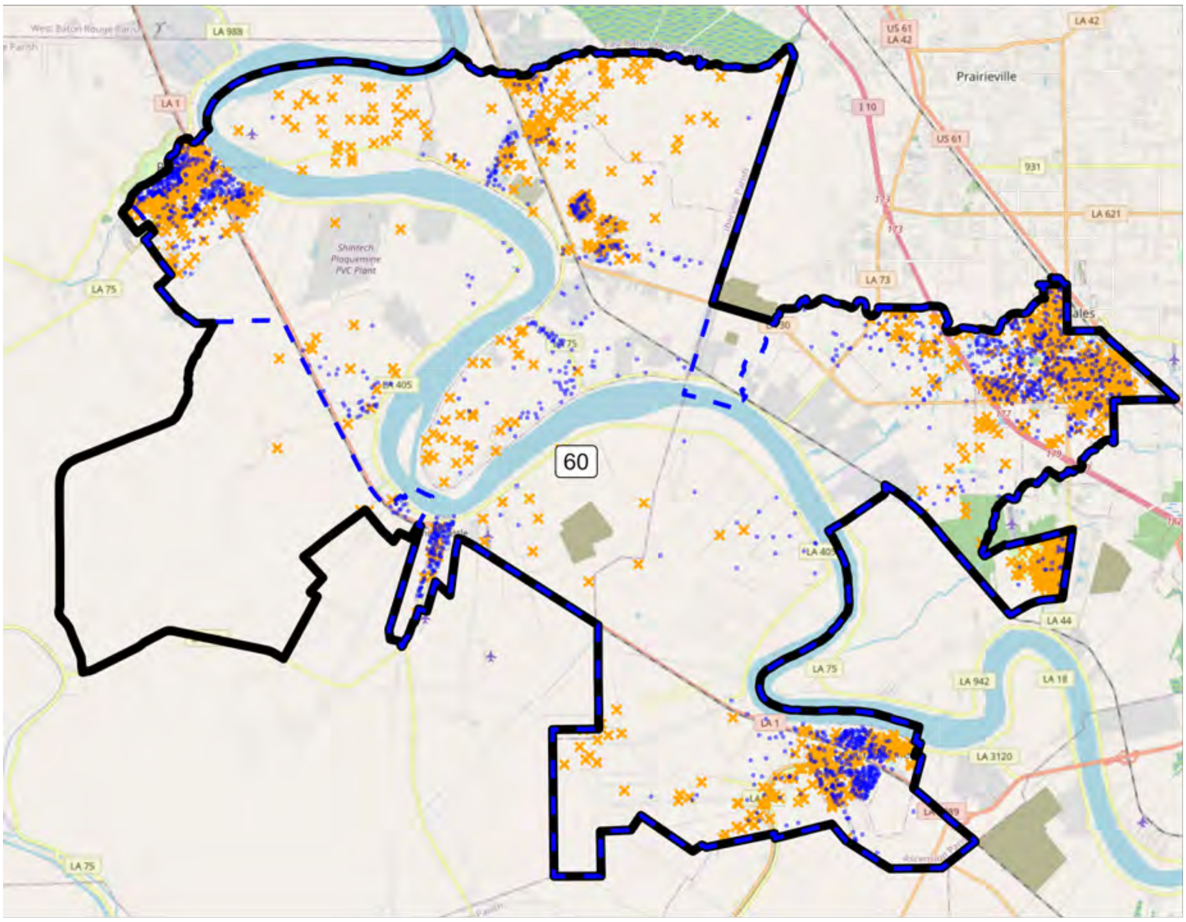


Figure 50: Most compact group of Black residents of voting age in Cooper Illustrative District 60 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,936 Black residents of voting age this approach identifies within the boundaries of Illustrative District 60. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.



5.4.5 Cooper Illustrative District 65

Likewise, in District 65, the Black population is concentrated in the overwhelmingly Black western portion of the district. Getting to a BVAP of 16,758 (50% of the district) requires taking in Black voters from outlying, heavily White areas surrounding the district. As the final two maps show, the most compact Black population in the district that reaches 50%+1 of the district's population can't be drawn entirely, or even almost entirely, within this area; once again it's only achieved by pulling the Black residents in heavily White precincts and blocks in the outskirts/rural areas of Baton Rouge. *See* Figs. 51 - 54.

Figure 51: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 65. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

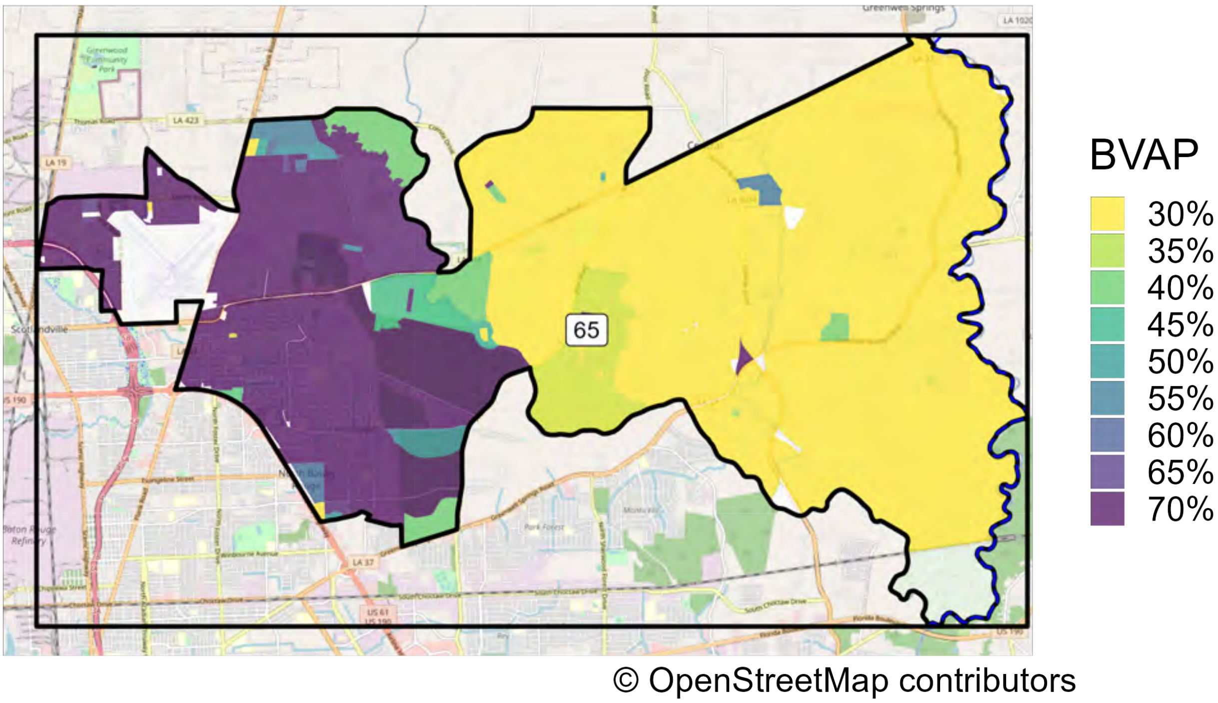


Figure 52: Location of Black and White populations in Cooper Illustrative District 65. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

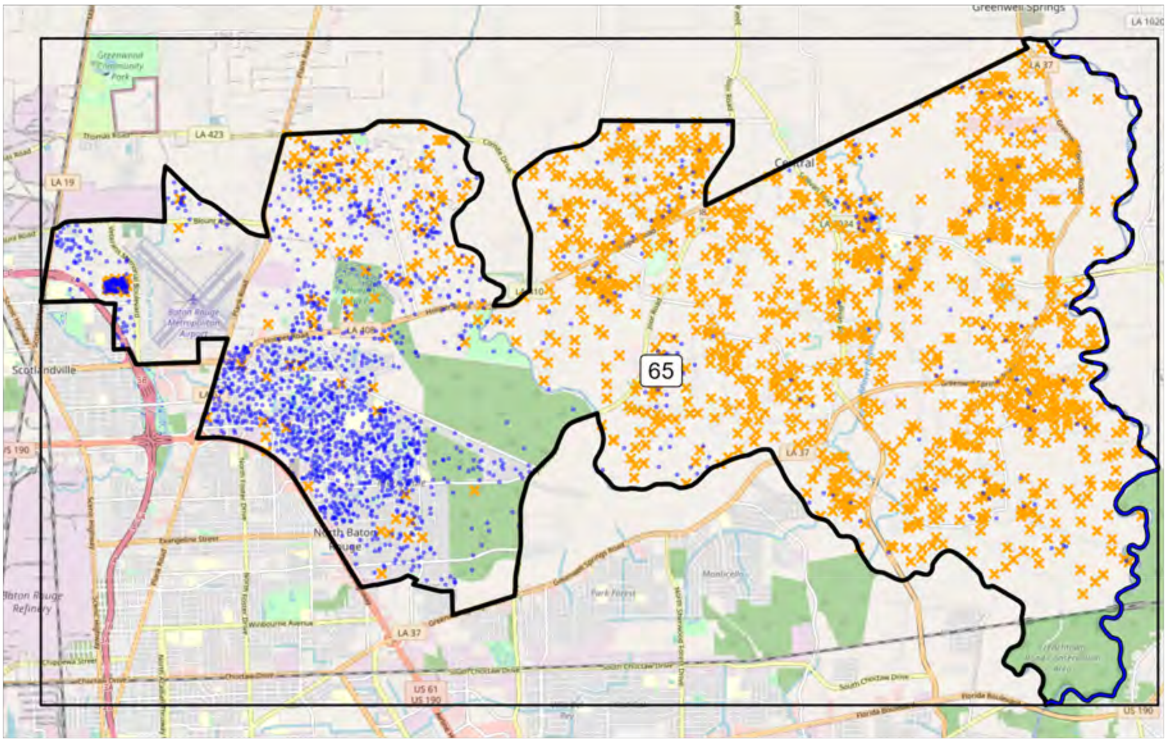


Figure 53: Most compact group of Black residents of voting age in Cooper Illustrative District 65 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,759 Black residents of voting age this approach identifies within the boundaries of Illustrative District 65.

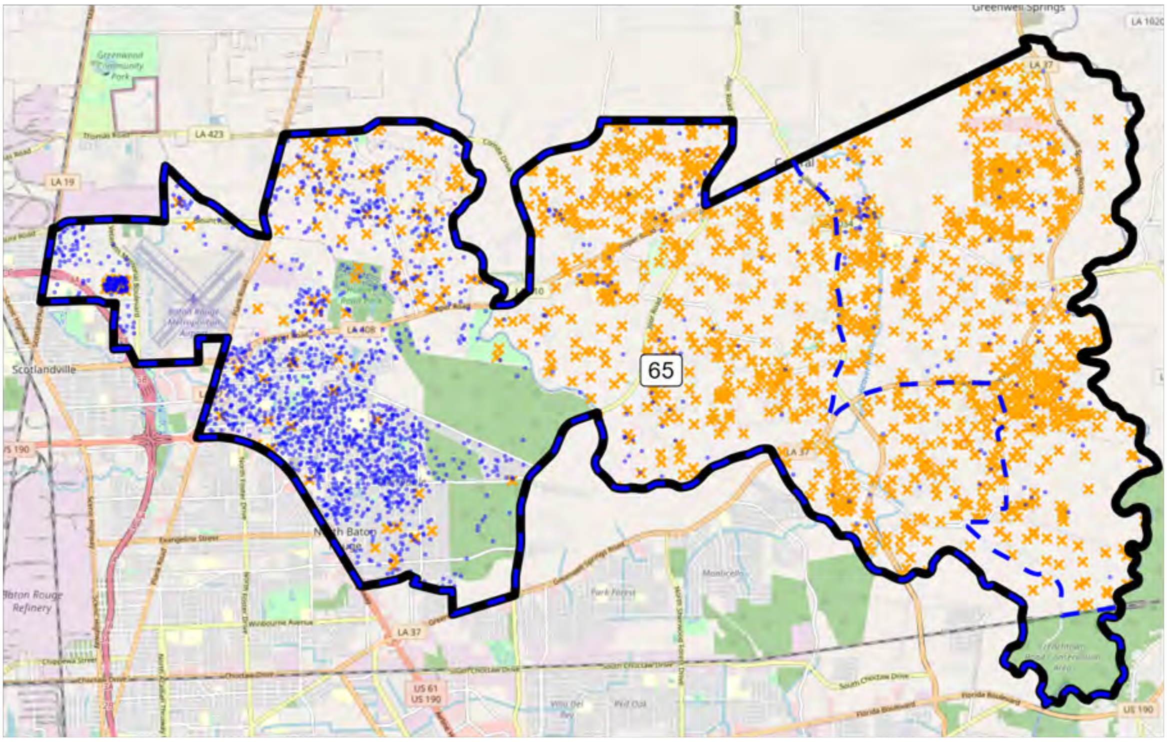
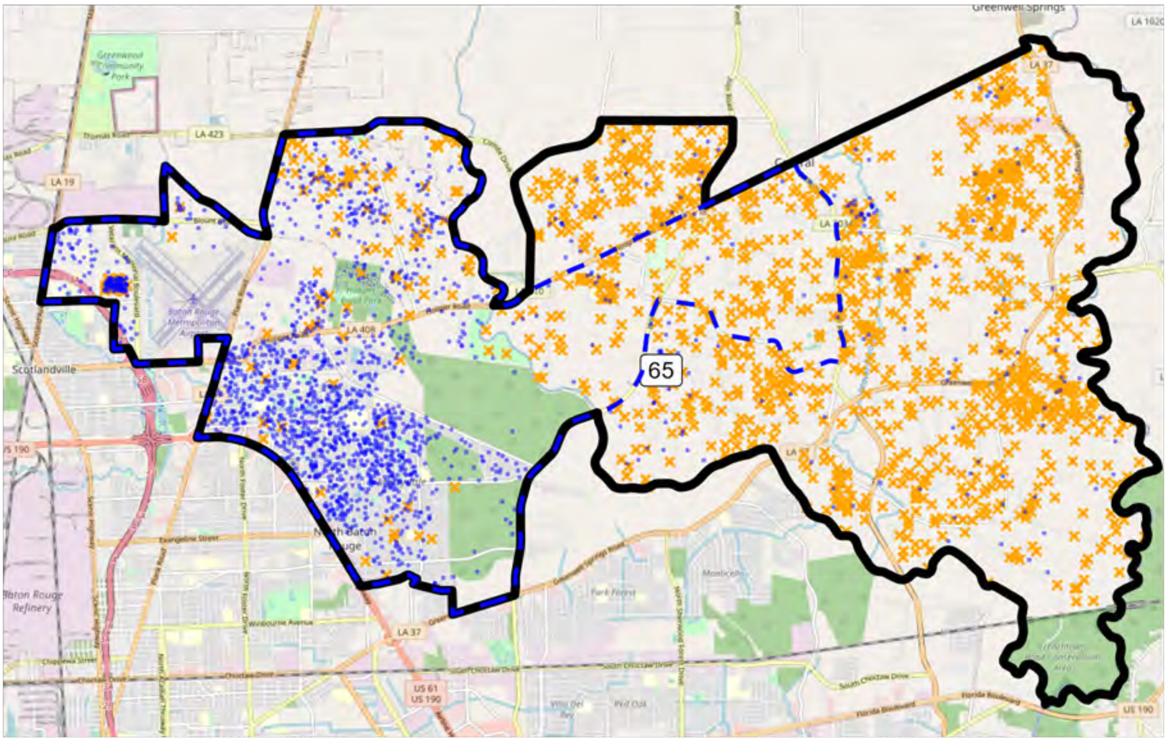


Figure 54: Most compact group of Black residents of voting age in Cooper Illustrative District 65 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,759 Black residents of voting age this approach identifies within the boundaries of Illustrative District 65.



5.4.6 Cooper Illustrative District 67

District 67 is much the same. Because it is only marginally 50% + 1 BVAP, the entire district is necessary to cross that threshold. It takes in the downtown area of Baton Rouge, but then passes through almost exclusively White areas to take in a patch of Black residents at the southeastern end of the district. *See* Figs. 55 - 58

Figure 55: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 67. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

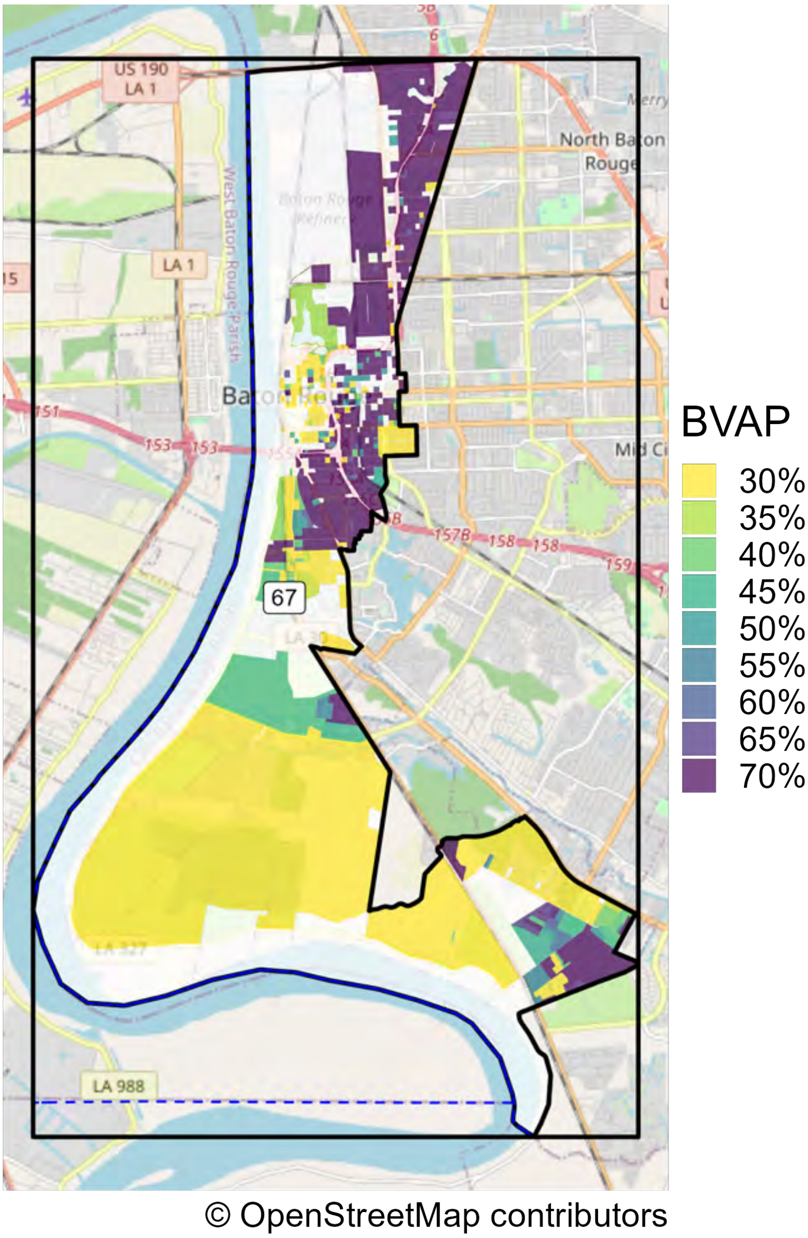


Figure 56: Location of Black and White populations in Cooper Illustrative District 67. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

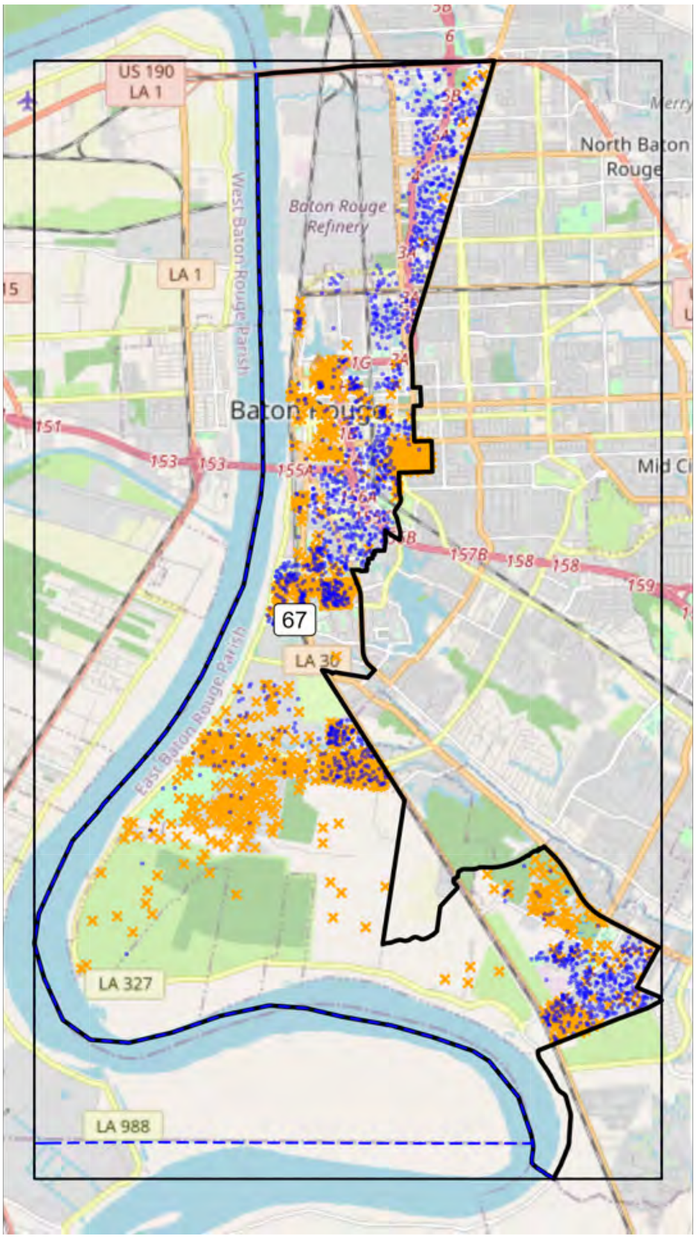


Figure 57: Most compact group of Black residents of voting age in Cooper Illustrative District 67 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 18,238 Black residents of voting age this approach identifies within the boundaries of Illustrative District 67. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

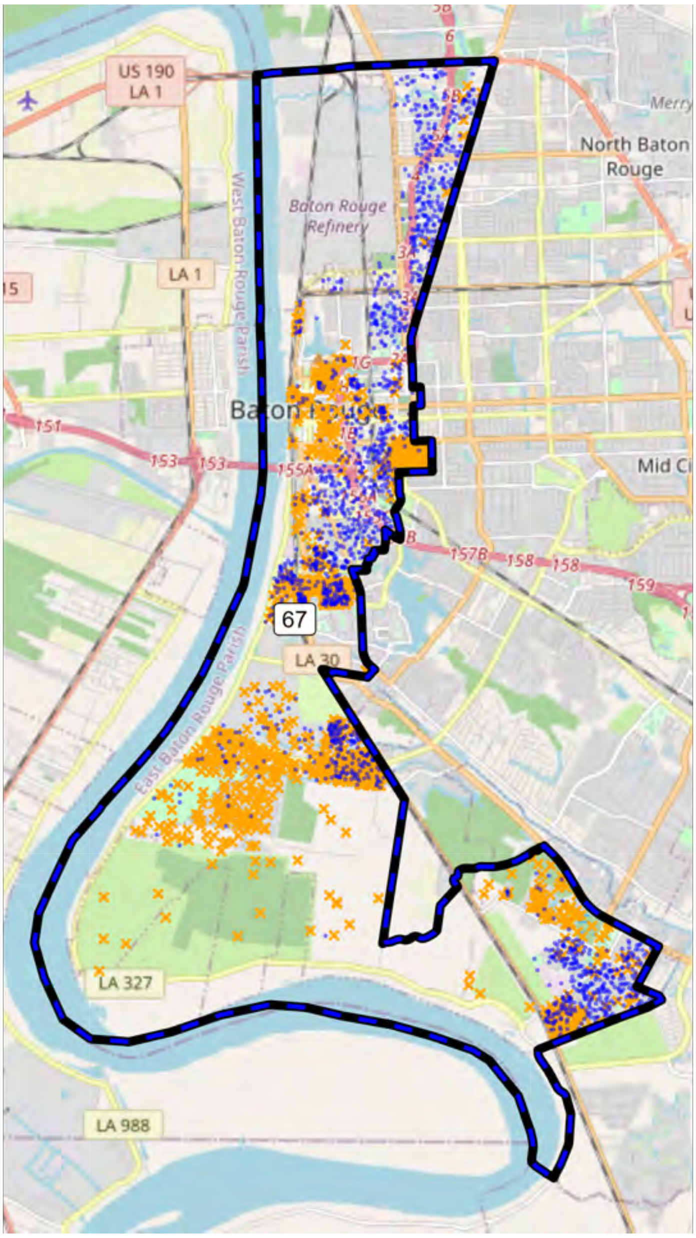
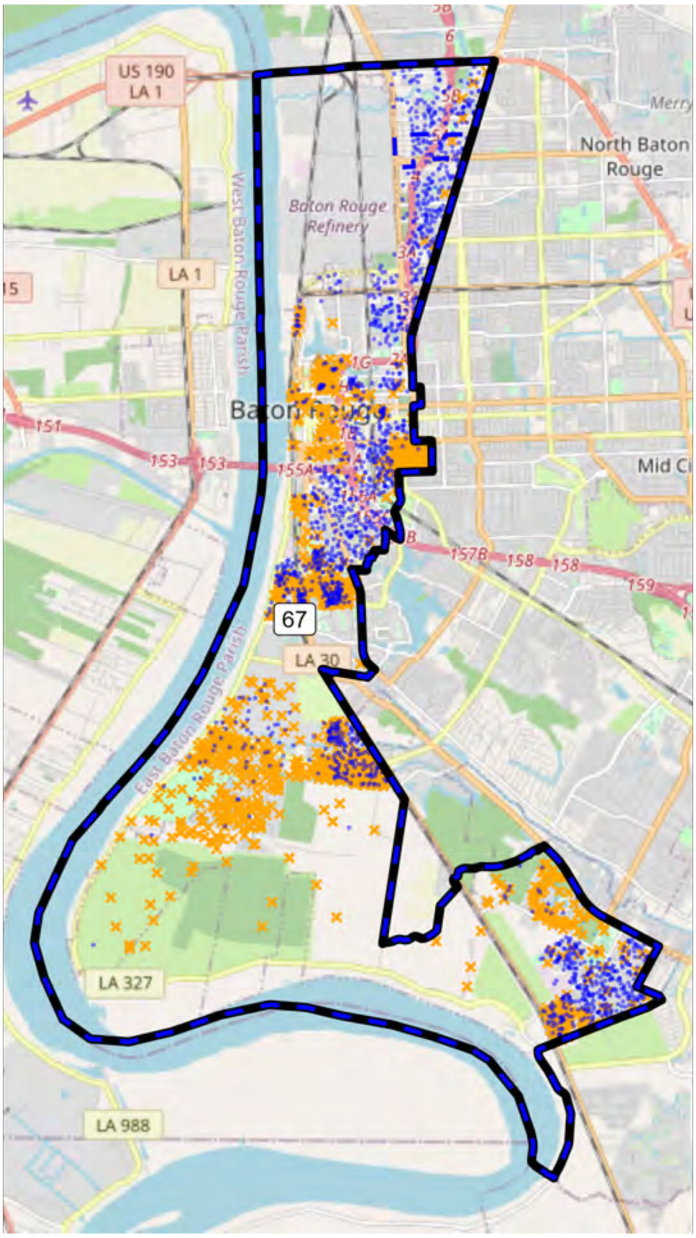


Figure 58: Most compact group of Black residents of voting age in Cooper Illustrative District 67 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 18,238 Black residents of voting age this approach identifies within the boundaries of Illustrative District 67. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.



5.4.7 Cooper Illustrative District 69

District 69 is almost entirely reliant on isolated Black individuals living in heavily White pockets to (barely) cross the 50% + 1 threshold. While there is a heavy concentration of majority Black precincts in the northern edge of the district, those blocks do not even come close to containing 50% of the Black population of the district. Instead, the district ranges southward into mixed and even overwhelmingly White areas of the region to cross that threshold. *See* Figs. 59 - 62.

Figure 59: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 69. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

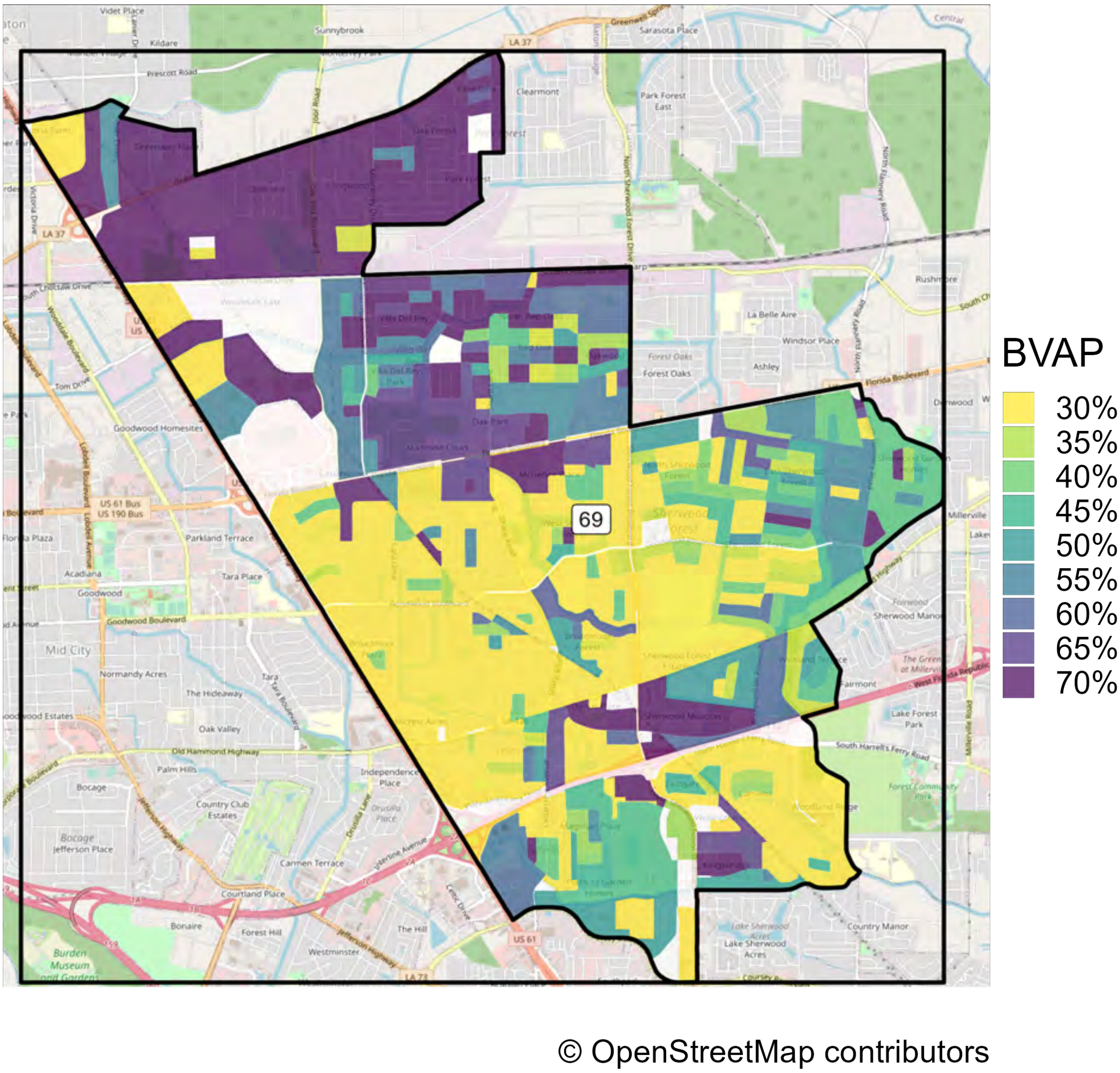


Figure 60: Location of Black and White populations in Cooper Illustrative District 69. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

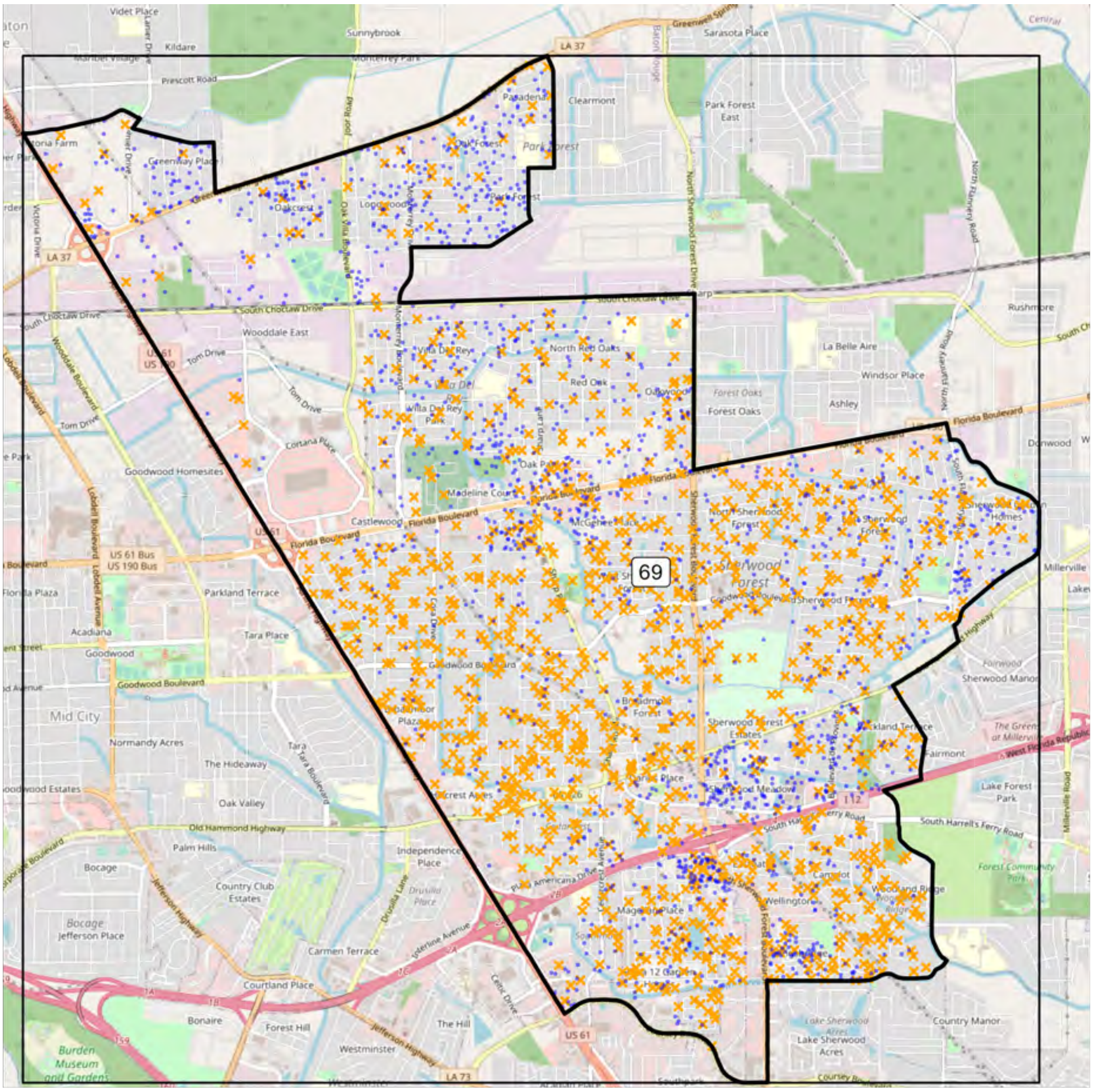


Figure 61: Most compact group of Black residents of voting age in Cooper Illustrative District 69 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,419 Black residents of voting age this approach identifies within the boundaries of Illustrative District 69. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

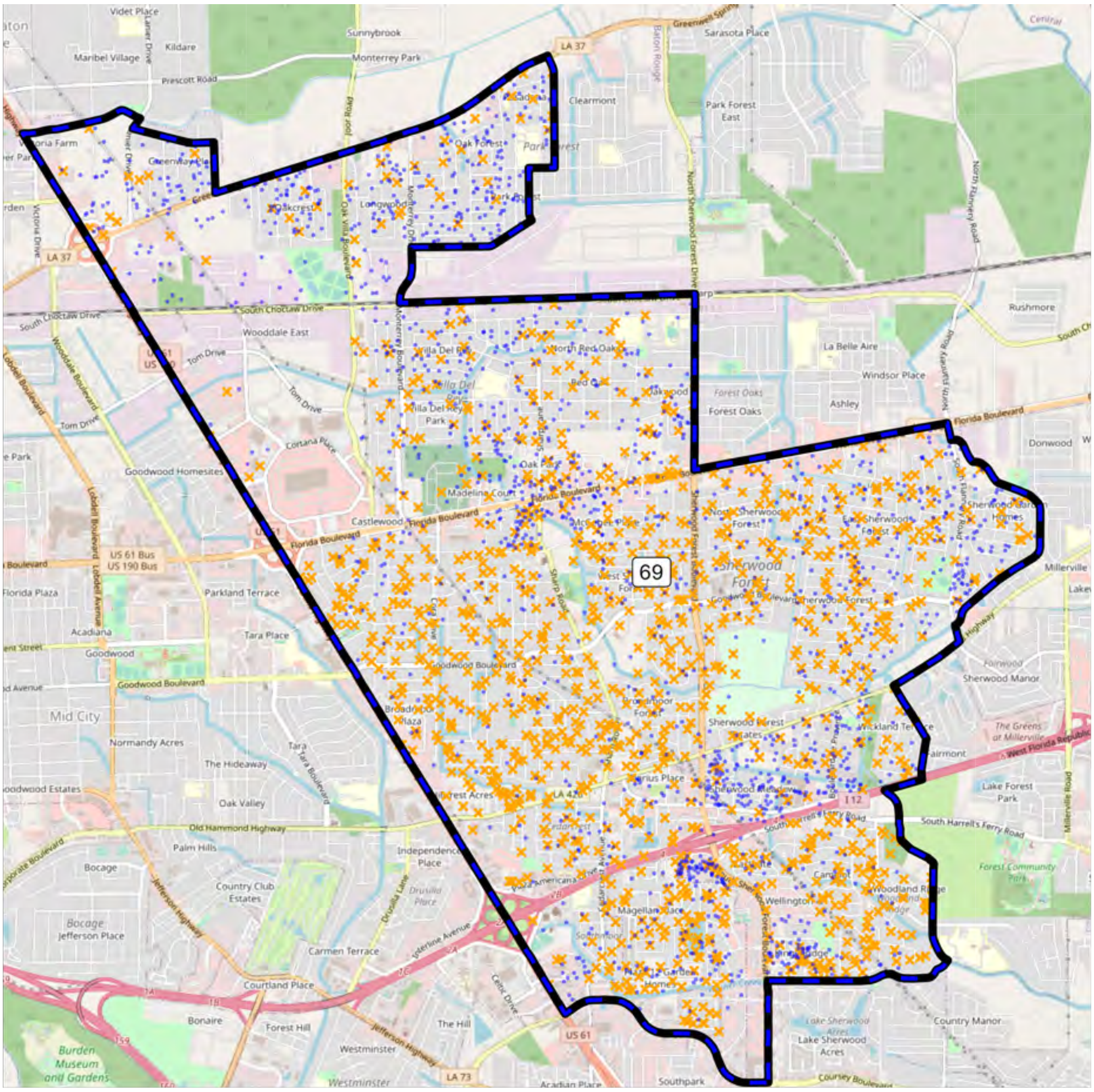
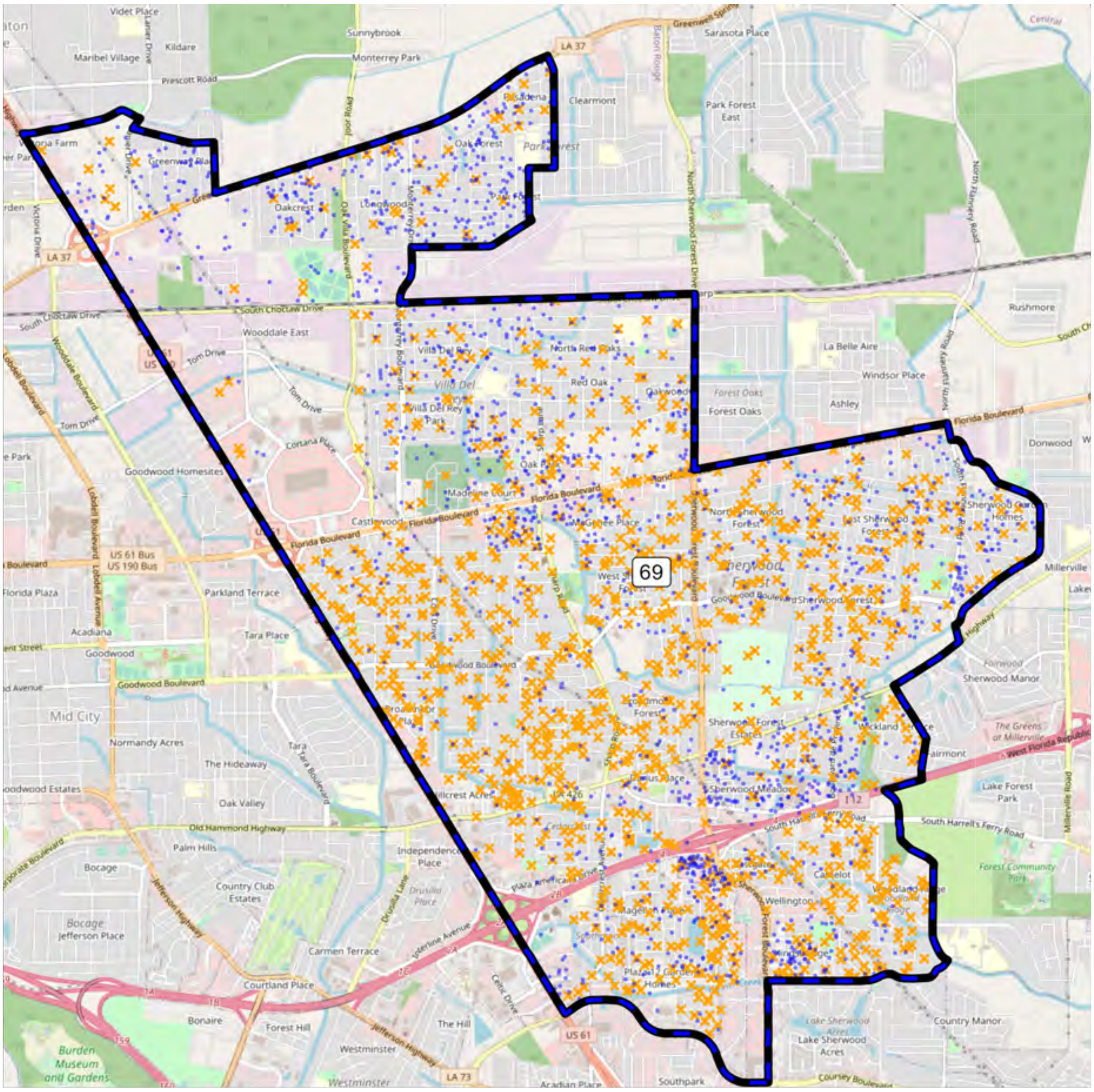


Figure 62: Most compact group of Black residents of voting age in Cooper Illustrative District 69 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,419 Black residents of voting age this approach identifies within the boundaries of Illustrative District 69. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.



5.4.8 Cooper Illustrative District 101

Finally District 101, which calls to mind Godzilla bending over, likewise does not contain a consolidated Black population at its core. While there is a compact grouping in the northwestern portion of the district, it is only by ranging out toward the parish line that the 50% + 1 threshold is crossed. *See* Figs. 63 - 66.

The Illustrative Maps do provide additional districts where Black voters are more than 50% of the Voting Age Population. It does so, however, at the expense of districts that actually contain compact groups that can constitute a majority of the population in a reasonably configured district.

Figure 63: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 101. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

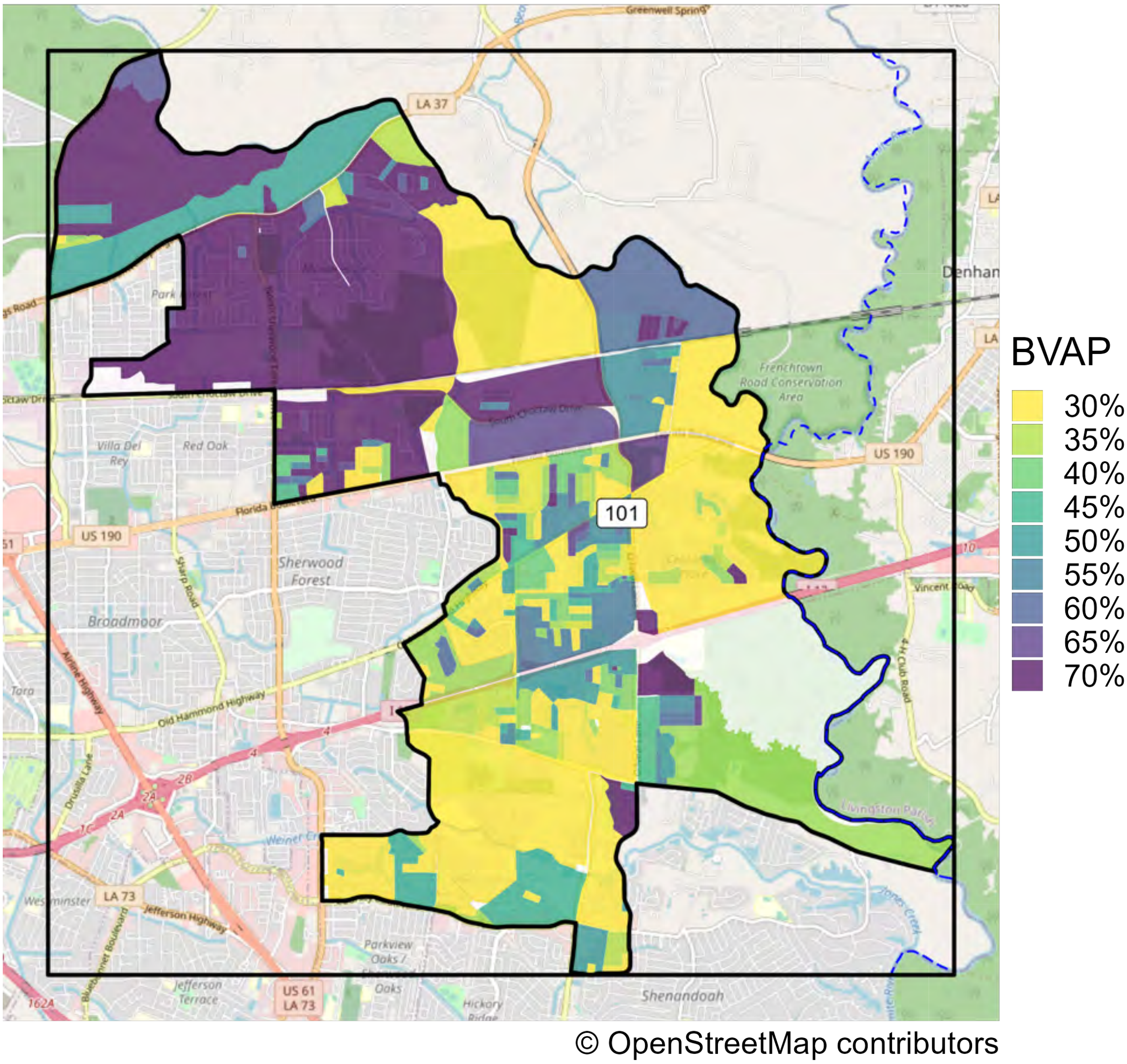


Figure 64: Location of Black and White populations in Cooper Illustrative District 101. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

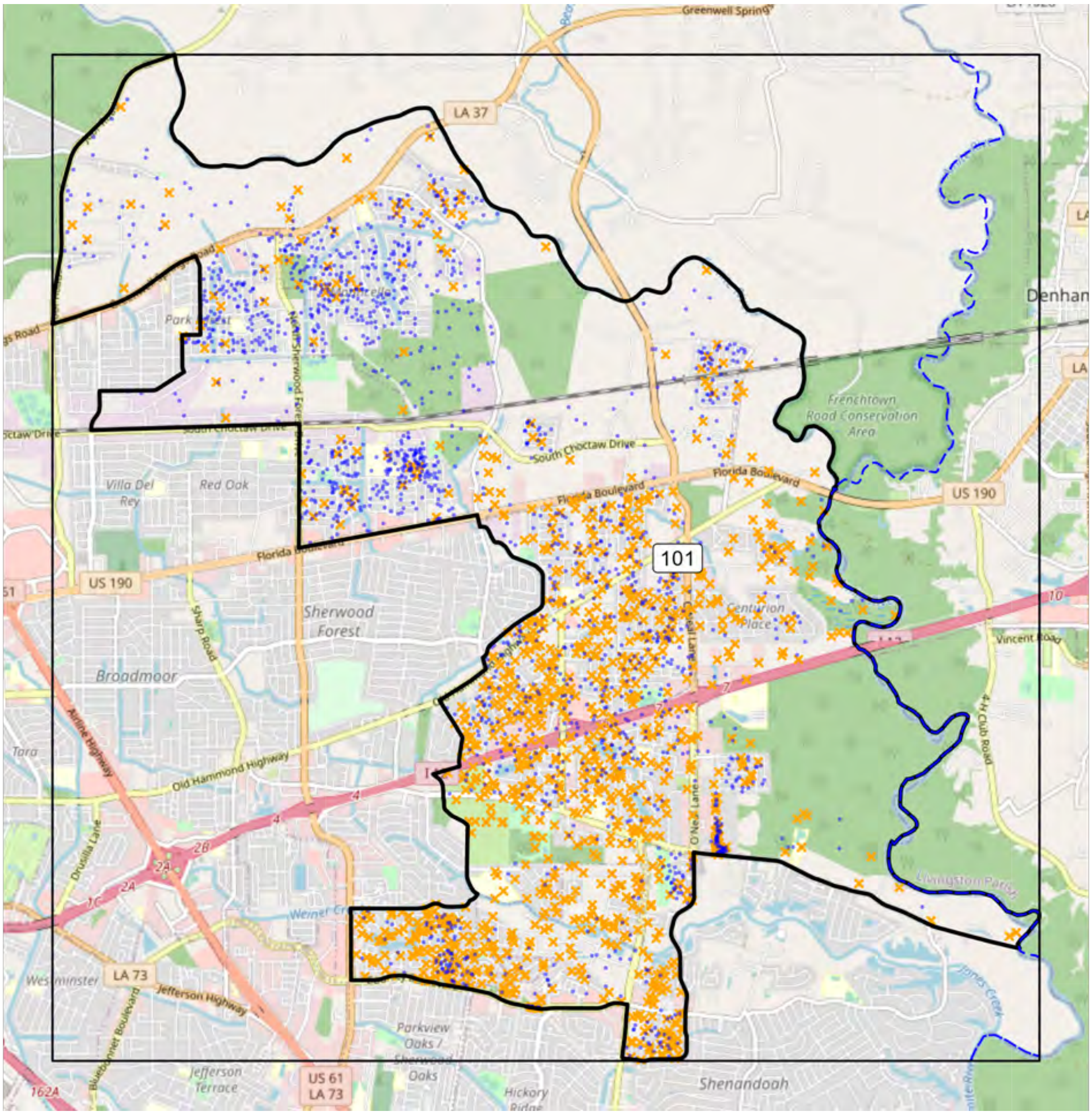


Figure 65: Most compact group of Black residents of voting age in Cooper Illustrative District 101 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,477 Black residents of voting age this approach identifies within the boundaries of Illustrative District 101. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.

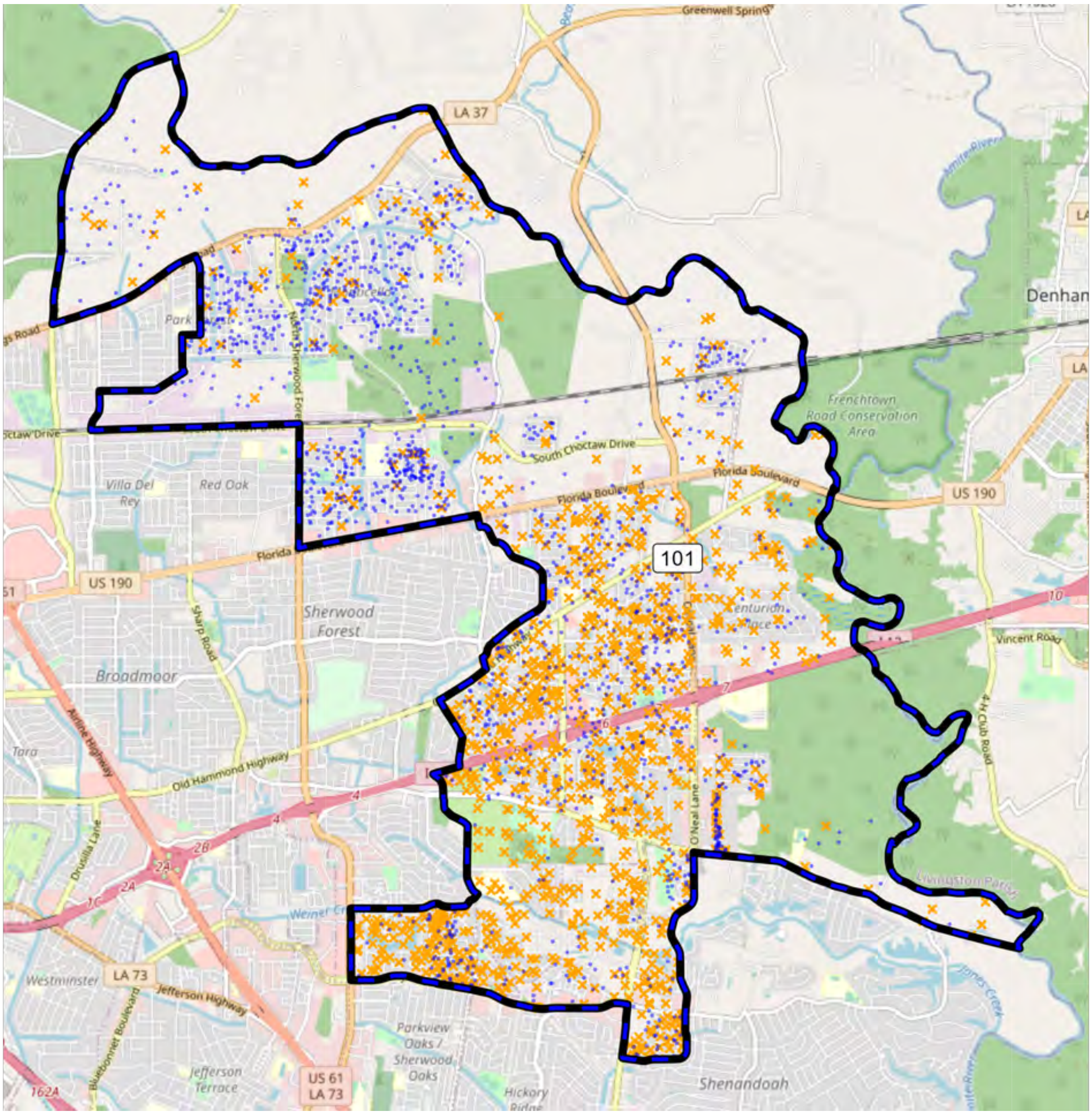
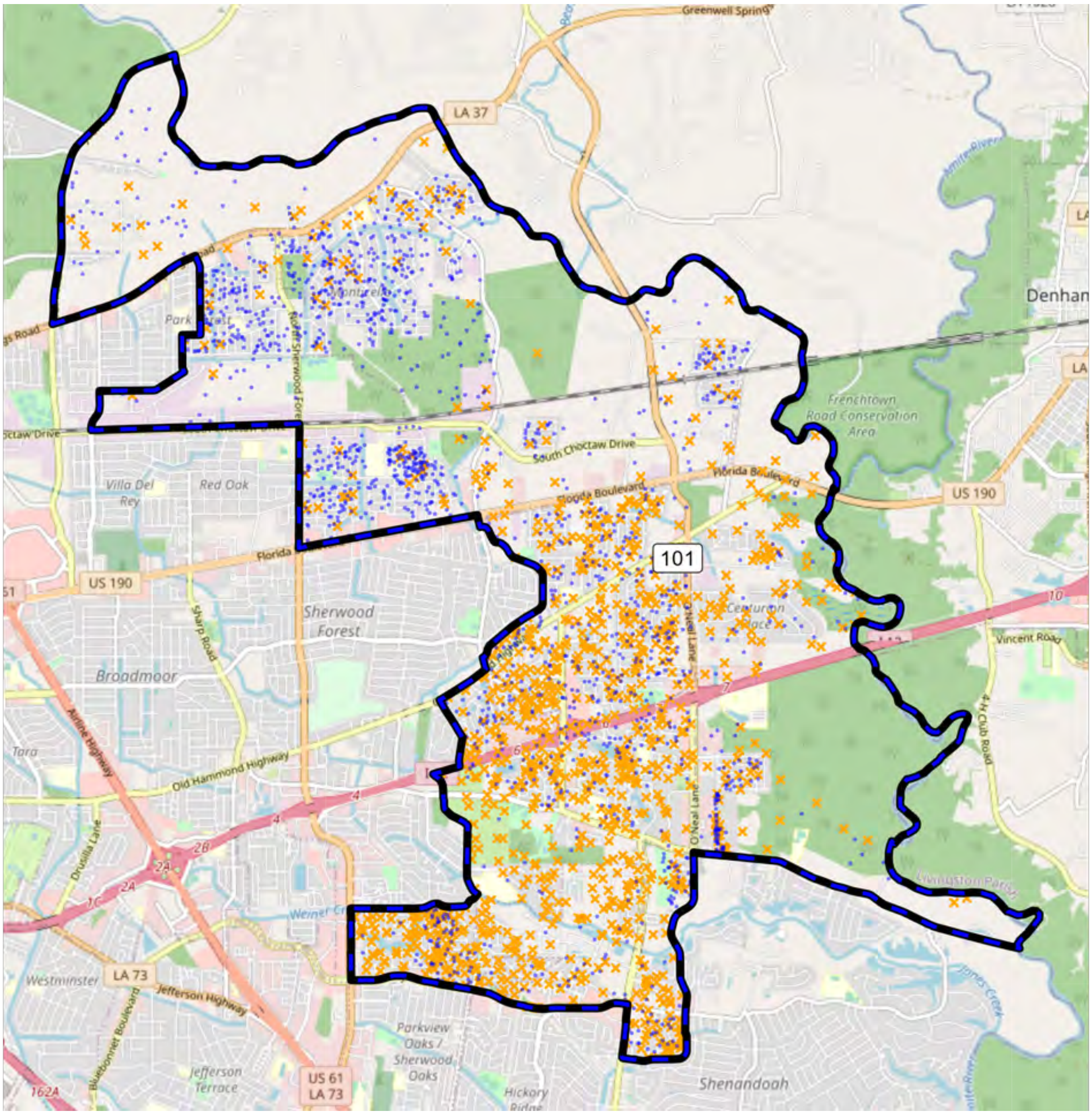


Figure 66: Most compact group of Black residents of voting age in Cooper Illustrative District 101 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group. This is the most compact collection of at least 16,477 Black residents of voting age this approach identifies within the boundaries of Illustrative District 101. Note that, in this map, the dashed blue line mostly sits on top of the district boundary line.



6 Discussion of Additional Cooper Senate Districts

The Illustrative Map for the state senate offers more of the same. It creates three more Black majority districts than the Enacted Map. However, the populations in all three of these districts are dispersed. The ideal population for a district here in the Senate map is 119,430 residents.

6.1 Shreveport Area

The first new district Mr. Cooper creates is in the Shreveport area. The Enacted Map (Figure 67) creates one Black majority district in the area. District 39 has a BVAP of 60,190, which constitutes 63.7% of the overall voting age population. While the district is sprawling, there are over 40,000 Black residents in the portion of the district in the City of Shreveport alone, who are enough to constitute a majority of the population in the district on their own.

The Illustrative Map (Figure 68), by contrast, splits this population in Shreveport to create an additional Black majority district. It is difficult to say whether the "new" district is District 38 or District 39. But regardless, both districts rely upon sprawling collections of Black residents to reach the 50% + 1 threshold under *Gingles*' first prong. The net effect is to take a district based upon a compact population and split it into two districts based upon non-compact populations.

The two districts here are discussed individually below.

Figure 67: Black Majority VAP District in the Shreveport Area, Enacted Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.

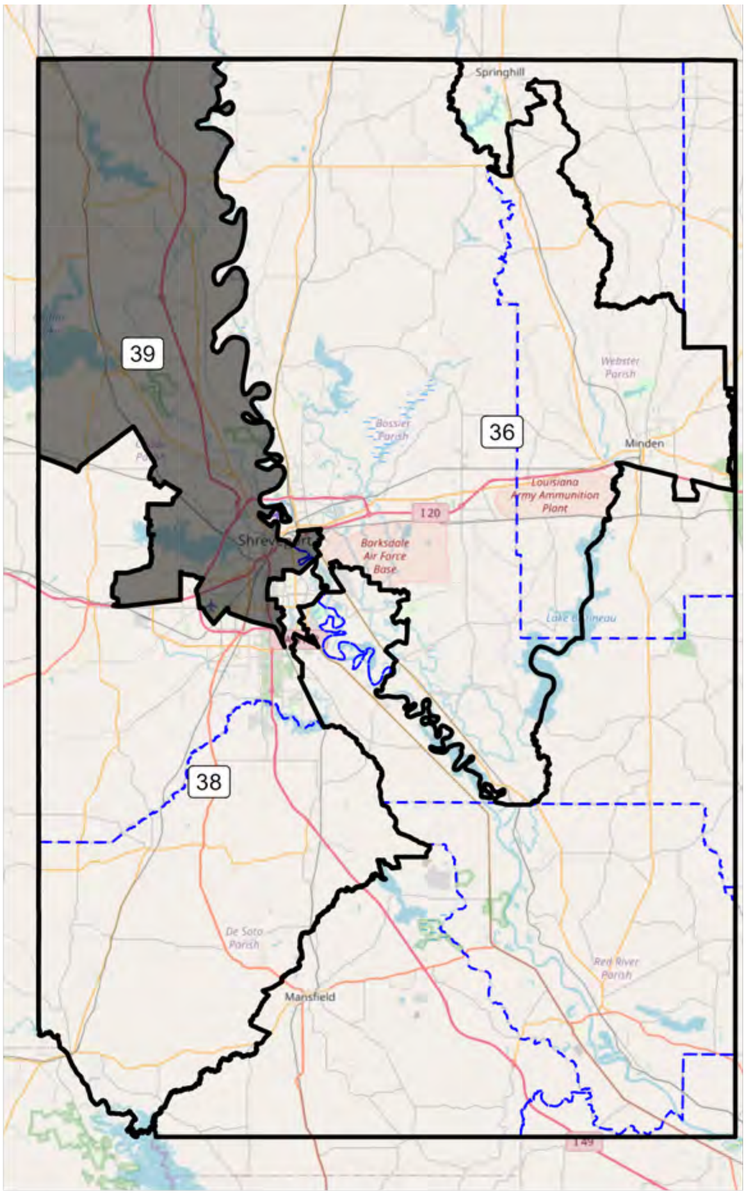
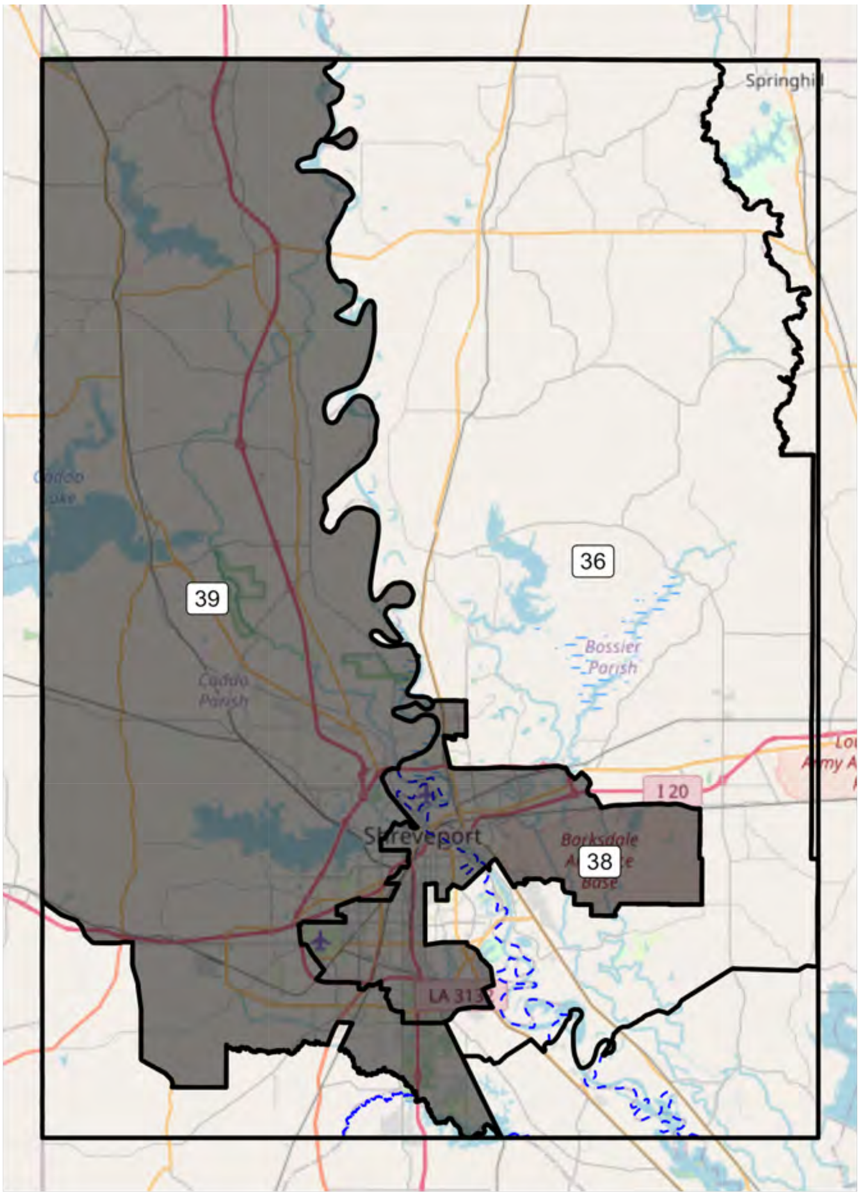


Figure 68: Black Majority VAP Districts in the Shreveport Area, Cooper Illustrative Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



6.1.1 Cooper Illustrative District 38

District 38 is the less egregious of the two districts. For a group to constitute a majority of the district as drawn, it would need a VAP of 43,212. There are 45,955 Black adult residents in the district as drawn, or 53.2% of the overall VAP.

But this again relies on drawing together Black populations from across the area, as the maps provided in Figures 69 - 73 demonstrate. The portion of the district in Caddo Parish is multi-racial – about 60% Black, with that population spread out over the city. There are 34,954 Black residents of voting age in this portion of the district - not enough to constitute a majority. To get to a Black VAP of 43,212, the district must instead cross the Red River to take in downtown Bossier City and then extend further into Bossier Parish past another layer of predominately White precincts. In other words, this is not a compact population group.

Figure 69: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 38. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

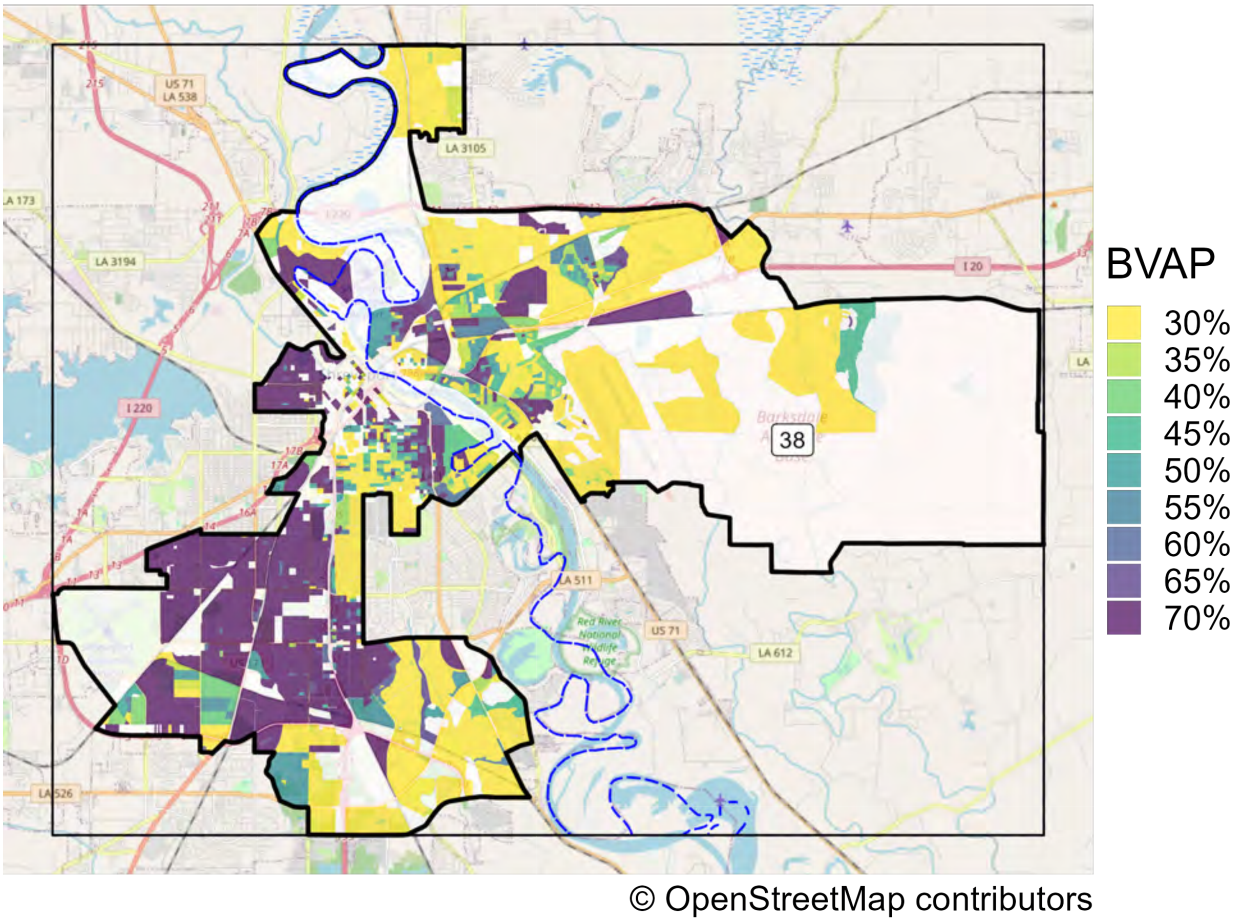


Figure 70: Location of Black population in Cooper Illustrative District 38. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

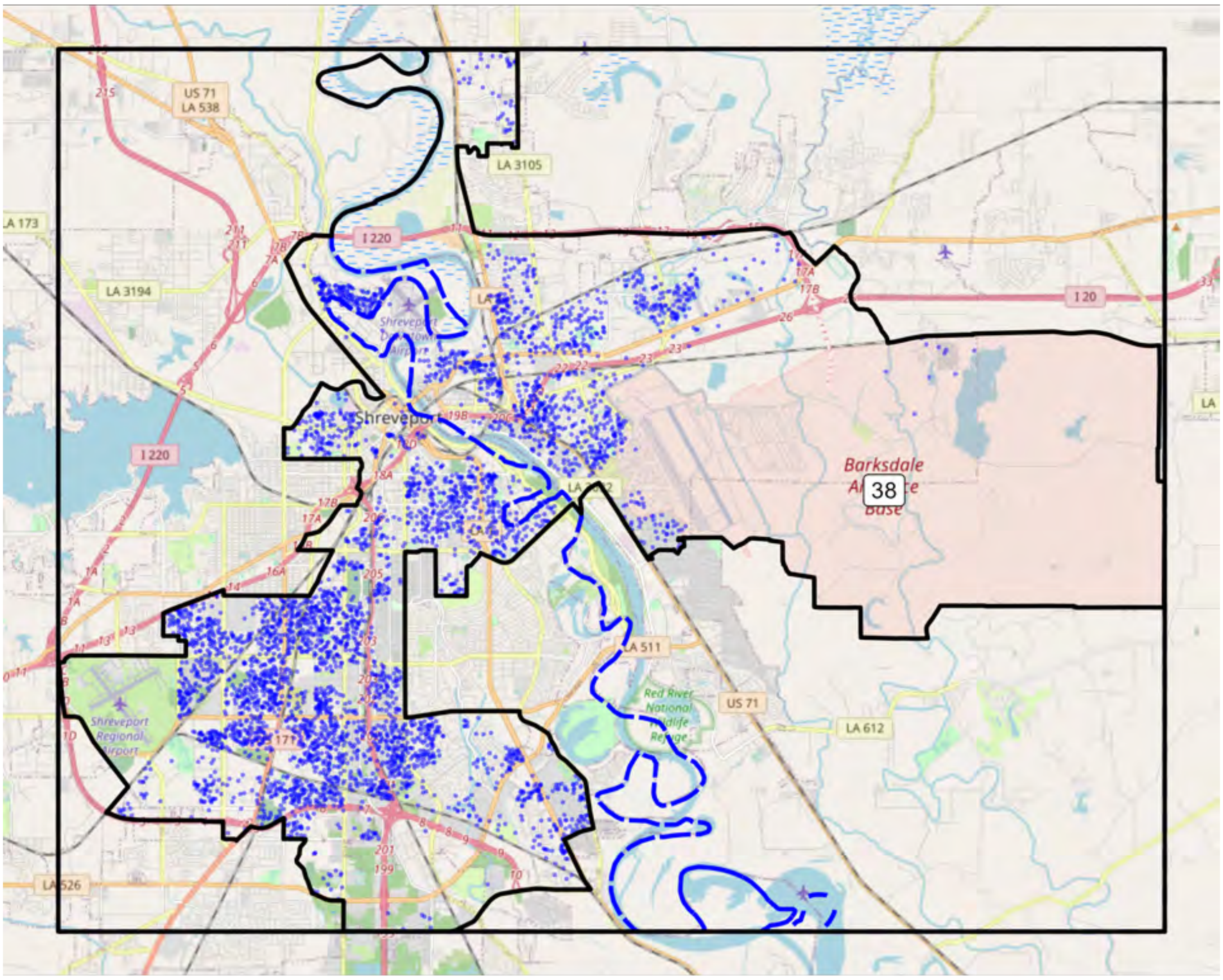


Figure 71: Location of Black and White populations in Cooper Illustrative District 38. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

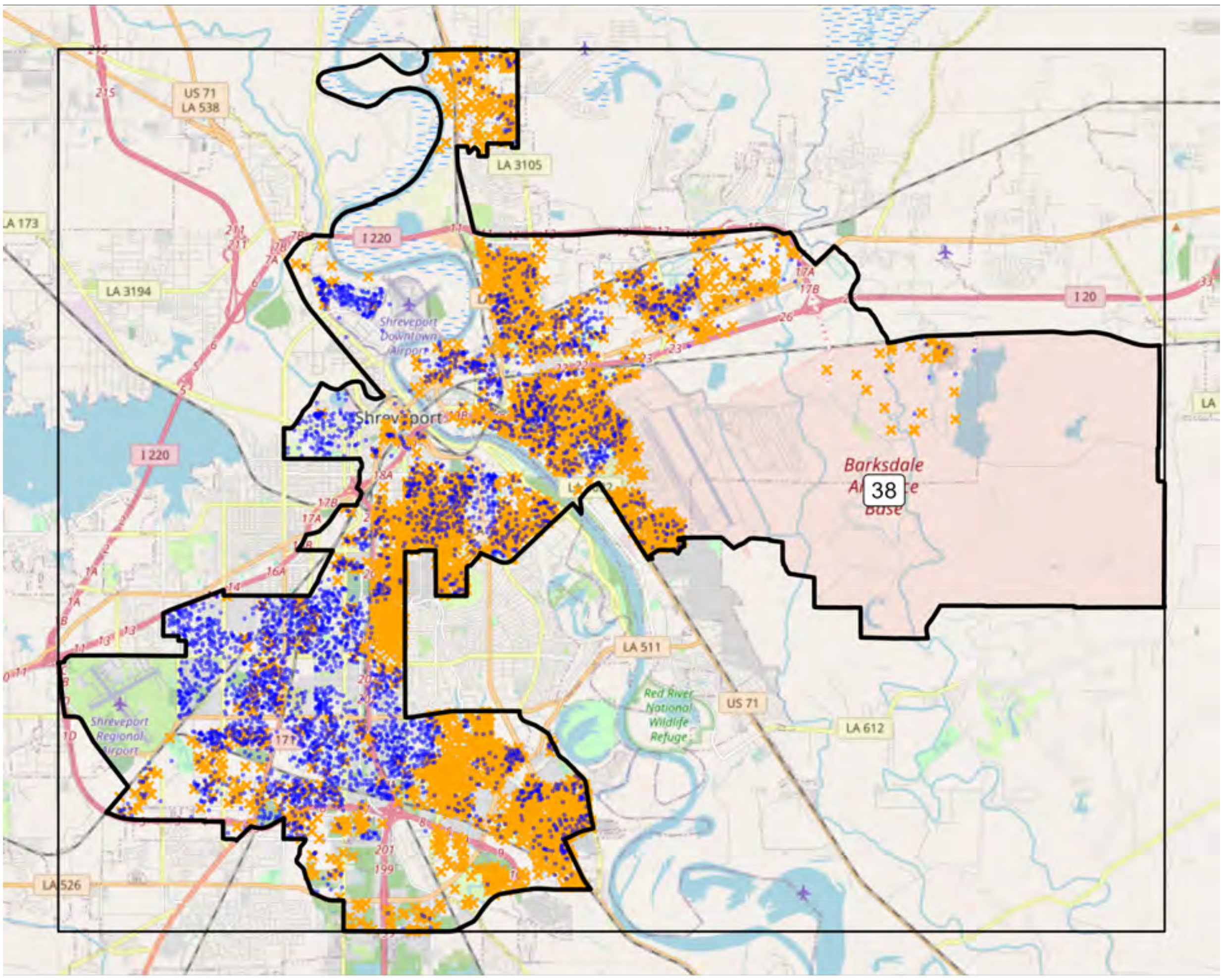


Figure 72: Most compact group of Black residents of voting age in Cooper Illustrative District 38 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.

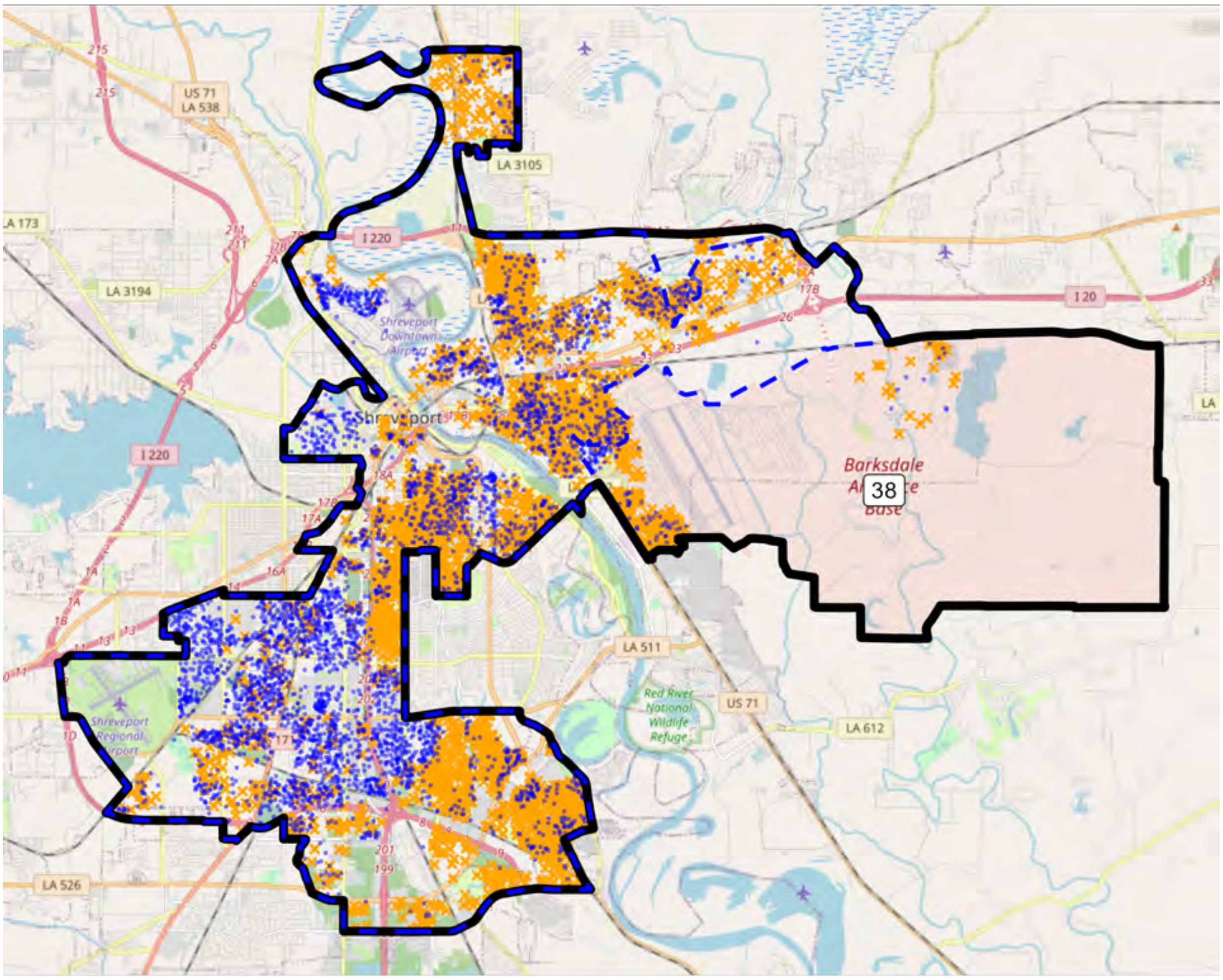
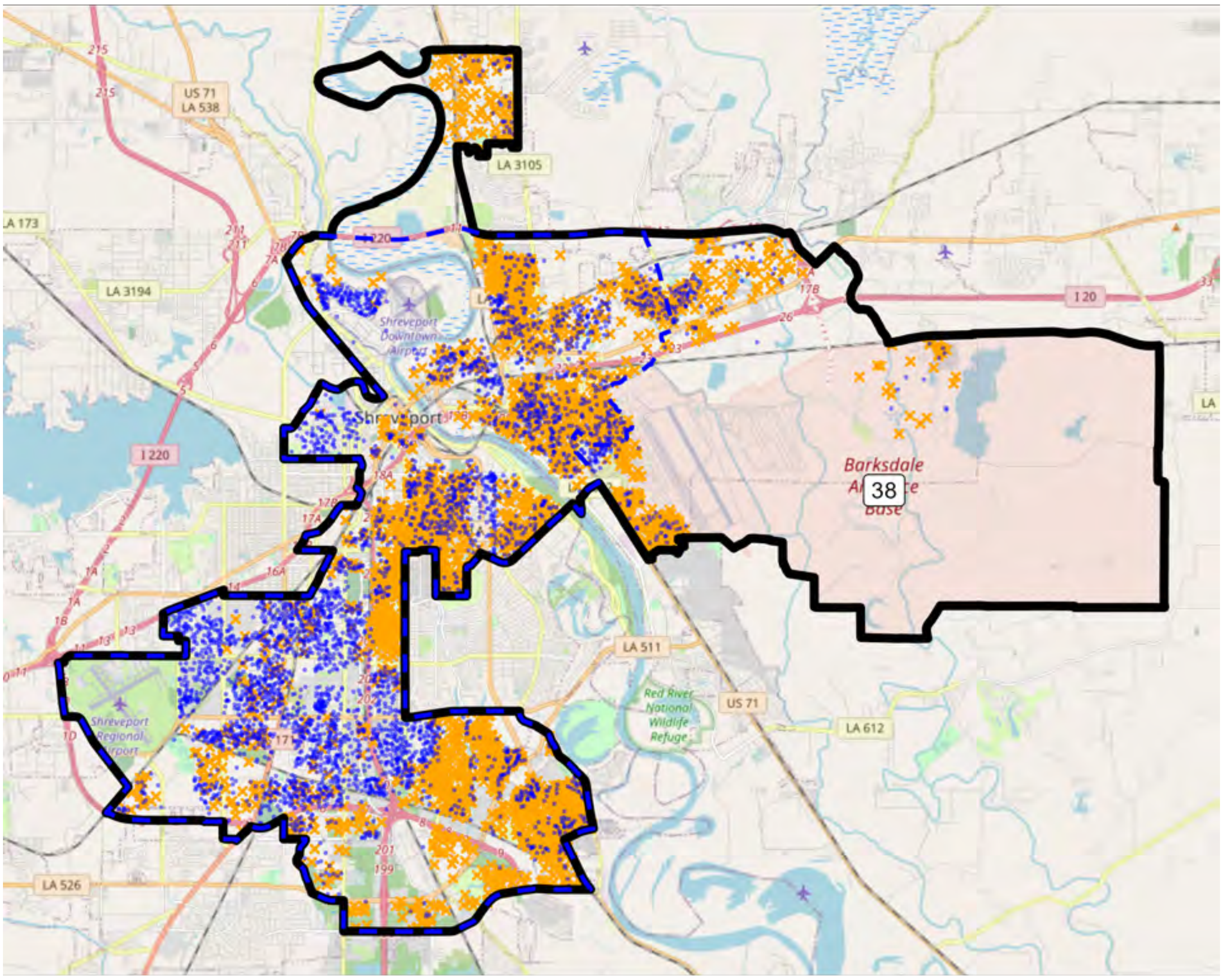


Figure 73: Most compact group of Black residents of voting age in Cooper Illustrative District 38 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.



6.1.2 Cooper Illustrative District 39

Nor is Illustrative District 39 based on a compact majority population. As a price of creating a second majority-Black district in the area, it sees its BVAP substantially reduced to 52.5% vis-a-vis the Enacted Map. Not only that, but, like Illustrative District 1 in the House map, it must now reach out into rural Caddo Parish to reach the 50%+1 threshold, taking in isolated pockets of Black residents in small towns and individual Black residents. This is illustrated in Figures 74 - 78.

Figure 74: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 39. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

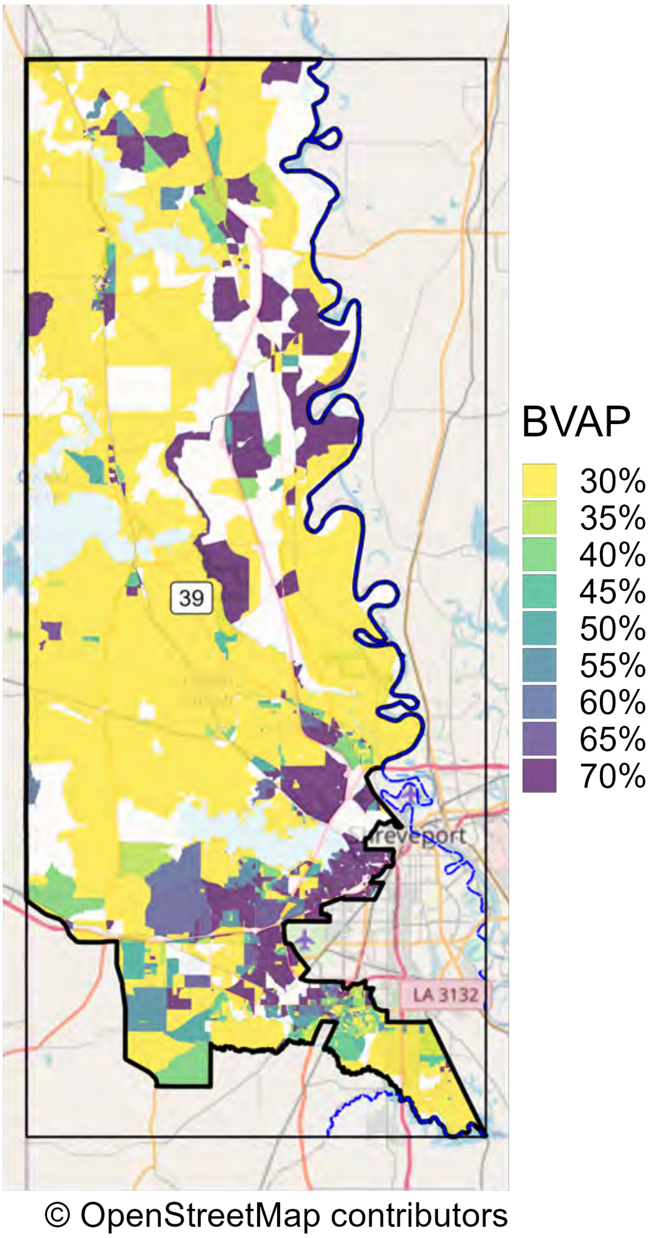


Figure 75: Location of Black population in Cooper Illustrative District 39. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

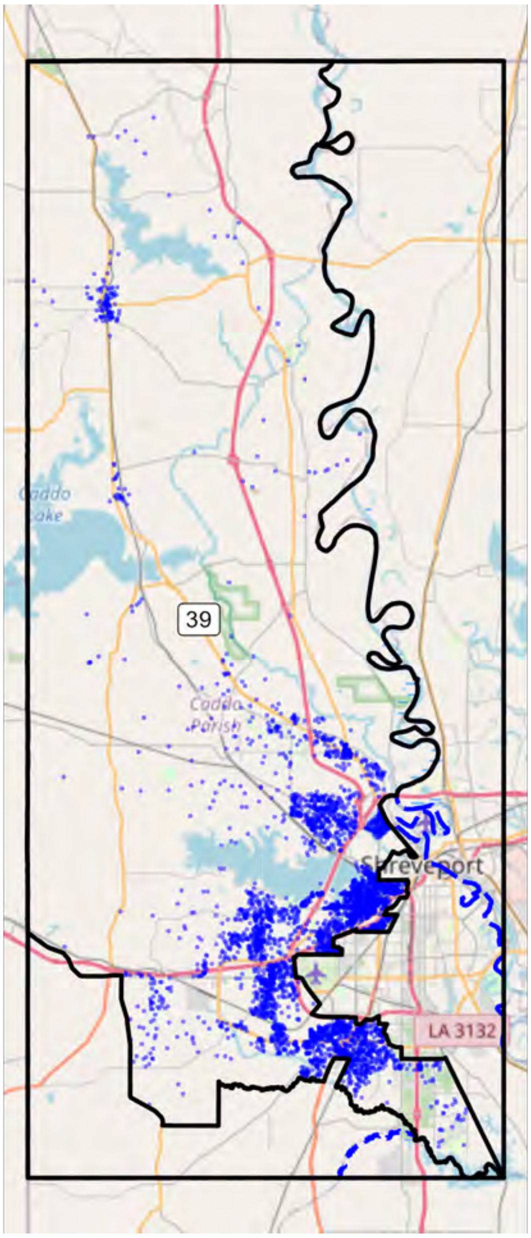


Figure 76: Location of Black and White populations in Cooper Illustrative District 39. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

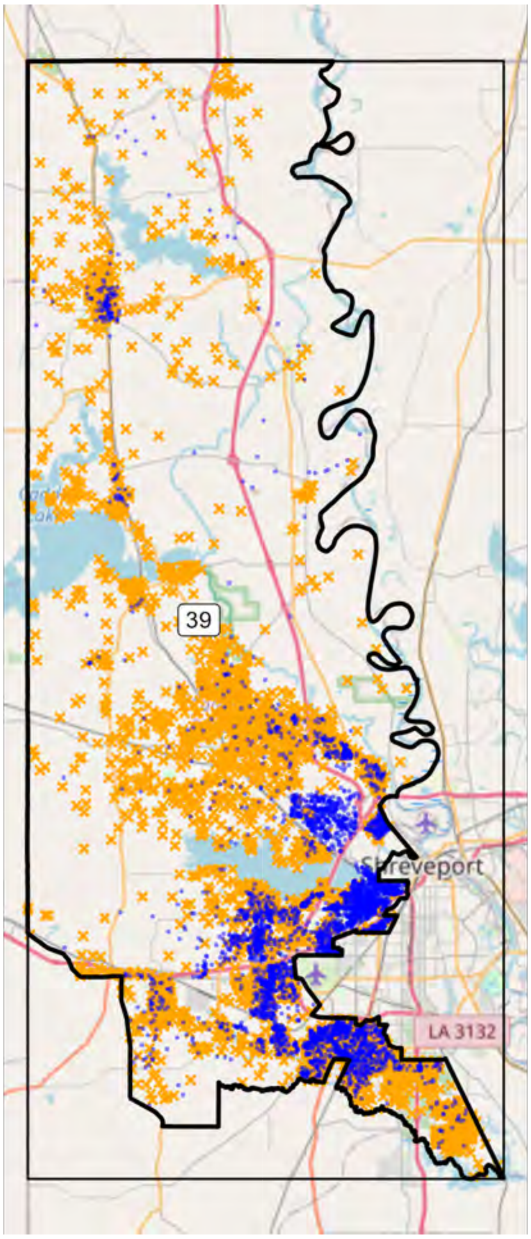


Figure 77: Most compact group of Black residents of voting age in Cooper Illustrative District 39 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.

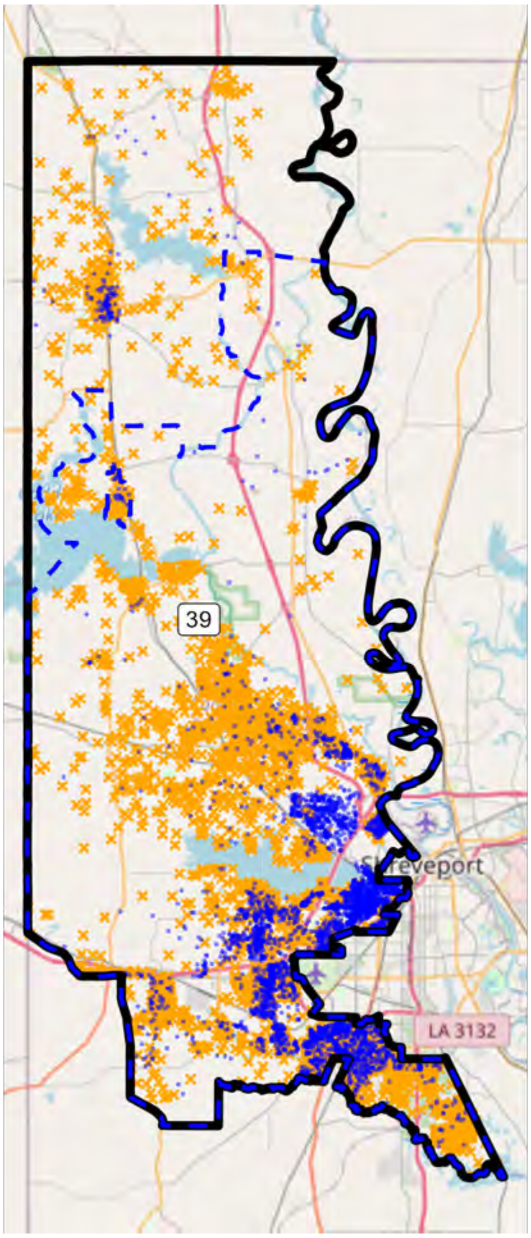
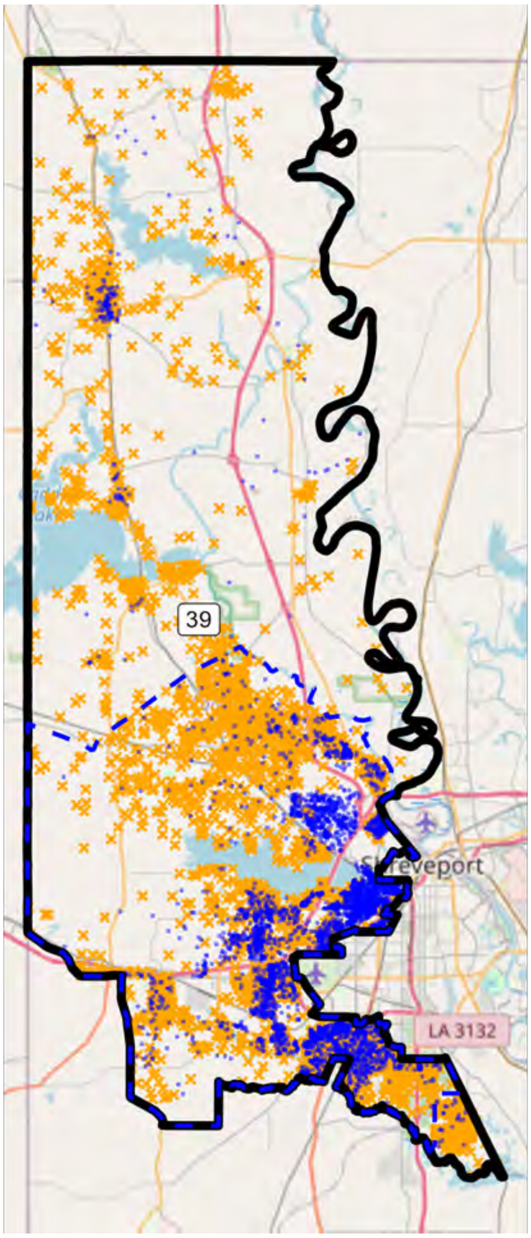


Figure 78: Most compact group of Black residents of voting age in Cooper Illustrative District 39 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.



6.2 East/West Baton Rouge Area

Mr. Cooper draws an additional majority Black district in the Baton Rouge area. As shown in Figure 79, the Enacted Map draws two majority Black districts here: Districts 14 and 15. Mr. Cooper's Illustrative Map (Figure 80), by contrast, takes the Black population in Baton Rouge and divvies it up among three districts, creating a new majority-Black 17th District.

Figure 79: Black Majority VAP Districts in the Baton Rouge Area, Illustrative Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.

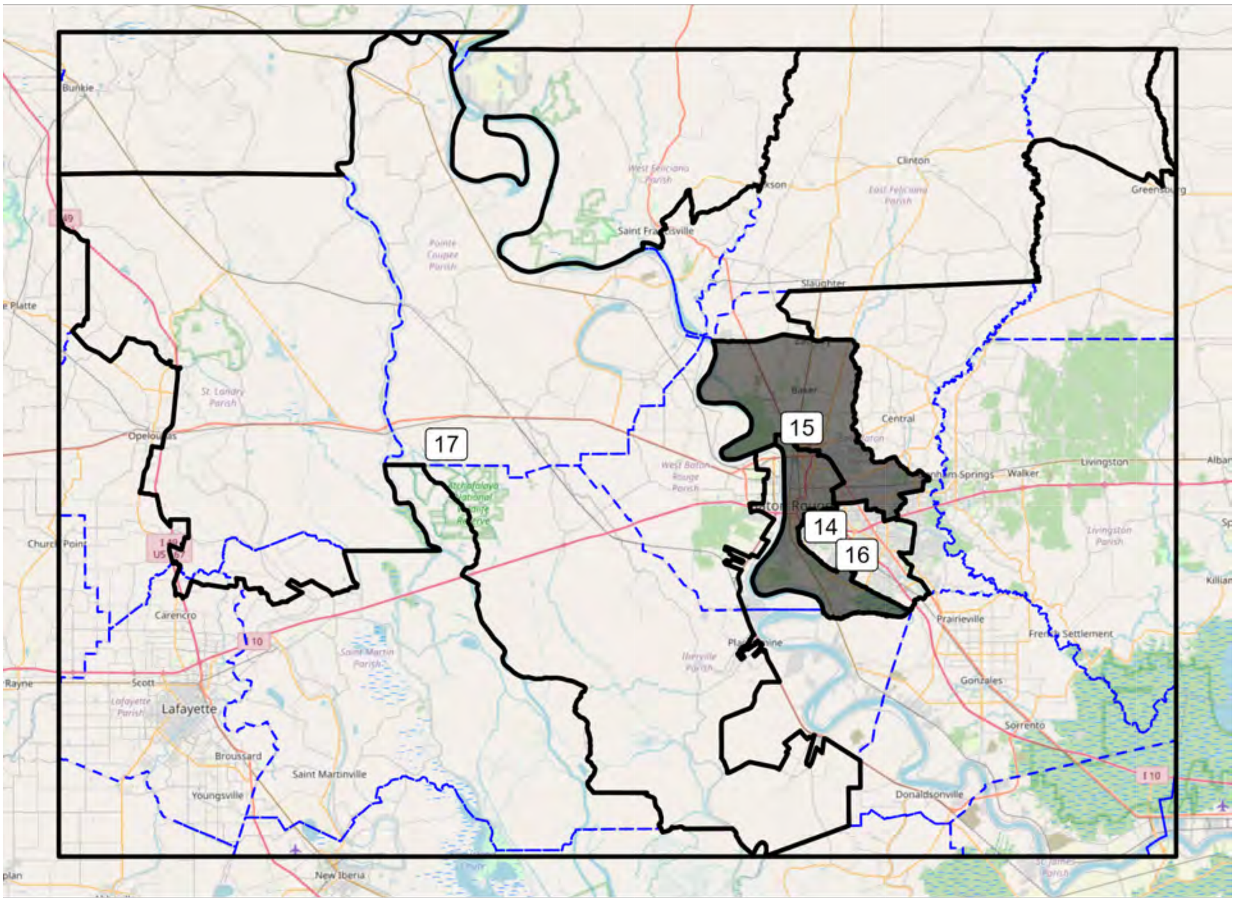


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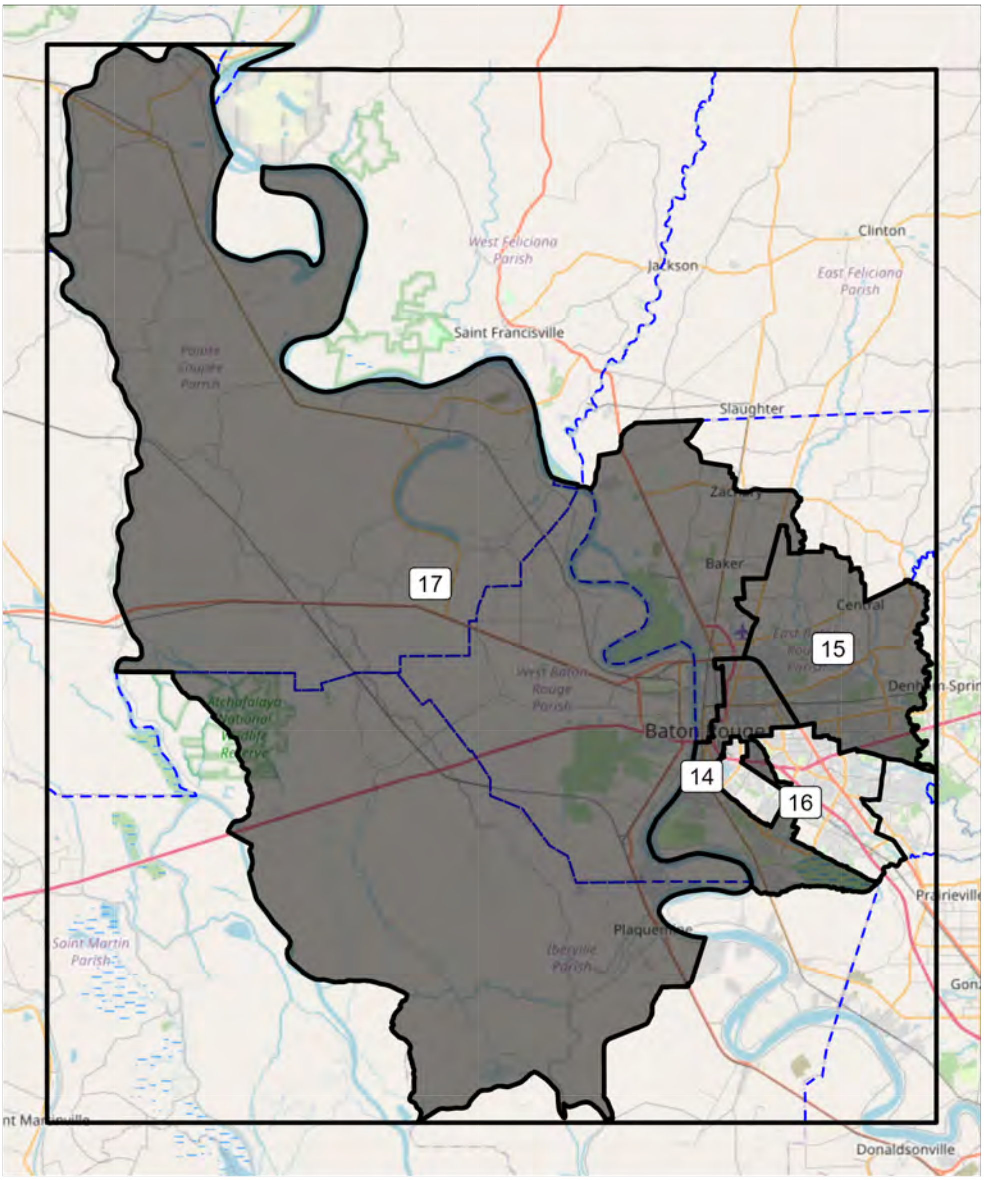
Figure 80: Black Majority VAP Districts in the Baton Rouge Area, Illustrative Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



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6.2.1 Cooper Illustrative District 17

The new 17th Senate district in the Illustrative Map has a VAP of 91,461. This means that a group would have to have a population of 45,731 to form a majority in the district. The BVAP as drawn is 47,997, giving the district a percent BVAP of 52.5%.

But as with the other districts reviewed in this report, this Black population is not compact. As the maps below show, the Black population is most concentrated east of the Mississippi River, in East Baton Rouge Parish. That accounts for 28,437 Black residents of voting age. When combined with the Black residents of voting age in West Baton Rouge Parish, the combined Black population is 36,586. This is still well short of what would be needed to constitute a majority of the district's population (even this requires crossing over heavily White enclaves like Brusly to reach Black areas around Addis).

To achieve a majority Black population in this district requires pairing large portions of Iberville and Pointe Coupee parishes with the remaining district core. In particular, the Illustrative Map includes New Roads and Plaquemine in the district to crosses the minimum 45,731 threshold. But doing so requires crossing large swathes of lightly populated, heavily White territory to achieve the population minimum required by the Voting Rights Act. In short, the district achieves its majority Black population only by uniting geographically disparate clusters of Black voters.

Figure 81: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 17. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

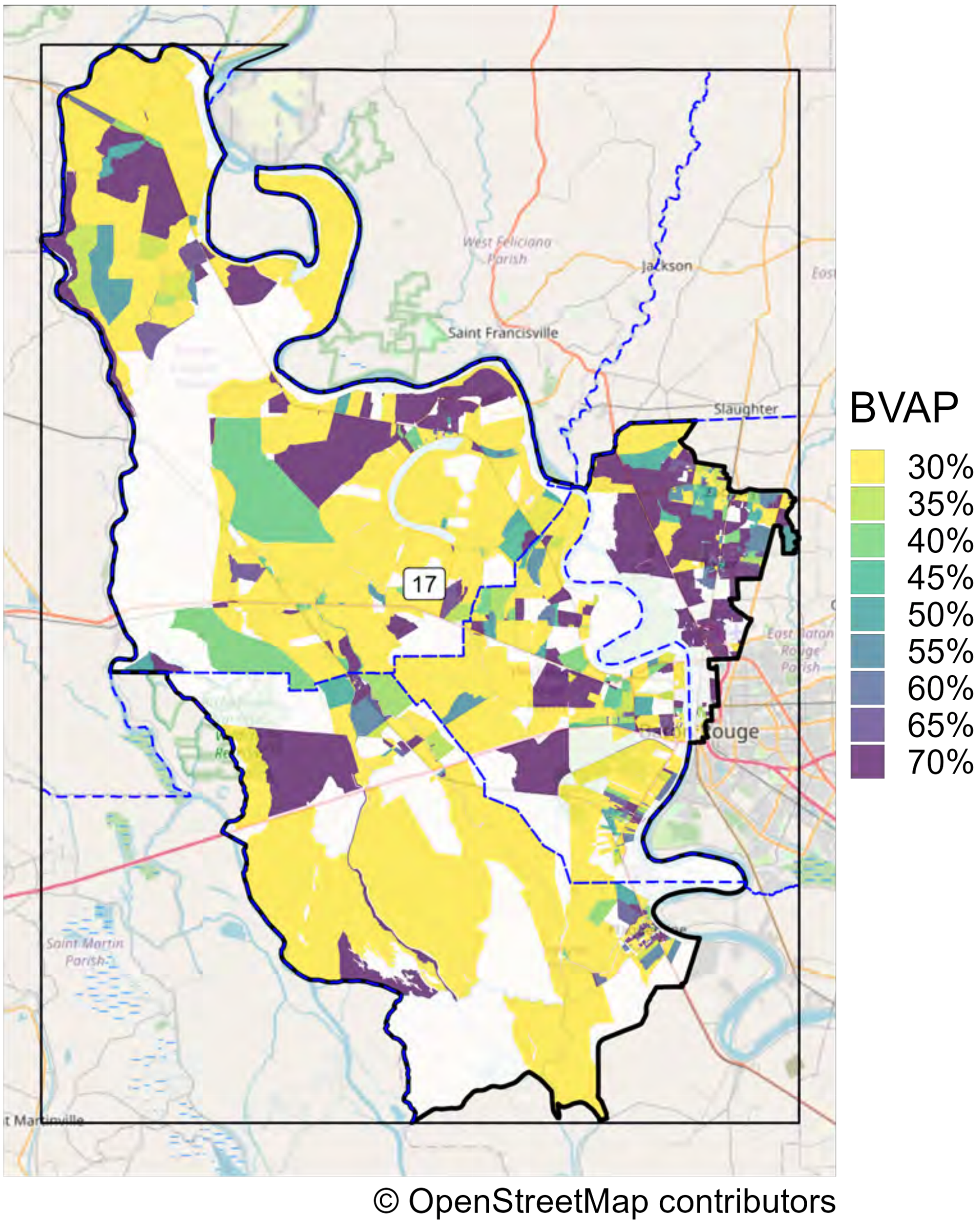


Figure 82: Location of Black population in Cooper Illustrative District 17. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

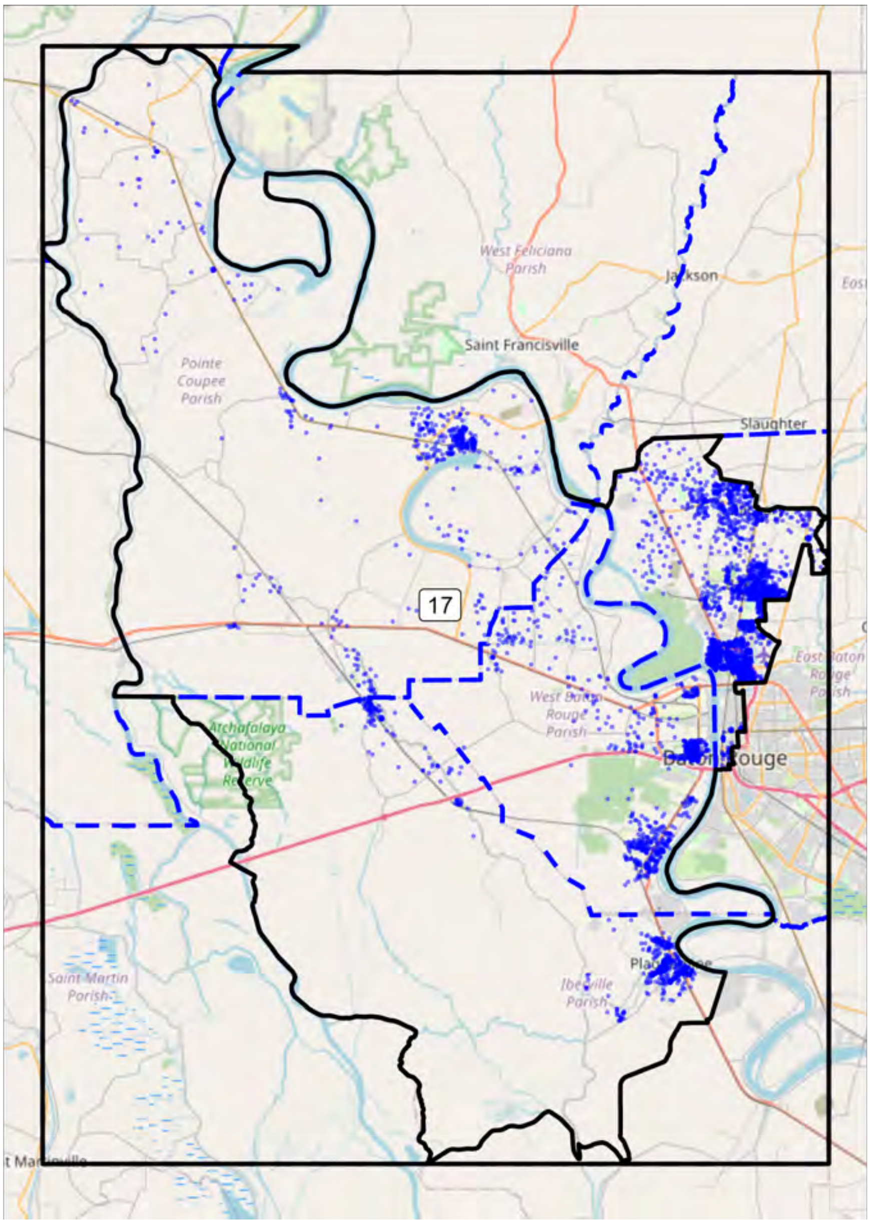


Figure 83: Location of Black and White populations in Cooper Illustrative District 17. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

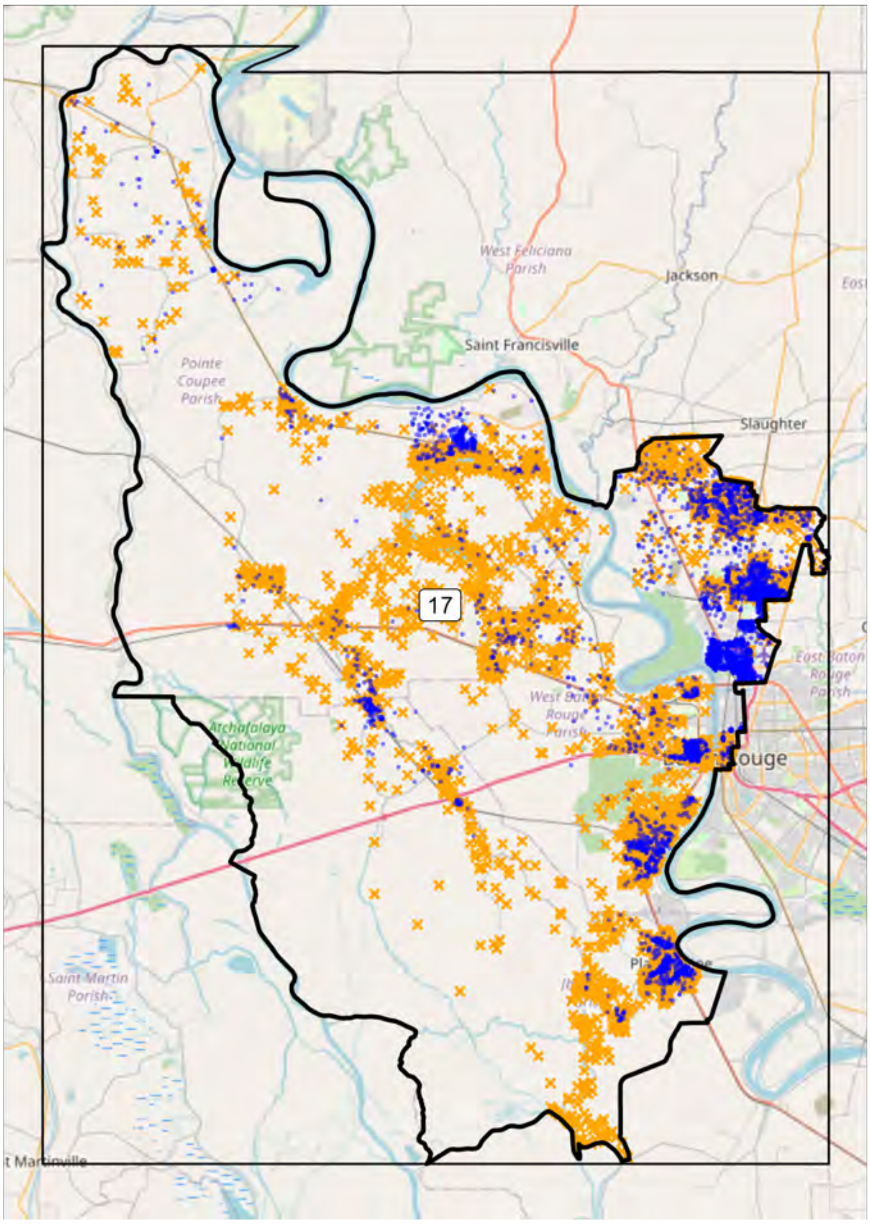


Figure 84: Most compact group of Black residents of voting age in Cooper Illustrative District 17 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.

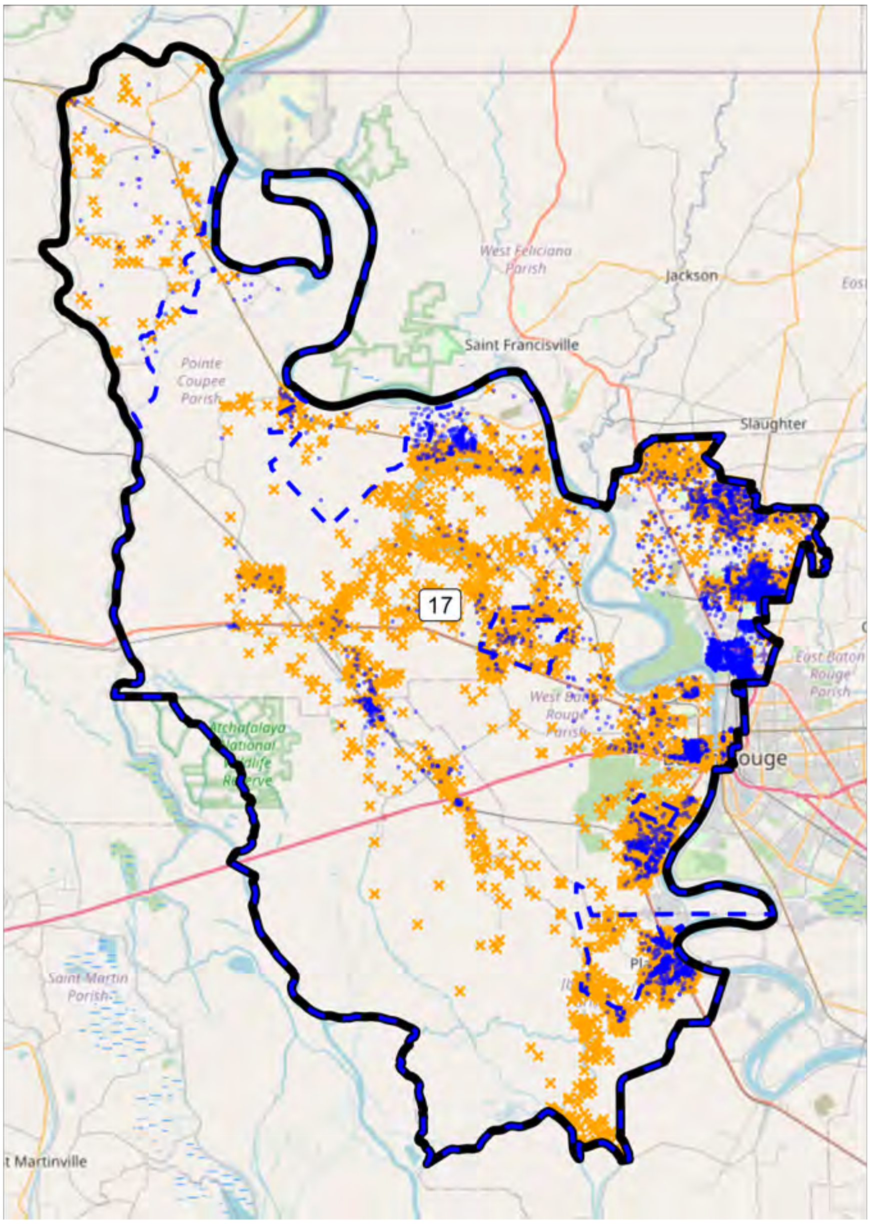
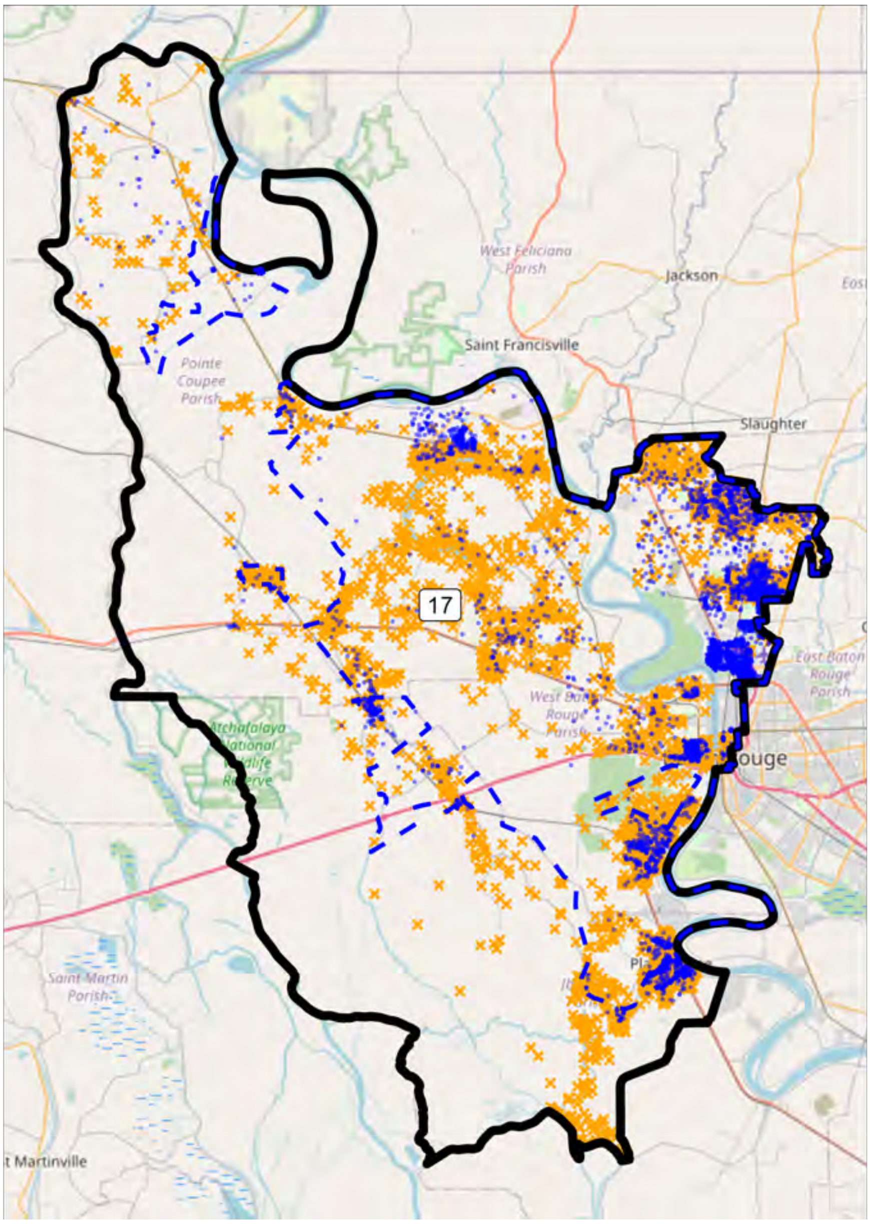


Figure 85: Most compact group of Black residents of voting age in Cooper Illustrative District 17 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.



6.3 New Orleans Area

Mr. Cooper makes creates substantial changes to the districts in the New Orleans area. His Illustrative Map creates a new minority-majority district by first making minor changes to districts 4, 5 and 7 from the Enacted Map. He then implements more significant changes to District 3. All told, these changes allow him to reconfigure District 19 as a minority-majority district. Compare Figures 86 and 87.

The problem with Mr. Cooper's approach is that he actually ends up reducing the number of districts that contain compact Black populations. The first set of changes, to districts 4, 5 and 7, are not problematic. Districts 4 and 5 have majorities clearly anchored in a single urban center (though District 5 resembles nothing so much as a dragon in flight). District 7 seems to meander across parish lines to rural portions of the state, but it has a compact majority of Black residents in New Orleans.

Because districts 4, 5, and 7 involve minor changes, I only discuss District 4 briefly, in order to illustrate what districts with compact Black majorities might look like, even though the overall district shape might be questionable.

Figure 86: Black Majority VAP Districts in the New Orleans Area, Enacted Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.

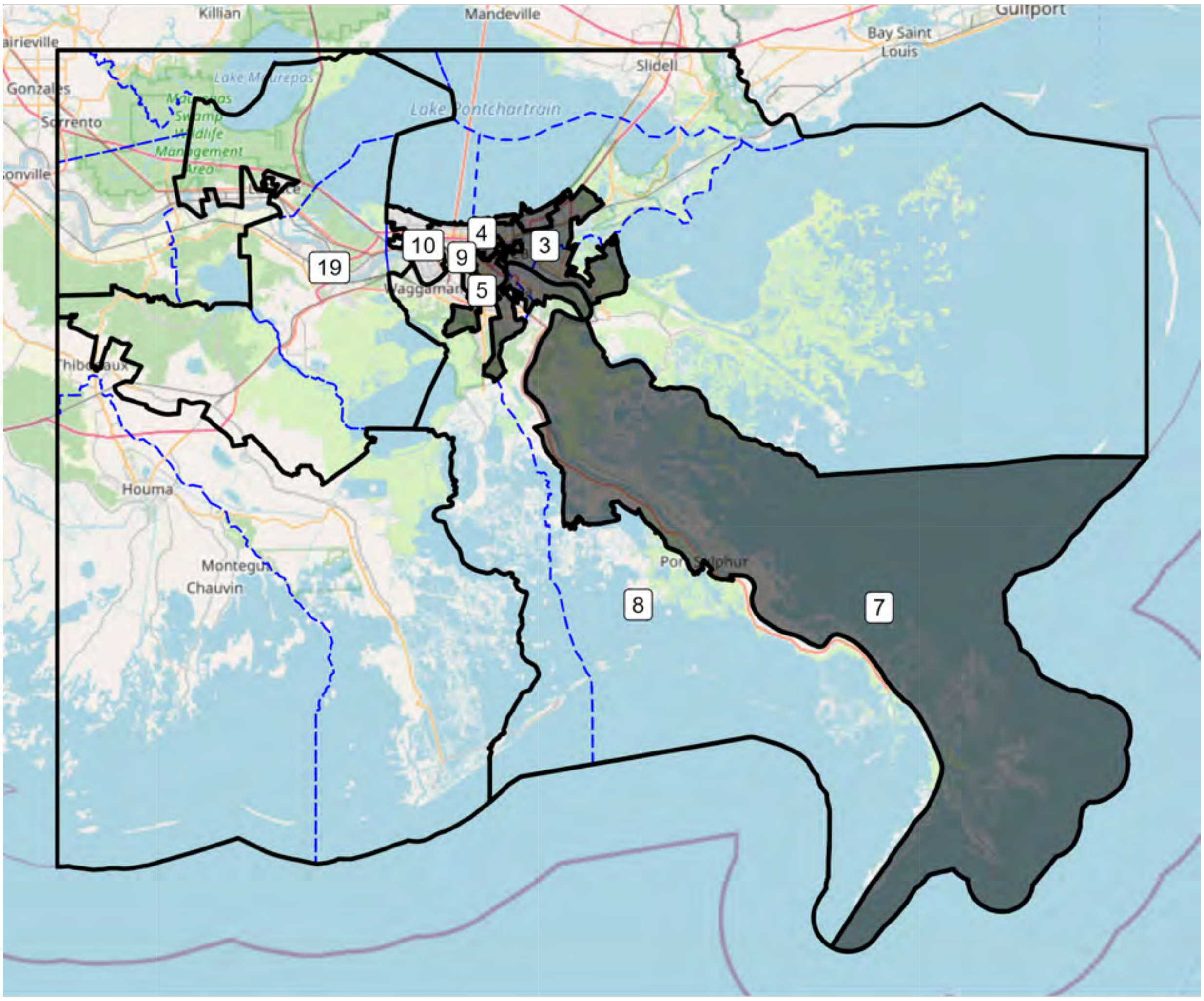


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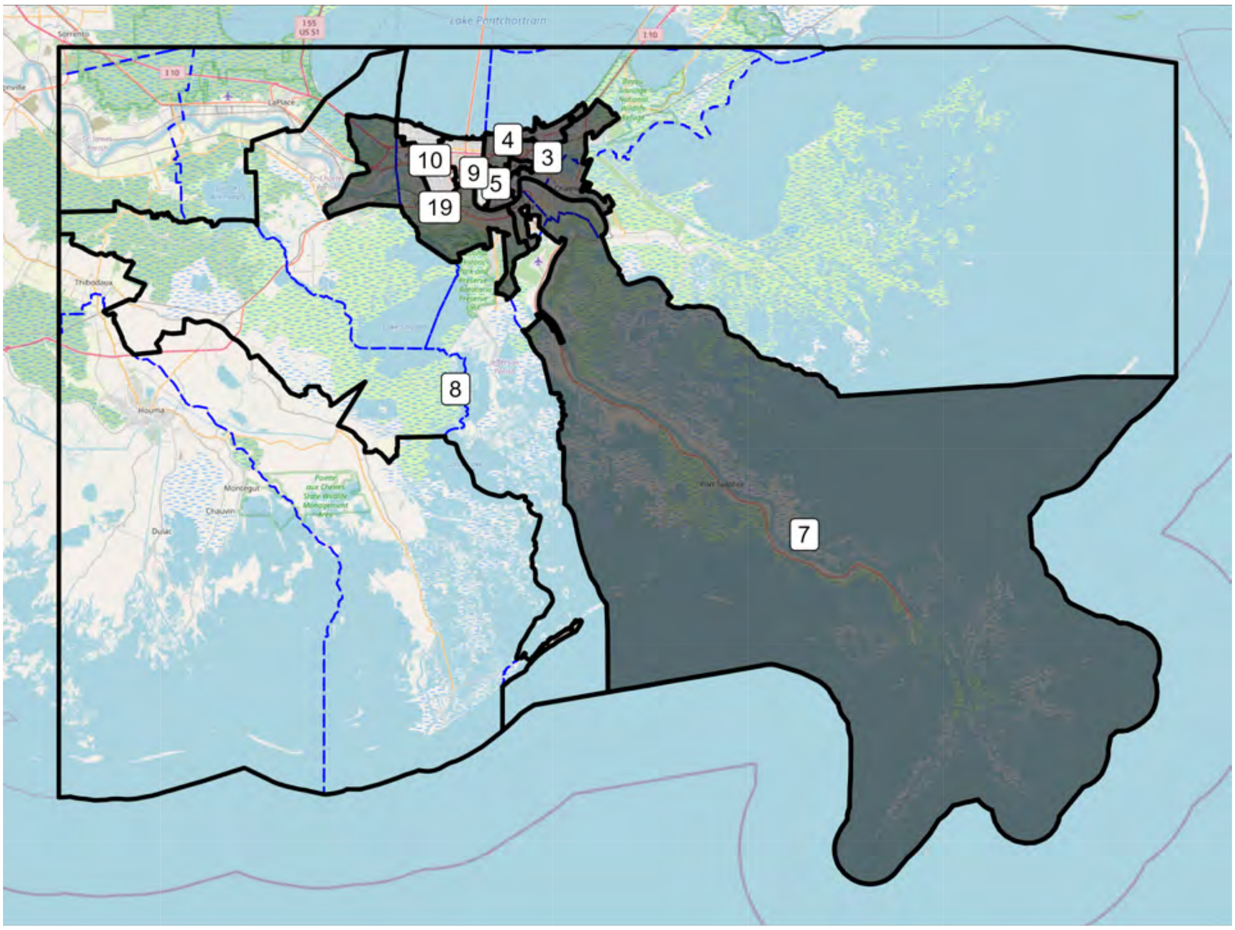
Figure 87: Black Majority VAP Districts in the New Orleans Area, Illustrative Map. Here, the dashed blue line depicts parish boundaries. Shaded districts are Black majority.



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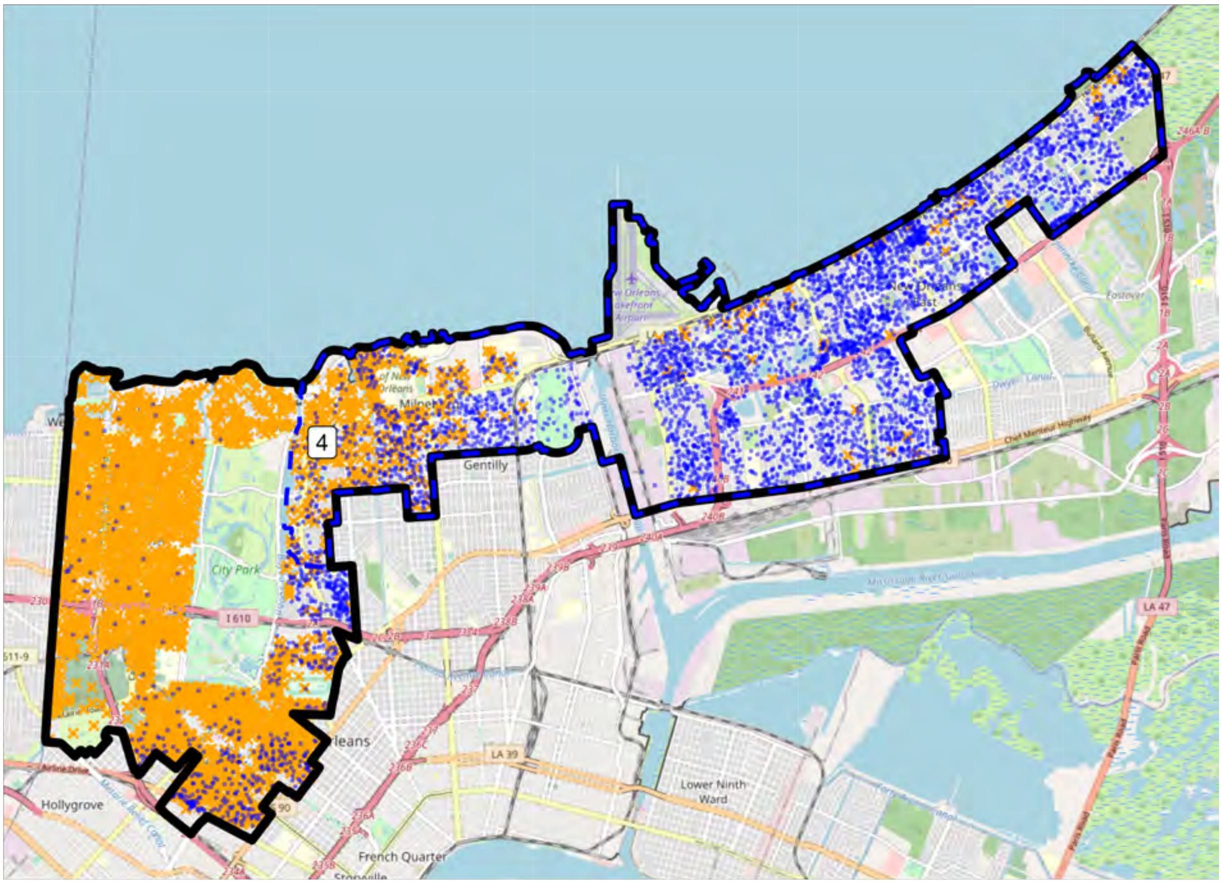
6.3.1 Cooper Illustrative District 4

At first blush, Illustrative District 4 looks like it might be another "baconmandered" district. But upon closer inspection, we can see that there is, in fact, a compact Black population contained wholly within the eastern portion of the district. Although there are Black individuals, and even a few concentrations of Black residents, in the western part of the district, they are not necessary to create a majority Black district in this configuration. This district would therefore contain a compact Black population numerous enough to constitute a majority in the district.

Figure 88: Most compact group of Black residents of voting age in Cooper Illustrative District 4 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.



6.3.2 Cooper Illustrative District 3

The reconfigured District 3, however, no longer is anchored in a compact population center. Instead, the new district – which resembles a horse galloping southward across the map, takes in heavily Black precincts across the map, interspersed with unpopulated or heavily White areas in the middle. Because the BVAP of this district is relatively low, the Black population isn't based in a single portion of the district, but rather is spread across the area. Moreover, all that can be eliminated while keeping the district minority-majority is are a handful of precincts in the front "hoof" of the horse, in St. Bernard Parish. In other words, all of these disparate population centers are needed to create a 50% + 1 district.

Figure 89: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 3. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

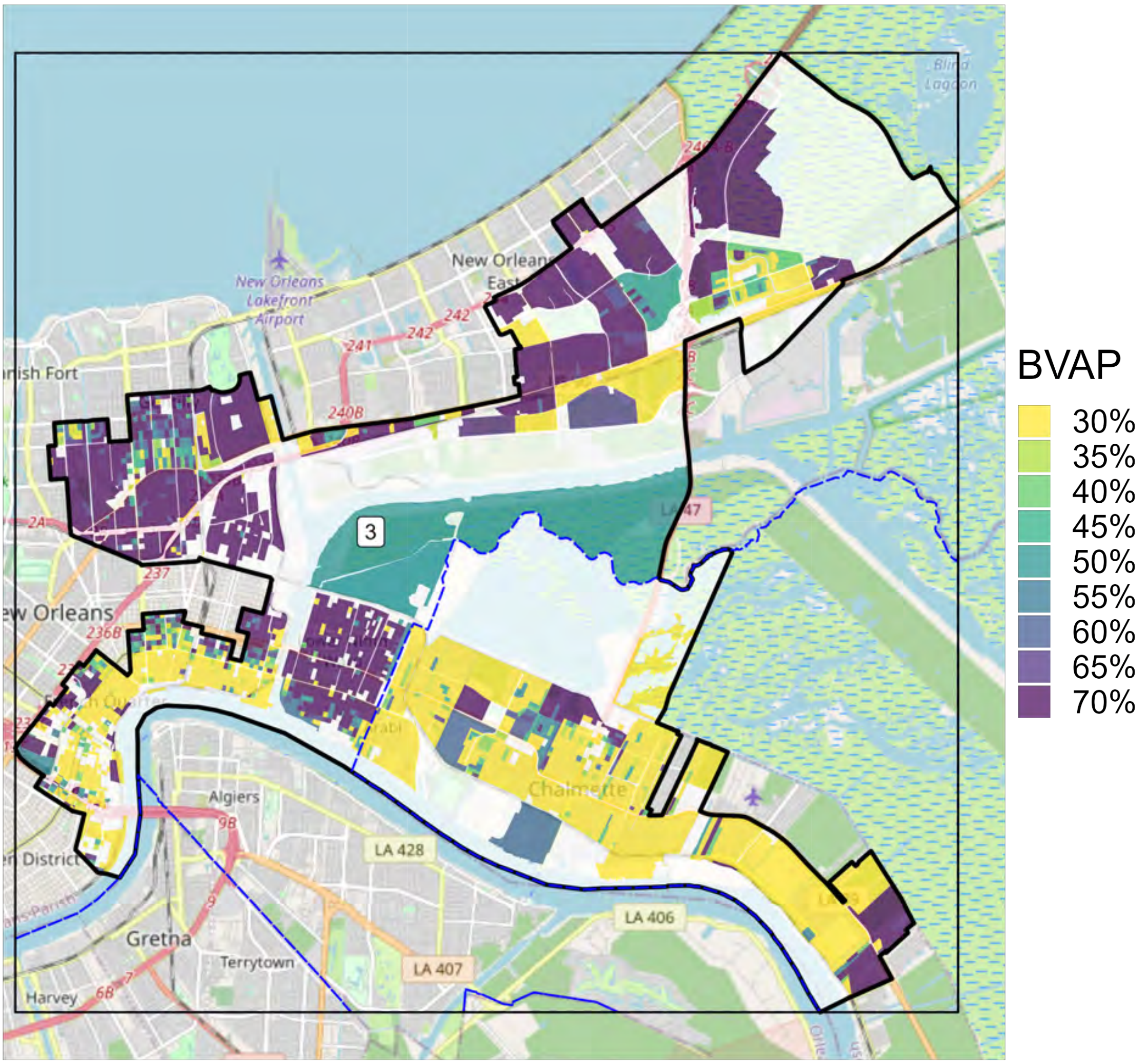


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Figure 90: Location of Black population in Cooper Illustrative District 3. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

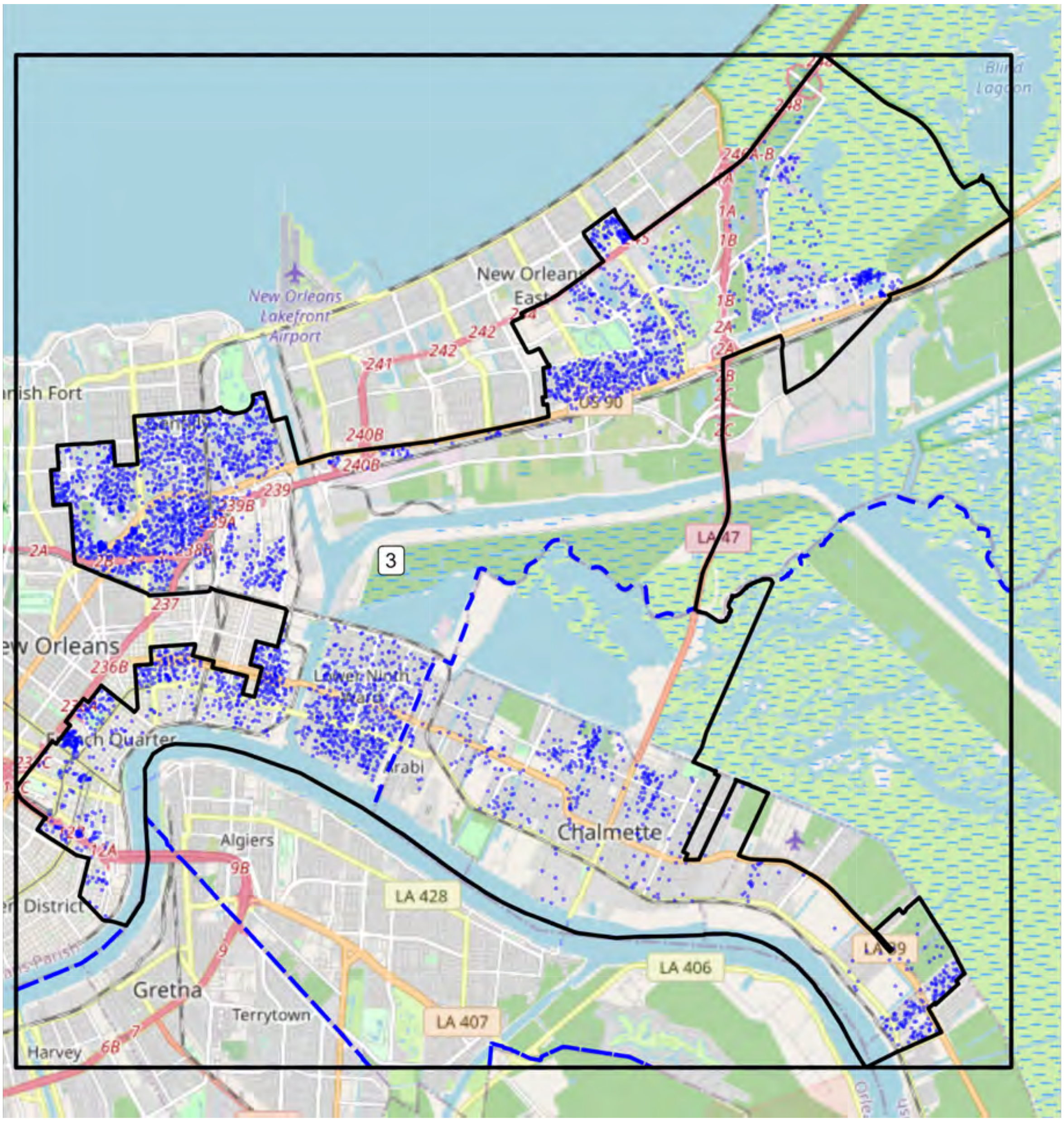


Figure 91: Location of Black and White populations in Cooper Illustrative District 3. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

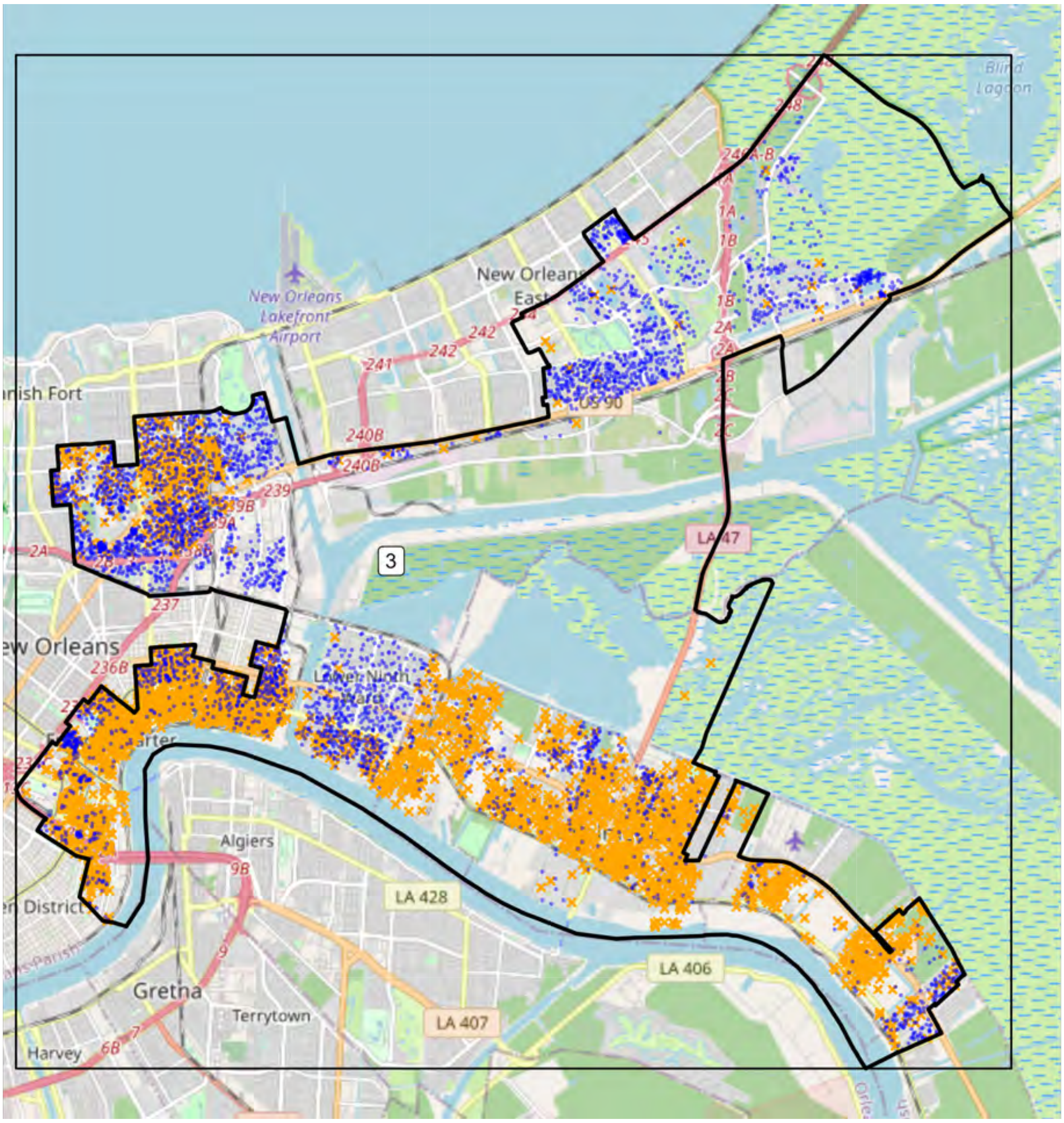


Figure 92: Most compact group of Black residents of voting age in Cooper Illustrative District 3 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.

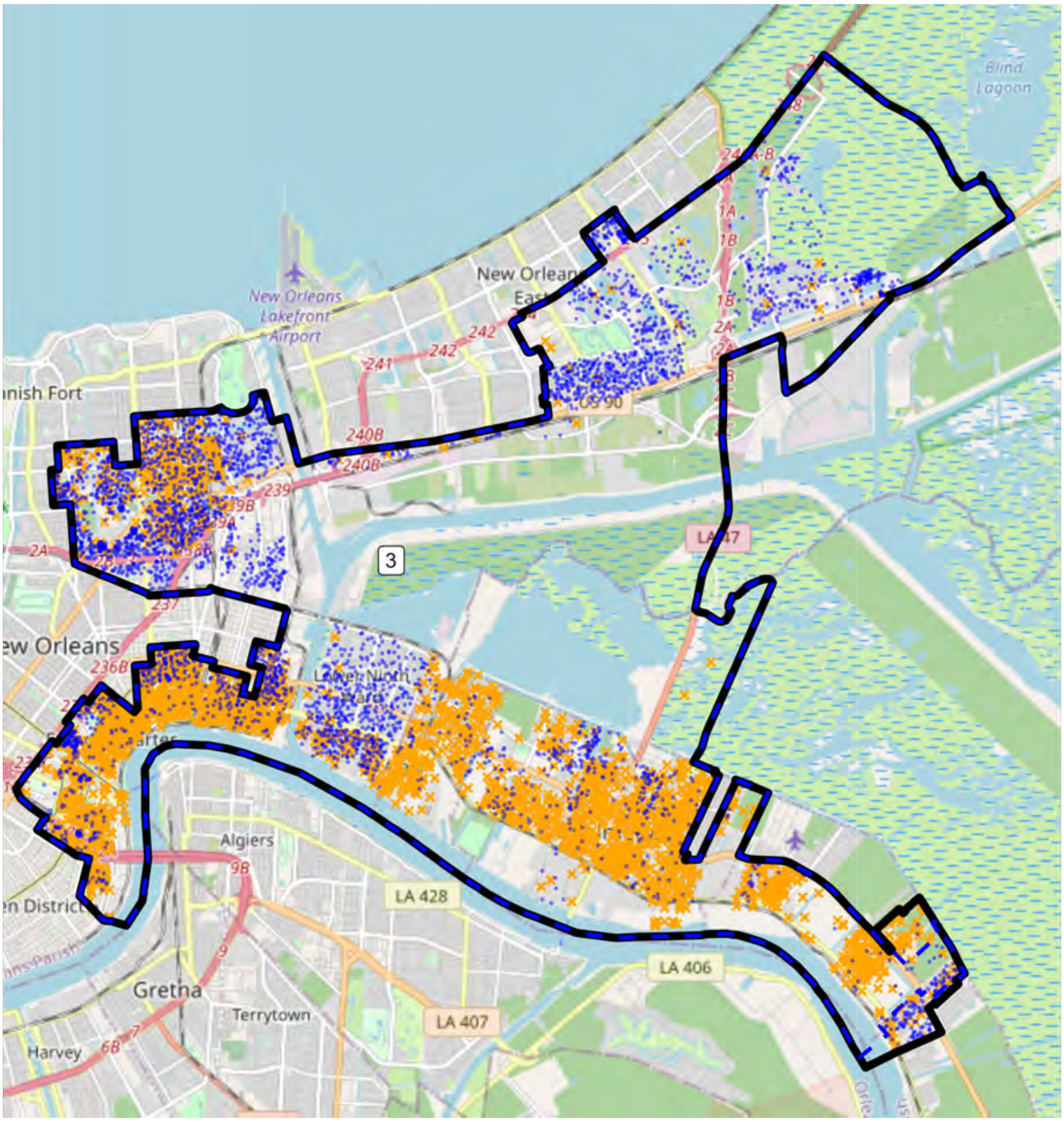
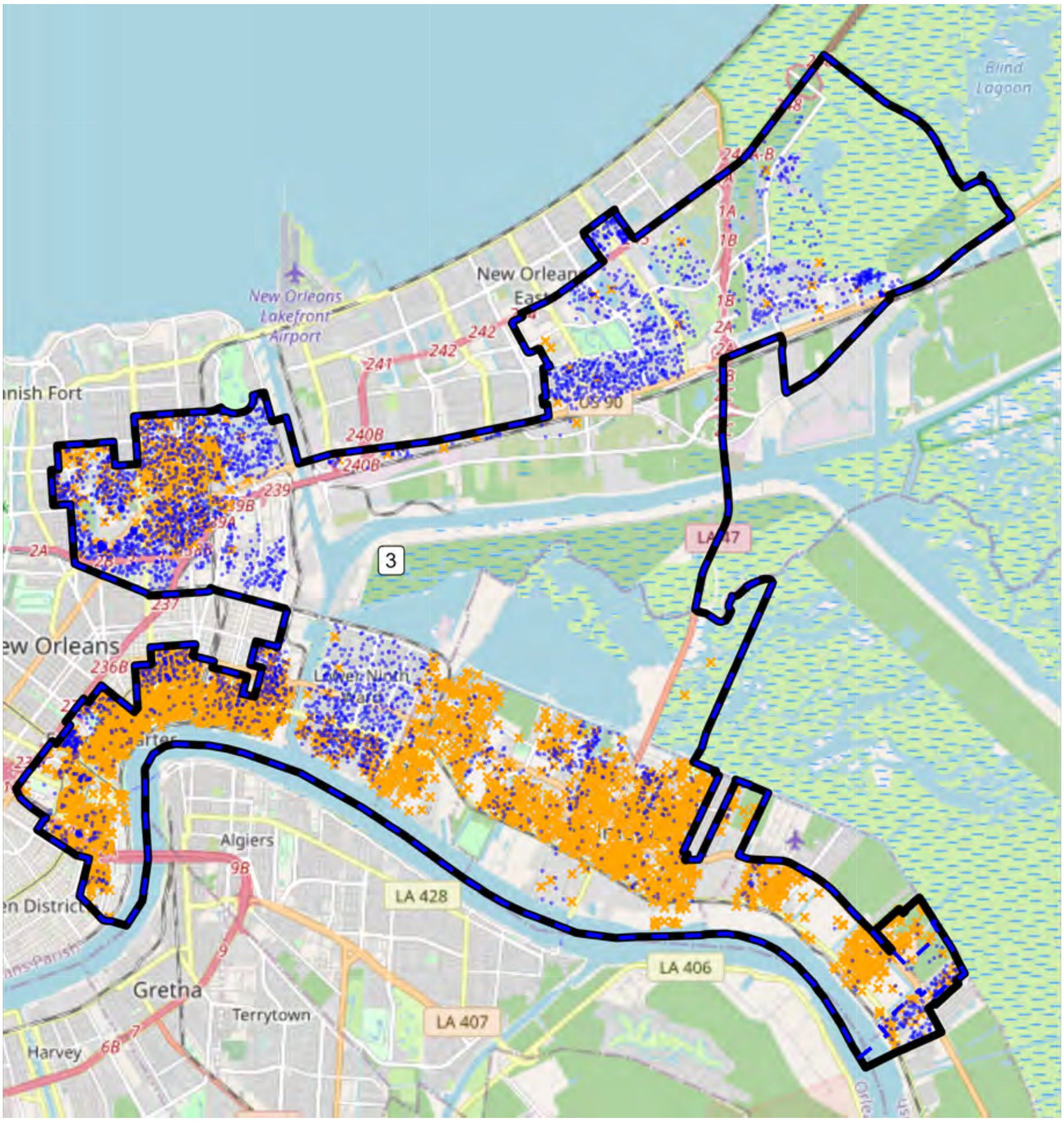


Figure 93: Most compact group of Black residents of voting age in Cooper Illustrative District 3 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.



6.3.3 Cooper Illustrative District 19

We see the same thing with the reconstituted Senate District 19. This district, based in New Orleans, has a VAP of 91,184, meaning that a group must have a population of 45,593 to constitute a majority in the district. The district has a BVAP of 46,472, meaning that the Black population exceeds the 50%+1 threshold by around 900 residents of voting age.

In order to (barely) cross the threshold, the district grabs Black voters from across northern Jefferson Parish, and into portions of St. Charles Parish. Along the way, it takes in heavily Black towns, like Woodmere and Waggaman along with White plurality cities like Westwego and Destrehan. Of course, almost all of this is necessary to make the district work, given that it is just barely majority Black. In other words, unlike other district in the New Orleans area, the Black population in District 19 is spread out across multiple towns, and even parishes, stitched together to barely cross the 50% + 1 threshold.

Figure 94: Percent BVAP in census blocks contained in Cooper Illustrative Map, District 19. White areas indicate empty blocks. Dashed blue lines reflect Parish boundaries.

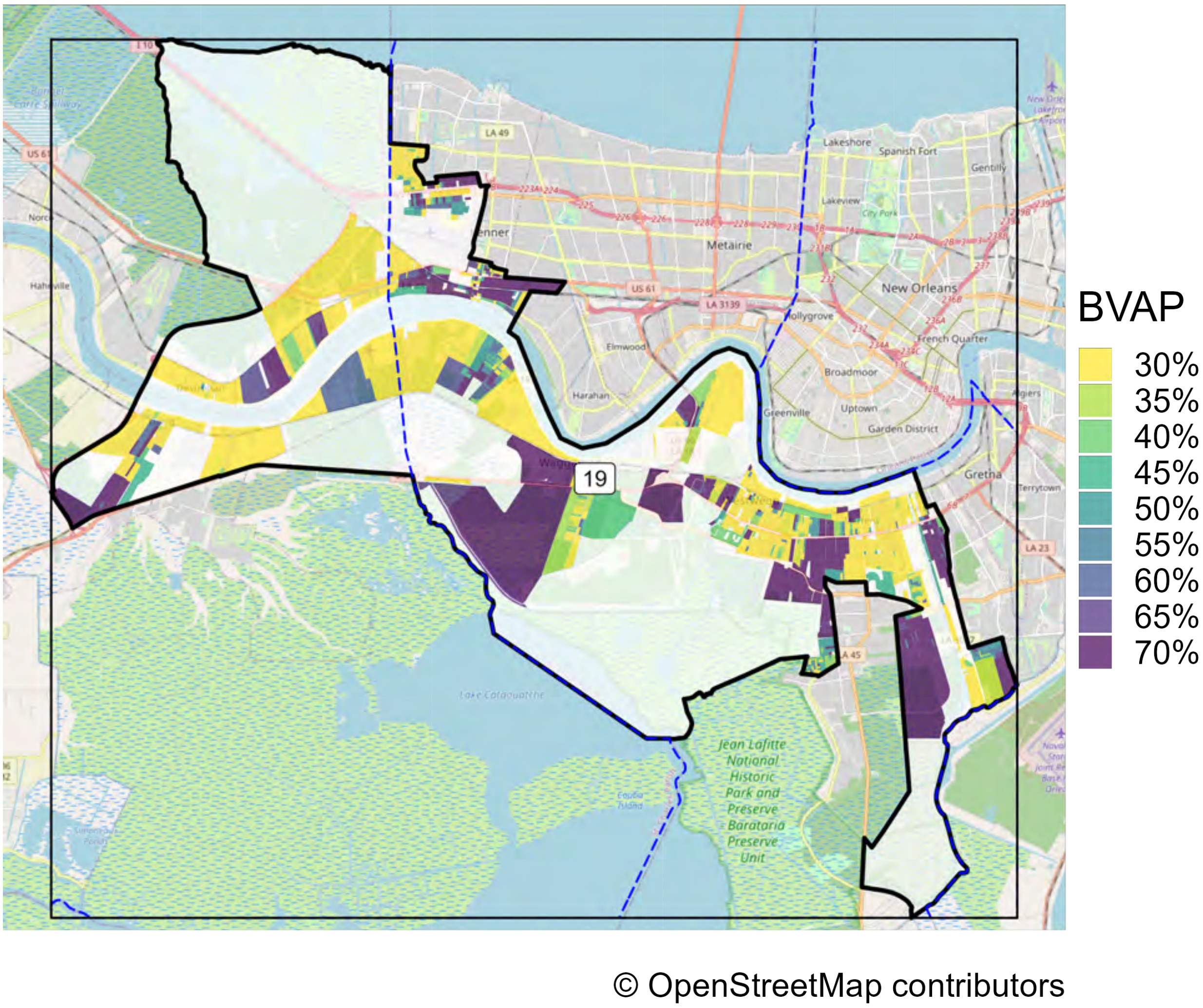


Figure 95: Location of Black population in Cooper Illustrative District 19. One blue dot represents 10 Black residents of voting age. Dashed blue lines reflect Parish boundaries.

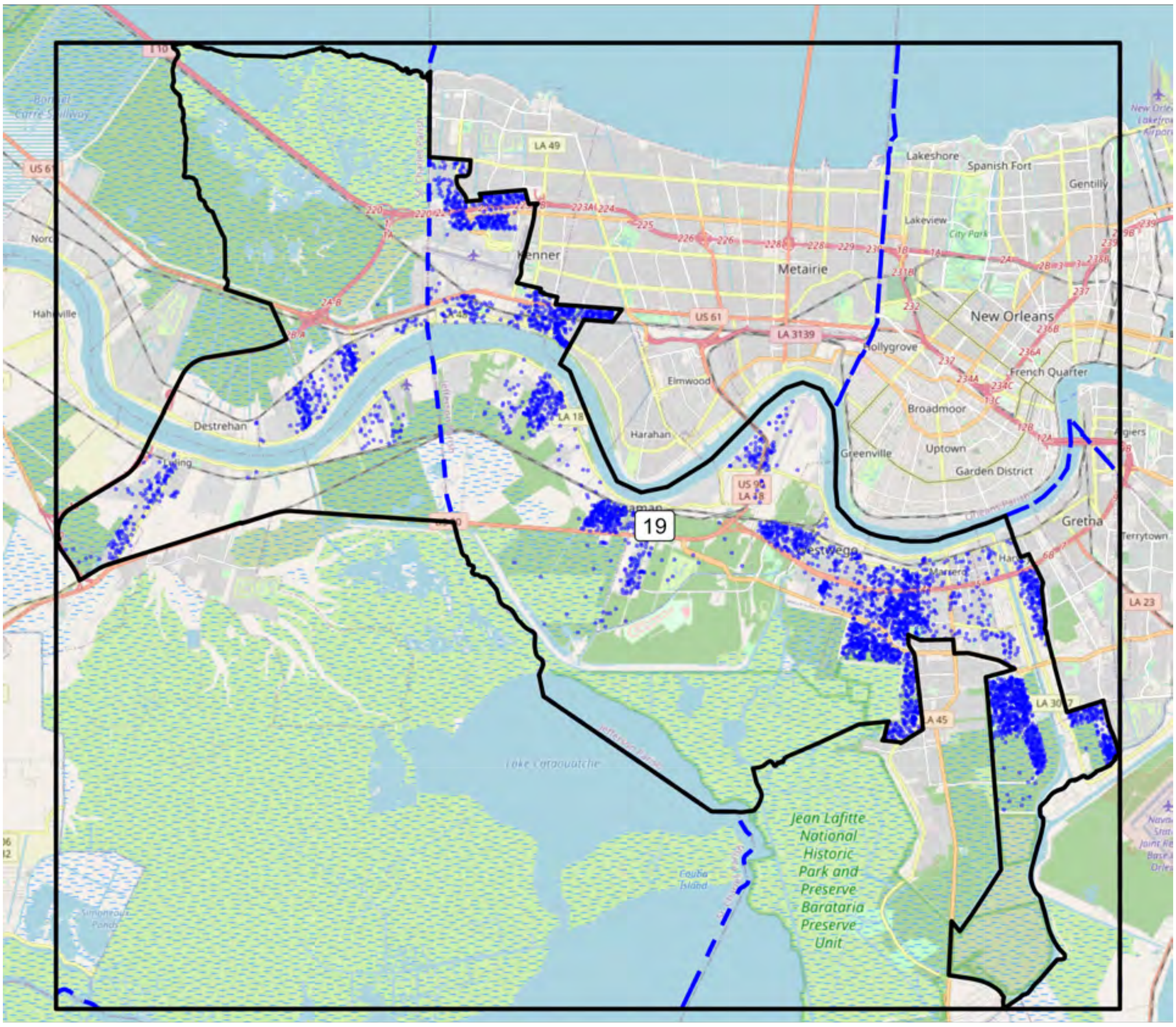


Figure 96: Location of Black and White populations in Cooper Illustrative District 19. One blue dot represents 10 Black residents of voting age. One orange 'x' represents 10 White residents of voting age. Dashed blue lines reflect Parish boundaries.

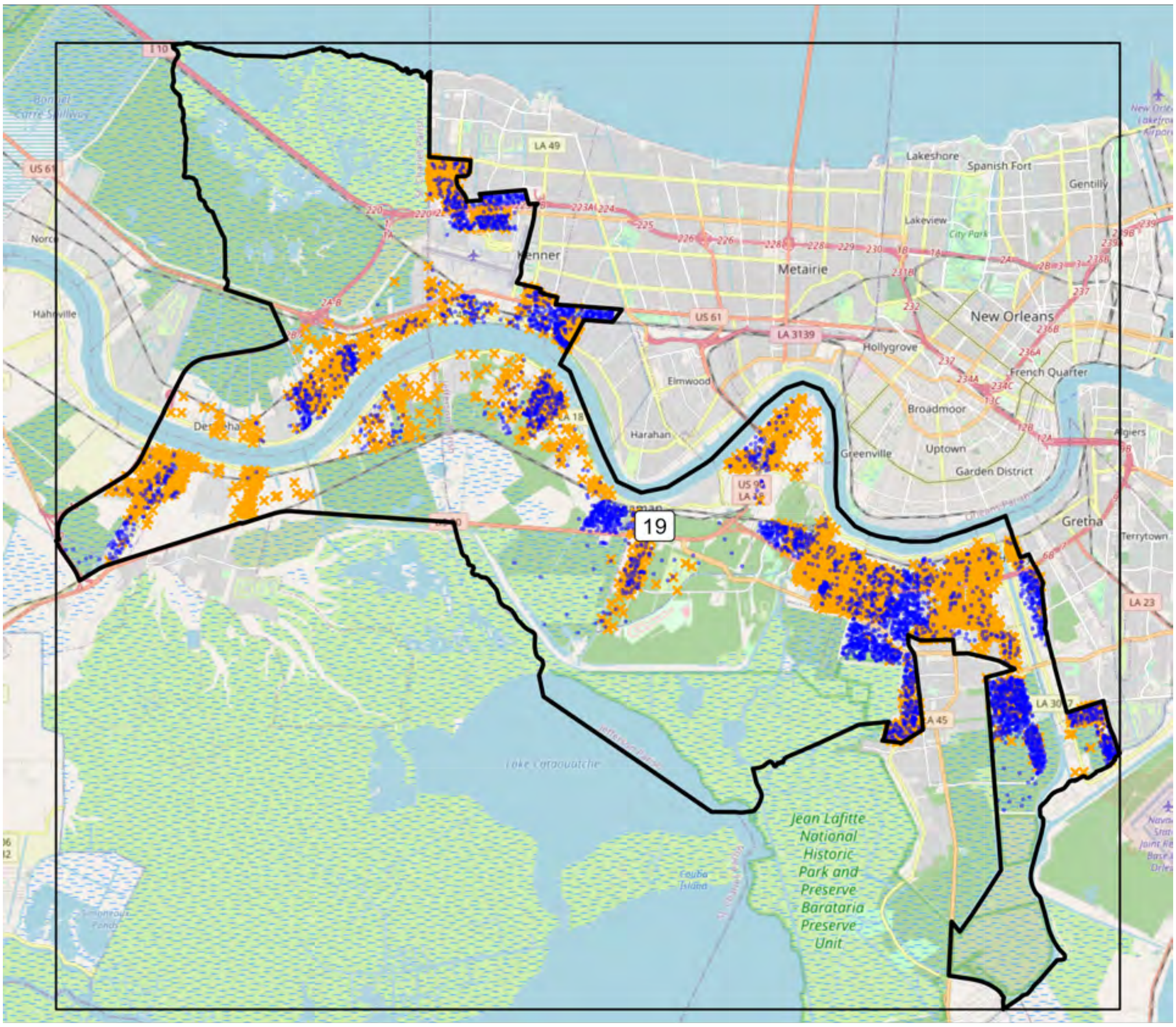


Figure 97: Most compact group of Black residents of voting age in Cooper Illustrative District 19 sufficient to constitute a majority of the population in the district, using moment of inertia approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.

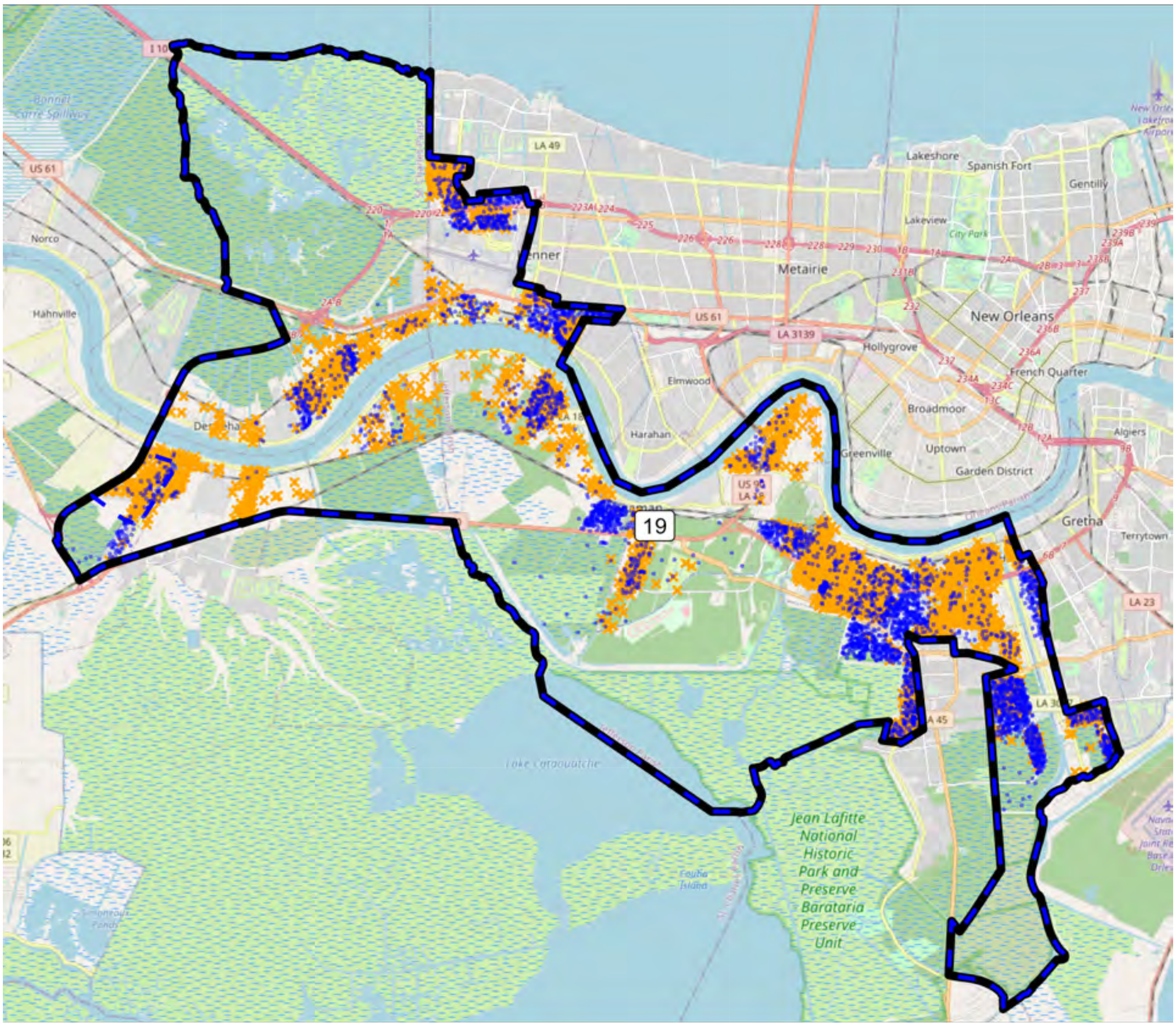
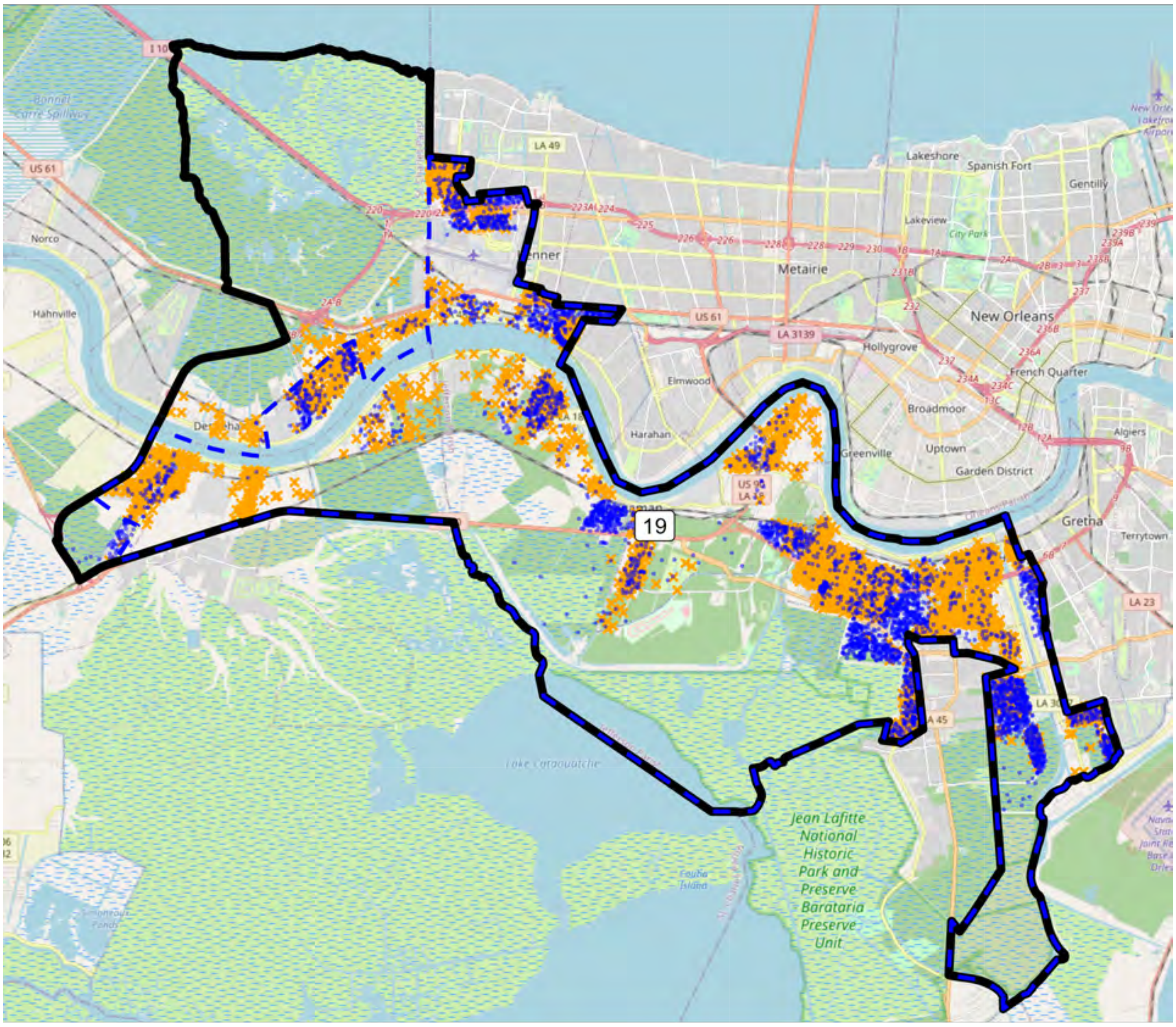


Figure 98: Most compact group of Black residents of voting age in Cooper Illustrative District 19 sufficient to constitute a majority of the population in the district, using Chen & Rodden approach. Here, dashed blue lines indicate the outer boundary of precincts containing the most compact group.



7 Conclusion

Mr. Cooper's Illustrative Map does produce districts with Black populations sufficient to constitute majorities in districts. However, those Black populations, either upon visual inspection or using typical techniques employed by political scientists, are not compact populations. In other words, this does not demonstrate the existence of additional districts beyond the baseline established by the Enacted Map that can be comprised of compact Black populations sufficient to constitute a majority in a reasonably configured district.

I declare under penalty of perjury under the laws of the State of Ohio that the foregoing is true and correct to the best of my knowledge and belief. Executed on 28 July 2023 in Delaware, Ohio.

Sean P. Trende

UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF LOUISIANA

CIVIL ACTION NO. 3:22-cv-00178 SDD-SDJ

DR. DOROTHY NAIRNE, JARRETT LOFTON, REV. CLEE EARNEST LOWE, DR. ALICE WASHINGTON, STEVEN HARRIS, ALEXIS CALHOUN, BLACK VOTERS MATTER CAPACITY BUILDING INSTITUTE, AND THE LOUISIANA STATE CONFERENCE OF THE NAACP
Plaintiffs,
vs.
R. KYLE ARDOIN, IN HIS OFFICIAL CAPACITY AS SECRETARY OF STATE OF LOUISIANA

Defendant.

Deposition of SEAN P. TRENDE, given the above-entitled cause, pursuant to the following stipulation, before Lori L. Marino, Certified Shorthand Reporter, in and for the State of Louisiana, via Zoom videoconference on Tuesday, September 26, 2023, commencing at 8:05 AM.

REPORTED BY:
Lori L. Marino
Certified Court Reporter

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(ALL PARTICIPANTS PRESENT VIA ZOOM VIDEOCONFERENCE:)

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E X H I B I T   I N D E X

S T I P U L A T I O N

It is stipulated and agreed by and between Counsel for the parties hereto that the deposition of SEAN P. TRENDE, is hereby being taken pursuant to the Federal Rules of Civil Procedure for all purposes in accordance with law;

That the formalities of certification and filing are specifically waived;

That the formalities of reading and signing are specifically not waived.

That all objections, save those as to the form of the question and/or responsiveness of the answer, are hereby reserved until such time as this deposition or any part thereof is used or sought to be used in evidence.

* * * * * * * *

LORI L. MARINO, Certified Court Reporter, in and for the State of Louisiana, officiated in administering the oath to the witness.

SEAN P. TRENDE, having been first duly sworn was examined and testified on his oath as follows:

EXAMINATION

BY MS. THOMAS-LUNDBORG:

Q Good morning, Mr. Trende. If you could, please, state your full name and address for the record.
A Sean, S-E-A-N, Patrick Trende T-R-E-N-D-E. It's 1146 Elderberry Loop, Delaware, Ohio 43015.
Q And you understand that you're under oath today, correct?
A Yes.
Q You understand that it's the same oath that you would take in a court of law?
A Yes.
Q Is there anything that would prevent you from answering my questions truthfully today?
A No.
Q You're not taking any medications or other substances that might impede your ability to answer truthfully?
A No.

Q Nice to meet you again. We met once five years ago now, but my name is Alora Thomas-Lundborg. I am an attorney for the plaintiffs currently at Harvard Law Election Clinic.
A Nice to meet you again, as well.
Q I know others have put their representations in the chat. So I will not go through those right now on the record. I've deposed you before. So I know you've been deposed before. Have you done a Zoom deposition before?
A Yes.
Q So I'm just going to remind you of some very quick ground rules that I'm sure you know very well. The first is to have verbal responses to all of my questions. Do you understand that?
A Yes.
Q And so that the record is clear, it's important that we do not talk over one another. You understand that?
A Yes.
Q If you don't understand a question of mine, please, ask me to repeat it or to

rephrase.
A Yes.
Q If you want to take a break, that's fine. I will be taking periodic breaks. If in a time crunch, I think we're going to try to power through as much as possible and take shorter breaks, but if you need to take a break for some reason, just let me know, and the only thing I ask is not to take a break while a question is pending. Do you understand that?
A Yes.
Q So counsel may object to certain questions I ask today. Unless you're instructed not to answer, you shall answer all the questions whether or not they're objected to. Do you understand that?
A Yes.
Q Where are you located today? Since this is Zoom deposition, we're all in different locations.
A I'm located at the law office of BakerHostetler here in Columbus, Ohio.
Q And who else is present in the room with you?

A Phil Strach.
Q Do you have any documents in front of you?
A I do not.
Q Okay. Were you able to download the exhibits to see today?
A I did look at them, yes. I'm sorry. Do you want me to open them on my laptop or something to that effect?
Q I think when I will be putting documents on the screen, I find that it's helpful if you have your own version as I'm putting on Zoom a version of the document in case you want to look at sections that I will not be pointing you to when I'm sharing my screen.
A I may do that at the break then. I'm assuming -- well, we'll see how it goes. I might ask to take a quick break to do that depending which documents you're pulling up.
Q So we're going to use some terms of art today, and I'd like to go over those just briefly. The first term of art that I'll be using is the "enacted map," and when I say enacted map, I may be referring to the

Louisiana House or the Louisiana Senate map that was passed by the Louisiana Legislature in 2021. Do you understand that?
A Yes.
Q And then, I will also be using the term "illustrative map." When I say illustrative map, I'll be referring to the maps drawn as a part of the Gingles 1 inquiry by Mr. Bill Cooper. Do you understand that?
A Yes.
Q Did you do anything to prepare for today's deposition?
A Yes.
Q What did you do?
A I spoke briefly with counsel and spent some time looking over my report and reply.
Q You said you met with counsel. How many meetings did you have with counsel?
A In preparation for this deposition, one.
Q How long was that meeting?
A Maybe, a half hour.
Q And by counsel, do you mean Mr. Strach, or do you mean someone else?

A I think Mr. Strach was present. Yeah, I was with Mr. Strach actually. Yeah.
Q Was anyone else present?
A I believe Mr. Farr was on the call, as well, and Ms. Riggins, R-I-G-G-I-N-S, joined intermittently.
MS. THOMAS-LUNDBORG:
So, I'm going to enter the first exhibit, just give me one second. One thing about Zoom depositions, they should be faster but they tend to be much slower, I find. So your screen now should be deposition notice of Sean Trende, and I will scroll through. This deposition notice is dated yesterday September 25, 2023. Were you given a copy of this -- actually. Sorry strike that. I'm going to do it in the reverse order. I'm going to actually show you something first, another document first.
So now, I've put on the screen a document entitled "Deposition Notice of Sean P. Trende," dated

August 23, 2023. Do you see that?
THE WITNESS:
Yes.
MS. THOMAS-LUNDBORG:
I'm going to have this document marked as Exhibit 1. This is the initial notice of your deposition that plaintiffs served on defense counsel.
BY MS. THOMAS-LUNDBORG:
Q Did you so see a copy of this deposition notice?
A Yes.
Q We should be able to do the rest of this fairly quickly.
MS. THOMAS-LUNDBORG:
Now, I'm going to show you what I'm going to have marked as Exhibit 2. This is the deposition notice of Sean P. Trende dated yesterday, September 25th. Do you see that?
THE WITNESS:
Yes.
BY MS. THOMAS-LUNDBORG:

Q We revised your deposition notice and served it on counsel to accommodate for another case beginning sometime with you today. Are you aware of that?
A Yeah. I have to testify in New Mexico tomorrow morning, and so I have to fly out tonight. I don't know that they'll get time for me, because I typically don't bill travel, but yeah.
Q Yes. I think I'm talking about our deposition, assuming there is time, there will be another deposition in the Louisiana Congressional case. Are you aware of that?
A Yeah, I knew that both were going to be covered today.
Q Okay. So I'm going to stop sharing what I'm going to have marked as Exhibit 2, which is the revised deposition notice, and move on. Now, you said that you reviewed your reports, correct, --
A Correct.
Q -- as part of your deposition prep.
MS. THOMAS-LUNDBORG:
So I am now going to share the screen what I'm going to have marked

as Exhibit 3.
BY MS. THOMAS-LUNDBORG:
Q Here you see there is a cover page titled "Expert report of Sean P. Trende in the Nairne, et al v. Ardion, et al" from July 28, 2023, and I'm going to quickly scroll through, hopefully, quickly scroll through.
A And I believe I'm now in receipt of hard copies of the exhibits.
Q Oh, great.
A This is my report.
MR. STRACH:
From July 18th?
THE WITNESS:
Yeah.
MR. STRACH:
July 28th, I mean.
THE WITNESS:
Yeah.
BY MS. THOMAS-LUNDBORG:
Q You'll see on the last page is your signature.
A Yes.
Q And I have it pulled up on the screen, and you say you have it in front of

you. Do you recognize this as a true and accurate copy of your expert report for this case?
A As far as I can tell, yes.
MS. THOMAS-LUNDBORG:
I find it helpful if you just mark a bunch of exhibits at the start. So we're going to do a few more. I have now put on the screen what I will have marked as Exhibit 4, and if you look at the cover page, it is the rebuttal report of Sean P. Trende in Nairne, et al v. Ardoin, et al. This one should be easier to scroll all the way through.
BY MS. THOMAS-LUNDBORG:
Q You'll see that your signature is on the final page, do you see that?
A Yes.
Q Does this appear to be a true and accurate copy of your rebuttal report in this case?
A Yes.
Q As part of your deposition prep, did you review the expert report written by Bill

Cooper in June 2023?
A No.
Q Did you review the expert report of Bill Cooper from June 2023 in writing your expert report?
A Yes.
MS. THOMAS-LUNDBORG:
I am now sharing my screen, and I'm going to have marked as Exhibit 5 the declaration of William S. Cooper. We'll briefly scroll through it. His signature is on page 60, with the date of June 29, 2023.
BY MS. THOMAS-LUNDBORG:
Q Does this appear to be a copy of the expert report of Bill Cooper that you reviewed in writing your expert report?
A Yes.
Q Do you recall that Mr. Cooper's expert report included exhibits to his declaration?
A I don't, but I believe that's right.
MS. THOMAS-LUNDBORG: So I'm now going to introduce two of the exhibits to the June report. I'll do them together.

We'll have marked as Exhibit 6, Bill Cooper's Exhibit K-1. As Exhibit 7, Bill Cooper's exhibit to his expert report K-2.
BY MS. THOMAS-LUNDBORG:
Q Did you rereview the rebuttal report of Mr. Bill Cooper?
A Not for this deposition.
Q Did you do review it in your work for this case in writing your reply or your rebuttal report?
A Yes.
MS. THOMAS-LUNDBORG:
I'm going to have marked as Exhibit 8. I've now put on the screen what I'm going to have marked as Bill Cooper's rebuttal Exhibit 8. Quickly scrolling through it, you'll see on page 14 was executed on August 11, 2023, and it has Mr. Cooper's signature.
BY MS. THOMAS-LUNDBORG:
Q Do you see that?
A I do.
Q As part of Mr. Cooper's rebuttal

report, he included exhibits. Do you recall that?
A No.
Q So I'm going to put on the screen what I will represent to you are accurate copies of the exhibits attached to Mr. Cooper's rebuttal report, at least a selection of the exhibits, and I think once we go through these, we'll have marked the first set of exhibits. We can go into some substantive questions.
A I don't know I kind of like this easy part.
MS. THOMAS-LUNDBORG:
So I'm having marked as Exhibit 9 to your deposition what was Exhibit A to Mr. Cooper's rebuttal report it is Mr. Cooper's revised initial report, and I believe he revised his report after several of defense experts noted that Mr. Cooper had used a map that was not, in fact, the enacted map in doing some of his analysis. So the revised report is the same as the initial report that

we discussed earlier except it updates all the tables with the enacted map. Did you understand that prior to today?
THE WITNESS:
No.
MS. THOMAS-LUNDBORG:
I have -- I'm going to actually go through them all together so we can go through them quickly. So I'm now going to share my screen, and I'm going to have marked as I just wanted to make sure I have the right thing on the screen. One second. I'm going to have marked as Exhibit 10, Exhibit B-1 to Bill Cooper's rebuttal report. I'm going to have marked as Exhibit 11, Exhibit B-2 to Mr. Cooper's rebuttal report. I'm going to have marked as Exhibit 12, Exhibit C-1 to Mr. Cooper's rebuttal report, and then, I'm going to have marked as Exhibit 13, Exhibit C-2 to Mr. Cooper's rebuttal report. So that the record is clear, we'll be

spending more time with these exhibits later in the deposition, but exhibits B-1, B-2, C-1 and C-2 are Mr. Cooper's comparative compactness measures for the illustrative map and the enacted map. I'm going to stop sharing.
BY MS. THOMAS-LUNDBORG:
Q I'd like to go back -- now that we have entered a bunch of exhibits that we will come back to later in this deposition, I'd like go back to your deposition prep. Did you review the deposition transcript of Mr. Bill Cooper in your prep for today?
A No.
Q Were you aware that he had been deposed?
A Yes.
Q Did knowledge of his deposition play any role in your prep today?
A No.
Q Did you review any of the other expert reports in this case?
A I might have early on in the case, and I think I saw the report of McCartan when

it was filed, but other than that, no. I don't think so.
Q You said that you saw -- you may have seen the report of Dr. McCartan. Do you intend to render any opinions on his report?
A I don't know if counsel will ask me at trial, but I don't have anything prepared or in my reports on him.
Q Do you intend to render opinions on any of the other experts in this case?
A Yeah, it's the same basic answer. I don't really know what I'm going to testify to at trial. I'll answer the questions that I'm asked, you know, that aren't objected to and sustained, but to my recollection, I haven't seen the reports. I would imagine the only relevance of my reports to theirs would be in direct.
Q Did you render any opinions about other experts in the two reports that you submitted thus far?
A I don't believe so. Without knowing the substance of what their reports is about, there may be things in my report that are applicable to them, but I don't know.

Q Did you review other documents in preparation for your deposition?
A Not to my recollection.
Q I'm now going to shift gears a little bit and ask you some questions about your involvement in this case. When were you officially retained as an expert in this case?
A Gosh, I don't know. Probably before the stay was put into place.
Q So that would have been in 2022?
A Yeah. I want to say June of 2022, but I'm not entirely sure.
Q And when did you begin work on this case?
A It would probably have been around that time.
Q When you joined the case, what were you told the subject matter was?
A I believe -- I mean, this is trying to remember more than a year ago, but my understanding of this case all along has been that it was a Section 2 case.
Q And what was your understanding of what the main issues were in the case?
A Well, as a Section 2 case, you know,

my understanding is always that it's going to be about Gingles prongs one to three and then the totality of the circumstances. I knew that my involvement was going to be limited probably to Gingles prong one.
Q Then, you anticipated my next question, which is what were you asked to do when you were retained in this case?
A I honestly -- I don't remember, because I believe when I was retained, it was in a sort of -- real professional term, a fire drill trying to get ready for a hearing when everything was on fast tracks back then; and then, when the stay was put into place, things calmed down. So I don't remember initially exactly what my marching orders were.
Q What were your marching orders before you submitted what we have marked as Exhibit 3, which is your initial report in this case?
A It was to examine the districts drawn by Mr. Cooper to determine -- first to illustrate the location of the black population of voting age in the districts, and second, to render an opinion as to whether they were reasonably compact.

Q Sorry. I'm just taking some notes. And we've spent some time just now referencing Gingles. Are you familiar with the Gingles preconditions?
A Yes.
Q And what is your understanding of what the Gingles preconditions are?
A The first precondition, numerosity and compactness. You have a reasonably compact -- well, I guess the nature of what the group has to be is the prime legal issue you all will be fighting over, but it's a reasonably compact minority group sufficient to be a majority in a reasonably configured district. The second prong is whether the minority group posed as a block -- shows cohesion in it's voting, and then, the third prong is whether the majority votes as a block sufficient such that the minority group typically wouldn't be able to elect its candidate of choice.
Q Did you, when you were retained, understand that Mr. Cooper is a Gingles 1 expert for the plaintiffs?
A That's my understanding, yes.

Q Was it your understanding that you would be a rebuttal Gingles 1 expert for the defendants or for defendant Secretary of State?
A Yes, that's right.
Q Do you intend to render any opinions on Gingles 2 and 3?
A No.
Q Outside of counsel, did you discuss the case with anyone else?
A My wife.
Q Did you have any discussions with any of the defense side experts in this case?
A I don't think so, no. I assume -- I understand that question to ask if I have had discussion with defense side experts about the subject matter of this case.
Q That is correct. Not -- I'm sure folks meet casually and have all kinds of discussions not relevant to today.
A Yes, that's right.
Q So we've spent sometime talking about your preparation for the deposition. I'd like to ask you about your preparation for writing your expert report. Aside from reading the

reports of Mr. Cooper, did you do any other research to prepare for the expert reports that you submitted in this case?
A So as I was writing this report, I'd also done the research for my dissertation. My third paper in my dissertation deals with redistricting simulations. So I had done a lot of work on different ways to execute simulations, and part of that is different measures of compactness; and a lot of that research was directly relevant to my engagement in this matter. So it's kind of a tricky question to answer, because in a sense the answer is no, because most of the research that I utilized here came out of work for a separate project, but it's not really no, because there is other research that is relevant to this report.
Q Okay, we will spend some time discussing your dissertation a little bit later, but just focusing in on the work you did for this report, was there any research that you did for the report that did not coincide with the research that you were doing for your dissertation?

A If we -- I don't remember any. If as we go through the report, I spot things that I need to update this answer, I'll do it, but I don't remember any.
Q Now, you said -- I believe you answered yes, that you did review Mr. Cooper's expert reports. Did you receive Mr. Cooper's shape files and block equivalency files for his illustrative maps?
A Yes.
Q Did you upload these files into a GIS system?
A I would have read them in R.
Q So did you not upload his map files into a GIS system to actually see the output?
A Well, you can see the output in R. That's how all the maps in my report are generated.
Q Then, when you uploaded them into R, did you use any other program to see the maps or simply used your R code and had them displayed through R?
A My R code. I may have put them in today's redistricting, as well, but it was mostly my R code, if not exclusively.

Q Have you set up your R code to have outputs of visual maps that can be looked at?
A Yes. That's how all the maps in my report were generated.
Q I would like to go back to the sources of your report versus the sources of your dissertation. Were there any sources that you have used in your dissertation that you did not cite in your expert report or your expert reports for this case? So I'm now referencing Exhibit 3 and 4.
A The bibliography to my dissertation is something like 10 pages long. So yeah, there are a lot of things that I cite to in my dissertation that I don't cite to here.
Q How did you decide which literature review to cite in your expert report and which to leave out?
A Well, so the first dissertation paper is about the Supreme Court. So all those cites are irrelevant and the second dissertation is about paper was about integrated nested Laplace approximations -- the second paper is about integrated nested Laplace approximations in spatial modeling of

elections data. So that stuff wasn't relevant. And then, the third paper, which is the one on redistricting, has some things, such as different redistricting, simulations that have been proposed over the years that just weren't relevant. So I tried to pull out the relevant pieces of information or citations.
Q Then, how did you determine whether the literature from this third simulations chapter was relevant for not relevant.
A Well, if related to population compactness, which is what my report is about, that's the first cut on what's relevant. I am not aware of any, as you might call it, negative authority on the citations that I've put in. So to the extent I didn't include citations, it was just because I figured I had proved the point sufficiently and didn't need to list every single possible citation the way you might in a dissertation. Just like in writing a legal brief, you might not cite every single piece of authority for a proposition.
Q In addition to the work that

coincided with your expert report -- with your dissertation, did you write any new code for the expert report in this case?
A Yes.
Q Can you explain that process to us?
A Well, you open up the R programming environment in a program called RStudio, and you begin -- you think about what it is that you need your code to do, what it is you're trying to accomplish, and you write a series of commands that R will execute to carry out those tasks.
Q And this process was separate from the process that you used in your dissertation; meaning, you went into RStudio and wrote brand new code for your report work in this case?
A I mean, you never write brand new code. I shouldn't say never. You rarely write brand new code, because there might be snippets you've used before rather that reinvent the wheel you can use. So the template for drawing these maps, I've used probably for about a year now. So I'm sure that language is reused, but in terms of, you

know, making sure that everything does what it needed to do here, it was all examined and executed on my computer.
Q You said that you may have used snippets in your code that you've used before, and one example you gave is the template for actually drawing the maps. Are there other examples of snippets of the codes that you used in this case that you have used previously?
A I'm sure there are. I just -- I'd have to think. I'm kind of trying to think through the code. You know, the dot plots -- well, that's part of the maps. The dot plots, I've used the code before. The call to pull up the open street map background, I've used before. I think those are the main things that would have been important, but gosh, there's just stuff that like -- well, there's a couple of -- in the R code at the very top, there's called source get packages and then, source -- there's another source command that will pull up the census data or ways to interpret the census data. So that would have been used before, and I'm sure there are other

things here and there that rather than try to reinvent the wheel, you would just import the code from a previous application, but those are the main ones that I can recall.
Q When you say you've used these snippets before, is that in other expert work, or is that in your other either academic work or professional work?
A I mean, probably both. So now, whenever I open up R, I always just execute that get packages command, because it imports all the packages that I typically use, because it's really frustrating to write a bunch of code and then execute it and have it crash, because you forgot to load the geomander G-E-O-M-A-N-D-E-R, package. So there's really not a clean delineation that this line of questioning might suggest.
Q How have you used this code -- let's focus on the academic work. How have you used this code in your academic work?
A Well, like I said, I tend to use the get packages command just as a matter of course. To pull up the background for the maps, the stuff that's borrowed from open

street maps, there's a script called gets the tiles that anytime I'm making a map, I'll use that script. So yeah.
Q I'm going back to your preparation for your expert report. Did you read the pleadings in this case?
A No.
Q Did you read any of the intervention papers in this case?
A No.
Q How many hours did you put into research and writing for this case?
A I don't know.
Q Do you have a ballpark estimate?
A No.
Q Would you say it was less than 20 hours?
A I honestly don't even have a ballpark. And I'm sorry, but this is just a process that's gone on, you know, over the course of a year. So I definitely couldn't do it that way.
Q Have you billed any time on this case yet?
A Yes.

Q Do you know how much time you've billed on this case so far?
A No.
Q Did you send the bill to counsel?
A Yes.
Q Okay, and you have a record of that time?
A Yes.
Q Do you recall when you last sent a bill to counsel?
A Probably August.
Q Do you recall what time you included in your August bill?
A I think it went back to November.
Q Do you recall how much time you billed for in your August bill?
A I want to say it was in the neighborhood of 120 hours.
Q All right, so we actually are going to open another exhibit. Give me one second. I've seen various versions of these, but this was the version that was submitted with what is Exhibit 3 in this case, so with your initial report, and this is your CV. It was from this summer. So this is your CV as of

this summer that we received. I'm just going to scroll through.
MS. THOMAS-LUNDBORG:
I'm going to have this exhibit marked as Exhibit 14.
BY MS. THOMAS-LUNDBORG:
Q Do you recognize Exhibit 14 as a true and accurate copy of your CV?
A Yes.
Q I think you said you have it in front of you, but I can also scroll on the screen. Are there any updates to this version of your CV?
A Let's see. Yeah. The New Mexico redistricting case, I've been deposed in now and will be testifying tomorrow or Thursday.
Q Anything else?
A I guess the report in the Congressional case here.
Q Is there anything else?
A I don't believe so.
Q Could you give me a brief overview of your educational background?
A Sure. I graduated Yale University in 1995 with a double major in history and

political science. In 2001, I graduated from Duke Law School. While I was at Duke, I also earned my master's degree in political science. In 2016, and -- I apologize for having to say it this way, but I matriculated at the Ohio State University. I earned a Master's of Applied Statistics from OSU in 2019, and I should earn my -- have my Ph.D. in December, December 17th to be exact.
Q So I'd like to just ask you a couple of follow-up questions. You have a JD. Do you intend to render any legal opinions in this case?
A I won't be acting in any capacity as a lawyer, and I'm going to try to avoid legal opinions.
Q Then, you mentioned your Ph.D. graduation date. Do you recall being deposed in South Carolina?
A Yes.
Q Okay. In April of 2022. At that time, you testified that your expected graduation date for your Ph.D. program was May of 2022. Do you recall that?
A Yes.

Q What happened regarding your graduation?
A I wasn't able to complete the third paper as quickly as I'd like, and things got incredibly busy on the work front.
Q I believe when you and I met back in -- well, forever ago in 2018, your third paper was on the efficiency gap. When did you change your third dissertation topic?
A I believe I changed it after the Rucho opinion came down. It might be after Gill v. Whitford, but I think it was after Rucho.
Q I believe you defended your dissertation yesterday; is that correct?
A That's correct.
Q How did that go?
A Great. I passed or completed it or however you want to word it.
Q Congratulations.
A Thank you.
Q Who was on your committee?
A My adviser is Greg Caldeira C-A-L-D-E-I-R-A, and then, the committee is Alex Acs, A-C-S, Tom Wood and Jim Gimpel,

G-I-M-P-E-L.
Q When did you formally form this current iteration of your committee?
A Oh, gosh, the current iteration was about two weeks ago. Jim came onboard -- we had -- it was Greg, Tom and Jim. So the original committee that was formed was Greg, Tom and -- Skyler Cranmer agreed to only do it for purposes of the prospectus; and if I'm getting my timeline right, because it's been a long strange trip, he was replaced by a guy named Bryce Acree, A-C-R-E-E, and then, Bryce committed suicide in December of 2019, and so it took awhile to find someone to replace him, and that's how Jim came on; and then, Alex came on a few weeks ago, because it turned out, you need three Ohio State faculty members on your committee. There was some confusion on reading the rules on external faculty members, and so he was added. I guess it was over Labor Day that he came on. So yeah, that would be about three weeks ago.
Q Sorry to hear about Professor Acree.
A Thank you.
Q I think we've already gone over the

chapters of your dissertation. I believe when I deposed you five years ago, your plan was to publish your chapters. Have any of those chapters been published in any peer-reviewed publication?
A No, I haven't submitted any of them.
Q Have you submitted any work for peer review.
A Yeah. Two papers.
Q And what's the status of those papers?
A One of them is on my CV -- when you say papers, do you mean the papers from the dissertation or just in general?
Q In general.
A Yeah. So one of them is on my CV, and one of them was a piece on COVID that I did with a couple of public health professionals that sat on a desk until someone else published the same research, at which point, it was pretty much moot.
Q You said one of them is on your CV. That is the -- on page six with James Gimbel and Reeves and yourself, "Reconsidering Bellwether Locations in U.S. Presidential

Elections." Is that what you're discussing?
A Correct.
Q On your CV, it says that it's forthcoming, but it also has a 2022 date. What is the status of this publication?
A I'll have to check to see if that should be updated. Yeah, it should have been published by now.
Q Are you aware of whether it's been published?
A No. I have to check the status of it.
Q What's the subject matter of this publication?
A Bellwether locations. Counties that predict presidential elections well.
Q Does this publication involve compactness?
A No.
Q Do you have any other publications currently pending publication?
A No.
Q Now, I believe you said that the code you used is R, correct?
A That's correct.

Q Do you write code in any other languages?
A I've done some coding in Stata S-T-A-T-A. Or Stata if you prefer. Those are the main languages for coding.
Q That you coded?
A That I coded, yes, sorry.
Q Because there's also Java, C-plus-plus?
A Correct. Python.
Q Have you written any code as part of your Ph.D. dissertation?
A Yes.
Q And what code is that?
A That was in R.
Q Was it this map code that we discussed earlier, or did you write different code for your Ph.D. dissertation?
A Different code.
Q As part of your Ph.D. dissertation, did you write any algorithms that are similar to the algorithms that you used in this report?
A Yes.
Q And what was that?

A So for the third chapter on communities of interest and redistricting, I wrote code for constructive Monte Carlo simulations. So when you're trying to generate compact districts with a constructive Monte Carlo simulation, you build the districts out by finding precincts that have centroids that are close to the centroids of the main district. So that's similar to one of the approaches utilized in finding a population compactness.
Q But it sounds like in your dissertation, you're actually running simulations. Do those simulations create maps?
A Yes.
Q Do they create maps for whole sets of geography? So what I mean is if, for example, your simulation would be run in this case, you would have created a whole map for the Louisiana Senate?
A Yes. It could be used to generate map -- whole maps for the Louisiana Senate.
Q And the same thing for the Louisiana House?

A Correct.
Q And as part of your dissertation, you are, in fact, running simulations to create whole maps; is that right?
A Correct.
Q Have you ever presented at an academic conference regarding redistricting?
A No.
Q Have you ever presented at an academic conference regarding voting rights?
A No.
Q I think you just mentioned that the algorithm you used is based on MCMC, which is Markov Chain Monte Carlo, right?
A It's a constructive Monte Carlo. When people talk about Markov, MCMC approaches, I usually think of the kind of the flip programs where you iterate through the map and flip precincts in and out. It's a constructive Monte Carlo approach.
Q If I use MCMC, will you understand that to be constructive MCMC? Will you understand that to be the same thing we were just discussing?
A Yeah, as long as you get the word

"constructive" in, I'll know what you're talking about.
Q Have you taught constructive MCMC?
A Yes.
Q And in which course was that?
A My voting rights -- my voter turnout and participation class.
Q How do you teach it in that class?
A We talk about -- well, a good portion of that class covers gerrymandering. So we talk about redistricting simulations and the various approaches that have been taken. I usually demonstrate the constructive Monte Carlo since you can actually put it up on the screen and draw a map every time a district flips so they can see how the algorithm works. I always think it's way more interesting than they do, but --
Q Do you teach students to run constructive MCMC, or do you just demonstrate it?
A No. I teach how it works and demonstrate it.
Q You teach students to write their own constructive MCMC codes?

A No.
Q Have any of your courses taught coding as part of the course?
A Yeah. So the -- there is one other update that should be on this as I look this over, which is -- so the political participation and voting behavior I taught in springs of 2022 and 2023, as well; and in the fall of 2022, I taught a course -- I can't remember the name, but the gist of it is survey methodology; and in both of those courses, students have to do a fair amount of R coding to be able to pass.
Q Now, I'm going to shift gears slightly. Can you give us a brief overview of your professional background?
A Starting when? I'm old now.
Q Well, that's why I said brief. So I know that you were a lawyer prior to your current kind of iteration. So just a summary of the facets of your professional life.
A Yeah, I practiced law until 2009, when I switched over to RealClearPolitics. I've been writing full-time at RealClearPolitics -- I guess it was 2010 I

switched over formally. I been writing full-time for them since then. You know, I've always had side projects, which RealClearPolitics has been fine with along the way, but that's been my main employer. RCP has been the only employer I've had a W-2 from since 2010 is perhaps the cleanest way to do that.
Q What is RealClearPolitics?
A RealClearPolitics is a company of about 50 people that produces a website that publishes daily.
Q And how would you describe the nature of the content on RealClearPolitics?
A Well, most of what we do is aggregation. So we'll aggregate poles. We aggregate articles from across the political spectrum. We do produce some original content, which is part of what I do, but it's mostly polling and elections focused.
Q And then, when you say you produced original contents, would that content be considered peer-reviewed?
A No.
Q And is your work at RealClearPolitics

still considered full-time?
A Yes.
Q I'd like to, if you have the time, just go through a couple more questions about your background, about prior testimony and then, we can take a short break.
A Sure.
Q So staying on Exhibit 14, your resume pages four through six lists the cases that you've served as an expert witness; is that correct?
A Yeah, with a couple of additions we discussed earlier.
Q Okay. Do you have a process for updating this list in your resume?
A Usually, when I'm getting ready to submit the report, I'll add new cases on. That's usually how I do it. And then, this resume just kind of gets cut and pasted from report to report with the updated cases on it.
Q I see that you have some demarcations of the subject matter of the expert testimony. Do you distinguish between cases where you wrote reports and cases where you testified live in court?

A I think this is all the cases where I wrote reports, but there may be other ones that I missed. I know the rule is cases where you've been deposed or testified, but I don't know. I just put it all on there. It's also, I guess, only the last four years, but that's a pain to keep up with too.
Q Do you know how many of these cases you've actually testified in court?
A Most of them.
Q But there are examples here like, I believe you did not testify in court in the Philip Randolph Institute v. Smith case?
A That's correct.
Q Are there other examples that you can recall?
A I didn't testify in court in Dixon v. Rucho, and I guess I would say in both of those cases, I wasn't called. I didn't testify in Carter v. Chapman because we were just amicus there. Didn't testify in NAACP v. McMaster because the case settled before we went to trial. I haven't testified yet in LULAC v. Abbott because that case hasn't gone to trial yet and the same is true of Agee v.

Benson. You know there is another case which is a Dodge City case. I think Coca is the name of it that I put a report in and been deposed on.
Q Are you familiar with the term "Daubert motion"?
A Yes.
Q Have you ever been the subject of a Daubert motion?
A Yes.
Q Do you recall which of these cases you may have been the subject of a Daubert motion?
A I mean, most of the early cases, it was at least -- I had Daubert motions filed against me. I don't think there was one in Feldman. I'm not sure there was one in Hobbs or Mecinas. Wasn't one in possibly Yaqui Tribe v. Rodriguez, and that's become less common in the more recent cases but every now and again.
Q Do you remember the case where you may have been the most -- let me strike that. Let me rephrase. Do you recall which case is your most recent Daubert motion?

A I can't remember if they filed one in the McMaster case or in the state racial gerrymandering case in South Carolina. I can't remember if they filed one in Jacobson. Well, I guess Montana, that case would be state court. So it wouldn't be Daubert, but so yes, if there's one in either of the South Carolina cases, that would probably be the most recent.
Q In the cases where you've testified in court, do you ever -- strike that. In cases where you've testified in court, has the court ever found your testimony unpersuasive to your knowledge?
A Yes.
Q And in which instances was that?
A So in the a -- in Feldman, the judge didn't seem to like any of the expert testimony. It wasn't struck, but he didn't find it terribly persuasive. The recent South Carolina case, the judges didn't find it persuasive. I'm sure there's others.
Q Now, looking at your resume, you again demarcated the subject matter generally of each case. How many of your prior cases

have been Section 2 Voting Rights Act cases?
A Well, the Dodge City case is a Section 2 case. The Agee v. Benson case is a Voting Rights Act case. The LULAC v. Abbott is a Voting Rights Act case, at least in part.
Q Sorry. Go ahead.
A I'll just say I can't remember if McMaster had a VRA component or either Rucho or the Covington cases had VRA components. I assume when we say Section 2, you mean Section 2 redistricting cases.
Q I think for the general question, you can tell me all Section 2 cases, and then, we can drill down on which of those were vote denial versus votes dilution. Are there any cases that we haven't mentioned that would have been vote denial?
A NAACP versus McCrory, the two Southern District of Ohio cases, Lee versus Board of Elections, Feldman, which eventually became Brnovich. Mecinas v. Hobbs. The Rodriguez case in Arizona, I think was a Section 2 case.
Q Then, you said of the vote dilution cases, I count three Dodge City, LULAC and

53

then, Acee v. Benson, I'm probably pronouncing that incorrectly.
A Agee.
Q Agee?
A I think the "G" is soft, but for the court reporter, it's A-G-E-E.
Q And have any of these cases proceeded to a final judgment?
A No. The trial in Agee is in November, but it hasn't gone to final judgment yet, and we're still kind of waiting in LULAC.
Q And what is the timing on the Dodge City case?
A Oh, yeah, the Dodge City case, I think, goes to trial in February.
MS. THOMAS-LUNDBORG:
All right. I think with that, we can take a five-minute break. Thank you for powering through this kind of first hour and 15 minutes. Thank you for bearing with us.
THE WITNESS:
Thank you.
(Recess taken.)
BY MS. THOMAS-LUNDBORG:

54

Q I'd like to just ask you one follow-up question about your background. Is there anything else that you need to do to meet your December 17th graduation date?
A My committee members need to sign the form, and -- if they haven't already done so. I didn't check this morning. File my application to graduate and application for exam. There may be like some more paperwork, but I don't think so.
Q You said file your application for exam. What is that?
A I filed it. I'm sorry.
Q Oh, you filed it.
A Yeah.
Q So it's just a form by your committee members is all that's needed?
A That's my understanding. Like I said, there may be some other paperworks, but there's no revisions that have to be made to the dissertation or anything like that. It wasn't a conditional pass.
Q So I'd like to go back to your work in this case. We spent sometime just before break discussing Section 2 and Gingles, and we

55

have discussed your case law related to Section 2. Sorry. Have you ever used the exact analysis you're proffering here in another case.
A No.
Q Are you aware of any court accepting the exact analysis that you are proffering here in another case?
A No. I'm not aware of other cases where the lawyers have wanted to argue about population compactness.
Q I think we spent some time earlier discussing the fact that you were critiquing a Gingles 1 expert; is that correct?
A That's my understanding, yes.
Q Is it your understanding that a Gingles 1 expert must draw a whole map?
A I don't -- I actually don't know the exact answer to that. I thought I did once, and then, there was that 2018 Supreme Court decision that was in the Fourteenth Amendment context, but I don't know if it has any implications for Gingles 1.
Q So just to be clear, you're not sure that whether a Gingles 1 expert must show that

56

a majority-minority district can be drawn within the whole configuration of the state or not?
A I'm not sure.
Q Are you familiar with the term "traditional redistricting criteria"?
A Yes.
Q What are traditional redistricting criteria?
A Well, if you ask different people, you'll get different answers, but they are qualitative factors that people have traditionally -- I hate to make an ipse dixit, but that people have traditionally used to evaluate districting maps. I guess theoretically to draw them, as well. So things such as compactness and contiguity and so forth.
Q Can you name other traditional redistricting criteria? I think you just named contiguity and compactness?
A Yeah. I mean so equal population -- the way it's understood today isn't necessarily traditional criteria, but some degree of ethnic population is. Communities

of interest, some states -- I know Dr. Chen has suggested that that shouldn't be considered one, or at least that's my understanding of his article on the subject matter. I don't know that the Voting Rights Act is a traditional redistricting criteria. I'd probably put it in that bucket now since it effects all the redistricting decisions but, obviously, you know, not before 1965 or '82.

Q What about respect for county and municipal lines?

A Yeah, yes, respect for county and municipal lines.

Q You said that One Person One Vote could be one. Are you aware of -- could you expound upon what One Person One Vote means?

A This is a legislative case. So the maps have to be drawn within plus or minus five percent. Even that's not quite necessarily a safe harbor. There's that case out of Georgia -- I'm blanking on the name right now -- that struck down a map that still fell within those numbers, but basically, you can feel pretty good about your math if you're

within plus or minus five percent, and you're probably going to get struck down if you go outside of that.

Q I'm sorry. I'm just going to grab my charger. So we're not taking a five minute break. I just need one second to plug in my computer.

So going back to traditional redistricting criteria, would you agree that there is a tension between meeting the various traditional redistricting criteria?

A There can be, yeah. Frequently is.

Q Would you also agree that in drawing maps, tradeoffs are simply inevitable between traditional redistricting criteria?

A Yes.

Q When you began your expert work in this case, was your goal to capture compactness only or other traditional redistricting criteria in your analysis?

A My goal was -- well, like I said, I honestly don't remember what I was doing at the very beginning, because that was a fire drill situation; but at least once the dust settled and the stay was in place, my job was

to determine whether the populations in the districts were compact -- the minority populations in the districts were compact.

Q Did you consider other traditional redistricting criteria in answering this question?

A No. I just looked at each district that was drawn and the minority population within it.

Q Do you know whether Louisiana has mandated through legislation that traditional redistricting criteria be used when drawing maps?

A There is certainly a list of factors that have to be examined. I don't know or recall exactly which factors are on it.

Q Okay.

MS. THOMAS-LUNDBORG:

I'm going to introduce another exhibit. I am going to have this mark as Exhibit 15. So what I've put on the screen and what I'm having marked as Exhibit 15 is Joint Rule 21. As you see the top, I downloaded this directly from the Louisiana

laws, Louisiana State Legislature website we all have been using, and you can see the web address at the bottom of the exhibit. We all have been using this version throughout deposition. I'd like to look at some of the traditional redistricting criteria here briefly.

BY MS. THOMAS-LUNDBORG:

Q Actually for a second, I'd like to go back to Cooper's July 23 report. So this is Exhibit 5.

A Is this the first or second report?

Q Technically, it's his second report in that he has a June report, a June 2022 report, but I am going to just focus on the 2023 reports for the purpose of your deposition.

A Okay.

Q I'm now going to page eight, paragraph -- no, I think I'm in the wrong -- well, it's page seven spilling over to page eight. So at the top -- bottom of page seven, beginning in paragraph eight, he states, "I drew the Illustrative Legislative Plan based

on traditional redistricting principles, including population equality, compactness, contiguity, respect for communities of interest, and the non-dilution of minority voting strength. I followed the guidelines spelled out by the Legislature in Joint Rule 21, the legislative guidelines for the 2022 map," and then, there's citation. Do you see that?
A Yes.
Q When you were conducting your analysis, were you aware that Mr. Cooper -- do you recall reading this paragraph?
A I don't recall it, but I'm sure I did.
Q Were you generally aware that Mr. Cooper was using Joint Rule 21 when drawing his map?
A I don't know if I was aware of that, because I wasn't really looking at his compliance with state law.
Q Do you know what effect incorporating traditional redistricting criteria would have had on your analysis if you would have included it?

A None.
Q I think we'll explore that answer some more. I'll stop the share now. Now, you said that you were asked to look at the compactness of the minority community; is that correct?
A Yes, of the minority voting age population.
Q How did you define compactness when beginning your work?
A So for the population, you can't really use the Reock or Polsby-Popper, because those types of measures -- Reock is R-E-O-C-K. Polsby-Popper is two hyphenated names -- because those deal with the shape of the district, not with the shape or density of populations within the district. So I used the only approach to population compactness I'm aware of, which is this moment of inertia approach.
Q And I think you testified no in the past, but are you aware of any other expert in a Gingles 1 case using this moment of inertia analysis when looking at compactness?
A No, I'm not really aware of cases

where people have tried to quantify the compactness of the population, but this is the only measure of population compactness I'm aware of.
Q Are you aware of cases where -- I think you just mentioned Reock and Polsby-Popper -- where Reock and Polsby-Popper have been used in a Gingles 1 analysis?
A Yeah. So you'll frequently use Reock or Polsby-Popper to measure the analogies, Reock and Polsby-Popper, convex hull, to measure the compactness of the district lines themselves, but I'm not aware of them being used to measure the compactness of populations.
Q You've used Polsby-Popper, convex hull and Reock in cases -- in instances where Section 2 compliance is important?
MR. STRACH:
Objection. Go ahead.
THE WITNESS:
Yeah. I think that's right but only to measure the compactness of the district.
BY MS. THOMAS-LUNDBORG:

Q Would one of those instances be your work in Virginia?
A So we never did a full Gingles analysis in Virginia. So I'm -- I have to be careful what I say, because I know there's a published report on that, but I did also sign a confidentiality order. So I can't stipulate that the Voting Rights Act is important, because I don't know whether Section 2 is triggered. I assume at least in some places it is, but we did use, I think, Reock and Polsby-Popper there, maybe, convex hull if we're looking at the compactness of districts to comply with the state law mandating compact districts.
Q What about in Arizona?
A Yeah. In Arizona, we used Reock and Polsby-Popper. There may have been a third metric there to measure the compactness of districts.
Q And Section 2 compliance was at issue in Arizona?
A Yes.
Q I have a question about how you conceptually approached this idea of

compactness of the minority population. When looking at your figures, I noticed at multiple times you used the term "most compact," and actually, rather than speaking from memory, let's get an example up.

A I can stipulate to that.

Q Okay. You recall that without me needing to put it in front of you. What did you mean by most compact?

A Within a district, it is the group of minority voters who could constitute 50 percent plus one of the district's voting age population, and it's the group that had the smallest moment of inertia metric.

Q Is it your understanding that the Voting Rights Act requires districts to be drawn at their most compact level?

A No. The question is if you're going to make a determination about -- let me step back. Within a district, there may only be one group, because some districts, you need every black individual of voting age that Cooper identified to meet the threshold in the district; but in a district like the far northwest of Louisiana, north of Shreveport,

where I think the BVAP was around 55 percent, there are multiple ways you might describe the group within the district that gets you to 50 percent plus one. So the question in my mind was okay, what's the best case scenario for Mr. Cooper? What's the most compact cluster of minority voters that could constitute 50 percent plus one of the district's voting age population?

Q Is there any peer-reviewed local science literature on this most compact concept?

A Well, yeah, the point of the redistricting simulations that I cite to that were using population compactness was to draw an optimized plan that minimized compactness, and so they were trying to draw using the moment of inertia method, the most compact districts they could.

Q Is it your testimony that those articles -- and I can look at one of them -- uses most compact concept in the exact same way that you do?

A Well -- no, they weren't using it for Section 2 compliance, but they were using it

to identify compact populations.

Q So let's spend some time talking about moment of inertia, which you previewed for us, and I do want to get your report up. So give me one second to pull it up. Let me share my screen. So I'm going to go to page 15 of your report. I want to make sure that we're looking at the right thing. Give me one second. This first full paragraph of the moment of inertia approach, I think this is where you preview what you've described as the moment of inertia. Could you just tell us now in your own words what the moment of inertia approach is that you use here?

A Sure. If you have like a bike tire and you want to spin it, you spin it right on the center of the tire, and the reason is that the bike tires are perfectly balanced, and so the place that spins is in the middle. Let's say the top half for whatever reason of the bike tire gets -- it's made of lead. It's no longer going to spin around that center axle, right. You're going to spin it once, and the lead part is going to drop to the bottom. The reason is the mass isn't equally distributed

anymore. So the centroid, the physical center of the tire is no longer the spinning point. The spinning point is going to be much lower down in the area of the bike tire. So that's, basically, what the moment of inertia is trying to find. It's the point that the -- it's the center of the mass in some ways of the object. So the way you calculate it is you find the sum of square distances to the district center and go from there.

Q Okay.

A So it punishes outliers, right, because you're squaring the distance as you even square there a loss. So that's a portion of it, but it, basically, a way to use the weighted square distances from the center.

Q I noticed that in your report, you've referred to the moment of inertia as a metric and also as a method. Is there a difference between a method and a metric?

A You know, when I used them -- I guess when I used it, I probably had in mind the method being the algorithm to calculate it, and the metric as the actual output, but I don't think -- there's no great importance to

the difference when I used them.
Q Well, what in way is moment of inertia a metric?
A Because it will give you the sum of squared distances of individuals from the district center, which is the moment of inertia, and you can use it to compare across different iterations to see which has more a compact population.
Q Now, you said it gives you the sum squared of districts. How is that output actually relayed in your report? Is it relayed through a number?
A It's some squared distances. No, it's stored in R.
Q So then, how do you relay the final metric in your report?
A It's the district -- it's relayed with a map. It's the district with -- it's the group of black voters of voting age within the district with the smallest moment of inertia, and it can be recalculated through the R code that I provided.
Q You said you linked through map and the purpose was to compare across districts;

is that correct?
A Within districts across clusters.
Q Within districts across clusters. Is there a way to compare across districts using this metric?
A I'm sure you could, but I didn't do that.
Q How would you do that if you wanted to compare across districts?
A You could look at the moment of inertia for District A for the most compact block of black population and then look at it for District B. If someone wanted to do that, the code is there for them to extract those particular numbers, but I was not doing comparisons across district. I was just identifying the most compact black populations sufficient to constitute 50 percent plus one of the district's voting age population in each district.
Q Okay, and if I want to compare across districts, in your code, would it spit out a numerical output that I could compare, or would I have to look visually at the two maps to do that comparison?

A It would be -- I believe it's stored in memory.
Q Right, but what's stored in memory? Is it visual depiction of the map, or is there an actual number that could be used to compare across districts?
A The number is calculated at some point, and I think it's stored. You might have to edit one of the functions to return the moment of inertia value instead of the map, but it gets calculated over the course of the -- actually no, you could just run the function by itself and not with the function call, and it would give you the value.
Q If I wanted to compare two moment of inertia values, how would I do that? How would I know which value was giving me a more compact value and which value was giving me a less compact value?
A The smaller value is more compact.
Q Did you for any of these simulations that you've read here report the moment of inertia values?
A No, because I wasn't doing cross district comparisons I was just looking for

the most compact population within each district.
Q Right.
A What's the best case scenario for Mr. Cooper's maps.
Q Right. Did you do any comparison of Mr. Cooper's map and values to the enacted map on the moment of inertia method?
A No. I don't know whether any of the districts in the enacted map are VRA compliant. So I don't even have that baseline to go off of.
Q Do you use the moment of inertia metric or method as you have described here today in your dissertation in that Chapter 3?
A No, because the dissertation Chapter 3 isn't dealing with the Voting Rights Act.
Q Have you published any peer-reviewed academic research on the moment of inertia method or metric as you've described here today?
A No. The moment of inertia method slash metric is one of the oldest in the compactness literature for determining the

compactness of a population. I haven't published my own peer-reviewed literature, and I doubt it would be publishable since this is such a venerable method for evaluating population compactness.
Q You say it's one of the oldest, but has it appeared in any of the many Gingles's cases that you're aware of?
A No, because from my understanding, the legal approach hasn't really been to explore population compactness. As I explained in my rebuttal report, up until fairly recently, it would have been extraordinarily computationally demanding to the point where it probably would have been infeasible to do it until fairly recently. So no, because my understanding is that the legal theory being propounded here isn't one that's been thoroughly explored.
Q Great. So just picking up on the last thing that you said, how long has -- well, let me ask a different question. Did your algorithm calculate moment of inertia for the whole map or just for the selected districts that you were asked to study?

A I only calculated the moment of inertia for minority populations within the remedial maps that -- or within the demonstration maps that would have been new VRA compliance suggested new VRA districts.
Q And how long have experts had access to computers that could calculate the moment of inertia for a handful of districts?
A Well, I have a pretty state-of-the-art computer, and for a state Senate district to iterate through the different precinct's starting points, probably takes a half hour. So I guess it depends how big your districts are and how much time you have, but the first redistricting simulation to do -- the first published redistricting simulations over statewide maps were in the 1990s. When you go back to like the 70s and 80s, they're only doing it on 40 precinct blocks. So it would be fairly recently that you would realistically be able to do this.
Q What do you mean by fairly recently? Are we talking the last 10 years?
A No. I assume you could have done in on a state district in maybe, the last 20,

done it efficiently.
Q Are you aware of any cases in the last 20 years where the moment of inertia was calculated in the way that you've calculated it here?
A Well, again, I'm not the lawyer in this case, and I haven't done the thorough legal research that I'm sure the lawyers here have done. To my understanding, this is not a legal approach that's been explored at least recently. So no, I'm not aware of any, --
Q Okay.
A -- but that's something I would have left the lawyers to research. All I knew is that when you're trying to measure the compactness of a population, this is the way to do it.
Q Great, but even in your own redistricting work in which Section 2 compliance may have been at issue, you have not run moment of inertia in other instances?
A Well, when I did the work for the Arizona case, I wouldn't have been familiar with the moment of inertia approach yet; and in the other cases, I wasn't asked to look at

population compactness.
Q Okay.
A It was hinted at in the Texas case, and in that -- as I talk it through, in that Kansas case. In that Kansas case, -- well, I can't get into why we made choices that we did in that case; and in the Michigan case, we're plaintiffs. So, obviously, we think our demonstration maps have compact minority populations, and the segregation in Michigan is so stark, it's almost impossible not to.
Q So you said in Texas, it was hinted at, but you didn't actually run the moment of inertia analysis that you ran here in Texas?
A No. No, that was a 200 plus page report and a lot of issues to cover, and so population compactness -- I got pressed in my deposition about ways to measure population compactness, metrics for it, but I didn't have time to actually run it.
Q So I think you've mentioned that you partly came up with this moment of inertia approach based on what you were asked to do by counsel; is that correct?
A Counsel asked me to explore

population compactness, because their interpretation of the Voting Rights Act is that it requires compact minority groups. I'm guessing defense disagrees with that. I was asked how would you do it, and I, in the course of doing research for my dissertation, had come across the moment of inertia approach, because that's the metric that the earliest redistricting simulations were using. So I was familiar with it. So I didn't come up with it at the invitation of counsel. It's a question I was asked, and I at least had some sense of what the answer was from my outside research.
Q You said you came across this research in your research for your dissertation, but did you actually use the algorithms that you're using here in your dissertation?
A No. No. I was aware of how you would measure population compactness, because the articles that I cite here are all articles that I came across in the course of my dissertation research, and so the algorithms are described within the articles, or at least

how to calculate the moment of inertia. So after being asked well, how would you find a compact population, it was a matter of going back to the articles, seeing the metric and then coding the metrics up.
Q Now, in your report -- and I can put it back up if it's helpful -- you discussed two separate algorithms; is that correct?
A That's correct. I have a hard copy in front of me now. So I can flip back and forth as need be.
Q I believe the first algorithm, you said weights BVAP, and you're seeking to pair -- use the moment of inertia to pair clusters until you reach a 50 percent BVAP; is that correct?
A Fifty percent plus one, yeah.
Q Fifty percent plus one, yeah. Does this method, the first method, have any limitations?
A Yes. So one limitation of it that's discussed in the literature is that it will tend to avoid -- if you have one densely populated area, it will tend to avoid other densely populated areas and skirt them,

because going into these other densely populated areas will move your moment of inertia substantially. So that's a known issue with it.
Q Are there any other limitations?
A Not that I can recall sitting here.
Q I'd like to -- and maybe, this will jog our memory about what potential limitations could be. I've put your report back up. I'm going to move to page 17. This is Figure 6. Let me zoom in a little bit, but you have in front of you. So maybe, we're fine. That seems to be the whole figure. So this is -- I believe, your testimony was the output of your moment of inertia were these maps; is that correct?
A Yes.
Q And Figure 6 is the output of your first algorithm, which weighed BVAP; is that correct?
A That's correct.
Q And the black lines, it's my understanding, that was the district that Mr. Cooper drew?
A Yes.

Q And then, the dotted line is -- the dotted lines -- are the lines that your algorithm determined was the most compact area within that district?
A That's right.
Q And then, there are other blue dots. What are those other blue dots represent?
A Every blue dot represents, I believe, 10 black residents of voting age.
Q Is it exactly 10? Do you know?
A No. No. It wouldn't work that way. Most of them would be exactly 10, but because you have to round, the last one -- if there's only one in a precinct -- or the last one in the precinct may not be 10.
Q And the orange, what does that represent?
A White residents of voting age, 10 as well, with the caveat that the last one may be rounded.
Q Looking at the blue and orange, the orange just visually looks larger to me, but do the blue and orange dots represent the same population size?
A They represent the same population

size. The reason that the orange is larger is because the blue is overlaid -- when you draw these maps, you draw them in layers, and since we're mostly interested in the black voting age population, that's layered on top of the white population; and so to minimize the effect of overplotting, you make the orange dots a little bit larger, or the orange "X"s a little larger, and that allows them to stick through and avoid some of the overplotting concerns.
Q So you said you made the orange dots a little larger. I think that means -- or at least my understanding is in your code, you set the alpha code, the orange process to one and then the blue dot to point five. Does that sound correct?
A The alpha in the code determines the transparency, not the size.
Q Okay. But is it correct that in addition to the sizing that you just mentioned, the color the transparency is one for the orange and point five for the blue?
A That's right, because you're layering the blue on top of the orange, making the blue

somewhat transparent. All it does is lighten the color a bit, but it also allows some of the orange to show through. Again, if you have a blue dot and an orange "X" that are the exact same size and the blue dot has the same transparent as -- is opaque, which is the alpha one, that orange "X" will be completely covered. So these differences are to allow you to understand that yes, there are still some white individuals that live in these heavily black areas that you would not otherwise be able to see.
Q So looking at this visual depiction of moment of inertia through your code, do you know what the total population is within the blue dots, the blue dotted line?
A Can you ask that again?
Q Do you know what the total population is? Not just the black population. I know that you set the algorithm to meet black population threshold. Do you know what the total population is in this part of the map?
A No. I don't really know how that would be relevant.
Q Okay. Do you know -- looking at what

has been drawn, the figure itself does not appear to be contiguous; is that right?
A The cluster is contiguous.
Q Right, but they don't -- it looks like there are two doughnut holes in there. So it looks like at least the visual depiction seems to be an non-contiguous space.
A The group is contiguous. There's one doughnut hole in the group, because the idea isn't to -- you could include that grouping there, north of I think that's -- well, -- it's not Caddo Lake. I can't remember what the name of that lake is, but just to the north of the lake, you can include it, and that would make the moment of inertia method even less compact.
Q You asked me --
A I'm sorry. I'm sorry. I don't know where that second doughnut hole you referred to is.
Q Well, it looks like there are two right next to each other, and it probably just depending on the Zoom, there's like -- it looks like there's a closed hole, and then, above that is like another hole. So they're

right on top of each other, but that's the reference of two doughnut holes.
A So the one -- I guess, are you saying so -- I think we agree where that first one is just to the north of that lake. Are you saying there's another one to north?
Q They're right on top of each other, and it appears, when I zoom in, there's a closed hole, and on top of it, there's like a little triangle?
A I think that's just the boundary zigging and zagging.
Q I don't know that material, whether it's one or two visually -- to me, it appears to be two. Your testimony is that it's one. Regardless, it seems to be a non-contiguous space within the depiction, correct?
A Right. So the point here is not to draw the district. The point is to find the most compact black population. Perhaps, you'd need to make it even less compact. If you wanted to -- why would you even ever draw it as the group by itself, because that population is insufficient to maintain the population of a district? So this isn't

redistricting directly. It's a way of identifying a compact population within a district that's already been drawn.

Q I think you anticipated where I'm going here. This visual depiction would not, in fact, tell someone here's the most compact district, because it doesn't account for contiguity or One Person One Vote, and we don't know how many people you'd need to add have a full population of a district.

MR. STRACH:

Objection. Go ahead.

THE WITNESS:

Yeah. This isn't a metric for determining the district's compactness. It's a metric for determining the population compactness; and since you're only looking for 50 percent plus one BVAP, generally speaking, you're going to need to add additional population to fill out an entire district, but the whole point of this is, you know, I didn't just want to just look at where the black population of the

district is residing, because you can have a circumstance where, you know, you draw a district -- there are actually of couple of examples in here of this -- where you can draw a district that has a very compact black population that's capable of being 50 percent plus one of the district's population; and then, you just kind of go out into other areas, because you need One Person One Vote and there just happened to be black residents of voting age in that area that you go out into, and that's not something that is -- you know, that would want to follow the Voting Rights Act or would fail to satisfy the Voting Rights Act. So that's what this exercise is meant to do. You have this district that's drawn, and the district itself sprawls a bit, but we don't really care about that. We care about knowing if the black population that reaches -- if there is a black cluster that reaches

50 percent plus one of the voting age population that's reasonably compact.

BY MS. THOMAS-LUNDBORG:

Q I think you testified earlier that this is both a method and a metric. Using the metric portion of the moment of inertia displayed here, what numbers were you using to determine whether or not a population was sufficiently compact to pass your metric?

A Well, as I understand it, and it's admittedly been awhile since I practiced law, but reasonability is a question ultimately for the finder of fact to determine. So the finder of fact is going to have to decide whether it is reasonable or not. In my opinion, when you have a district that the most compact black population sprawls over heavily white suburbs, places where there appear not to be black residents and goes out into rural areas, where it picks up isolated pockets here and there, that's not compact under any reasonable definition of the term. The fact finder might ultimately disagree with that though.

Q But did you have a numerical metric

that you were using when making this determination, or were you looking at the map as we're doing here today?

A Looking at the map. You know, as Justice O'Connor wrote in Shaw, redistricting is an area where appearances do matter, and I don't think there's anyway you can look at this and say that is a reasonably compact population, but the fact finder might disagree. It's just the same way that a Polsby-Popper of point two or .21 or.22 is ultimately meaningless. You know, there's ultimately a question of reasonability when the court in Allen v. Milligan was talking about the demonstration districts there. They said we don't see strange appendages. It doesn't seem to be extremely distended. There's, obviously, judgment calls being made there that the court is comfortable with.

Q But Polsby-Popper and Reock, I think as you just mentioned, do give a numerical output that can be used by the court and compared across this district and the old district or this district and other configurations, correct?

A This gives a numerical output if you really wanted to go down that road, but at the end of the day, all the Reock score is telling you is what percentage of the area of the minimum bounding circle is being filled. I mean, okay, why point to or not point to .21 or .22? It all requires some degree of judgment call.

Q But again, the Polsby-Popper and Reock produced scores that are frequently actually recorded, and while your testimony today is that there is a recorded number for the moment of inertia, you did not provide those numbers in this report?

A No, but if you wanted to do a cross-district comparison, it would be easy do to do from my code. If you wanted to run it under any other district, all you would have to do is go into my code and change the district number that you're drawing the map for, but population compactness is one of those things, especially in the context of the Voting Rights Act, that's tricky to do across districts, because for example, some districts don't have -- most of the districts don't have

a 50 percent plus one black population. So you'd never be able to -- the process would run infinitely had that happened once or twice. So it's a different approach than you would get with something like Polsby-Popper, but at the end of the day, they all involve some degree of judgment call.

Q I'm going to put something else on the screen. I just want to make sure I get the right exhibit number. So I think you just testified that it would be easy to run your analysis on another district using your code and we did just that.

MS. THOMAS-LUNDBORG:

I am now sharing on the screen what I am going to have marked as Exhibit 16. This is a demonstrative exhibit where we did, in fact, run your code on one of the enacted map's districts. This is House District 62.

BY MS. THOMAS-LUNDBORG:

Q In your report, you spent some time talking about the changes that Mr. Cooper made in the Baton Rouge area. District 62 is one

of those changes, and I believe you also criticized the fact that Mr. Cooper redrew this district, District 62. Do you remember the part of your report where you discussed the Baton Rouge area?

A I remember the part of my report with the Baton Rouge area, but I don't remember what I said about District 62.

Q We can probably pull that up. Just give me one second. I am just getting myself organized. So I'm going to stop my share for a second, and we'll go back. I'm going to go back to your report. Just give me one second while I go to page 54. I'm on page 54 of your initial report, and I'll just read the first two sentences: "Mr. Cooper draws new black majority districts in the Baton Rouge area with Illustrative Districts 60, 65, 68 and 69. He then removes a minority-majority district that exists in the Enacted Plan: District 62." Do you see that?

A Yes, and so now, I can answer your previous question unless you had some follow-up you wanted to do before I get there.

Q You can go ahead.

A That's not a criticism of Dr. Cooper -- or Mr. Cooper. What's going on here is I was trying to figure out what the new districts were, and so there were to my view four new districts, but there were really only three additional minority-majority districts in the region.

Q In one of the districts that you note was changed in the Baton Rouge area was this district District 62, which I've now put back up on the screen. Do you see that?

A Yes.

Q Do you know, just going back to District 62, whether District 62 existed in its current configuration in the 2010 map?

A I don't.

Q Do you know whether District 62 crosses from an urban to suburban and rural population?

A It certainly does.

Q Does it surprise you that we were able to find in the enacted map a district like 62, which based on the eyeball test seems to fail your moment of inertia method?

A I think it clearly fails. Does it

surprise me? Kind of indifferent one way or the other, because there's lots of district I didn't look at. But I wouldn't defend this as a VRA district.
MS. THOMAS-LUNDBORG:
You know, I think we can take another five-minute break. I just -- so everyone on the phone is aware, if we keep going at this rate, I think I have another couple of hours, but I should be done after lunch. So my idea would be let's take a five-minute break now, and then, take a lunch break at 12:40ish for maybe, half an hour or so; and then, I would come back on the record, and maybe, only have an hour of time left, and then, I could turn it over to the Congressional folks. Now, that's assuming we're going at this rate. I'm assuming we're not going to get bogged down in this kind of next portion.
We can go off the record if we're not already off the record.

(Recess taken.)
BY MS. THOMAS-LUNDBORG:
Q So I'd like to shift back to your second algorithm. We spent some time before the break dealing with the first. So let me pull up your report again. In efficient use of my break, I did order lunch though. Okay, let's get this going.
So this is just by reference, I'm sure you recall, but on page 16, you claim that your second algorithm is based on a Chen & Rodden method; is that right?
A Yes.
Q In support of this second algorithm, you cite an article from Chen & Rodden from 2013 titled "Unintentional Gerrymandering: Political Geography in Electorial Bias and Legislatures" from the Quarterly Journal of Political Science; is that right?
A Oh, yes. It's similar to the algorithm outlined by Chen & Rodden, yeah.
Q And this is the primary article that you cite in support of this second algorithm; is that right?
A Correct.

Q Did you consult with any other sources to help you in your implementation of the Chen & Rodden method?
A No. This is the basic method that I used for compactness in my dissertation. So it was familiar to me from that.
Q Okay.
A It's useful, because rather than defining compactness by the district shape, it defines compactness by the distance between centroids; and while populations are point reference data and don't really have shapes, they do have centroids.
Q When thinking about how to implement the Chen & Rodden method for this litigation, did you discuss implementation with anyone?
A No. Other than the attorneys.
Q And I asked you this about the first algorithm, I'll ask it here. Have you written any peer-reviewed articles on the implementation of this second method?
A No.
Q Now, you write that your algorithm is similar to the Chen & Rodden method. Why didn't you use the Chen & Rodden method

itself?
A Because the Chen & Rodden method is used for drawing compact districts as such, and here, we're not interested in the district shape. We're interested in the population. So rather than using the centroid of the precinct, it uses the centroid of the population, because we're dealing with point reference data in trying to find the centroids there, not with areal data, A-R-E-A-L.
Q So to rephrase, you can tell me if I got this correct. The Chen & Rodden method draws actual districts where your method is not drawing districts in and of itself.
A That's right. We're both trying to find compact groupings by comparing distances between centroids, which is the basic approach. It's just a different application of how to do that. They're trying to draw districts. I'm trying to find compact populations. It's aeral units versus point reference units.
Q So let me just get that article up on the screen.
MS. THOMAS-LUNDBORG:

I'm going to have marked as Exhibit 17 the Chen & Rodden article that we were just discussing "Unintentional Gerrymandering "Political Geography and Electorial Bias in Legislatures," and I will scroll quickly through it for identification purposes.

BY MS. THOMAS-LUNDBORG:

Q The only one difference is I have highlighted in my version some phrases that we may have discussed together, but otherwise, do you recognize this as the Chen & Rodden article that you cite?

A Yes.

Q Okay. Now, this method is similar to the algorithm that we were discussing prior to the break. I think the main difference is that in the first algorithm, you weight BVAP, but in this algorithm, you're weighting the precinct size; is that correct?

A Let me just --

Q If you're looking at your report, I believe you describe the differences between the two on pages 15 and 16 of your report.

A Right, I'm looking at page 16. I just take this to be an important point, so I want to make sure I get it right. (Witness peruses document.) Yeah, that's right.

Q Okay, all right. So focusing on precincts for a minute, why did you decide to weight precinct size?

A Well, because, I have the lengthy definition beforehand of compact from around the time that the amendments to the Voting Rights Act were passed, talking about it being closely and firmly united, taking little space, relatively little, small, light economical model of the automobile not as relevant, but the idea being that compact means small areas, and so that was the weighting here.

Q But why is precinct versus some other form of geography percent?

A Well, you could run it off blocks, but it would take forever.

Q Do you understand precincts to be a static form of geography, meaning a form of geography that doesn't change?

A No, they change over time, but this

is how most maps are drawn is at the precinct level. I don't know if there's split precincts within districts in this map. So they're a good unit of mapping, almost certainly what Mr. Cooper was using when he drew his map; but if someone really wanted to challenge it and they had say a super computer, you could conceivably run it at the block level. I tried, and after a day, I gave up on the endeavor.

Q You said that precincts can change over time. Is it your understanding that they do change over time in Louisiana?

A Yes.

Q Do you know who's responsible for precinct changes in Louisiana?

A I don't.

Q And to go over some of the aspects we discussed in the first method, like the first method, the second method does not necessarily fully populate districts; is that right?

A Right, because the point isn't to draw a district. The point is to identify the compact population that could be 50 percent plus one.

Q We talked about the ways in which your method might be related to what Chen & Rodden did. I'd like to look at page 249 of their report of their article. So I'm on page 249, and I'll just read for the record the first highlighted part of this article. It says, "Our goal is to design a districting algorithm that uses only traditional geographic criteria of the kind favored by reform advocates. Our challenge is to guarantee equal apportionment of population while requiring geographic contiguity for all simulated districts, paying no attention to either voter partisanship or any demographic information other than simple population counts. Another concern is geographic compactness." Do you see that?

A Yes.

Q Based on their description of what they were doing here, it seems that there are a few key differences between your approaches there. Is that fair to say?

A There are a few differences, but I don't think they're key.

Q Well, one difference is they sought

to guarantee equal apportionment of population, and you did not.
A Well, they're applying it in a different way. They're applying it to draw district maps. What I'm taking is their concept of compactness.
Q Right, but they said that they sought to guarantee equal apportionment, and your algorithm did not.
A Right, because it's the concept of compactness that I'm borrowing from them, not the exact application, because they're using it to run redistricting simulations, but the compactness conception is still the same.
Q They also say that they are required geographic contiguity, and we at least saw the last algorithm. Your algorithm does not necessarily require contiguity; is that right?
A First off, the minority population is compact in the last map. Secondly, that's using a different algorithm than this one.
Q Do you know if this algorithm that the Chen & Rodden, your version of Chen & Rodden would guarantee contiguity?
A The minority group should be -- or

the most compact minority group should be contiguous.
Q Do you know that whether the output of your algorithm would guarantee a contiguous shape? We saw in the moment of what you're calling your moment of inertia algorithm, it did not guarantee a contiguous shape. Do you know if this algorithm would?
A Well, it does produce a contiguous shape. It can render other portions of the district noncontiguous that will have to be filled in when you actually draw the district; but as far as the most compact population cluster, that which is what we're interested in, that would be contiguous.
Q But would the output have noncontiguous shapes as we saw in the last algorithm?
A The area that's not necessary to constitute 50 percent of the population may be noncontiguous.
Q Okay.
A -- but the shape of the unit of interest, which is the most compact population of black residents of voting age sufficient to

be 50 percent plus one of the districts should be contiguous.
Q They also say that they did not pay attention to any demographic information, which I take to mean race included, but your algorithm did, in fact, take demography into account, correct?
A So in a sense. The algorithm that I have, when it's selecting precincts, isn't looking at race here. It's tallying race as it goes, because that's how the algorithm knows when to stop, but for this particular algorithm being an aeral-based metric, it's going to pay attention to, you know, making the district compact or the grouping compact as it builds out.
Q Okay. What role does increase in the weighting of precincts size play in your compactness algorithms?
A Well, since this looking is at compactness as a closely grouped area, it's trying to avoid sprawling precincts when it builds out the districts. Or not the districts. The clusters.
Q Have you ever been an expert witness

on the other side of Chen?
A Yes.
Q Have you ever in that expert work criticized the use of the Chen & Rodden method?
A So certainly for trying to enumerate the possible maps on top of a map where it hasn't been enumerated, you can't do that, but you can enumerate the possibilities here; and so the traditional challenge that's been lodged against the Chen & Rodden method that you don't know the target distribution would be completely inapplicable here, because this isn't sampling. This is enumeration.
Q Have you had any other criticisms of the Chen & Rodden method?
A Gosh, I've been doing this such a long-time, as you said way back when, when we first met, I don't remember; but that's my main criticism today is that for sampling, producing an unbiased sample, there's good evidence it won't -- if left to run an infinite number of times, it wouldn't produce every map, but it will produce every compact cluster here.

Q I believe you said you're going to testify in New Mexico, and New Mexico is one of those instances where Chen is on the other side of you?
A Correct.
Q Do you have any other criticisms of Chen in the New Mexico case?
A Well, Dr. Chen -- Dr. Chen filed his rebuttal report and I don't think we got a reply there. So I'm not sure even how much I'm even going to be allowed to testify against him, if at all. You know, I think there -- at the deposition, their counsel asked me about criticisms that I had, but I don't know how much of that is going to come out. I don't know if we're even going to get to do rebuttal testimony there.
Q Do you recall being deposed in New Mexico?
A Yes.
Q Do you recall in that deposition in New Mexico criticizing the Chen method as a method to capture compactness?
A Actually, no, but I think --
Q Okay.

A I will take from the phrasing of your question that I did.
Q Give me one second.
MS. THOMAS-LUNDBORG:
I'm going to have marked as Exhibit 18 just for deposition purposes, your testimony in New Mexico.
BY MS. THOMAS-LUNDBORG:
Q I've put on the screen -- it was previously sent to your counsel -- your testimony in what is Republican Party of New Mexico, et al versus Oliver, and it's a deposition from September 6, 2023, and I'm just going to have your read your testimony on page 113, lines four through 22. It's long so I'm not going to read it all into the record. I would ask that you read it to yourself, and we can see if it refreshes your recollection about whether you've had any criticisms of Dr. Chen's method as a method to capture compactness.
A Counsel, I apologize, I left my readers in the car. Is there any way you can zoom in on that, because the print on there is

tiny, as well? Oh, that's perfect.
Q Wait. Wait. Cutting off some of the lines. If you need me to scroll down, let me know, because I'd like you to go to line 22. Okay.
A Okay.
Q So does this refresh your recollection about whether you've had any criticisms about the use of Dr. Chen's method and compactness?
A So Dr. Chen was pretty emphatic that in this case, he wasn't using the Chen & Rodden method from the 2013 article, and I was able to see from the code that there was at the very least an add-on to the end of it that uses a MCMC flip thing to try to smooth out the edges, but yeah, I agree with this; that when these the districts are being drawn, they don't use Polsby-Popper or Reock as the metric. So if you're trying to compare district compactness, they won't map well necessarily onto Polsby-Popper or Reock, because it's a different concept of what compactness is.
Q I'd like to go back to the Chen &

Rodden method itself, and I'm going to go back to their article, which is Exhibit 17. Okay. So now I'm back on page 249, and I'm going to ask you a question about this second highlighted portion. In it, they say "A procedure for simulating compact district" -- oh, wait. Sorry. I want to ask you a different question. Let me just find where it is and highlight that part. I'm going to find the exact place where they discuss it. It's right above. Let me see if I can highlight it in realtime probably. Here we go. So I'm now going to read what is now the highlighted portion in which they say, "Our approach is to experiment with alternative algorithms that approach compactness in different ways or ignore it altogether. Due to space constraints, we focus on two algorithms: One that aims for compactness, and one that does not." Do you know which of the two algorithms your method is based upon, the compact algorithm or the non-compact algorithm?
A The one that aims for compactness.
Q And then, so now, that we're on the same page about which algorithm you used, they

go on to describe their compact algorithm. They state, "Our procedure for simulating compact districts is as follows," and then, they list steps that they used. They refer step one through 2c and then on the following page, they have 3a, 3b, 3c, 3d. Out of all the steps that they used, do they weight precinct size in any of their steps?
A No. They're weighting distances from centroids.
Q Why wouldn't you use the same weighting approach that they used?
A Because the question that I was asked to answer was to look at the area of the districts that are drawn.
Q Why wouldn't it be weighted districts between centroids look at the area?
THE COURT REPORTER:
Can you repeat the question?
BY MS. THOMAS-LUNDBORG:
Q Why wouldn't the weighted districts between centroid answer the area of question?
A Because you may end up bringing in a massive precinct that inflates the size of the district, and since this is looking for a

small -- districts that are a small area, using a definition of compactness that focuses on area, that was the more appropriate application.
Q So by weighting the district size, and I think this is what your answer was just now, your algorithm favored smaller precincts?
A Right. When given a choice, it will choose a smaller precinct by area.
Q And precincts should have a similar number of individuals in them, correct?
A No.
Q Do they tend to?
A Oh, I haven't looked at that, but I don't think I'm going to testify to that, because I don't think it's probably true.
Q Okay. Do you know if it's more likely to find smaller precincts in urban geography?
A Yes.
Q So by favoring smaller precincts, your algorithm would favor urban geography over rural geography?
A Right.
Q Since the Chen & Rodden method

doesn't weight districts, they wouldn't necessarily have the same favoritism. I mean, instead of weight -- sorry -- precincts sizes.
A Well, indirectly, because their weighting the distances between centroids, and larger precincts are going to have larger distances between the centroids.
Q Though I believe your testimony was that it is less likely to happen in your methodology, which is partly why you changed your methodology from what they did, correct?
A I don't know if I -- I'm not trying to be obstreperous, but I don't know if I would put it in exactly those words. The reason that I used this methodology is that there was a different definition of compactness that was relying on area.
Q Well, right, and so I previously asked you why their weighting of the distances between centroids wouldn't answer the area question, and I believe your answer was about precinct size. So if the record is unclear here, I think this is the time to make it clear what the differences were between your weighting of precincts sizes and their

weighting of distances between centroids?
A Yeah, I think the confusion or disagreement is in the way that the question was proposed the second time. It's not that the centroid distances are going to have nothing to do with precinct size, because larger precincts are going to tend to have centroids that are further from the boundaries, but not necessarily. You could have like a long, skinny district, where coming at it from a certain angle, the centroid is very close to the boundary. So the area is a more direct way of getting at the precinct area, but there's still going to be a relationship between the size of the precinct favored and the location of precinct centroid.
Q So then, why not again use the Chen & Rodden centroid district approach versus your weighted precinct approach?
A I suppose you could use the centroid, and someone could check to see if it got a different answer. I used area because rather than using their centroid method to try to approximate area, you could just use area.

Q I'd like to just focus for a second on their steps 3a through 3d, and I'm going to start reading the paragraph that begins with "Steps 2a through 2c are repeated until the total number of districts is exactly d. At this point in the procedure, these d districts are geographically contiguous and reasonably compact, due to the nearest distant criteria employed in step 2b. However, the districts are not guaranteed to be equally populated. Hence, repeated iterations of steps 3a through 3c are designed to achieve an equitable distribution of population across the simulated districts." Do you see that?
A Yes.
Q And you did not run steps 3a through 3c in your algorithm, correct?
A Oh, that's right, because we're not trying to sample whole district maps. The borrowing doesn't come from a way to draw full district maps, which isn't something I was looking into. The borrowing was the concept of geography as something unrelated to the shape of the district, Polsby-Popper or Reock. Or compactness, not geography.

Q So getting back to this question of precinct size and the favoring of smaller precincts, how would your approach work in a primarily suburban district?
A Well, since the idea of compactness that this is trying to explore is compact as in taking in little area, it will start with the precincts, and it will continue to pick up suburban precincts, which will tend to be smaller until you reach whatever 50 percent plus one of the population is for that clusters BVAP.
Q Okay. What about a rural area? Same?
A It will go through the precincts that it can find that are the smallest.
Q Okay.
A But part of the reason that you run this algorithm with every precinct in the House -- or in the district as a starting point is to ensure that every precinct is selected at least once. So it controls to a certain degree for that precinct size issue by starting in every precinct in the district.
Q But, I think we saw in the visual

that I can put back up on the screen, not every precinct is in the end going to be depicted in your analysis; and in fact, I don't think we put up the Chen & Rodden version. So it probably helps ground our discussion. Let me just put up the right exhibit. So I'm back to Exhibit 3. I believe this is Figure 7 on page 18, which is that Chen & Rodden version of this particular district. Do you see that?
A Yes.
Q So I think you just testified that your method wouldn't necessarily select all of the precincts, but in the output, there is a kind of dotted line around the precincts that are eventually selected; is that correct?
A Right. So it tries out every precinct as a starting point in the district and takes the one that leads to the most compact area as defined by area.
Q Okay.
A And I think maybe, part of where we're getting wrapped around the axle here is just remembering that this analysis is starting with the definition of compact as

being a small area. Maybe, that's not a good definition to use. That's something the court will have to decide, but if we were to use an understanding of compact as being a small dense area, this is the way of approaching it.
Q Could I ask a question about how this approach would work in a scenario where a town or municipality on its own would never be large enough to constitute a full district, and you would necessarily -- whether the district is majority-minority or majority -- majority have to draw from the suburban and rural areas?
A Well, if it's majority-majority, it's not going to work, because you're never going to find that 50 percent plus one compact population. The algorithm will run infinitely and never converge. If you are running it on a small town -- I mean, that's the whole point of this is that that cluster up south of -- I think that's Caddo Lake. It might be Cross Lake up in the top -- yeah. I remember I used to fish on Caddo Lake with my dad, and I think that's what that one is. That small town to the south of it has a cluster of black

individuals of voting age, but they aren't sufficient to constitute 50 percent plus one of the district. So the question would be can you ground a VRA compliant district based on that population, and the answer would appear to be no. You know, in Shreveport, if that district had a little bit more of the black population of Shreveport in it, you would probably have a compact 50 percent plus one district, but nevertheless sprawled out into rural Louisiana, and that would be fine, because you would have that compact population that's 50 percent plus one as the grounding for the district.

Q Yeah. I mean -- so let me rephrase my question. This is a hypothetical that I would pose to you, and I'm curious to know how your analysis would deal with it. You have a town that on its own is not sufficient to constitute a district and will need to go out into the suburban and rural population no matter what. The map drawer has a choice. It could go west or east. To the west, there would be minority population. To the east, there would be majority population. Under

that scenario, would your analysis ever find that the compactness requirement had been met by going west and picking up the majority population versus going east and picking up the white population?

MR. STRACH:

Objection.

THE WITNESS:

So that's a bit of a lengthy hypothetical, and I tried to ground it in this map we have in front of us, the House District 1. The answer is that that cluster in the small town probably isn't sufficient to sustain a minority-majority district. Now, as far as what this approach would detect, it's going to -- the first approach would look for the most compact cluster of black residents. This metric is going to look for the smallest area. So depending on how the precincts are laid out, just how much pop -- but it's going to keep adding area until it gets to 50 percent plus one black

population. So depending on how the districts and the precincts are laid out, it probably will favor the population, the suburban population to the west for exploring, but it still has to reach 50 percent plus one of the black population or the population of the district. So if it's not going to get that in the suburban area to the west, it's still going to have to explore the area to the east.

BY MS. THOMAS-LUNDBORG:

Q Are you familiar with the --

A And on subsequent runs of the district, it's going to start out in that -- in the rural area to the east. So if there was ultimately a very compact black population to be discovered out east, it would do so when it uses those precincts as it's starting point.

Q Right, but then, there is the method, which is drawing the line, and then, there is the then visual analysis, and sometimes, numerical, though, we don't have the numbers

here that happens as a second step. In this hypothetical, assuming we did, in fact, pick up on the west, my understanding is the visuals might fail your test still.

A Well, yeah. You might end up with -- I guess I'm a little confused about this hypothetical and the questions we're running through. It's going to look at compact population from an areal perspective in rural, Louisiana, and it's going to look to compact population from an areal perspective in suburban and urban Louisiana. If area -- when Congress passed the Voting Rights Act, if it understood compactness -- or I'm sorry. The 1982 amendments to the Voting Rights Act, it understood compactness to be defined in terms of area. Then, this is going to explore what Congress was getting at when it passed the Voting Rights Act and when the Gingles's factors were later announced. If that's a bad definition of compactness, if that's not what the words meant in the 1980s, well, then, you would use a different technique to explore it, but it is what it is. It's looking for the smallest area that can be 50 percent plus one

under the assumption that that's what compact
means.
Q Right. I'm not trying to hide the ball here with my hypothetical. So I'll give the game away. What I'm really trying to figure out is are there circumstances under your analysis in which a combination of an urban, suburban and rural area would meet your test, and the underlying assumption here is that they're going to be times in which you will have to combine urban, suburban and perhaps, even rural areas to meet the equal population requirements.
A Well, it doesn't matter what you're doing to meet the equal population requirements. It only matters -- this analysis only tells us where the most compact black population is. If there is a compact black population that can be 50 percent plus one of the district, you can do whatever you want with the rest of the district, at least from my analysis. So like I said, if this district had taken in a little bit more of the black population of Shreveport, so it wouldn't have had to reach out halfway to the Arkansas

border to get it's sufficient black population, we probably are having a very different discussion here even though the district would still sprawl over a large area to meet the equal population requirement.
Q Right, and that would be true if the black population in your answer was concentrated in a particular area. I think you said multiple times that it is area that you're looking at, correct?
A With this metric, it's measuring area, correct.
Q And are you familiar with the term packing?
A Yes.
Q What is packing?
A Packing is when you intentionally place partisans within a district to reduce their impact, I guess, on elections.
Q Are you familiar with the term "packing in a racial context"?
A Yeah. So if you intentionally draw a district using race as a predominant factor to reduce the ability or to separate people in our context, I guess black individuals on the

basis of their race, that's packing. It could be packing in a Voting Rights Act context if there were, in fact, more districts that could be drawn that would elect the minority candidate of choice under the -- and also meet the Gingles's preconditions, but that's the question here is whether this district is meeting the Gingles's preconditions.
Q You are familiar with the idea of packing in a racial context where a minority would be concentrated into a certain number of districts?
A Yes.
Q Okay.
A They're concentrated into a certain number of districts here.
MS. THOMAS-LUNDBORG:
I actually think we're at a good place to take a lunch break. I think after lunch I'm going to circle up, but I probably have a half an hour to an hour of questions. Then, I can turn it over to the Congressional folks.
We can go off the record.

(Lunch recess taken.)
BY MS. THOMAS-LUNDBORG:
Q So I have just a few more questions for you, and I can turn you over. I think though, I probably will in case -- well, let's get there when we get there.
You would agree that there are a varying waves of statistical measures of compactness that have been accepted by the courts in redistricting cases?
A Yes.
Q So I'd like to go through some of the measures of compactness that have been accepted by the court. Well, I'll ask one more question. The measures that have been accepted by the courts today are expressed as mathematical formulas, correct?
A Yes, as mathematical output, I guess. Sure.
Q Which measures have been the most prominent that you are aware of?
A Probably Reock and Polsby-Popper.
Q You just mentioned the Reock measure, and I think we've talked about it a bunch today. Do you know who the person is who's

credited with coming up with the Reock score?
A Ernest Reock.
Q Who is he?
A He was someone who published in 1961, well before I was learning who professors were. I just know he wrote the article.
Q Did you ever write an expert report in a case where you credited Professor Reock with the Reock method?
A I believe so, yes.
Q Do you recall whether in that expert report you also listed Professor Reock's university affiliations?
A I don't know.
Q Does it sound familiar to that Professor Reock may have been the director of Rutgers University's Center for Government Service?
A I have no reason to believe you would make something like that up. So I can go along with that.
Q Okay. How does Reock measure compactness?
A It takes the district, and it draws the smallest circle around the district that

it can without cutting the district edge. So it's the minimum bounding circle, and effectively, it's the percentage of that circle that the district fills. It's the area of the district over the area of the minimum bounding circle.
Q And do you know who Reock was scored?
A It's on a range from zero to one.
Q And is it your opinion that the moment of inertia and Chet & Rodden method that you describe in your report is superior for measuring compactness for real?
MR. STRACH:
Objection. Go ahead.
THE WITNESS:
To measure the compactness of the population, yeah, because you're dealing with points, not district boundaries.
BY MS. THOMAS-LUNDBORG:
Q Okay, and for measuring the compactness of a district?
A If you're looking to measure the compactness of a district boundary, you would use something like Reock or Polsby-Popper or

something of that nature.
Q I think we've discussed this a little bit in the morning. Have you ever run the Reock measure score?
A Yes.
Q Have you done so in your expert redistricting work?
A Yes.
Q And I believe you ran the Reock measure for the Louisiana Congressional case; is that correct?
A If I don't remember, I should probably remember quickly. I think that's right.
Q Why did you run it there?
A I think because I was asked to find the compactness of the district.
Q Are you aware of whether courts have ever credited the use of the Reock score in an expert's Gingles 1 analysis?
A As I understand it, most of these cases are tried using district compactness as the theory. So yeah, you would -- it's been credited, and you would use Reock or Polsby-Popper for district compactness. My

understanding is that defense has a district different theory.
Q Do you recall that Mr. Cooper ran the Reock scores on both his illustrative map and the enacted map?
A Yes.
Q Do you recall what his results found?
A No. I wasn't interested in district compactness. I was interested in population compactness.
Q Would it surprise you that district compactness, that Mr. Cooper's maps either met or beat the enacted maps?
A On average, it would not surprise me.
Q Do you have any reason as you sit here today to -- strike that. Is it your opinion as you sit here today that Mr. Cooper's maps are non-compact on a district compactness basis?
A I haven't done any work one way or the other on the district level compactness of the maps.
Q I think I have just a few follow-up questions. You mentioned Reock, and you have run Reock in your redistricting work. I think

you've also mentioned Polsby-Popper; is that right?
A That's right.
Q And generally, what is the Polsby-Popper method?
A The Polsby-Popper method takes -- instead of the minimum bounding circle, it takes the perimeter of the district and looks at the area of the circle with the same perimeter as the district and asks what percentage, and then, it's the ratio of the area of that district to the area of the circle with the same perimeter.
Q You've also run Polsby-Popper in the past?
A Yes.
Q And you've done that in your expert redistricting work?
A Yes.
Q And Mr. Cooper did it here on his maps and the enacted maps?
A I will certainly accept your representation on that.
Q Okay, and I'm going to ask the same questions about convex hull. Are you familiar

with convex hull metric?
A Yes.
Q Have you run the convex hull metric in your prior redistricting work?
A I have.
Q I don't think I asked this question about Polsby-Popper. So let me go back quickly. Does Polsby-Popper give a score?
A Yes.
Q Does convex hull give a score?
A Yes.
Q And did you run convex hull in this case?
A No, because I wasn't interested in district compactness.
Q And then, a similar question about the Schwartzberg metric. Are you familiar with the Scwartzberg metric?
A I am.
Q Have you run that metric before?
A I have. Though, I don't anymore.
Q You said you don't anymore?
A I don't.
Q When did you stop running that metric?

A After Dr. Duchin pointed out that it's just the square route of Polsby-Popper.
Q Do you recall when that was?
A I believe it was during the Texas litigation before it got stayed. So sometime last year.
Q Let me just check quickly.
MS. THOMAS-LUNDBORG:
Let me just check quickly. I think I'm done. Just in case anything else comes up, I will close out your deposition by the end of the day, but I am going to turn it over to the Congressional case, and just leave it open for a second if anything comes up, but we will at least close out my deposition by the end of today, but I'll close it out to Dan in the Congressional case before doing that.
I think we're in a different zoom room. Do we want to go off the record and rejoin the others in Link with the other one?
(Whereupon, the deposition was

concluded at 12:24 PM.)

WITNESS CERTIFICATE

I, SEAN P. TRENDE, do hereby certify that the foregoing testimony was given by me, and that the transcription of said testimony, with corrections and/or changes, if any, is true and correct as given by me on the aforementioned date.

DATE SIGNED SEAN P. TRENDE

Signed with corrections as noted.

Signed with no corrections noted.

C E R T I F I C A T E

I, LORI L. MARINO, Certified Court Reporter, in and for the State of Louisiana, as the officer before whom this testimony was taken, do hereby certify that SEAN P. TRENDE, after having been duly sworn by me upon authority of R.S. 37:2554, did testify as hereinbefore set forth in the foregoing 133 pages; that this testimony was reported by me in the stenotype reporting method, was prepared and transcribed by me or under my personal direction and supervision, and is a true and correct transcript to the best of my ability and understanding; that the transcript has been prepared in compliance with transcript format guidelines required by statute or by rules of the board, that I have acted in compliance with the prohibition on contractual relationships, as defined by Louisiana Code of Civil Procedure Article 1434 and in rules and advisory opinions of the board; that I am not related to counsel or to the parties herein, nor am I otherwise interested in the outcome of this matter.

Dated this 2nd day of October, 2023.

Lori L. Marino

LORI L. MARINO, CCR
CCR #87069
STATE OF LOUISIANA

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Unintentional Gerrymandering: Political Geography and Electoral Bias in Legislatures

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ABSTRACT

While conventional wisdom holds that partisan bias in U.S. legislative elections results from intentional partisan and racial gerrymandering, we demonstrate that substantial bias can also emerge from patterns of human geography. We show that in many states, Democrats are inefficiently concentrated in large cities and smaller industrial agglomerations such that they can expect to win fewer than 50% of the seats when they win 50% of the votes. To measure this "unintentional

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gerrymandering,'' we use automated districting simulations based on precinct-level 2000 presidential election results in several states. Our results illustrate a strong relationship between the geographic concentration of Democratic voters and electoral bias favoring Republicans.

In majoritarian political systems like the United States, the extent to which electoral support for a party translates into legislative representation is driven by the geographic distribution of votes across districts. For instance, in a set of hotly contested U.S. states including Florida, Michigan, Ohio, Missouri, Indiana, and Pennsylvania, the Democrats have had far more statewide success in winning presidential, U.S. Senate, and gubernatorial races than in winning control of state legislatures. Party strategists and pundits as well as academics (King and Gelman, 1991; Hirsch, 2003; McDonald, 2009a) have noticed that this disconnect between statewide partisanship and representation is driven by a disadvantageous distribution of Democratic voters across legislative districts. A window into this phenomenon is provided by Florida's notorious tied presidential election of November 2000, in which votes for George W. Bush outnumbered votes for Al Gore in 68% of Florida's Congressional districts.

Why does this type of electoral bias emerge? One source of bias is intentional gerrymandering, whereby district maps are drawn to favor partisan or racial groups. Another source is unintentional gerrymandering, whereby one party's voters are more geographically clustered than those of the opposing party due to residential patterns and human geography.

Ever since Elbridge Gerry proposed his famous Massachusetts district, the U.S. literature on electoral bias has been dominated by the notion of intentional gerrymandering. The machinations of politically motivated cartographers take center stage in the theory literature (e.g., Gilligan and Matsusaka, 1999; Gul and Pesendorfer, 2010) as well as in empirical studies (e.g., Abramowitz, 1983; Cain, 1985; Cox and Katz, 2002; Herron and Wiseman, 2008; McCarty *et al.*, 2009). Likewise, studies of racial gerrymandering have used theoretical (e.g., Shotts, 2001, 2003) and empirical analyses (e.g., Brace *et al.*, 1988; Hill, 1995; Lublin, 1997; Cameron *et al.*, 1996; Griggs and Katz, 2005) to show that efforts at enhanced minority representation inexorably pack Democrats into relatively few districts.

A significant reform movement in the United States is predicated on the notion that observed electoral bias stems from intentional gerrymandering.

Districting reformers in many states have advanced various statutory and constitutional proposals to prohibit partisan gerrymandering and enforce more neutral, objective criteria and procedures in the redistricting process. In Florida, for example, in response to a striking pattern of pro-Republican electoral bias, a coalition of left-wing interest groups invested significant energy and resources into passing Amendments 5 and 6, which voters approved in November 2010. These ballot initiatives mandate that newly drawn congressional and state legislative districts be compact and contiguous in shape, and the initiatives prohibit redistricting plans drawn with the intent to favor either political party.

Such reforms are based on the assumption that human geography plays no significant role in generating electoral bias. Reformers are betting that the inefficient distribution of Democrats across districts in a number of states would disappear if the process of districting could only be sufficiently insulated from Republican cartographers and minority interest groups.

This article examines the possibility that human geography plays a far greater role in generating electoral bias in the United States than commonly thought. Building on existing literature, we explore the argument that Democrats are often more clustered in space than Republicans as a result of the industrial revolution, great migration, and subsequent patterns of suburbanization (Fenton, 1966; Dixon, 1968; Erikson, 1972, 2002; Jacobson, 2003; McDonald, 2009a, 2009b). This argument dovetails with the emphasis on similar aspects of human geography in the comparative literature (e.g., Johnston, 1976; Taylor and Gudgin, 1976; Gudgin and Taylor, 1979; Johnston and Hughes, 2008; Rodden, 2010).

We show that in many urbanized states, Democrats are highly clustered in dense central city areas, while Republicans are scattered more evenly through the suburban, exurban, and rural periphery. We illuminate this pattern with an in-depth case study of Florida and demonstrate that it holds up in many other states. Precincts in which Democrats typically form majorities tend to be more homogeneous and extreme than Republican-leaning precincts. When these Democratic precincts are combined with neighboring precincts to form legislative districts, the nearest neighbors of extremely Democratic precincts are more likely to be similarly extreme than is true for Republican precincts. As a result, when districting plans are completed, Democrats tend to be inefficiently packed in homogeneous districts.

This observation raises some vexing empirical questions: To what extent is observed pro-Republican electoral bias a function of human geography rather than intentional gerrymandering? To what extent might pro-Republican bias persist in the absence of partisan and racial gerrymandering?

The main contribution of this paper is to answer these questions by generating a large number of hypothetical alternative districting plans that are blind as to party and race, relying only on criteria of geographic contiguity and compactness. We achieve this through a series of automated districting simulations. The simulation results provide a useful benchmark against which to contrast observed districting plans. We show that in general, pro-Republican partisan bias is quite persistent in the absence of intentional gerrymandering. Moreover, consistent with our argument about human geography, we demonstrate that the highest levels of electoral bias against Democrats occur in states where Democratic voters are most concentrated in urban areas.

1 Political Geography and the Roots of Electoral Bias in the United States

Electoral maps from recent U.S. presidential elections illustrate clearly that in much of the United States, support for Democrats is highly clustered in densely populated city centers, declines gradually as one traverses the suburbs and exurbs, and levels off in moderately Republican rural areas. Additionally, in the rural periphery, there are scattered pockets of strong support for Democrats in smaller agglomerations associated with nineteenth century industrial activity along railroad lines, canals, lakes, and rivers, as well as in college towns.

To illustrate the relationship between population density and voting behavior, we match precinct-level results from the 2000 presidential election to precinct boundary files produced by the U.S. Census. We are able to obtain such 2000 precinct-level data for 20 states. We then generate block group estimates of election results, which we plot against population density data from the census in Figure 1. The relationship between population density and Democratic voting is generally widespread, but there is some cross-state heterogeneity. This relationship is most pronounced in the most industrialized and urbanized states, but it is less pronounced or absent in less industrialized Southern states with large rural African American populations and in relatively sparse Western states.

It is important to note that the densely populated urban block groups in the lower-right corners of the scatter plots in Figure 1 are not randomly

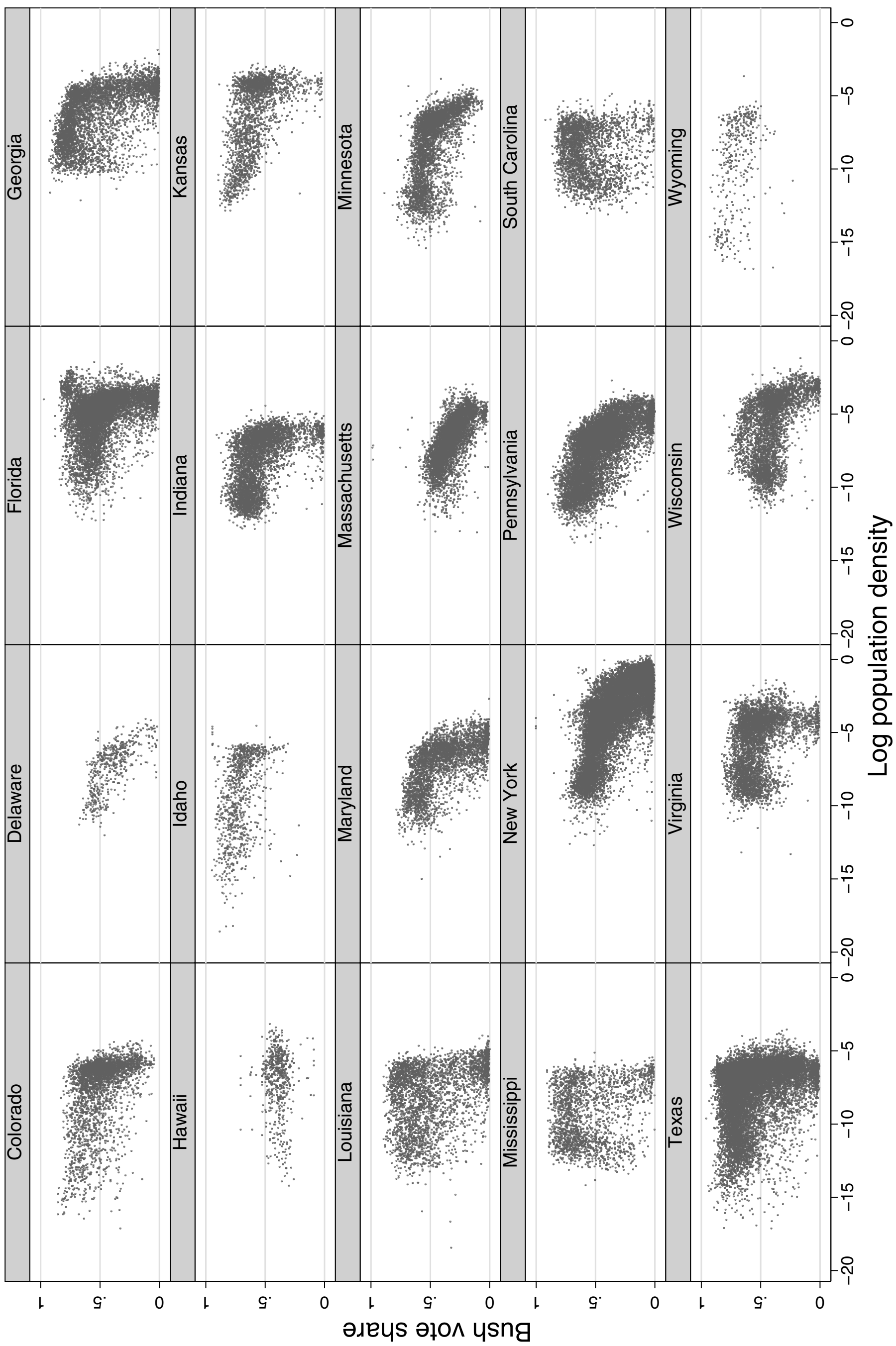

Figure 1. Population density and Republican Presidential Vote Share, census block groups.

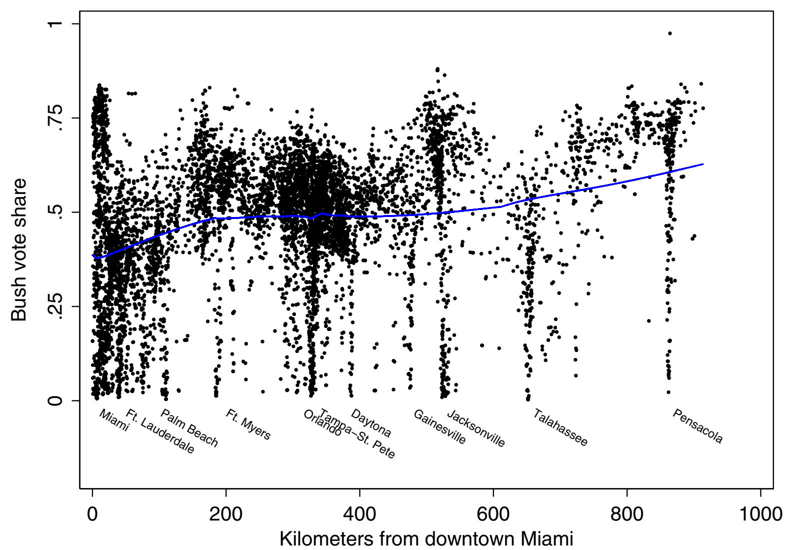

Figure 2. The spatial arrangement of partisanship in Florida.

distributed in space; many of them are in close proximity to one another. For example, support for Democrats in Florida is highly concentrated in downtown Miami and the other coastal cities to its immediate North, as well as downtown Orlando, Tampa, St. Petersburg, Daytona, Gainesville, Jacksonville, Tallahassee, and Pensacola, as well as a few other smaller railroad and college towns. The suburbs of these cities, along with rural Florida, are generally Republican, but only moderately so.

Figure 2 displays the distance in kilometers between the center of Miami's central business district and the location of every census block group in Florida. Figure 2 displays this distance on the horizontal axis, and the vertical axis displays the block group's Bush vote share. Block groups toward the right of this plot are further away from Miami, and the extreme right side of the plot depicts block groups in the Florida panhandle. The lower left corner of the plot displays the large number of overwhelmingly Democratic precincts in downtown Miami, Ft. Lauderdale, and Palm Beach. Above these urban cores in the graph are more heterogeneous suburban neighborhoods where the Bush vote share, on average, only slightly exceeds 50%.

The tips of each of the other ''stalactites'' in Figure 2 are city centers where Al Gore's vote share in November 2000 often exceeded 90%. In each case, as one moves outward from the city center, the Bush vote increases, and each city is surrounded first by a very mixed area, second by a suburban periphery that produced solid but not overwhelming support for Bush, and then finally by a rather heterogeneous but moderately Republican periphery. Analogous plots are quite similar in all of the other states that are characterized by high correlations between population density and voting in Figure 1.

These depictions illustrate two important patterns with consequences for districting. First, Democrats are far more clustered within homogeneous precincts than are Republicans. For example, while Bush received over 80% of the vote in only 80 precincts, Gore received over 80% in almost 800 precincts. Second, the stalactite shape of cities and their surroundings in Figure 2 illustrate that Democratic precincts tend to be closer to one another in space than Republican precincts. That is, the nearest neighbors of predominantly Democratic precincts are more likely to be predominantly Democratic than is the case for Republican precincts.

Some simple spatial statistics allow us to demonstrate this. First, we can identify the nearest neighbor of every precinct, defined as the precinct with the most proximate centroid, and ask whether that neighbor has the same partisan disposition. For any reasonable cut-off used to differentiate "Democratic" and "Republican" precincts (e.g., lower than 40th vs. higher than 60th percentile values of Bush share, 30th vs. 70th, etc.), we find that indeed, the nearest neighbors of Democratic precincts are significantly more likely to be Democratic than is the case for Republicans, whose neighbors are more heterogeneous.

Alternatively, rather than forcing precinct partisanship to be binary, it is useful to examine the extent to which each precinct's election results are correlated with those of its neighbors, and ask whether the extent of this spatial autocorrelation is higher in Democratic than in Republican districts. Anselin's (1995) local Moran's I is well suited to this task. For each precinct i, the local Moran's I is given by:

$$I_i = \frac{Z_i}{m_2} \sum_j W_{ij} Z_j$$

where

$$m_2 = \frac{\sum_i Z_i^2}{N}$$

and Z_i is the deviation of Bush share with respect to the mean across all precincts, N is the number of precincts, and W_{ij} is a matrix of weights with ones in position i, j whenever precinct i is a neighbor of precinct j,

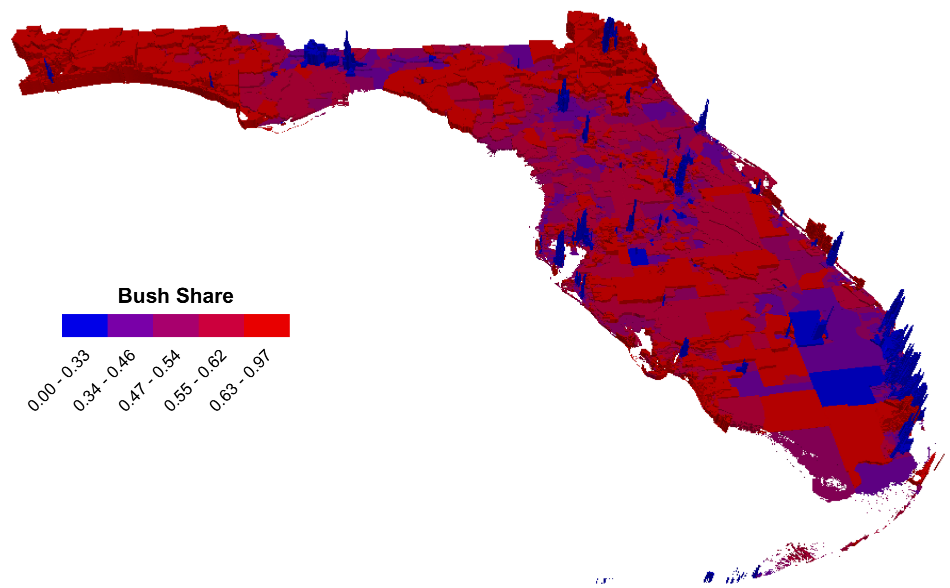

Figure 3. 2000 Bush vote share. Colors correspond to Bush vote share, heights correspond to local Moran's I.

and zero otherwise. We define neighbors as precincts that share any part of any boundaries or vertices (Queen Contiguity), although we get very similar results when using Rook contiguity or distance-based spatial weights.

Overall, I_i is much higher for majority-Democratic precincts than for Republican precincts, indicating that Democratic precincts are far more spatially clustered. Figure 3 displays I_i for each precinct using an extruded map, in which the height of each extrusion corresponds to the extent of spatial autocorrelation, and the color moves from blue to red as the precinct's Bush vote share increases. Figure 3 illustrates clearly that the most Democratic precincts in Florida's city centers are also those with the highest levels of local spatial autocorrelation; that is, they are surrounded by other very Democratic precincts. While there are some Republican-leaning areas of high spatial autocorrelation in little Havana, suburban Jacksonville, and the Panhandle, Republican precincts overall tend to be located in more heterogeneous neighborhoods.

The process of building electoral districts involves someone — incumbent politicians, judges, or districting boards — stringing together contiguous census blocks. Drawing on the rhetoric of reform advocates, let us consider a districting process in which these census blocks are assembled without political or racial manipulation. To illustrate, consider a process of randomly selecting one of the dots in Figure 2 and randomly connecting it with surrounding dots until enough dots have been selected to form a state legislative district or Congressional district.

This process is likely to undermine the representation of Democrats for three reasons. First, suppose that the initial seed is a precinct in one of the stalactites representing Florida's large cities, such as Miami, Jacksonville, or Tampa. Such a city is sufficiently large that this process will likely combine extremely Democratic districts with other extremely Democratic districts, thereby forming a district that is overwhelmingly Democratic.

Second, outside of little Havana, it is difficult to find a Florida precinct that, when randomly chosen as the initial seed, would produce an analogously extreme Republican district. In addition to being more internally heterogeneous, Republican precincts tend to be located in heterogeneous suburban and rural areas of the state where their nearest neighbors are more diverse. For instance, suppose the initially chosen precinct is rural and extremely pro-Republican. If one strings together neighboring precincts until reaching the population threshold for a district, this will usually require the inclusion of some rather heterogeneous precincts, often including pockets of Democrats in small cities or towns and on the fringes of larger cities.

A third reason concerns the locations of small Democratic-leaning towns throughout Florida. Although dense, pro-Democratic cities are often combined together to form Democratic districts along the Eastern Coast, there are also small, isolated, inland pockets of Democratic voters in the manufacturing and transportation agglomerations that sprung up along railroad tracks in the nineteenth century, such as Ocala or Pensacola, and the college towns of Tallahassee and Gainesville. When the size of districts is large relative to these small clusters of Democrats, these towns are often subsumed into predominantly rural, moderately Republican districts, thus wasting Democratic votes in districts that are won by Republicans.

The roots of unintentional gerrymandering in Florida can be summarized as follows. The complex process of migration, sorting, and residential segregation that generated a spatial distribution of partisanship has left the Democrats with a more geographically concentrated support base than Republicans. When compact, contiguous districts are imposed onto this geography without regard for partisanship, the result will be a skew in the distribution of partisanship across districts such that with 50% of the votes, Democrats can expect fewer than 50% of the seats.

2 Automated Districting and Electoral Bias

Studies of electoral bias typically flow from the normative premise that in a two-party system, a party with 50% of the votes should receive 50% of the seats. Empirical studies use either aggregate data over several elections or transformations of district-level data from individual elections to examine the seat share that would be obtained by the parties under a hypothetical scenario of a tied election. Our goal is different. Rather than examining the bias associated with existing districting plans, many of which were undoubtedly influenced by efforts at partisan and racial gerrymandering, we seek to estimate the electoral bias that would emerge under hypothetical districting plans that are not intentionally gerrymandered.

Rather than using information from existing districts to simulate hypothetical tied elections, we use information from precinct-level election results, and we perform a large number of automated, computer-based simulations of legislative districting plans. Our computer simulations construct these districting plans in a random, partisan-blind manner, using only the traditional districting criteria of equal apportionment and geographic contiguity and compactness of single-member legislative districts. For each of these simulated districting plans, we calculate the Bush–Gore vote share of each simulated single-member district, and we use this vote share to determine whether the district would have returned a Democratic or Republican majority. We begin with Florida's 2000 presidential race because of its unique quality as a tied election.

Since the early 1960s, scholars have suggested automated districting as a solution to the problem of partisan gerrymandering (e.g., Vickrey, 1961; Weaver and Hess, 1963; Nagel, 1965). More recently, scholars have used hypothetical districting experiments to examine partisan polarization (McCarty *et al.*, 2009), partisan representation (Altman, 1998), and the impact of various districting criteria (McDonald, 2009b). These previous studies have often used automated redistricting in order to obtain a baseline against which to detect the intentions of those drawing the lines. Cirincione *et al.* (2003) use a simulated districting algorithm to detect racial gerrymandering in South Carolina's congressional districting plan, while Altman and McDonald (2004) propose an enhanced method of this algorithm for detecting partisan gerrymandering. Johnston and Hughes (2008) apply an automated districting algorithm in Brisbane, Australia in order to gain a baseline against which to compare the boundaries chosen by neutral commissioners. Extending this past work, we use simulations to examine the electoral consequences of a hypothetical districting process without any intentional partisan or racial gerrymandering.

As of the November 2000 election, Florida consisted of 6,045 voting precincts. These precincts are the smallest geographic unit at which election results are publicly announced, so we use the precinct as the building block for our simulations. Hence, a complete districting plan consists of assigning each one of Florida's precincts to a single legislative district. Florida voters cast 5.96 million Presidential election ballots in 2000, so the average precinct cast a total of 986 presidential votes.

Our goal is to design a districting algorithm that uses only traditional geographic criteria of the kind favored by reform advocates. Our challenge is to guarantee equal apportionment of population while requiring geographic contiguity for all simulated districts, paying no attention to either voter partisanship or any demographic information other than simple population counts. Another concern is geographic compactness. Many districting reform proposals include explicit (if vague) compactness requirements, and reformers sometimes equate compactness with fairness. Moreover, an algorithm that makes no attempt to achieve compactness might create districts that seem too far removed from the real world. On the other hand, if we build some strict compactness criteria into the algorithm, we run the risk that any pro-Republican bias observed in the simulated plans could be driven exclusively by compactness criteria that, for instance, force the most extreme Democratic precincts in Miami to be joined together.

Our approach is to experiment with alternative algorithms that approach compactness in different ways or ignore it altogether. Due to space constraints, we focus here on two algorithms: one that aims for compactness and one that does not.

Our procedure for simulating compact districts is as follows. Suppose that we begin with n precincts and wish to create d districts with equal population.

(1) To begin the simulation procedure, each of the n precincts represents a single district. Hence, there are n districts, each containing only one precinct at the outset.

(2a) Randomly select one of the n districts and denote it as district i.

(2b) Among the neighboring districts that border district i, select the one that is geographically closest, and denote it as district j. Geographic proximity is measured as the distance between district i's centroid and the respective centroids of i's neighboring districts.

(2c) Merge district i together with district j in order to form a single, new district. There are now $n - 1$ total districts remaining.

Steps 2a through 2c are repeated until the total number of districts is exactly d. At this point in the procedure, these d districts are geographically contiguous and reasonably compact, due to the nearest distance criterion employed in step 2b. However, the districts are not guaranteed to be equally populated. Hence, repeated iterations of steps 3a through 3c are designed to achieve an equitable distribution of population across the simulated districts. These steps iteratively reassign precincts to different districts until equally populated districts are achieved.

(3a) Among all pairs of districts that border one another, identify the pair with the greatest disparity in district population. Within this pair, let us denote the more populated district as i and the less populated district as j.

(3b) Identify the set of all precincts currently within district i that could be reassigned to district j without violating the geographic contiguity of either district i or j.

(3c) For each precinct p satisfying the criterion in step 3b, define D_p as precinct p's geographic distance to the centroid of district i, minus precinct p's distance to the centroid of district j.

(3d) Among the set of precincts satisfying the criteria in step 3b, select the precinct, p, with the highest value of D_p. Reassign this precinct from district i to district j.

Steps 3a through 3d are repeated until every district's population is within 5% of the ideal district population. The ideal district population is defined as the statewide population, divided by d, the total number of districts. Hence, these steps iteratively reassign precincts in order to achieve equal population across the districts. However, steps 3c and 3d perform such precinct reassignment in a manner that preserves the geographic compactness of the districts. Compactness is preserved because step 3d generally reassigns a precinct that was geographically distant from its old district's centroid and geographically close to the centroid of its new district.

In order to simulate non-compact districts, steps 1 and 2a are performed in the same manner as in the compact districting algorithm. The procedure for non-compact districts then proceeds as follows:

(2b) Select one of district i's bordering districts at random and denote it as district j.
(2c) Merge district i together with district j in order to form a single, new district. There are now $n-1$ total districts remaining.

Steps 2a through 2c are repeated until the total number of groups is exactly d. At this point in the procedure, these d districts are geographically contiguous but not guaranteed to be equally populated. Hence, repeated iterations of steps 3a through 3c are designed to achieve an equitable distribution of population across the simulated districts.

(3a) Identify the most populated district and denote it as district i.
(3b) Randomly select one of the precincts lying within district i and denote it as precinct p.
(3c) If precinct p can be reassigned from district i to a new district without violating the geographic contiguity of either this new district or district i, then reassign p to this new district. If two or more new districts satisfy this criterion, then reassign precinct p to one of these new districts at random.

Steps 3a through 3c are repeated until every district's population is within 5% of the ideal district population. The ideal district population is defined as the statewide population, divided by d, the total number of districts.

In order to help illustrate the output of these simulations, the Appendix displays sample maps of both compact and non-compact plans for Florida's 25 Congressional districts, as well as maps that zoom in on Miami and Jacksonville.

3 Simulation Results

For each procedure, we perform 25 simulations of Florida districting plans for each of a range of reasonable legislature sizes, ranging from 2 to 200 districts. For each simulation, we can simply aggregate the precinct-level Bush–Gore vote counts within each district and count up the number of districts in

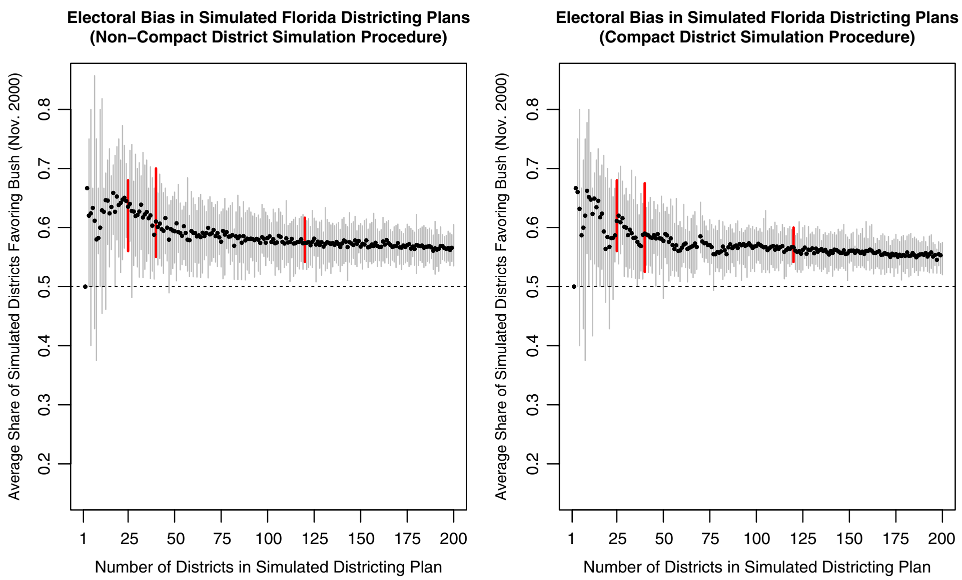

Figure 4. Republican electoral bias in simulated Florida districting plans.
Note: Black dots indicate the average share of simulated districts that have pro-Bush majorities in the simulated plans. Gray bars depict the entire range of pro-Bush district shares that were observed across all simulations for each given legislature size. Red bars depict the range of simulated outcomes for legislatures of 25 districts (Florida's Congressional Delegation), 40 districts (the Florida State Senate), and 120 districts (the Florida State House).

which Bush received a majority. The expectation is that if there is no partisan bias, the average share of pro-Bush districts should be around 50%.

Our simulations reveal pro-Republican bias in the partisan distribution of seats in any realistically sized legislature; that is, significantly over one-half of the legislative seats have Republican majorities. Figure 4 summarizes the distribution of seat shares produced under our simulations. The left panel presents results using the non-compact procedure, and the right panel reports results for the compact procedure. In this figure, the horizontal axis represents the number of single-member districts in each simulated plan. The vertical axis reports the percentage of these districts that have Republican majorities. For each different hypothetical legislature size, the dot represents the average share of simulated districts with pro-Bush majorities across all simulated plans, and the gray bars depict the entire range observed across all simulations for each given legislature size. The red colored bars depict the entire range of simulated outcomes for legislatures of 25 districts (Florida's Congressional Delegation), 40 districts (the Florida State Senate), and 120 districts (the Florida State House).

The figure illustrates, for example, that when we conducted random simulations that divided Florida into 25 districts using the compact procedure, Republicans won an average of 61% of the seats. The most biased of the simulated plans gave the Republicans 68% of the seats, and the least biased plan gave them 56%. Overall, this plot illustrates the significant pro-Republican bias that results from a districting procedure that is based solely on geography and population equality. Moreover, this result is not driven by the compactness of the simulated districts. The results are just as striking when we use the non-compact simulation procedure.

We find that the real-life districting plans enacted by the Republican-controlled Florida legislature in 2002 are all within the range of districting plans produced by our simulation procedures. For example, in 2002, the state legislature enacted a Congressional districting plan in which Bush voters outnumbered Gore voters in 17 out of 25 districts, or 68%. This level of pro-Republican electoral bias falls just within the tail of the distribution of electoral biases produced across all of the randomly simulated, compact districting plans (56–68%), as illustrated in Figure 4. Hence, because the enacted districting plan falls within the range of plans produced by our compact districting procedure, we are simply unable to prove beyond a doubt that the enacted districting plan represents an intentional, partisan, Republican gerrymander.

Both panels of Figure 4 show that a legislature consisting of only two single-member districts will always have exactly one Democratic and one Republican seat, a result that follows naturally from Florida's 50–50 Bush–Gore vote share. But as the legislature grows in size, the partisan division of legislative seats quickly begins to favor the Republicans. When the simulated legislature has 25 seats — the size of Florida's Congressional delegation after the 2000 reapportionment — Republicans win an average of 61.2% of the districts when we use the compact procedure and 63.5% of the districts when we use the non-compact procedure.

As the size of the legislature increases further, some of the medium-density Democratic clusters in suburbs and small towns that had previously been subsumed in their surrounding Republican peripheries begin to win their own seats, and thus the Republican seat share slowly declines. However, a striking result is that the Republicans always continue to control over one-half of the total seats. For any districting plan of realistic size, the pro-Republican bias exhibited in our simulations is significant. With only a few exceptions, the entire range of simulations produces a hypothetical legislature with a solid Republican majority in spite of the tied election.

To provide a closer illustration of the distribution of districting plans produced by the simulations, we conduct 250 independent simulations in which Florida is divided into 25 congressional districts using the non-compact procedure. Figure A6 in the Online Appendix depicts the partisan breakdown of districts produced under these 250 simulations.

This figure illustrates that all of the 250 simulated plans result in pro-Republican electoral bias: In each plan, at least 14 of the 25 districts (56%), and as many as 19 of the 25 districts (76%), have a pro-Bush majority. Moreover, the figure reveals that the distribution of partisan bias across the simulations follows a normal distribution. Most of the simulations resulted in the production of 15, 16, or 17 pro-Bush districts. Drawing 14 or 18 pro-Bush districts was a rarer outcome, and only an exceedingly small number of simulations produced as many as 19 Bush-leaning districts. Hence, these simulations demonstrate that a range of partisan outcomes is achievable under the simulations, but most of the simulations result in a predictable partisan distribution of seats that indicates significant pro-Republican electoral bias.

4 A Closer Look at Political Geography

Next, we use the simulation results to take a closer look at political geography as an explanation for this persistent Republican advantage. In Figure 5, we present the results of 200 independent random simulations in which Florida is divided into 25 districts.

Each plotted point in Figure 5 represents one of Florida's 6,045 precincts, and we plot high, medium, and low density precincts separately, referring to them loosely as urban, suburban/town, and rural. For each plotted point, the horizontal axis measures the partisanship of the precinct, as measured by Bush–Gore vote share in November 2000. The vertical axis measures the average partisanship of the 200 simulated districts to which the precinct was assigned during our simulations.

The patterns of spatial autocorrelation reported above give rise to the generally positive correlation between the partisanship of a precinct and the

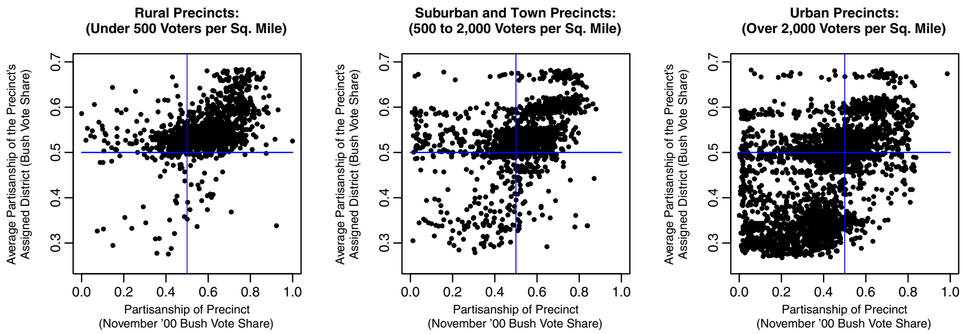

Figure 5. The partisanship of precincts' assigned districts.

Note: Each point represents a single Florida precinct. The horizontal axis indicates the precinct's partisanship, as measured by George Bush's November 2000 share of the two-party vote. The vertical axis measures the average partisanship (George Bush vote share) of the simulated district to which the precinct was assigned. This measure is based on 25 independent random simulations of dividing Florida into 40 Senate districts, using the non-compact simulation algorithm.

partisanship of the legislative district to which the precinct was assigned. In other words, pro-Bush precincts are typically assigned to pro-Bush districts. In particular, the left and middle plots reveal that outside of dense city centers, pro-Bush precincts were almost always assigned to majority-Bush districts. Hence, the lower-right quadrants of these plots — where pro-Republican precincts are assigned to majority-Democratic districts — are generally empty.

By contrast, majority-Gore precincts outside of dense urban neighborhoods are often in the upper-left quadrant of the plots. In other words, rural, small town, and suburban precincts that lean Democratic are often subsumed into moderately Republican districts. As described above, there are isolated pockets of support for Democrats in African-American enclaves in the suburbs of big cities and in smaller towns with a history of railroad industrialization or universities. However, these Democratic pockets are generally surrounded by Republican majorities, thus wasting these Democratic votes. As a result, the Democrats are poorly situated to win districts outside of the urban core.

Figure 5 illustrates that pro-Gore precincts in urban areas are generally assigned to overwhelmingly Democratic districts in our simulations. There is a large cluster of observations at the bottom of the lower-left quadrant of the bottom graph, indicating that Democratic precincts are assigned to extremely Democratic districts. By contrast, there are very few corresponding Republican precincts in the extreme upper right of any of the plots. Taken together, these plots show that because of their geographic support distribution, Democrats not only waste more votes in the districts they lose, but they also accumulate more surplus votes in the heavily Democratic districts they win. These two phenomena explain the rather extreme pro-Republican bias revealed by our simulations.

5 Does Geography Constrain Partisan Gerrymandering?

Taken together, the simulation results presented thus far suggest that residential geography alone generates significant partisan bias in Florida's districting plans. As Figure 4 illustrates, almost the entire range of simulated districting plans for every reasonable legislature size produces at least some pro-Republican bias. Among all of the randomly simulated plans consisting of 25 districts (U.S. Congressional delegation), 40 districts (Florida Senate), and 120 districts (Florida House), not a single simulated plan produces at least as many Gore-leaning districts as Bush-leaning districts. Hence, both the compact and the non-compact simulation procedures are unable to produce a single Congressional, Senate, or House districting plan for Florida that is either neutral or pro-Democratic in its distribution of seats. This finding reflects the significant pro-Republican bias in Florida that results from the geographic constraint that each district must be contiguous, even if non-compact district shapes are permitted. Our simulation results show that this contiguity requirement alone is sufficient to consistently produce pro-Republican districting outcomes in Florida.

Could a sufficiently creative Democratic gerrymander work around these geographic constraints and produce a neutral or pro-Democratic districting plan in Florida? In theory, it seems that a clever Democratic cartographer might generate radial districts emanating from the city centers so as to break up the major agglomerations and create snake-like districts to connect some of the smaller cities. Such a hypothetically contorted districting arrangement would possibly neutralize the inherent Republican advantages in geographic districting. Is such a hypothetically neutral or pro-Democratic gerrymander achievable in real-life practice?

First, the key finding of our simulation results is that for the Florida Congressional, Senate, or House districts, our two simulated districting procedures are unable to produce a single districting plan that is neutral or pro-Democratic in terms of electoral bias. Hence, a real-life Democratic gerrymanderer would have to draw districting maps with even more creativity than our simulated non-compact districting plans in order to achieve a hypothetically neutral outcome. Moreover, human geography makes the task of a Democratic cartographer far more difficult than that facing a Republican-favoring cartographer, whom we have shown can do strikingly well by literally choosing precincts at random.

Second, to determine whether an electorally neutral districting plan in Florida is achievable in real-life practice, we examine the districting plans proposed by Democrats in the state legislature. Even though Florida's state legislature was controlled by the Republican Party during the 2002 redistricting cycle, Democratic legislators are nevertheless permitted to propose their own districting plans, and many did so in 2002. We examine these Democrat-proposed districting plans in order to measure how the most Democrat-favorable districting proposals fared in terms of electoral bias.

Specifically, we obtained district-level statistics for every proposed districting plan submitted to the Florida Senate during the 2002 redistricting cycle. To see how these real-world districting proposals compare against our non-compact, simulated districting plans, Figure 6 displays the number of Bush-leaning districts in the Congressional (Figure 6A) and Florida Senate (Figures 6B) districting plans adopted by the Republican-dominated legislature in 2002. Additionally, Figure 6 also displays the number of Bush-leaning districts in each of the alternative districting proposals submitted during the redistricting process by various Republican legislators, by various Democratic legislators, and by the League of Women Voters (hereinafter: LWV) in the Florida legislature.[1]

Figure 6 displays the share of majority-Republican seats generated by each proposed plan and each computer-simulated plan, as well as a histogram displaying the distribution of Republican seat shares generated by 100 of our simulations. Figure 6A displays plans for the Florida delegation

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[1] The Florida Senate provides information on all plans submitted to the Senate Committee on Reapportionment by Senators or the public at archive.flsenate.gov, accessed on September 20, 2012.

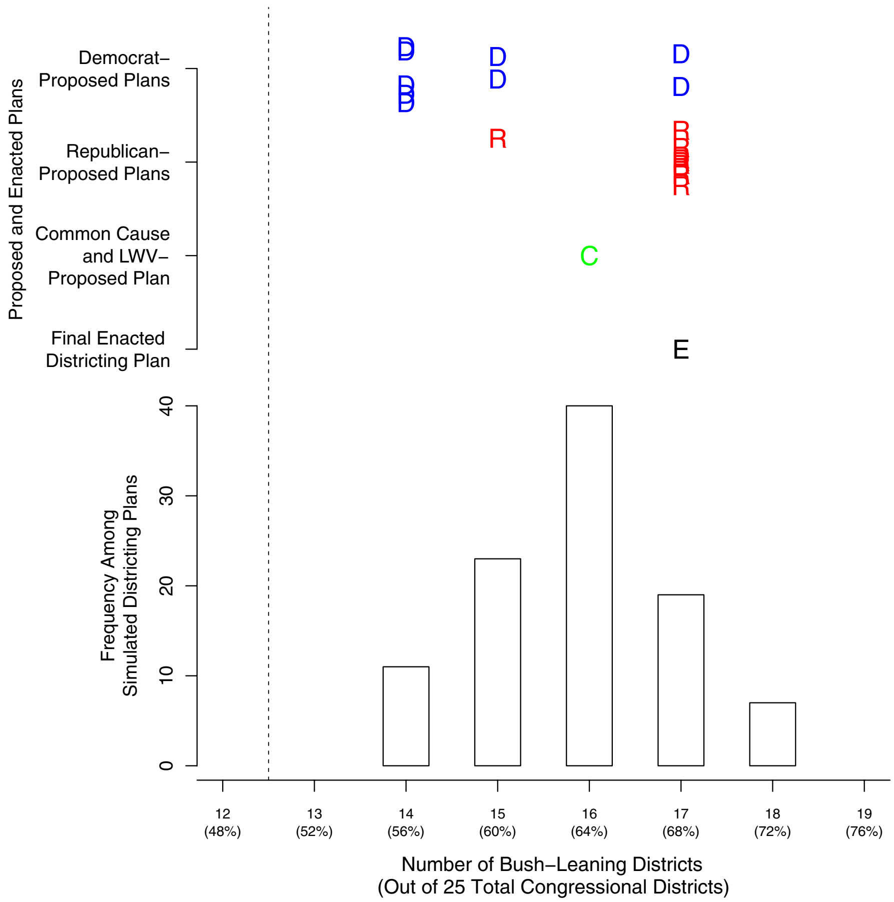

Figure 6A. Enacted, proposed, and simulated districting plans for Florida's 25 congressional districts.

Note: Proposed plans include all Congressional districting plans submitted for consideration to the Florida State Senate Committee on Reapportionment in 2002.

to the U.S. House, and Figure 6B displays plans for the Florida Senate. In terms of electoral bias, every one of the submitted plans falls well within the range of the simulated districting plans. Not surprisingly, the Republican plans tend to produce larger Republican majorities than Democratic or LWV plans, but remarkably, not a single unbiased or pro-Democratic plan was submitted by any of the Democratic legislators. Of course, we cannot conclude from Figure 6 that Democrats submit biased plans solely because

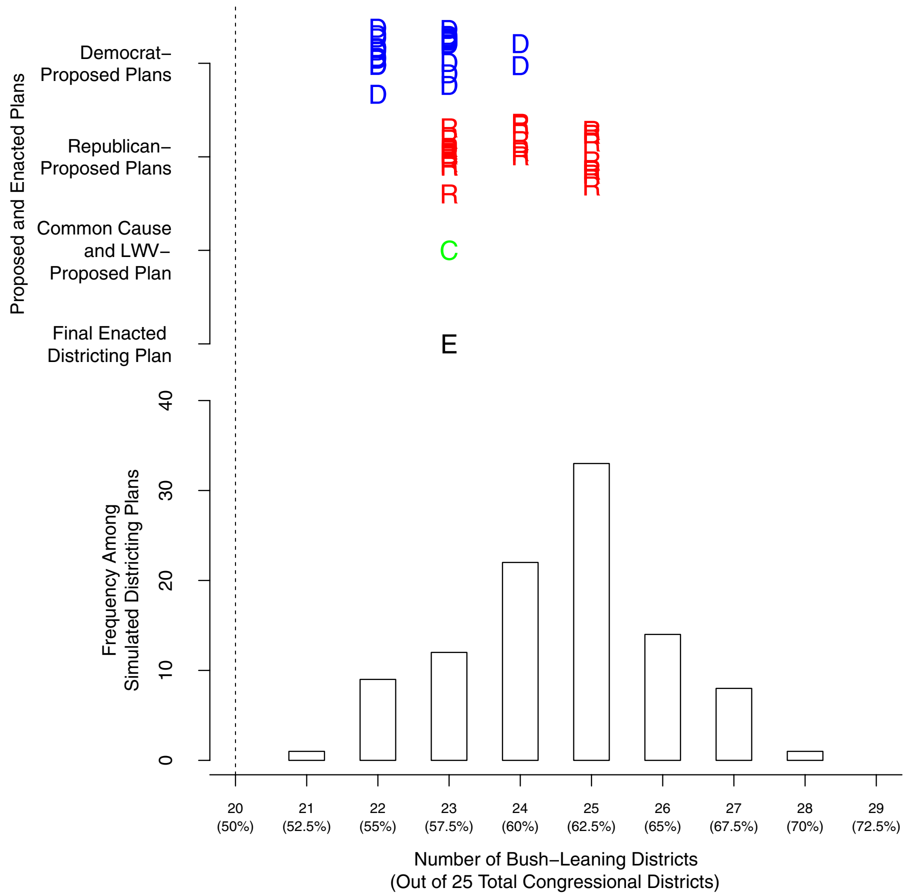

Figure 6B. Enacted, proposed, and simulated districting plans for Florida's Senate (40 districts).

Note: Proposed plans include all Senate districting plans submitted for consideration to the Florida State Senate Committee on Reapportionment in 2002.

of the constraints generated by human geography. However, at a minimum, Figure 6 suggests that the level of bias produced in the real world of strategic partisan cartographers, courts, and the Voting Rights Act is not radically different from that produced by human geography alone.

We acknowledge, however, that various political considerations may have influenced the drawing of the various Democrat-submitted plans. For example, important considerations for Democratic cartographers include minority representation and protection of incumbents, especially those incumbents submitting the districting proposals. An additional possibility is that Democratic mapmakers understood that a pro-Democratic redistricting plan would never secure passage in the Republican-controlled state legislature; hence, perhaps only plans with built-in Republican bias were even worth submitting.

6 Simulation Results across U.S. States

The most striking result thus far is the rather consistent size of the pro-Republican bias in Florida; additionally, much of this bias would have occurred with a simple, random districting scheme that is blind to race or partisanship. This finding raises at least two broad questions. First, to what extent does an urban concentration of Democrats generate a similar political geography of electoral bias in other states? Second, building upon Figure 6, to what extent does the electoral bias that would be generated by our automated districting algorithm track electoral bias observed in actual districting plans?

In order to provide the necessary cross-state perspective, we have linked November 2000 precinct-level data reported by county governments with corresponding GIS boundary files provided by the U.S. Census Bureau. The reprecincting and the use of completely different precinct identifiers in the two data sets make this a difficult challenge. While improved coordination between the census department and state election officials will soon allow for a more complete data set for more recent elections, for the November 2000 elections we have been able to match 20 states. We have applied exactly the same automated districting algorithm introduced above and produced graphs like those in Figure 4.

The only difference is that because elections in other states were not tied, before performing the simulations we applied a uniform swing to the precinct-level results in order to examine the seat share in a "hypothetical" tied election. We then calculate the average bias estimates across all simulations corresponding to the number of districts in each state's lower chamber, its upper chamber, and its U.S. Congressional delegation. A useful feature of the 2000 presidential election is the fact that it was very close in a number of states, so that the uniform swing used to achieve a hypothetical tie is not a far stretch of the imagination. However, in consistently lopsided states like Massachusetts or Oklahoma, close statewide elections are less frequent.

Figure 1 revealed that the extent to which Democrats are spatially concentrated in urban areas varies considerably across states. We capture this heterogeneity in a simple way by using block group-level data and regressing, state by state, the Democratic vote share in the 2000 presidential election on logged population density, weighting by the block group's population. The coefficient from this regression is displayed on the horizontal axis of the first panel of Figure 7. The vertical axis displays the average estimated Republican vote share obtained from 50 simulations of the state's Congressional and state legislative districts. Observations above 0.5 indicate that on average, the districting algorithm produced districts that would turn tied elections into Republican legislative majorities.

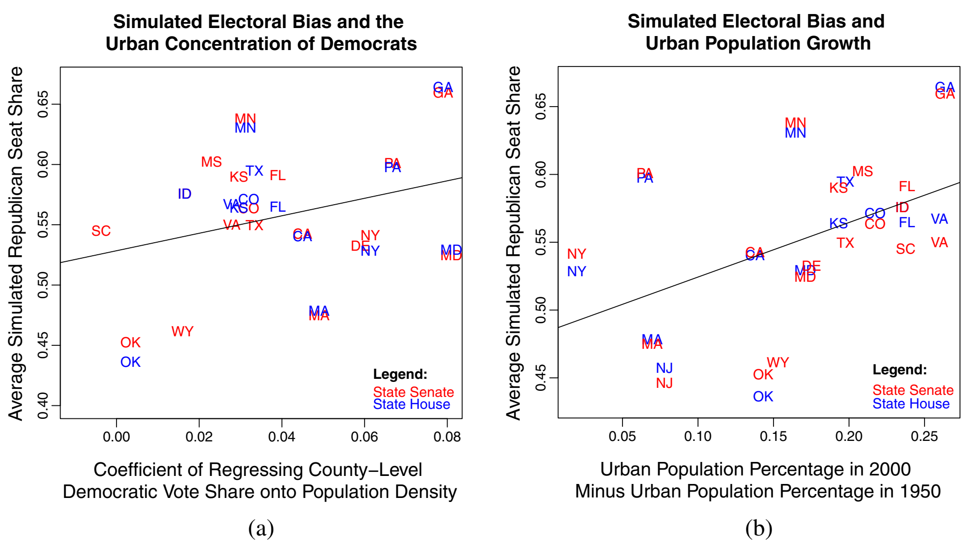

Figure 7. Simulated electoral bias in state legislatures and the urban concentration of democrats.

Note: The solid lines represent least-squares regression fits. The horizontal axis in the left plot is measured as the estimated coefficient of population density when county-level Gore (November 2000) vote share is regressed onto county-level population density within each state. The vertical axis represents the simulated electoral bias for state legislative chambers, measured as the percentage of simulated congressional districts with Republican majorities when the statewide Republican vote share is exactly 50%.

Figure 7 suggests that Florida is not an outlier. The correlation between population density and Democratic voting is even higher in several other states, and in most of them, the simulations consistently produced similar or even higher levels of pro-Republican bias than in Florida. Average bias in favor of Republicans is substantial — surpassing 5% of legislative seats — in around half the states for which simulations were possible. It appears that in some of the largest and most urbanized U.S. states, even without overt racial or partisan gerrymandering, the Democrats are at a disadvantage in translating votes to seats simply because their voters are inefficiently clustered in urban areas. According to the simulations, this problem is less severe for the Democrats in Western and Southern states, where their voters are more efficiently spread out in space. The second panel in Figure 7 provides a different perspective on urbanization and electoral bias by plotting the simulation results against the extent to which the state has urbanized since 1950, suggesting that the Democrats face the most inefficient geographic support distributions in states that have experienced the most urbanization.

Next, we compare the bias generated by our simulated plans to that created by the districting plans that were in place both before and after the 2002 redistricting cycle. To calculate the latter, we superimpose the actual legislative district boundaries on the November 2000 precinct-level presidential election results and aggregate Bush and Gore votes, then apply the uniform swing in order to examine the share of districts that would be won by Bush in a hypothetical tied state legislature election. In Figure 8, this quantity is plotted on the vertical axis, and the simulated Republican seat shares are plotted on the horizontal axis, with lower chambers displayed in red and the upper chambers in blue.

The positive correlation between the simulation estimates and those based on actual districts suggests the strong ability of our simulations to predict the direction and extent of electoral bias across states. In general, the states where the simulations produced large pro-Republican bias, like Texas and Pennsylvania, are the same states where the actual districting plans produced similar bias. As with the simulations, observed electoral bias in these states tends to favor Republicans, sometimes quite dramatically so.

Figure 8 plots include a 45-degree line, such that any observation above (below) the line indicates that the observed pro-Republican bias associated with the existing plan exceeds (falls short of) the bias found in our race- and partisan-blind simulations. Most of the districting plans are clustered fairly close to this 45-degree line, suggesting that in most states, observed

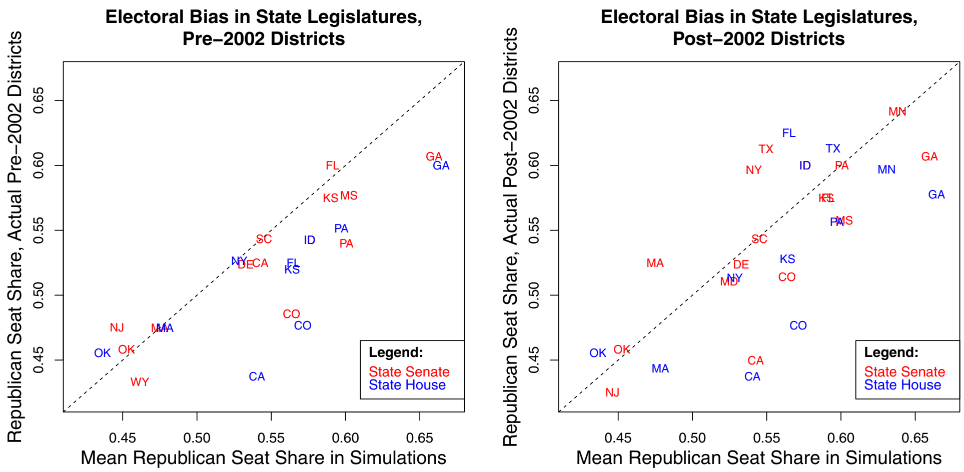

Figure 8. Electoral bias in simulated districting plans versus actual districting plans.

Note: In both plots, the horizontal axis plots estimates of the share of seats in the legislature that would have Republican majorities from districting simulations under the hypothetical scenario of a tied statewide 2000 presidential vote. Also using 2000 presidential results, the vertical axis plots the percent of seats that would be won by Republicans after applying the uniform swing to votes aggregated to the level of actual districting plans. Each measure is displayed separately for the upper and lower chambers of each state's legislature.

electoral bias would not necessarily disappear in the absence of intentional partisan and racial gerrymandering. Moreover, the 45-degree line provides a useful benchmark against which to compare observed districting plans. For instance, the plans drawn by Democrats in California and Georgia are friendlier to Democrats than the average of the simulated plans. Yet, in a state like Georgia, where the simulations reveal an especially bad geography for Democrats, even an aggressive pro-Democratic gerrymander was unable to completely erase the built-in pro-Republican bias. The simulations also identify cases, like the Florida House of Representatives and the Texas State Senate, where Republican cartographers appear to have done better for themselves than would be predicted from the simulations.

We must stop short of characterizing the deviation from the 45-degree line in Figure 8 as a measure of partisan gerrymandering because this deviation is also driven by a variety of factors including court interventions and efforts at racial representation. Nevertheless, automated districting simulations place observed plans into useful perspective. If one encounters a districting plan characterized by 7 or 8% pro-Republican bias in a state like Georgia or Pennsylvania, one cannot necessarily infer that partisan manipulation has taken place. Nor can one necessarily infer that efforts at minority representation are to blame, because party- and race-blind simulations produce even larger levels of bias.

On the other hand, in a state like New Jersey, Democrats are evenly dispersed throughout an urban corridor that lacks a sprawling and heterogeneous rural periphery, thus avoiding the phenomenon described in the Florida example above. As a result, the simulations predict modest pro-Democratic bias in New Jersey, and this is reflected in the actual adopted plans. If Republicans in New Jersey and neighboring Pennsylvania submitted plans that produced an identical 10% bias in their favor, claims of partisan manipulation should carry more weight in New Jersey.

7 Discussion

This article has demonstrated that in contemporary Florida and several other urbanized states, voters are arranged in geographic space in such a way that traditional districting principles of contiguity and compactness will generate substantial electoral bias in favor of the Republican Party. This result is driven by a partisan asymmetry in voters' residential patterns: Democrats live disproportionately in dense, homogeneous neighborhoods in large cities that aggregate into landslide Democratic districts, or they are clustered in minor agglomerations that are small relative to the surrounding Republican periphery. Republicans, on the other hand, live in more sparsely populated suburban and rural neighborhoods that aggregate into districts that are geographically larger, more politically heterogeneous, and moderately Republican. We have explained how these geographic patterns can explain a large part of the pro-Republican bias observed in recent legislative elections in Florida and several other states.

Together, our theoretical explanation and our simulation results contribute to the literature on legislative districting and electoral bias in three ways. First, we have built upon and extended the work of political geographers who have noticed that electoral bias emerges in two-party systems when one party's voters are more concentrated in space. For example, Gudgin and Taylor (1979) show that in a competitive two-party system, if the cross-district support distributions of the two parties are skewed, the party with too many of its supporters packed into the districts of the tail of the distribution will suffer in the transformation of votes to seats. Writing in the 1970s about Britain, they conjecture that due to the inevitability of densely packed support in coalfields and manufacturing districts, the Labour Party faced a right-skewed support distribution, causing it to suffer from a less efficient transformation of votes to seats than the Conservatives. Rydon (1957) and Johnston (1976) provide similar descriptive accounts of pro-Conservative electoral bias in Australia and New Zealand, respectively.

Erikson (1972, 2002), Jacobsen (2003), and McDonald (2009a, 2009b) have made similar observations about the relative concentration of Democrats in urban U.S. House districts in the post-war period. However, perhaps because the process of redistricting is typically more politicized in the United States than in Commonwealth countries, the U.S. literature tends to focus overwhelmingly on the partisan and racial motivations of those drawing the lines. This article has attempted to provide a window into the role of human geography in U.S. electoral bias through the use of automated simulations. It shows that pro-Republican bias can be quite pronounced even in the absence of intentional gerrymandering, and is greatest in states where Democratic voters are more geographically concentrated than Republican voters. A goal for future research is to complete simulations for all 50 states, and develop more sophisticated explanations for cross-state and time-series variation in the partisan bias owing to human geography.

Second, our findings show that voter geography confounds the traditionally hypothesized relationship between gerrymandering and the partisan control of legislatures. Past scholars have taken sharp positions in favor (e.g., Carson *et al.*, 2007) and against (Abromowitz *et al.*, 2006; Mann, 2007; McCarty *et al.*, 2009) the hypothesis that gerrymandering affects polarization in the House of Representatives, and scholars have also examined the impact of gerrymandering on the incumbency advantage (Friedman and Holden, 2009). Other studies have analyzed the effect of racial gerrymandering (e.g., Hill, 1995; Shotts, 2001, 2003) and respect for municipal boundaries (e.g., McDonald, 2009b) on electoral bias.

Our findings caution that the relationships between intentional gerrymandering and observed electoral bias are not necessarily identical across different states. Rather, the nexus between districting strategies and partisan control of legislatures is confounded by the electoral bias that emerges from underlying residential patterns in each state. Because geographic patterns of Democratic voter concentration vary widely across states, each state has a different baseline partisan seat distribution that would emerge under a districting process without overt gerrymandering. Hence, our work suggests the possibility that each state's unique voter geography may either open up or restrict opportunities for mapmakers wishing to implement politically motivated gerrymandering strategies. Simulation results like those presented in this article might provide a useful baseline for future empirical studies.

Third, our simulation results offer insight into the likely effect of various redistricting reforms, such as Amendments 5 and 6 in Florida, that attempt to mandate the seemingly objective districting criteria of compactness, contiguity, and respect for municipal boundaries. Our simulation method mimics the type of districting process mandated by such reforms. Our results suggest that in Florida, New York, Pennsylvania, and other urbanized states with substantial rural peripheries, such reforms are likely to lock in a powerful source of pro-Republican electoral bias that emanates from the distinct voter geography of these states. Hence, our simulations suggest that reducing the partisan bias observed in such states would require reformers to give up on what Dixon (1968) referred to as the ‘‘myth of non-partisan cartography,’’ focusing not on the *intentions* of mapmakers, but instead on an empirical standard that assesses whether a districting plan is likely to treat both parties equally (e.g., King *et al.*, 2006; Hirsch, 2009).

Although presidential and statewide elections have been quite close over the last decade, the Republicans have consistently controlled between 60 and 70% of the seats in Florida's state legislature and Congressional delegation. Beyond the electoral bias in the transformation of votes to seats that we illustrate in this paper, Ansolabehere *et al.* (2012) describe another, more subtle impact of the asymmetric distribution of partisans across districts. It is conceivable that because of the extent to which liberals are packed into urban districts, the Democratic platform, or at least its perception by Florida voters, is driven by its legislative incumbents — a small group of leftists from Miami–Dade and Broward counties who never face Republican challengers — which in turn makes it difficult for the party to compete in the crucial moderate districts. This hypothesis may help to explain why the Democrats consistently receive higher vote shares in presidential than in state races.

It is striking that political geography can turn a party like the Florida Democrats, with a persistent edge in statewide registration and presidential voting, into something approaching a permanent minority in legislative races. One might imagine that a future Supreme Court would entertain the notion that this situation reaches the rather high bar for justiciability of partisan gerrymandering laid out in *Davis v. Bandemer* (1986), where a gerrymander must be shown to have essentially locked a party out of power in a way that frustrates ''the will of the majority.'' The recent opinions of the pivotal justices, however, suggest that a claimant would need to demonstrate that an ''egregious'' gerrymander is intentional. Proving such intent in court will be difficult in states where equally egregious electoral bias can emerge purely from human geography.

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Rebuttal Report of Sean P. Trende

in *Nairne, et al. v. Ardoin, et al.*

1. I have been asked by counsel to review the Declaration of William Cooper, dated August 11, 2023, and respond to it insofar as it critiques my previous report in this matter. Mr. Cooper's response, on my read, is confined to ¶¶50-52 of my report.

2. First, Cooper doesn't respond to the meat of my report. For example, he does not dispute that I've calculated the moment of inertia statistic correctly, nor does he dispute that the moment of inertia is a legitimate approach for calculating the compactness of a population, nor does he dispute that I have identified the most compact groups of Black residents of voting age sufficient to constitute a majority in each district. In fact, he suggests that with some more work, the "unorthodox" approach outlined may be worthy of a peer-reviewed article.

3. To the extent this is a critique, it isn't clear why this approach would be called "unorthodox." Mr. Cooper doesn't dispute that this method of measuring population compactness is among the oldest metrics for compactness in the redistricting literature. That its *application* ***may*** be unorthodox has nothing to do with the reliability or legitimacy of the technique itself, which is peer-reviewed and well-established.

4. With those concessions in place, Mr. Cooper simply offers legal argumentation that, in my view, is best reserved for counsel to make and judges to decide. He writes "In a Section 2 redistricting lawsuit, compactness is not measured by where part of a minority population is located in a district. Rather, it is measured based on the distribution of the entire population of the district and the district shape."

5. That is pure legal analysis; the way to measure compactness is something for the lawyers to argue and judges to decide. To the extent it is even proper for me to respond, I would simply note that the language of *Gingles* prong 1 references the compactness of the *minority population*, not the compactness of the district itself (which must simply be 'reasonably configured'). Opining on the implications of this is not something I was retained to do, nor would I be particularly inclined to do so. I was simply retained to determine whether the minority populations were reasonably compact, upon which plaintiffs' experts do not appear to engage.

6. Cooper notes that he has never been involved in a case that involves the moment of inertia approach, and that his (and my) Maptitude for Redistricting software doesn't include this metric. What of this? It's true that most litigation focuses on the compactness of the district shape. My understanding is that defendants wish to focus on the compactness of the population. My understanding is that this reflects multiple references in *Gingles*, *LULAC* and other cases to the compactness of the population. That Mr. Cooper has never been involved in a case involving population compactness has nothing to do with the proper legal standard, in my view. But that's also something, in my view, for lawyers to argue and judges to decide. At best, the only thing relevant from his opinion here is that he doesn't dispute that the MOI approach is an accepted way to measure the compactness of populations.

7. In ¶52, Mr. Cooper indirectly explains why he likely hasn't been involved in cases involving population compactness. Until fairly recently, undertaking the venture that he suggests (measuring the MOI for White and Black populations in every district in the state) would have been, as he suggests, a "monumental" project. First, shapefile data was not widely available until the 2010s. Even today, state legislative shapefiles pre-2010 can be difficult to obtain. But one can easily obtain congressional district shapefiles going back to the Founding, census shapefiles going back to the 1910s, and election return data going back decades. But this is a new development. Second, computing power has increased dramatically. Running computer simulations on a statewide basis wasn't achieved until the 1990s, and didn't become commonplace until the 2000s. Chen & Rodden ran a ground-breaking, state-of-the-art simulation in the early 2010s that produced a thousand simulated maps.

8. Today, however, my desktop computer can produce millions of simulated maps using more accurate and computationally involved techniques than those found in Chen & Rodden in a few hours. The "monumental" task Mr. Cooper describes – which would have previously been monumental indeed – would involve a few hours gathering data, a few more hours adapting the code I've written (my senate code currently takes 135 lines

to produce five separate analyses), and then leaving my computer to run overnight. In other words, the reason Mr. Cooper hasn't encountered this type of analysis is not that it is incorrect, it is that until relatively recently it would have been infeasible.

9. The closest Mr. Cooper comes to offering expert rebuttal testimony is his final paragraph, where he suggests that my failure to look at the MOI for all of the Black and White populations in the Enacted Plan renders my analysis "topological gobbledygook." Five-syllable words aside, this is not reasoning, it is *ipse dixit.* Mr Cooper offers no actual justification for why a proper analysis would need to do this. I struggle to imagine such a justification.

10. Perhaps under an equal protection theory one would want to see if Whites and Blacks of voting age are treated differently. In a Section 2 case, however, I'm unsure what such an endeavor would tell us. After all, most of the districts in Louisiana don't have minority populations sufficient to comprise a majority of the population in their districts, whether compact or not. The VRA also doesn't require compact White populations, nor, to my understanding, does Louisiana law. In short, undertaking the task Mr. Cooper describes would not be difficult. To my understanding of the issues in this case, however, it would not provide useful insight either.

I declare under penalty of perjury under the laws of the State of Ohio that the foregoing is true and correct to the best of my knowledge and belief. Executed on 21 Aug. 2023 in Delaware, Ohio.

Sean P. Trende

UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF LOUISIANA

DR. DOROTHY NAIRNE, JARRETT LOFTON, REV. CLEE EARNEST LOWE, DR. ALICE WASHINGTON, STEVEN HARRIS, ALEXIS CALHOUN, BLACK VOTERS MATTER CAPACITY BUILDING INSTITUTE, and THE LOUISIANA STATE CONFERENCE OF THE NAACP, Plaintiffs, v. R. KYLE ARDOIN, in his capacity as Secretary of State of Louisiana, Defendant.	Case No. 3:22-cv-00178-SDD-SDJ

SURREBUTTAL DECLARATION OF DOUGLAS JOHNSON, PH.D.
AUGUST 21, 2023

1. I am over the age of eighteen (18) and am competent to testify to the matters set forth herein. The following is true of my own personal knowledge and I otherwise believe it to be true.

2. I am the President of National Demographics Corporation ("NDC") and have consulted on over 400 redistricting projects across the country. A copy of my current CV was attached to my prior expert report in this case. My CV lists my history of redistricting and related expert-witness experience.

3. I have been retained by counsel for the Legislative Intervenors, the Honorable Clay Schexnayder, in his official capacity as Speaker of the Louisiana House of Representatives, and the Honorable Patrick Page Cortez, in his official capacity as President of the Louisiana Senate. My compensation is $300 per hour for my work on this case and is not contingent upon the outcome of the case.

Scope of Work

4. Counsel asked me to respond to the August 11, 2023, rebuttal report of plaintiffs' expert, Mr. Cooper. Mr. Cooper creates and then "rebuts" inaccurate paraphrases of my previous report. In this report I will respond to Mr. Cooper's actual quotations, not some creative but distorted paraphrasing.

Mr. Cooper's Use of Race

5. In paragraph 30 of his rebuttal report, Mr. Cooper admits that he changed his illustrative plans on the basis of race:

> "I also made changes to improve the performance of the districts for black preferred candidates based on the feedback counsel received from Dr. Handley."

6. Mr. Cooper provides no elaboration on how he increased the Black percentage of voters "based on the feedback counsel received from Dr. Handley." Nor does Mr. Cooper state in which districts he increased the percentage of Black voters based on the unspecified "feedback" he received from plaintiffs' counsel, but at least in this statement he admits race was the predominant factor in the changes he made. This confirms the primary opinion of my earlier report.

Mr. Cooper's Lack of Use of, or Lack of Disclosure of, CVAP Data

7. In paragraph 19 of his rebuttal report, Mr. Cooper makes this statement:

> "Dr. Johnson claims that I did not import CVAP data into Maptitude. This is not true. Disaggregated block-level CVAP data is available in Maptitude running on my desktop computer. . . . I only examined CVAP by district at the summary level as I drew the plans."

8. The CVAP data are not in the Census Block file that Mr. Cooper disclosed as the Census Block file he used while drawing his maps.

9. The assumption underlying the statement in my report was that Mr. Cooper did, in fact, turn over the files he said he used when drawing the maps. He now states his mapping files included data that was not in the file he turned over. This apparent conflict means either that the

statement in his rebuttal report is incorrect, or he has failed to turn over the data files he used while drawing his maps. Only Mr. Cooper can answer which is the case.

10. Mr. Cooper also asserted that he provided block-level CVAP data from the Redistricting Data Hub in a file that he turned over. This is an irrelevant statement. Maptitude for Redistricting can only tabulate data "at the summary level," as Mr. Cooper asserts he did (in paragraph 19), if that data are available in the Census Block file Maptitude is using for mapping. No block-level CVAP data are in the mapping Block file that Mr. Cooper provided.

Mr. Cooper's Inaccurate and Misleading List of "New" Majority-Black Districts

11. In paragraph 19 Mr. Cooper creates a fake paraphrase of my report:

> "Dr. Johnson makes additional false claims that I overcounted the number of additional majority-Black districts in the Illustrative Plan."

12. I find it telling that he did not actually quote my report. Here is my actual statement from my opening report:

> 78. Plaintiffs' expert claims the 2023 Illustrative Plans shows the Legislature could have drawn three more majority-Black Senate Districts (Mr. Cooper's June 30, 2023, report at paragraph 73, claiming new majority-AP Black VAP SDs 17, 19 and 38) and six more majority-Black House Districts (paragraph 103, claiming new majority-AP Black VAP HDs 1, 23, 38, 60, 65 and 68).
>
> 79. Unfortunately, plaintiffs' expert's data are incorrect. As his own June 30, 2023, report's Exhibit N-1 shows, HD23 is already majority-Black in the Enacted Map:
>
> *[table omitted from quotation]*
>
> 80. And plaintiffs' expert also fails to mention that his 2023 House Illustrative Map eliminates a majority-Black VAP district: HD62, as shown in his June 30, 2023, report's own Exhibit I-1 and N-1
>
> *[table omitted from quotation]*
>
> 81. In summary, plaintiffs' expert's claimed list of "six additional majority-Black districts" incorrectly includes HD23 as an "additional" district, when HD23 was already majority-AP Black VAP in the enacted map. And plaintiffs' expert's

> claimed list also fails to acknowledge that the 2023 House Illustrative Map also eliminates majority-AP Black VAP HD62."

13. Mr. Cooper's "rebuttal" ignores the fact that each of my statements is accurate:

    a. HD23 is not a new majority-AP Black VAP district. It is already majority-AP Black VAP in the Enacted map; and

    b. His list of majority-AP Black VAP districts fails to acknowledge that he redrew Enacted HD62 so that it is no longer majority-AP Black VAP.

14. Mr. Cooper's paragraph 35 is accurate when it says new majority-Black districts "can easily be determined by doing a manual count comparing the district-level percentages." But this just adds to the mystery of why the list in his earlier report was wrong, as I accurately noted in my report.

Illustrative Map New Majority-Black Districts Are Not More Compact

15. In paragraph 13 of his rebuttal report, Mr. Cooper again gets creative in his paraphrasing:

> "I have prepared additional exhibits to counter Dr. Johnson's claims in ¶¶ 15-29 that the majority Black districts in the Illustrative Plan are not compact."

16. However, Mr. Cooper's report in this section reacts to a straw-man argument. My argument, as stated in paragraph 15 of my opening report, was that "the twenty-one districts changed between the 2022 House Illustrative Map and the 2023 House Illustrative Map made the 2023 map even less compact than the 2022 House Illustrative Map." That statement, and the analysis that followed, compared Mr. Cooper's 2022 House Illustrative Map to his 2023 House Illustrative Map. Since the changes between the 2022 Illustrative Map and the 2023 Illustrative Map did not improve compactness, clearly improving compactness was not a significant consideration in that 2023 redraw. Yet again, the evidence is clear that race was the predominate

factor when Mr. Cooper was drawing the districts. Since my point was that the 2023 districts are not more compact than the 2022 districts, Mr. Cooper's rebuttal that the Illustrative Map districts are more compact than the Enacted Map districts is irrelevant.

17. In Mr. Cooper's paragraphs 14, 15, 16 and 17, he dwells entirely on plan-wide compactness scores of his 2023 Illustrative Map compared to the Enacted Map.

18. Mr. Cooper claims to rebut my statements about "the majority Black districts in the Illustrative Plan" but never mentions the majority Black districts.

19. Even more oddly, the referenced paragraphs of my report also did not mention "the majority Black districts." Mr. Cooper seems confused about what he is rebutting in this portion of his report.

20. In this section of his "rebuttal" Mr. Cooper simply claims the raw numbers presented in the Maptitude reports declare his maps are "more compact" than the Enacted Maps. He does not state, and thus I cannot respond or reply to, how he came to that conclusion. There are many ways to look at compactness data. One common, but mistaken, approach is to look at average scores. This is a poor approach. Consider two maps: one map where every district is reasonably compact, and another map where half the districts are highly compact and the other half are extremely non-compact. The average score for both maps would be the same, despite the significant compactness problems in the second map. A second way to analyze compactness data is to select a threshold below which a district is considered non-compact and then count how many districts in each map are non-compact. (And to repeat that for each compactness measure in use). These are just two of the ways compactness data can be evaluated – there are many others. Mr. Cooper does not state how he is reviewing the data. He simply makes a questionable, unsupported, and overly broad blanket claim that his map is "more compact."

21. What is clear, however, is that Mr. Cooper's "Rebuttal" report does not raise any concerns with nor rebut the compactness analysis contained in my report.

22. Despite Mr. Cooper's statement that his compactness rebuttal also addresses Paragraphs 22 through 26 of my report, those paragraphs of my report describe the way Maptitude for Redistricting software works, not compactness.

23. Similarly, Paragraphs 27 through 29 of my report address how Mr. Cooper's own report states that the number of majority-Black House and Senate districts has increased faster than the rate of increase in the Black population according to Mr. Cooper's own data. Despite Mr. Cooper's reference to them, those paragraphs also are not part of my report's discussion of compactness.

Being "Aware" of Data Does Not Equal Using that Data

24. In paragraph 23, Mr. Cooper writes:

> "Contrary to Dr. Johnson's claim in ¶¶ 36-37, I was aware of cultural regions, MSAs, and Planning Districts as I developed the Illustrative Plans. Of course, there is no way to avoid multiple regional splits and comply with one-person, one-vote and the Voting Rights Act."

25. Mr. Cooper frames his entire discussion of cultural regions, MSAs and Planning Districts as factors other than race that he claims to consider when drawing his illustrative plans. As a professional demographer and someone who has created hundreds of redistricting plans in my career, I find Mr. Cooper's statement that "I was aware" noteworthy for its omission—that is, that he made no claim to have actually drawn any lines based on those regions. One can be "aware" that the Mississippi is a river, or that Texas is west of Louisiana, but being "aware" of something provides no evidence that one factored something into the drawing of maps.

26. I agree with Mr. Cooper that <u>one or two</u> crossings of a regional border may be necessary to "comply with one-person, one-vote" requirements. But the Illustrative Maps cross

numerous regional borders five, six, seven or even eight times. One-person, one-vote requirements can require that one district cross a regional boundary on one side and that another district cross the same regional boundary on the other side, as one or two crossings may be necessary to ensure that districts on each side of the region in question can share the region's population to meet equal population requirements.

27. Equal population requirements do not require more than two boundary crossings. Yet, Mr. Cooper's 2023 Illustrative Senate and House maps cross many regional boundaries five, six, seven and even eight times. Those crossings cannot be explained by the need to meet population requirements.

28. It may be true that Mr. Cooper was "aware" of those regional boundaries. But the five, six, seven and eight crossings of those boundaries prove that race, not the regional boundaries, was his predominate consideration when drawing his district lines.[1]

Pure Luck Is Unlikely to Result in Eight House Districts between 50.2 and 50.9% AP Black VAP

29. In paragraph 29 of his rebuttal report, Mr. Cooper states:

> "I did not shade or color-code census blocks by race percentages, nor did I know the exact racial percentage of any VTD while I was drawing the map."

30. Yet the precision of his 2023 Illustrative House map, where eight House districts are between 50.2% and 50.9% AP Black VAP, the unusual shape of some of those districts, and the way those districts ignore city, region, and major roads as their borders, prove one of three scenarios had to be true:

---

[1] The 2023 Illustrative Senate map crosses the Houma-Thibodaux MSA border five times and the New Orleans – Metairle MSA border five times; the Baton Rouge MSA border six times; the Lafayette MSA border six times; the Delta "Key Multi-Parish Cultural Region" border six times; and the Acadiana "Key Multi-Parish Cultural Region" border ten times. The 2023 Illustrative House map crosses the Lafayette MSA border seven times; the Baton Rouge MSA border eight times, and the Acadiana "Key Multi-Parish Cultural Region" eight times.

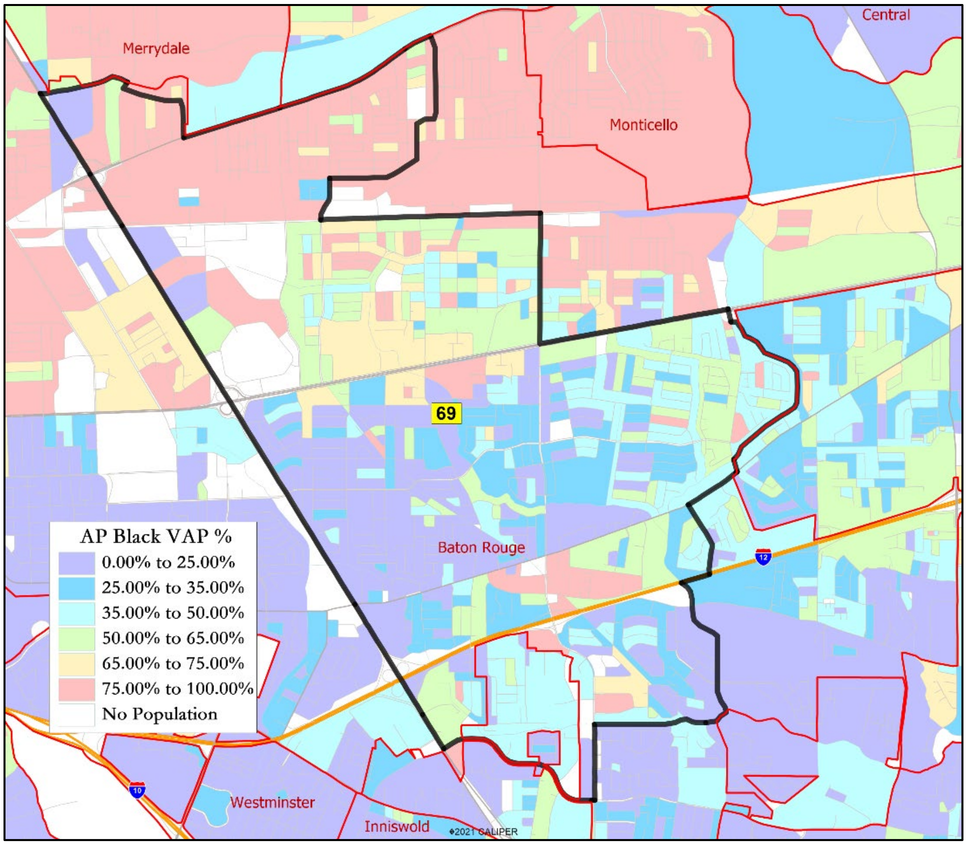
a. Mr. Cooper had AP Black VAP data on his screen;

b. Mr. Cooper has so much experience drawing maps in Louisiana that he knows the AP Black VAP percentage of each Vote Tabulation District without needing to put the shading on his screen; or

c. Mr. Cooper did a trial-and-error approach of adding in 'this or that' Vote Tabulation District until the districting in question reached his desired barely-over-50% target in each of those districts.

31. Any of these three scenarios prove Mr. Cooper used race as the predominant factor when drawing the Illustrative Maps.

32. 2023 Illustrative House Map District 69 provides an illustration of what Mr. Cooper asks the Court to believe: that the district boundary shown below arrived at precisely 50.2 percent AP Black VAP without Mr. Cooper looking at – or using pre-existing detailed knowledge of – racial data. Note how the lines in the north go almost, but not quite, to the Baton Rouge – Merrydale border; how the lines zig and zag through northeast Baton Rouge (near Monticello) seemingly randomly; how the border goes all the way to the City's eastern boundary along the Lively Bayou, then veers back in through Baton Rouge neighborhoods just north of Interstate 12, and extends outside Baton Rouge to include the unincorporated Cottages at Southfork / Regency Club Apartments area rather than staying in Baton Rouge and including the section of the City below I-12 along Harrells Ferry Road:



33. Each of these decisions contributed to the creation of a district that is precisely 50.2% AP Black VAP. In my experience, it is extremely unlikely that one district would end up at such a barely-majority figure purely by luck if drawn by a mapper who "did not shade or color-code census blocks by race percentages, nor did I know the exact racial percentage of any VTD while I was drawing the map."

34. HD69 is not unique. In the Illustrative House Map a total of <u>eight</u> districts ended up – we are apparently supposed to believe 'by luck' – at 50.2 to 50.9 percent AP Black VAP.

35. Mr. Cooper presents two conflicting claims in paragraphs 29 and 30 of his rebuttal report:

> "I did not shade or color-code census blocks by race percentages, nor did I know the exact racial percentage of any VTD while I was drawing the map"

> **AND**

> "I made changes to improve the performance of the districts for black preferred candidates based on the feedback counsel received from Dr. Handley."

36. These eight very precisely-drawn districts and the lack of any explanation from Mr. Cooper regarding how he arrived at these lines (other than that they created majority-AP Black VAP districts) can only lead to the conclusion that his use of race as a predominate factor when making "changes to improve the performance of the district for black preferred candidates" is the accurate statement.

Parish Splits

37. In Paragraph 37, Mr. Cooper lauds that his map contains fewer Parish Splits than the Enacted Map. But in his Paragraph 26 Mr. Cooper acknowledges that dividing a Parish can "make perfect sense."

38. I agree with Mr. Cooper's opinion in Paragraph 26 of his Rebuttal report that a Parish split is not automatically negative, which leads to the logical conclusion that raw counts of the number of split Parishes is not a conclusive factor in one map being preferable to another.

39. I also note that Mr. Cooper seems unaware that his statement that it "makes perfect sense" for both the Enacted and Illustrative House District 54 to cross the Parish, Planning District, MSA and "Key Cultural Region" border undermines the eleven pages he spent in his original report trying to assert these were important boundaries.

"Minor" Changes

40. In Paragraph 7, Mr. Cooper repeats his "minor" characterization of the differences between the original Illustrative Maps and the 2023 Illustrative Maps:

> "The changes I made between the 2022 Illustrative Plan and the now-current Illustrative Plan are minor."

41. As I demonstrated in my prior report, and as Mr. Cooper acknowledged as accurate in paragraph 12 of his Rebuttal report, the 2023 Illustrative House Map moves 83,489 people into a different district assignment than in the original Illustrative House Map.

42. As I demonstrated in my prior report, and as Mr. Cooper acknowledged as accurate in paragraph 12 of his Rebuttal report, the 2023 Illustrative Senate Map moves 35,276 people into a different district assignment than in the original Illustrative Senate Map.

43. I disagree that changing over 118,000 district assignments is "Minor."

44. In paragraph 28 of his report, Mr. Cooper makes a similar (and also inaccurate) claim that the differences between the House and Senate maps he incorrectly analyzed as the "Enacted" maps and the actual Enacted maps are "substantially similar."

45. Since Mr. Cooper has yet to provide the geographic files for the map he incorrectly analyzed as the "Enacted" maps, I cannot calculate the precise count of how many people he had in the wrong districts. From a visual review of the images in his reports and an eyeball comparison of those images with the population data in Maptitude, there are <u>at least</u> tens of thousands of people moved between the different versions of the maps. My previous report maps the substantial differences between the different versions. In my opinion, maps that reassign tens of thousands of people are rarely "substantially similar."

46. The attached exhibits 1 (for the Senate) and 2 (for the House) report the total population, population deviation, percentage population deviation and AP Black VAP percentage for each House and Senate district in each plan. A comparison of these exhibits, in addition to the maps in my earlier reports, reinforce the significant, or non-"minor," racial and other differences between the enacted plans and Mr. Cooper's various rounds of illustrative maps.

All opinions in this report are subject to amendment in the event additional relevant information is received.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 21st day of August, 2023.

Douglas Johnson, Ph.D.

Exhibit 1

Dr. Douglas Johnson

8/20/2023

Enacted Senate Map
Population Deviation

District	Population	Deviation	% Deviation	% 18+_AP_Blk
37	113,500	-5,930	-5.0%	24.9%
34	113,538	-5,892	-4.9%	63.7%
30	113,737	-5,693	-4.8%	12.2%
17	114,040	-5,390	-4.5%	30.1%
32	114,168	-5,262	-4.4%	18.1%
12	114,171	-5,259	-4.4%	22.3%
28	114,358	-5,072	-4.2%	22.7%
11	114,481	-4,949	-4.1%	8.4%
13	114,815	-4,615	-3.9%	7.7%
1	115,622	-3,808	-3.2%	21.4%
2	115,780	-3,650	-3.1%	57.7%
15	115,848	-3,582	-3.0%	73.9%
33	116,896	-2,534	-2.1%	23.0%
27	117,231	-2,199	-1.8%	28.8%
6	117,595	-1,835	-1.5%	22.9%
35	117,819	-1,611	-1.3%	15.5%
4	117,821	-1,609	-1.3%	57.2%
21	118,105	-1,325	-1.1%	26.5%
18	118,250	-1,180	-1.0%	15.3%
16	119,031	-399	-0.3%	19.6%
3	119,519	89	0.1%	57.3%
29	119,834	404	0.3%	56.6%
14	120,750	1,320	1.1%	58.0%
31	120,902	1,472	1.2%	23.4%
8	120,920	1,490	1.2%	25.8%
25	122,998	3,568	3.0%	20.8%
10	123,168	3,738	3.1%	12.2%
19	123,416	3,986	3.3%	28.7%
20	123,445	4,015	3.4%	12.7%
5	123,995	4,565	3.8%	50.2%
26	124,178	4,748	4.0%	16.0%
38	124,283	4,853	4.1%	31.0%
7	124,487	5,057	4.2%	59.5%
36	124,512	5,082	4.3%	25.2%
9	124,537	5,107	4.3%	11.9%
24	124,799	5,369	4.5%	53.1%
39	124,908	5,478	4.6%	63.7%
23	125,014	5,584	4.7%	12.8%
22	125,286	5,856	4.9%	26.1%
	120,116	686	0.57%	Ave for Black-Majority
	119,160	-270	-0.23%	Ave for Not-Black-Majority

Dr. Douglas Johnson

2023 Illustrative Senate Map

Population Deviation

8/20/2023

District	Population	Deviation	% Deviation	% 18+_AP_Blk
5	113,653	-5,777	-4.8%	51.8%
18	113,880	-5,550	-4.6%	14.7%
4	113,887	-5,543	-4.6%	58.1%
12	114,171	-5,259	-4.4%	22.3%
3	114,295	-5,135	-4.3%	51.3%
29	114,304	-5,126	-4.3%	50.9%
35	114,324	-5,106	-4.3%	20.1%
37	114,442	-4,988	-4.2%	22.0%
11	114,481	-4,949	-4.1%	8.4%
38	114,693	-4,737	-4.0%	53.2%
15	114,959	-4,471	-3.7%	54.5%
34	115,559	-3,871	-3.2%	63.0%
36	116,808	-2,622	-2.2%	15.5%
39	116,965	-2,465	-2.1%	52.5%
1	117,408	-2,022	-1.7%	21.9%
6	118,131	-1,299	-1.1%	26.5%
7	118,604	-826	-0.7%	52.3%
16	119,031	-399	-0.3%	19.6%
17	119,166	-264	-0.2%	52.5%
8	119,463	33	0.0%	18.9%
31	119,801	371	0.3%	25.9%
19	120,000	570	0.5%	51.0%
14	120,105	675	0.6%	58.1%
24	120,600	1,170	1.0%	52.0%
13	120,616	1,186	1.0%	11.2%
22	121,992	2,562	2.1%	28.2%
20	122,493	3,063	2.6%	13.4%
28	123,409	3,979	3.3%	20.3%
27	123,854	4,424	3.7%	35.8%
26	123,880	4,450	3.7%	15.2%
2	124,072	4,642	3.9%	51.7%
30	124,341	4,911	4.1%	13.7%
32	124,599	5,169	4.3%	18.4%
23	124,628	5,198	4.4%	13.9%
33	124,802	5,372	4.5%	26.6%
21	124,879	5,449	4.6%	25.5%
25	125,021	5,591	4.7%	13.6%
10	125,111	5,681	4.8%	11.4%
9	125,330	5,900	4.9%	12.2%
	117,204	-2,226	-1.86%	Ave for Black-Majority
	120,676	1,246	1.04%	Ave for Not-Black-Majority

Dr. Douglas Johnson

2022 Illustrative Senate Map
Population Deviation

8/20/2023

District	Population	Deviation	% Deviation	% 18+_AP_Blk
5	113,653	-5,777	-4.8%	51.8%
18	113,880	-5,550	-4.6%	14.7%
4	113,887	-5,543	-4.6%	58.1%
15	114,100	-5,330	-4.5%	54.8%
12	114,171	-5,259	-4.4%	22.3%
3	114,295	-5,135	-4.3%	51.3%
29	114,304	-5,126	-4.3%	50.9%
35	114,324	-5,106	-4.3%	20.1%
37	114,442	-4,988	-4.2%	22.0%
11	114,481	-4,949	-4.1%	8.4%
38	114,693	-4,737	-4.0%	53.2%
14	114,973	-4,457	-3.7%	55.9%
34	115,559	-3,871	-3.2%	63.0%
7	115,744	-3,686	-3.1%	52.7%
36	116,808	-2,622	-2.2%	15.5%
39	116,965	-2,465	-2.1%	52.5%
1	117,408	-2,022	-1.7%	21.9%
20	117,817	-1,613	-1.4%	12.8%
6	118,131	-1,299	-1.1%	26.5%
16	119,031	-399	-0.3%	19.6%
31	119,801	371	0.3%	25.9%
24	120,600	1,170	1.0%	52.0%
13	120,616	1,186	1.0%	11.2%
22	121,992	2,562	2.1%	28.2%
19	122,620	3,190	2.7%	50.1%
28	123,409	3,979	3.3%	20.3%
27	123,854	4,424	3.7%	35.8%
26	123,880	4,450	3.7%	15.2%
2	124,072	4,642	3.9%	51.7%
30	124,341	4,911	4.1%	13.7%
8	124,379	4,949	4.1%	19.8%
32	124,599	5,169	4.3%	18.4%
23	124,628	5,198	4.4%	13.9%
33	124,802	5,372	4.5%	26.6%
21	124,879	5,449	4.6%	25.5%
25	125,021	5,591	4.7%	13.6%
10	125,111	5,681	4.8%	11.4%
17	125,157	5,727	4.8%	54.5%
9	125,330	5,900	4.9%	12.2%
	117,187	-2,243	-1.88%	Ave for Black-Majority
	120,685	1,255	1.05%	Ave for Not-Black-Majority

Exhibit 2

Enacted House Map
Population Deviations

District	Population	Deviation	% Deviation	% 18+_AP_Blk
20	42,204	-2,156	-4.86%	15.5%
39	42,262	-2,098	-4.73%	28.4%
38	42,309	-2,051	-4.62%	23.1%
30	42,313	-2,047	-4.61%	20.4%
16	42,328	-2,032	-4.58%	62.5%
32	42,409	-1,951	-4.40%	14.4%
11	42,458	-1,902	-4.29%	56.4%
44	42,506	-1,854	-4.18%	59.5%
91	42,508	-1,852	-4.17%	40.7%
84	42,520	-1,840	-4.15%	19.9%
88	42,542	-1,818	-4.10%	13.4%
43	42,630	-1,730	-3.90%	14.5%
24	42,692	-1,668	-3.76%	10.2%
57	42,697	-1,663	-3.75%	57.9%
23	42,708	-1,652	-3.72%	50.9%
17	42,807	-1,553	-3.50%	63.3%
72	42,817	-1,543	-3.48%	52.7%
54	42,849	-1,511	-3.41%	3.1%
28	42,851	-1,509	-3.40%	26.8%
62	42,969	-1,391	-3.14%	55.1%
71	43,001	-1,359	-3.06%	11.3%
25	43,136	-1,224	-2.76%	23.5%
53	43,160	-1,200	-2.71%	20.2%
52	43,163	-1,197	-2.70%	14.7%
19	43,183	-1,177	-2.65%	27.5%
50	43,190	-1,170	-2.64%	32.1%
76	43,228	-1,132	-2.55%	26.1%
22	43,238	-1,122	-2.53%	24.7%
7	43,279	-1,081	-2.44%	29.4%
77	43,291	-1,069	-2.41%	8.3%
95	43,337	-1,023	-2.31%	13.6%
105	43,366	-994	-2.24%	35.9%
45	43,372	-988	-2.23%	14.0%
9	43,401	-959	-2.16%	21.1%
98	43,431	-929	-2.09%	17.8%
90	43,451	-909	-2.05%	21.0%
67	43,566	-794	-1.79%	51.9%
46	43,596	-764	-1.72%	21.2%
81	43,632	-728	-1.64%	11.8%
66	43,703	-657	-1.48%	18.5%
103	43,764	-596	-1.34%	25.0%
15	43,934	-426	-0.96%	6.2%
83	43,956	-404	-0.91%	54.6%

61	44,049	-311	-0.70%	75.3%
10	44,137	-223	-0.50%	32.9%
6	44,174	-186	-0.42%	16.5%
74	44,185	-175	-0.39%	6.8%
13	44,187	-173	-0.39%	27.0%
65	44,189	-171	-0.39%	21.9%
93	44,224	-136	-0.31%	56.6%
27	44,225	-135	-0.30%	11.0%
33	44,243	-117	-0.26%	7.7%
14	44,279	-81	-0.18%	22.2%
85	44,303	-57	-0.13%	35.5%
21	44,329	-31	-0.07%	55.4%
100	44,360	0	0.00%	80.8%
29	44,544	184	0.41%	73.6%
78	44,584	224	0.51%	9.3%
68	44,607	247	0.56%	20.2%
26	44,636	276	0.62%	64.3%
63	44,638	278	0.63%	69.7%
41	44,744	384	0.87%	20.1%
60	44,864	504	1.14%	37.7%
1	44,941	581	1.31%	23.1%
36	45,062	702	1.58%	15.0%
55	45,124	764	1.72%	24.3%
92	45,176	816	1.84%	30.2%
58	45,194	834	1.88%	56.8%
104	45,197	837	1.89%	14.0%
89	45,218	858	1.93%	3.7%
102	45,264	904	2.04%	65.6%
40	45,296	936	2.11%	54.6%
8	45,325	965	2.18%	19.9%
48	45,339	979	2.21%	17.9%
101	45,346	986	2.22%	60.2%
5	45,375	1,015	2.29%	19.4%
70	45,398	1,038	2.34%	21.2%
75	45,463	1,103	2.49%	27.8%
87	45,538	1,178	2.66%	59.1%
79	45,579	1,219	2.75%	11.6%
64	45,619	1,259	2.84%	6.6%
2	45,642	1,282	2.89%	67.4%
42	45,662	1,302	2.94%	18.7%
49	45,670	1,310	2.95%	10.1%
37	45,672	1,312	2.96%	17.5%
94	45,685	1,325	2.99%	9.4%
59	45,699	1,339	3.02%	18.7%

96	45,706	1,346	3.03%	55.1%
97	45,713	1,353	3.05%	72.3%
86	45,736	1,376	3.10%	23.9%
34	45,879	1,519	3.42%	72.6%
12	45,889	1,529	3.45%	19.0%
99	45,922	1,562	3.52%	78.1%
35	45,975	1,615	3.64%	12.4%
3	46,122	1,762	3.97%	73.9%
82	46,202	1,842	4.15%	11.6%
80	46,249	1,889	4.26%	14.9%
51	46,319	1,959	4.42%	21.6%
56	46,361	2,001	4.51%	20.2%
4	46,405	2,045	4.61%	72.1%
47	46,480	2,120	4.78%	11.3%
18	46,494	2,134	4.81%	30.9%
73	46,503	2,143	4.83%	15.0%
31	46,510	2,150	4.85%	17.0%
69	46,550	2,190	4.94%	23.7%
	44,344	-16	-0.04%	Ave for Not-Black-Majority
	44,401	41	0.09%	Ave for Black-Majority

Dr. Douglas Johnson

2023 Illustrative House Map

Population Deviations

8/20/2023

District	Population	Deviation	% Deviation	% 18+_AP_Blk
19	42,229	-2,131	-4.80%	13.2%
39	42,262	-2,098	-4.73%	28.4%
16	42,314	-2,046	-4.61%	59.8%
14	42,319	-2,041	-4.60%	37.7%
35	42,335	-2,025	-4.56%	8.7%
34	42,400	-1,960	-4.42%	50.0%
51	42,400	-1,960	-4.42%	22.2%
21	42,463	-1,897	-4.28%	54.3%
28	42,508	-1,852	-4.17%	24.5%
91	42,508	-1,852	-4.17%	40.7%
84	42,520	-1,840	-4.15%	19.9%
43	42,630	-1,730	-3.90%	14.5%
38	42,695	-1,665	-3.75%	50.8%
57	42,703	-1,657	-3.74%	53.4%
5	42,708	-1,652	-3.72%	50.9%
22	42,723	-1,637	-3.69%	18.7%
2	42,776	-1,584	-3.57%	67.3%
69	42,827	-1,533	-3.46%	50.2%
54	42,849	-1,511	-3.41%	3.1%
56	42,898	-1,462	-3.30%	20.4%
46	42,944	-1,416	-3.19%	17.9%
30	42,952	-1,408	-3.17%	20.6%
17	43,007	-1,353	-3.05%	54.5%
50	43,010	-1,350	-3.04%	20.4%
7	43,102	-1,258	-2.84%	18.0%
53	43,160	-1,200	-2.71%	20.2%
52	43,163	-1,197	-2.70%	14.7%
15	43,211	-1,149	-2.59%	8.3%
76	43,228	-1,132	-2.55%	26.1%
77	43,291	-1,069	-2.41%	8.3%
27	43,325	-1,035	-2.33%	9.1%
105	43,366	-994	-2.24%	35.9%
45	43,372	-988	-2.23%	14.0%
9	43,401	-959	-2.16%	21.1%
98	43,431	-929	-2.09%	17.8%
90	43,451	-909	-2.05%	21.0%
47	43,617	-743	-1.67%	9.0%
88	43,658	-702	-1.58%	11.8%
41	43,722	-638	-1.44%	26.8%
103	43,764	-596	-1.34%	25.0%
11	43,867	-493	-1.11%	55.5%
60	43,920	-440	-0.99%	52.8%
61	43,938	-422	-0.95%	50.2%

83	43,956	-404	-0.91%	54.6%
20	43,964	-396	-0.89%	35.8%
36	44,017	-343	-0.77%	11.9%
101	44,038	-322	-0.73%	50.8%
10	44,137	-223	-0.50%	32.9%
73	44,181	-179	-0.40%	21.3%
74	44,185	-175	-0.39%	6.8%
66	44,223	-137	-0.31%	18.8%
93	44,224	-136	-0.31%	56.6%
85	44,303	-57	-0.13%	35.5%
100	44,360	0	0.00%	80.8%
1	44,473	113	0.25%	55.3%
78	44,584	224	0.51%	9.3%
72	44,738	378	0.85%	50.6%
25	44,786	426	0.96%	16.2%
13	44,864	504	1.14%	24.2%
65	44,864	504	1.14%	56.0%
29	44,991	631	1.42%	57.8%
3	45,006	646	1.46%	58.8%
12	45,007	647	1.46%	18.9%
55	45,124	764	1.72%	24.3%
40	45,170	810	1.83%	54.9%
92	45,176	816	1.84%	30.2%
23	45,186	826	1.86%	50.6%
104	45,197	837	1.89%	14.0%
49	45,204	844	1.90%	11.6%
89	45,218	858	1.93%	3.7%
102	45,264	904	2.04%	65.6%
96	45,266	906	2.04%	55.5%
8	45,325	965	2.18%	19.9%
33	45,338	978	2.20%	7.7%
63	45,354	994	2.24%	57.2%
67	45,379	1,019	2.30%	51.6%
48	45,413	1,053	2.37%	18.2%
58	45,435	1,075	2.42%	51.3%
37	45,438	1,078	2.43%	18.7%
75	45,463	1,103	2.49%	27.8%
86	45,487	1,127	2.54%	20.0%
87	45,538	1,178	2.66%	59.1%
62	45,579	1,219	2.75%	26.8%
79	45,579	1,219	2.75%	11.6%
94	45,685	1,325	2.99%	9.4%
59	45,699	1,339	3.02%	18.7%
97	45,713	1,353	3.05%	72.3%

Population Deviations

71	45,787	1,427	3.22%	14.5%
44	45,853	1,493	3.37%	60.9%
68	45,870	1,510	3.40%	54.2%
99	45,922	1,562	3.52%	78.1%
42	45,959	1,599	3.60%	16.1%
70	45,990	1,630	3.67%	16.8%
64	45,997	1,637	3.69%	9.2%
24	46,036	1,676	3.78%	11.8%
95	46,063	1,703	3.84%	8.8%
82	46,202	1,842	4.15%	11.6%
18	46,226	1,866	4.21%	25.7%
4	46,232	1,872	4.22%	57.5%
80	46,249	1,889	4.26%	14.9%
6	46,262	1,902	4.29%	16.0%
32	46,476	2,116	4.77%	13.4%
81	46,481	2,121	4.78%	8.2%
31	46,510	2,150	4.85%	17.0%
26	46,544	2,184	4.92%	63.4%
	44,325	-35	-0.08%	Ave for Not-Black-Majority
	44,428	68	0.15%	Ave for Black-Majority

2022 Illustrative Map
Population Deviations

District	Population	Deviation	% Deviation	% 18+_AP_Blk
19	42,229	-2,131	-4.80%	13.2%
39	42,262	-2,098	-4.73%	28.4%
48	42,289	-2,071	-4.67%	18.2%
16	42,314	-2,046	-4.61%	59.8%
14	42,319	-2,041	-4.60%	37.7%
35	42,335	-2,025	-4.56%	8.7%
34	42,400	-1,960	-4.42%	50.0%
21	42,463	-1,897	-4.28%	54.3%
28	42,508	-1,852	-4.17%	24.5%
91	42,508	-1,852	-4.17%	40.7%
58	42,518	-1,842	-4.15%	50.5%
84	42,520	-1,840	-4.15%	19.9%
29	42,617	-1,743	-3.93%	58.6%
43	42,630	-1,730	-3.90%	14.5%
38	42,695	-1,665	-3.75%	50.8%
5	42,708	-1,652	-3.72%	50.9%
22	42,723	-1,637	-3.69%	18.7%
73	42,733	-1,627	-3.67%	22.5%
2	42,776	-1,584	-3.57%	67.3%
54	42,849	-1,511	-3.41%	3.1%
46	42,944	-1,416	-3.19%	17.9%
30	42,952	-1,408	-3.17%	20.6%
17	43,007	-1,353	-3.05%	54.5%
7	43,102	-1,258	-2.84%	18.0%
53	43,160	-1,200	-2.71%	20.2%
52	43,163	-1,197	-2.70%	14.7%
50	43,190	-1,170	-2.64%	32.1%
15	43,211	-1,149	-2.59%	8.3%
76	43,228	-1,132	-2.55%	26.1%
49	43,234	-1,126	-2.54%	10.3%
77	43,291	-1,069	-2.41%	8.3%
27	43,325	-1,035	-2.33%	9.1%
105	43,366	-994	-2.24%	35.9%
45	43,372	-988	-2.23%	14.0%
9	43,401	-959	-2.16%	21.1%
98	43,431	-929	-2.09%	17.8%
90	43,451	-909	-2.05%	21.0%
57	43,462	-898	-2.02%	57.3%
47	43,617	-743	-1.67%	9.0%
88	43,658	-702	-1.58%	11.8%
41	43,722	-638	-1.44%	26.8%
103	43,764	-596	-1.34%	25.0%
63	43,863	-497	-1.12%	57.4%

Population Deviations

11	43,867	-493	-1.11%	55.5%
61	43,938	-422	-0.95%	50.2%
83	43,956	-404	-0.91%	54.6%
20	43,964	-396	-0.89%	35.8%
36	44,017	-343	-0.77%	11.9%
10	44,137	-223	-0.50%	32.9%
69	44,159	-201	-0.45%	51.8%
74	44,185	-175	-0.39%	6.8%
66	44,223	-137	-0.31%	18.8%
93	44,224	-136	-0.31%	56.6%
96	44,255	-105	-0.24%	51.7%
85	44,303	-57	-0.13%	35.5%
100	44,360	0	0.00%	80.8%
1	44,473	113	0.25%	55.3%
78	44,584	224	0.51%	9.3%
25	44,786	426	0.96%	16.2%
13	44,864	504	1.14%	24.2%
3	45,006	646	1.46%	58.8%
12	45,007	647	1.46%	18.9%
55	45,124	764	1.72%	24.3%
40	45,170	810	1.83%	54.9%
92	45,176	816	1.84%	30.2%
23	45,186	826	1.86%	50.6%
60	45,195	835	1.88%	50.5%
104	45,197	837	1.89%	14.0%
89	45,218	858	1.93%	3.7%
102	45,264	904	2.04%	65.6%
8	45,325	965	2.18%	19.9%
33	45,338	978	2.20%	7.7%
67	45,379	1,019	2.30%	51.6%
37	45,438	1,078	2.43%	18.7%
75	45,463	1,103	2.49%	27.8%
87	45,538	1,178	2.66%	59.1%
79	45,579	1,219	2.75%	11.6%
62	45,595	1,235	2.78%	27.6%
56	45,596	1,236	2.79%	20.2%
86	45,632	1,272	2.87%	16.9%
101	45,672	1,312	2.96%	51.6%
94	45,685	1,325	2.99%	9.4%
59	45,699	1,339	3.02%	18.7%
97	45,713	1,353	3.05%	72.3%
65	45,747	1,387	3.13%	52.3%
71	45,787	1,427	3.22%	14.5%
44	45,853	1,493	3.37%	60.9%

Population Deviations

68	45,870	1,510	3.40%	54.2%
99	45,922	1,562	3.52%	78.1%
42	45,959	1,599	3.60%	16.1%
70	45,990	1,630	3.67%	16.8%
64	45,997	1,637	3.69%	9.2%
24	46,036	1,676	3.78%	11.8%
72	46,041	1,681	3.79%	51.7%
95	46,063	1,703	3.84%	8.8%
82	46,202	1,842	4.15%	11.6%
4	46,232	1,872	4.22%	57.5%
80	46,249	1,889	4.26%	14.9%
6	46,262	1,902	4.29%	16.0%
51	46,319	1,959	4.42%	21.6%
18	46,417	2,057	4.64%	20.4%
32	46,476	2,116	4.77%	13.4%
81	46,481	2,121	4.78%	8.2%
31	46,510	2,150	4.85%	17.0%
26	46,544	2,184	4.92%	63.4%
	44,334	-26	-0.06%	Ave for Not-Black-Majority
	44,411	51	0.12%	Ave for Black-Majority

UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF LOUISIANA

DR. DOROTHY NAIRNE, JARRETT LOFTON, REV. CLEE EARNEST LOWE, DR. ALICE WASHINGTON, STEVEN HARRIS, ALEXIS CALHOUN, BLACK VOTERS MATTER CAPACITY BUILDING INSTITUTE, and THE LOUISIANA STATE CONFERENCE OF THE NAACP, Plaintiffs, v. R. KYLE ARDOIN, in his capacity as Secretary of State of Louisiana, Defendant.	Case No. 3:22-cv-00178-SDD-SDJ

DECLARATION OF DOUGLAS JOHNSON, PH.D.

1. I am over the age of eighteen (18) and am competent to testify to the matters set forth herein. The following is true of my own personal knowledge and I otherwise believe it to be true.

2. I am the President of National Demographics Corporation ("NDC") and have consulted on over 400 redistricting projects across the country. A copy of my current CV is attached. My CV lists my history of redistricting and related expert-witness experience.

3. I have been retained by counsel for the Legislative Intervenors, the Honorable Clay Schexnayder, in his official capacity as Speaker of the Louisiana House of Representatives, and the Honorable Patrick Page Cortez, in his official capacity as President of the Louisiana Senate. My compensation is $300 per hour for my work on this case and is not contingent upon the outcome of the case.

Scope of Work

4. Counsel asked me to undertake the following tasks:

   a. Analyze plaintiffs' illustrative State House and State Senate plans for Louisiana served with plaintiffs' July 22, 2022, report of William Cooper (the "Illustrative Maps" or "2022 Illustrative Plans"), and the illustrative State House and Senate maps served with Plaintiffs' June 30, 2023, report of William Cooper (the "2023 Illustrative Plans") to analyze, among other things, whether race appears to be the predominate consideration used in drawing those maps;

   b. Compare the 2022 Illustrative Maps and the 2023 Illustrative Maps to identify the scope of changes between the two sets of maps;

   c. Review the "Key Regions" referenced by Plaintiffs' expert, Mr. Cooper, to identify whether there is sufficient evidence provided to support such designations and examine the degree to which the 2023 House and Senate Illustrative Maps follow and respect those "Key Regions" boundaries.

   d. Review the other sections of plaintiffs' expert reports and comment on any areas I viewed as noteworthy or questionable.

Data Used

5. For my analysis, I acquired and loaded into my computer the Louisiana state redistricting geography and data from Caliper Corporation, the Enacted House and Senate map geographic shapefile from the state's redistricting data website, and the 2022 and 2023 Illustrative House and Senate Plan files and other data from Plaintiffs' expert-witness disclosures in this case.

Scope of Changes from 2022 to 2023 Illustrative Maps

7. On June 30, 2023, Mr. Cooper served a supplemental expert report that included his 2023 Illustrative Plans. Mr. Cooper asserted (in paragraph 11 of his supplemental report) that his new plans "update the illustrative plans described in [his] July 22, 2022, declaration to better reflect communities of interest and include other technical changes."

8. Using Maptitude, industry-standard GIS software for redistricting, and other software tools, I analyzed the four maps to determine the number of Census Blocks and population counts that were changed between the 2022 and 2023 State House illustrative maps, and between the 2022 and 2023 State Senate illustrative maps.

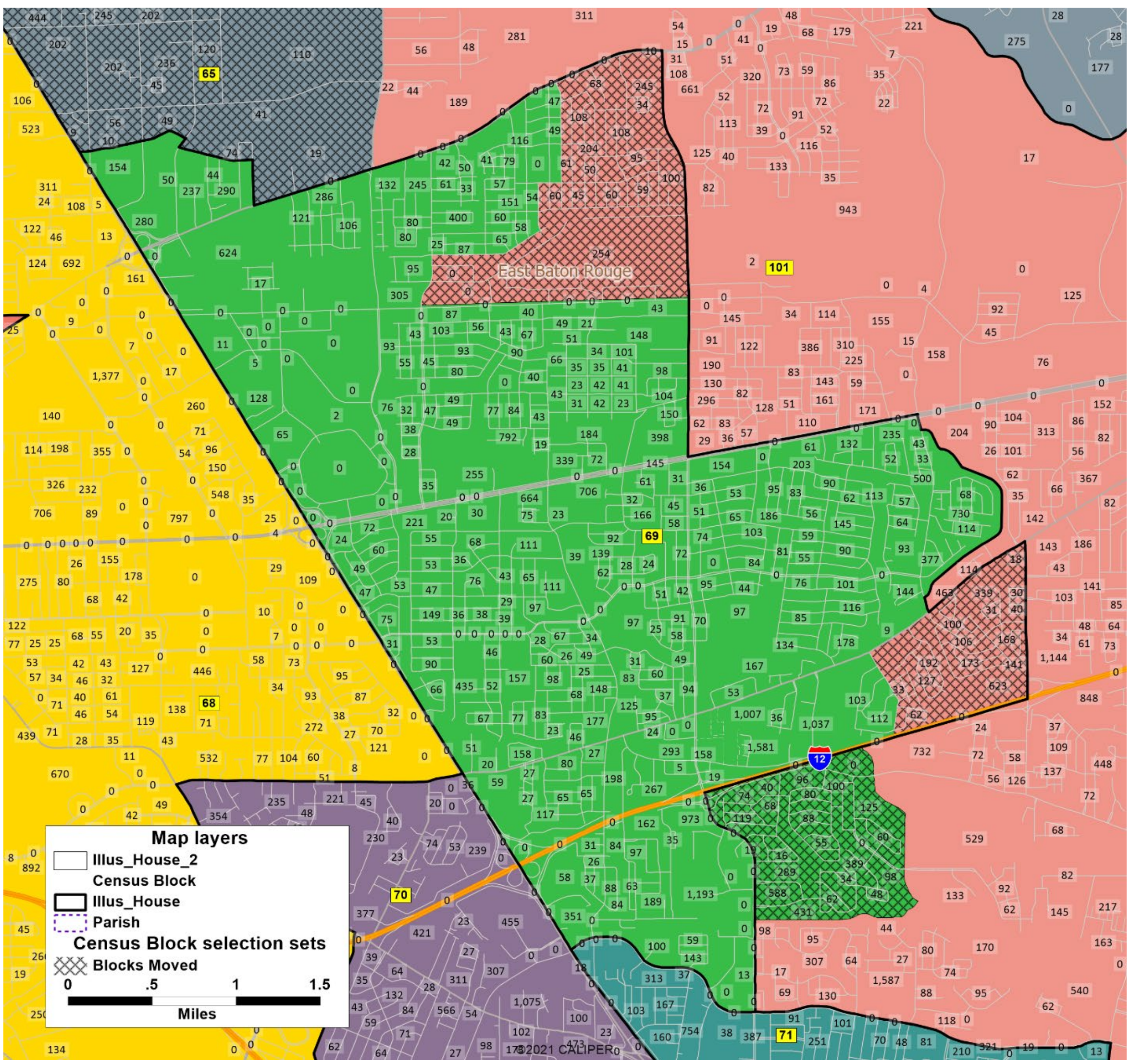
9. The Illustrative 2 House map makes changes to 21 House Districts (20.0% of the 105 total House Districts) from the Illustrative House map. The changed House Districts are Districts 1, 2, 18, 29, 48, 49, 50, 51, 56, 57, 58, 60, 62, 63, 65, 69, 72, 73, 86, 96, 101. In total, 2,464 Census Blocks change House district assignments. These Census Blocks contain 83,489 people, of whom 44.6% (37,238) are Any Part Black. In other words, Illustrative House Map 2 changes the district assignments of 83,489 Louisiana residents (nearly the population equivalent of two entire House districts).

10. Mr. Cooper's Exhibit B-2 from his June 30, 2023, report purports to highlight in red the changed districts. It does not highlight HD1 and HD2, even though there was a change made to those districts—one that involved the reassignment of a single zero-population Census Block.

11. Mr. Cooper's Exhibit B-2 highlights as changed HD8, but in fact HD8 is unchanged, as can be confirmed by comparing this Exhibit B-2 from his June 30, 2023, report with Exhibit I-1 from his original July 22, 2022, report.

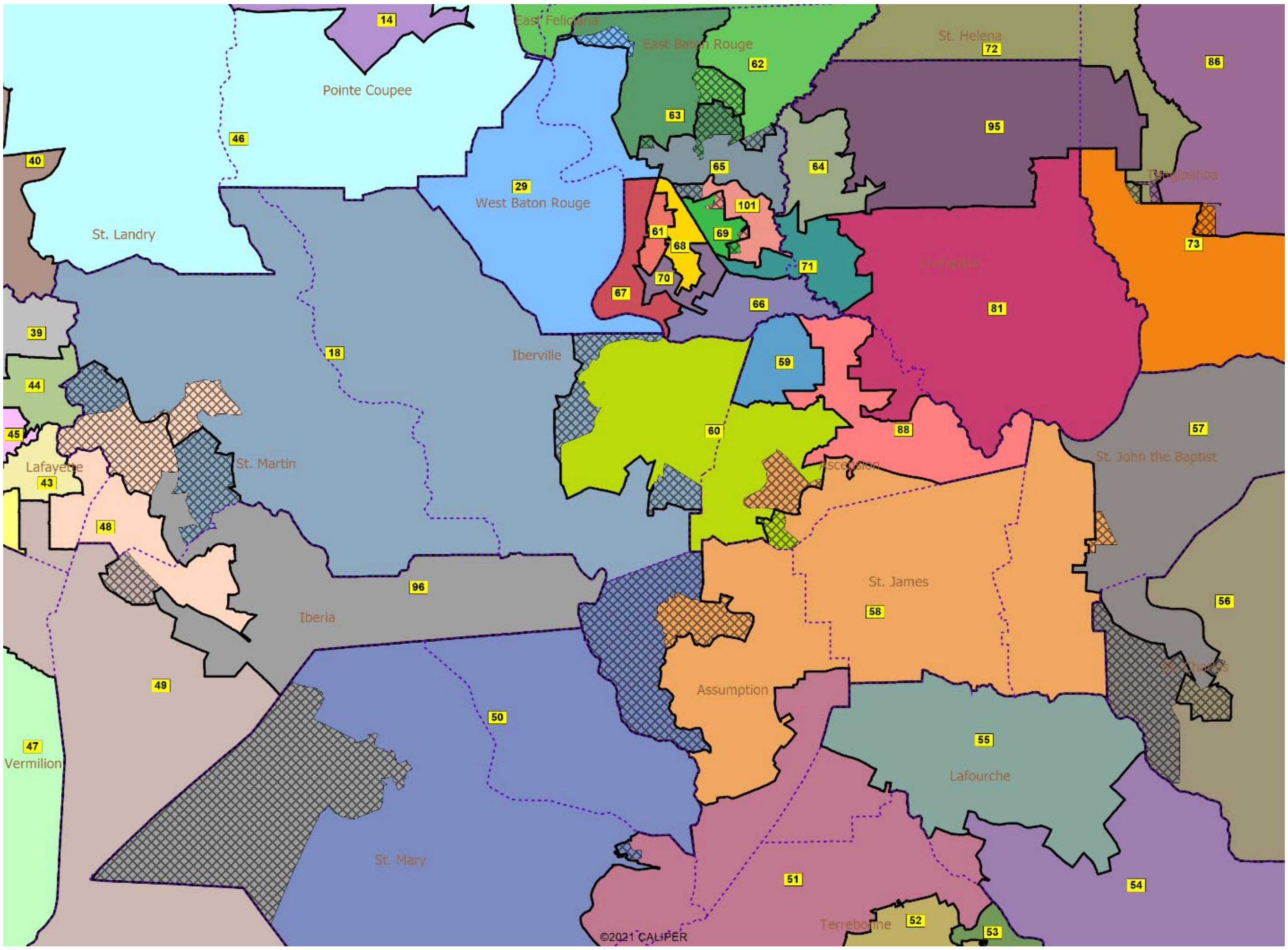
12. Mr. Cooper's Exhibit B-2 does not highlight as changed HD69, but both a comparison with his original July 22, 2022, report's Exhibit I-1 and a look at the map reveals HD69 is significantly changed. In the image below, the colored areas are the Illustrative 2 House Districts. The black lines are the Illustrative House Districts. And the Census Blocks with the black cross-hatching are the Blocks that changed assignments between plaintiff's expert's Illustrative map and his Illustrative 2 map. The numbers shown are the total population of each Census Block:

Figure 1



13. The changed House Districts stretch across Southern Louisiana from Lafayette to Baton Rouge and south to the border of the St Charles and Lafourche Parishes:

Figure 2



14. Turning to the State Senate maps, I have determined that 665 Census Blocks were moved from one Senate District in the Illustrative Senate map to a different Senate District in the Illustrative 2 Senate map. These Census Blocks contain 35,276 people, of whom 49.5% (17,467) are Any Part Black. The Census Blocks assigned to new Senate Districts in the Illustrative 2 Senate map change seven Senate Districts: SD7, SD8, SD14, SD15, SD17, SD19 and SD20 (18 % of the 39 total Senate districts).

Illustrative House and Senate Map Revisions Resulted in Less-Compact 2023 Maps

15. Oddly enough, the twenty-one districts changed between the 2022 House Illustrative Map and the 2023 House Illustrative Map made the 2023 map even *less* compact than the 2022 House Illustrative Map.

16. Both plaintiff's expert and I use the Maptitude for Redistricting software. I used Maptitude to compute the ten measures of compactness built into the software. The results are attached as an appendix to this report. The results show that only two compactness measures that improved were the Ehrenburg and Length-Width measures (focusing on the "minimum," or least-compact, district by each measure). HD96, which was the least-compact district in the 2022 House Illustrative Map, improved from a 0.12 Ehrenburg score to a 0.18 Ehrenburg score in the 2023 House Illustrative Map – still an extremely non-compact district by that measure, but no longer the least-compact district in the map.

17. The 0.06 improvement in HD96's Ehrenburg score was accompanied by a 0.09 improvement in neighboring HD48's Ehrenburg score. But those improvements were more than offset by the combination of a newly-added extra split of the St. Mary Parish, a 0.04 decrease in neighboring HD18's Ehrenburg score, and a significant 0.22 drop in neighboring HD50's Ehrenburg score.

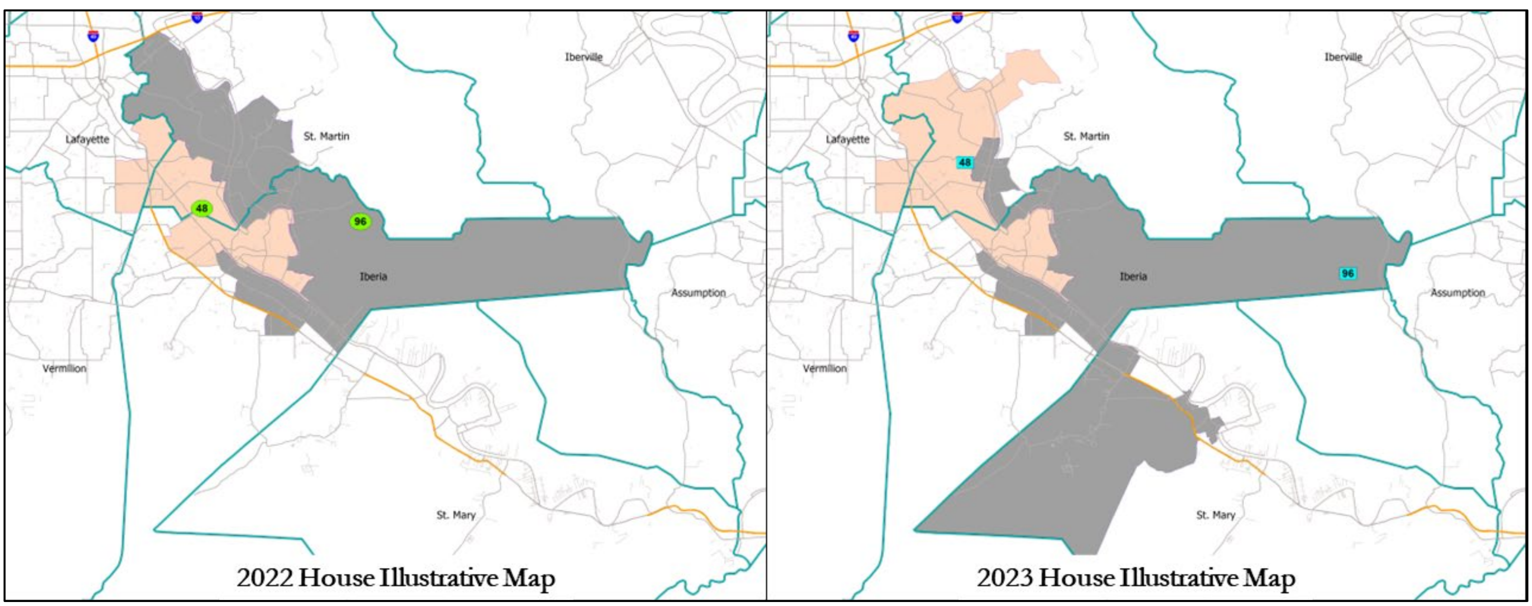
18. But the Ehrenburg improvement in HD96 did not improve the overall map score, which remained a median 0.36 under Ehrenburg. Similarly, the average score remained constant or essentially constant at a 0.01 difference between the 2022 and 2023 maps under eight of the eleven compactness scores built into Maptitude.[1]

[1] The eight constant or 0.01 change compactness measures are Reock, Schwartzberg, alternate Schwartzberg, Polsby-Popper, Population Polygon, Area/Convex Hull/ Population Circle, and Ehrenburg.

19. The scores for the three other compactness measures built into Maptitude[2] became less compact for the 2023 House Illustrative Map than they were in the 2022 House Illustrative Map.

20. The changes to HD50 between the 2022 and 2023 Illustrative Maps further violate traditional redistricting principles by taking HD96 from being a simple combination of the southern non-contiguous portion of St Martin Parish and as much of St. Mary Parish as possible within the equal population requirements in the 2022 map[3], to now adding a 5,000-person piece of Assumption Parish into HD50 and having HD96 become a third district dividing up St Mary Parish.

Figure 3



21. The changes from the 2022 Senate Illustrative Map to the 2023 Senate Illustrative Map similarly make the 2023 Senate Illustrative map less-compact than the 2022 Senate

[2] Cut Edges, Perimeter, and Length-Width.
[3] HD50 in the 2022 House Illustrative Map is identical to HD50 in the Enacted Map.

Illustrative according to the average score on eight of the eleven Maptitude compactness measures[4]. The least-compact district is less compact in the 2023 Senate Illustrative Map than the least-compact district in the 2022 Senate Illustrative Map according to two Maptitude compactness measures[5] and unchanged by the other seven district-specific measures[6].

Maptitude Data Does Not Corroborate The Claim That Plaintiffs' Expert Used Socio-Economic Data When Mapping

22. Despite plaintiffs' expert's claims to have used "socio-economic characteristics" and data when drawing his maps (e.g., Cooper June 30, 2023, supplemental report in paragraphs 10, 75, and 105–106), the data used in his redistricting system do not include socio-economic data. To understand how clear this fact is, one must understand a little bit about how the Maptitude for Redistricting software (which both plaintiffs' expert and I use for most of our work) operates.

23. Maptitude stores data at the Census Block level and reports that data at the District level by aggregating all the Block-level data in a given District. The data and potential changes are displayed live in real time. But only data available in the Block level of geography can be calculated at the District level.

24. For illustrative purposes, below is a screen shot of my Maptitude window with the Enacted Senate map visible. In the image below, the area marked "1" is the list of layers available in the map (those with the green check mark are currently showing in the map, while those

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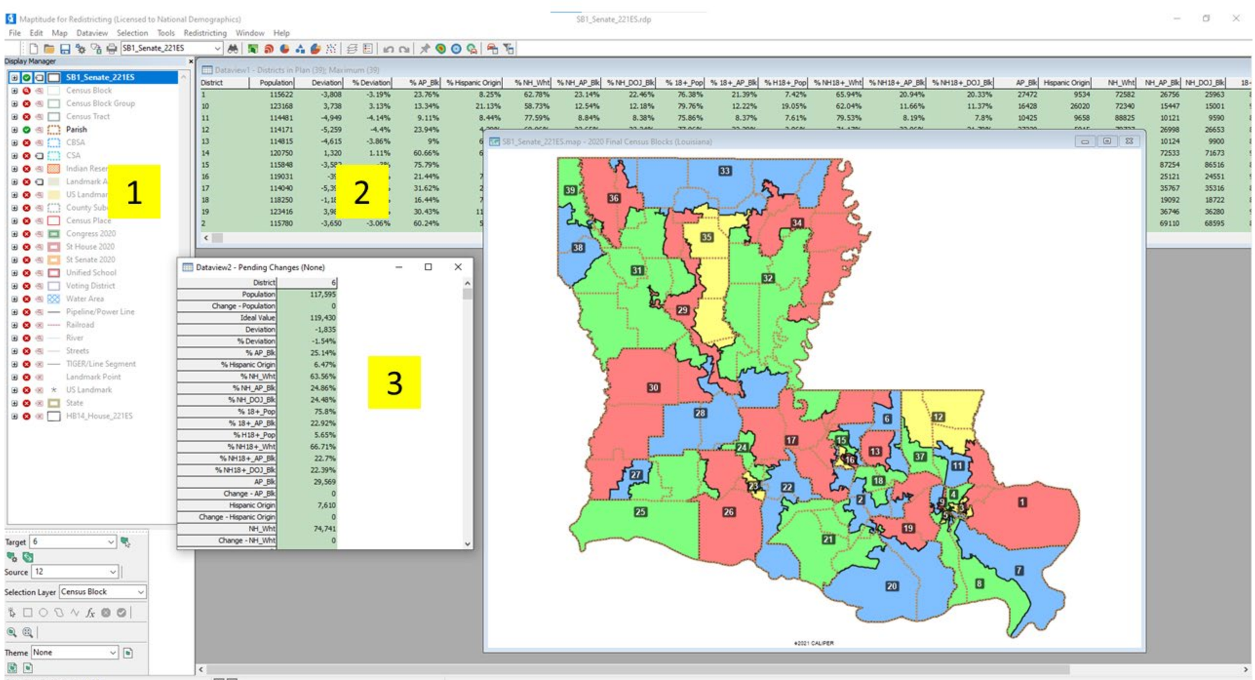
[4] Less-compact: Reock, Schwartzberg, Alternate Schwartzberg, Polsby-Popper, Area/Convex Hull, Ehrenburg, Length-Width and Cut Edges. More-compact (by the absolute minimum change possible of 0.01 in each case): Population Polygon and Population Circle, along with the Perimeter measure.

[5] Reock and Population Polygon

[6] The "cut edges" and Perimeter tests do not give useful individual district scores – they are only useful as whole-map measurements – so they are not included in this count.

with an "x" in a red circle are currently hidden). While the other layers are available as overlays, Maptitude does its calculations using only the data available in the Census Block layer. The area marked "2" are the demographics for each district as drawn in the map at the time the screen shot was taken. And the area marked "3" is a "Pending Changes" window that currently shows no pending changes, but where the demographics of any impacted district(s) would be shown live corresponding to every mouse click in the map.

Figure 4



25. The Census Block data provided by Mr. Cooper contains only (1) the total population by race and ethnicity and (2) the voting age population by race and ethnicity that come standard from Caliper Corporation. Those are the full contents of the Census Bureau's PL94-171 redistricting data file, released after each decennial Census. No Citizen Voting Age Population data nor any other socio-economic data are included in the Maptitude Census Block data file provided by Mr. Cooper as the file he used for drawing his map.

26. Separately Mr. Cooper provided the Citizen Voting Age Population (CVAP) data compiled by HaystaqDNA (which he footnotes as coming from the "Redistricting Data Hub"). But he did not merge that into the Census Block file he claims was used while drawing his maps. He did not provide any socio-economic data compiled at the Census Block level. So the CVAP and socio-economic data would not have been compiled by, nor reported in, the Maptitude software as he drew the map and as he made decisions regarding where to place his illustrative map lines.

Population Change, 2000 (1991 lines) to 2022

27. Plaintiffs' expert's discussion of the changes in the state's Black population between 2000 and 2020 seems to undermine the claim that the 2022 enacted plans undermine Black representation. As Mr. Cooper notes in his June 30, 2023, report (at paragraph 34), from 2000 to 2020 the state's "Any Party Black Voting Age Population" increased from 29.95% to 31.25% -- an increase of 1.3%. And from 2000 to the enacted 2022 House map, the number of majority-Black seats increased from 26 (24.8% of 105) to 29 (27.6% of 105) majority-Black House seats, according to plaintiffs' expert's Paragraphs 53, 54 and 55 – a 2.8% increase. In other words, the Black-majority number of House seats increased more than twice as fast as the Black share of the state's Voting Age Population (2.8% versus 1.3%).

28. Similarly, as plaintiffs' expert notes in his June 30, 2023, report's paragraphs 53, 54 and 56, the number of majority-Black Senate seats increased from 10 in 2000 (25.6% of 39) to 11 (28.2% of 39) – an increase of 2.6%, or exactly double the increase in the Black share of the state's Voting Age Population.

Figure 5

	2000	**2020/2022 with % increase**
Black % of Voting Age Population	29.95%	(2020 Census) 31.25% **+1.3%**
Majority-Black % of House Districts	26	(2022 Enacted Map) 29 **+2.8%**
Majority-Black % of Senate Districts	10	(2022 Enacted Map) 11 **+2.6%**

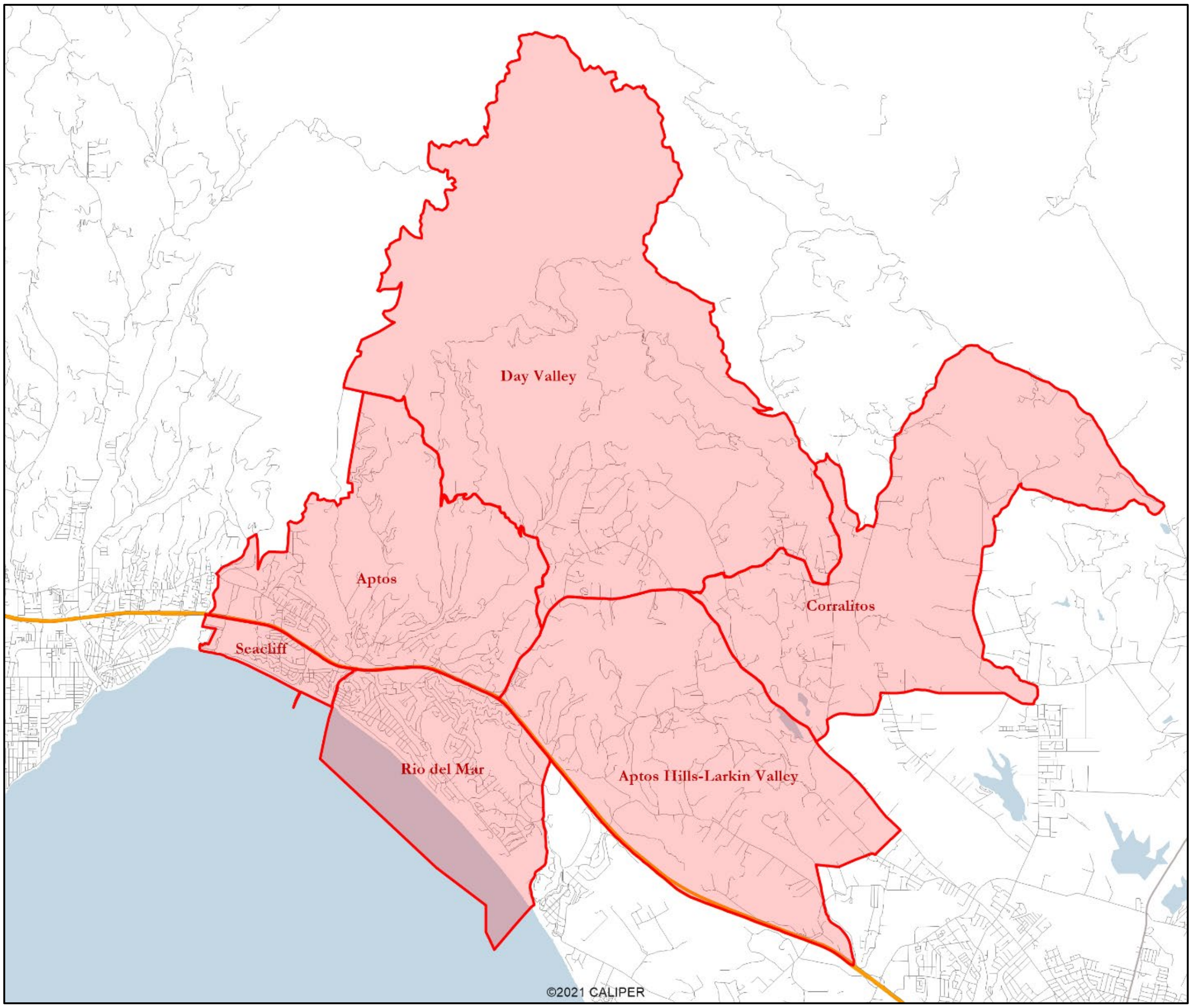
29. It is also worth noting that plaintiffs' expert's statement in his paragraph 58 is simply false, even according to his own math. His Figure 11 shows that three, not two, Black-majority House districts have been added between the map in place in 2000 and the 2022 enacted House map.

Communities of Interest splits report (Exhibits L-1 and P-1)

30. In Exhibits L-1 and P-1 of his June 30, 2023, report, Mr. Cooper provides his list of "municipalities" split by the 2023 Illustrative Plans. These reports are misleading, however, as Census Places are not the same thing as municipalities or communities of interest. In fact, Census Places consist of incorporated towns and cities PLUS unofficial areas designated near-randomly by someone either in the Parish (possibly decades ago) or by someone in Washington DC.

31. As one example that I am personally very familiar with, my (unincorporated) community of Aptos, California, self-identifies as one community called "Aptos" and shares one high school, one primary shopping area, and is geographically isolated – all classic indications of a "community of interest." But the Census Bureau subdivides even our small 27,000-resident unincorporated community into six different CDP's:

Figure 6



32. Plaintiffs' expert has not provided any support or explanation for his claims that such randomly-designated Census Designated Places – not recognized by state or local governments – constitute communities of interest worthy of consideration (in his view) in redistricting.

Wikipedia Is Not A Reliable Source For Defining "Key Multi-Parish Community Regions"

33. Plaintiffs' expert identifies, in paragraph 27 and Figure 2 of the Cooper June 30, 2023, report, what he terms "key multi-parish cultural regions." In my view, however, the sources of evidence he uses to define these "key multi-parish cultural" regions are not sufficiently reliable to be used for such a political-science analysis or when mapping.

34. While the "Acadiana" region's 22 parishes are sourced to the Legislative website (see plaintiffs' expert's footnote 17) or a geography quiz from the state's Common Core curriculum asking students to identify the 12 delta parishes (footnote 19), his other regions are sourced to either an academic website that lists no shared characteristics since Louisiana achieved statehood in 1812 (footnote 18), or, even worse, uses Wikipedia as the source of a "key multi-parish community regions" (footnote 20). I am unconvinced that either Wikipedia or five pre-1812 characteristics are sufficiently accurate and reliable to allow plaintiffs' expert to accurately identify "key" communities of interest relevant to redistricting in 2023.

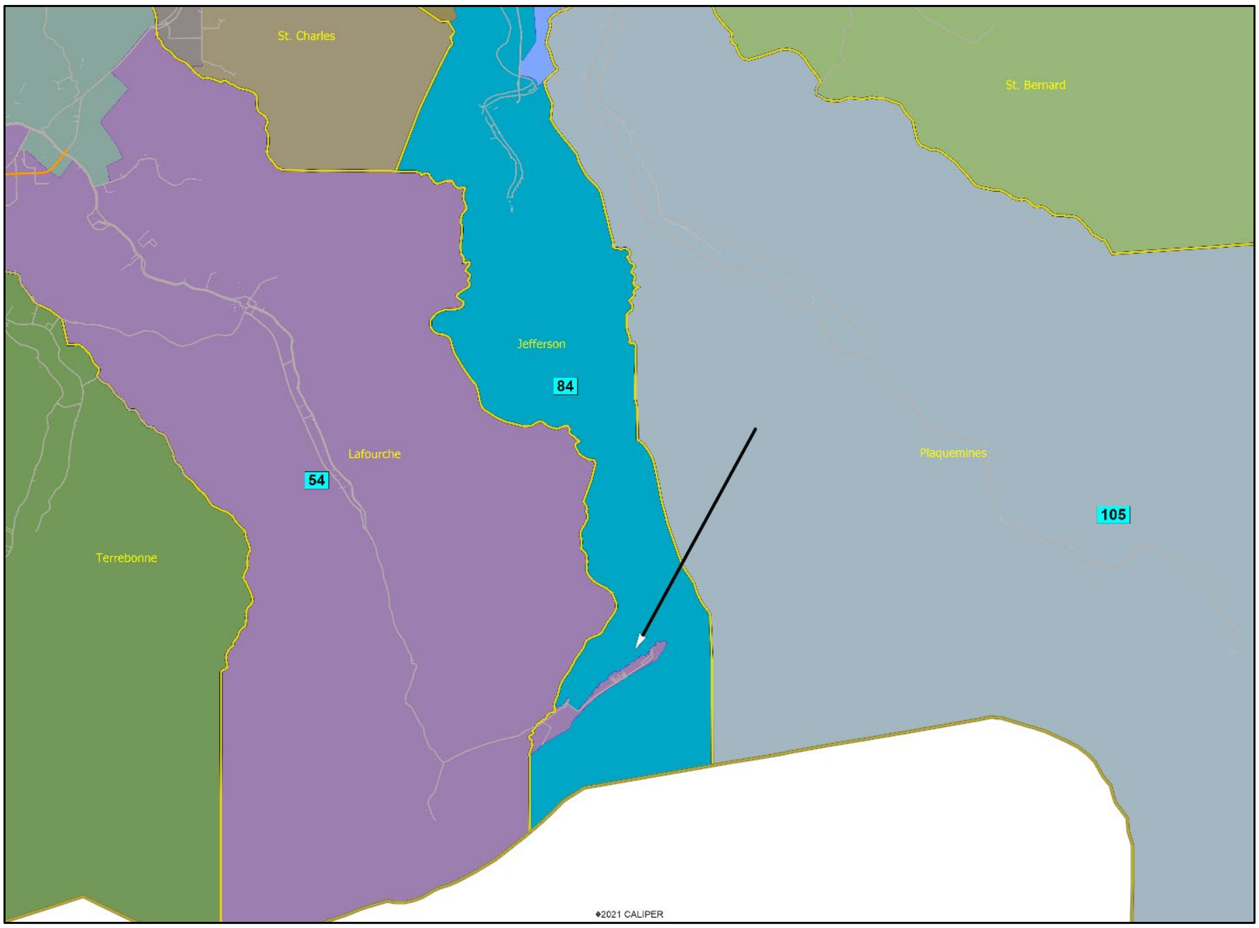
Plaintiffs' Expert's Map Repeatedly Divides His Own "Key Regions"

35. Mr. Cooper's June 20, 2023, report's Figure 2 shows the state divided into "key multi-parish cultural regions"; his Figure 3 shows the state divided into eight "Planning Districts" that he analyzes by race and ethnicity; and Figure 9 shows the Census-drawn Metropolitan Statistical Areas, or MSA's, which he also analyzes by race and ethnicity.

36. If plaintiffs' expert actually considered any of these true "key regions" in the state, the illustrative map would cross the region boundaries no more than twice (as one entry split and one exit split might be necessary to balance populations in a given region and the bordering region).

37. Plaintiff's 2023 Illustrative House map, to its credit, does unite the southeastern "PD-1 New Orleans Area" Planning District as much as possible, crossing its border only once (though even that crossing is notable, as it is the 1,005-person 'finger' extending east out of HD 54 along the shoreline highlighted by the arrow in the following figure):

Figure 7



38. Returning to the question of plaintiffs' "Key Regions," every other Planning District boundary is crossed by anywhere from three to seven House districts. If someone drawing a map truly considered Planning Districts as key communities of interest, that person would not draw a map in that way.

39. The 2023 Illustrative Senate map (where SD20 shares the same "finger" into Jefferson Parish shown above for HD54) pays even less attention to Planning Districts. PD-5, Imperial Calcasieu, is crossed by only two districts, but every other Planning District border is crossed by three to eight times.

40. The 2023 House and Senate Illustrative maps clearly show that plaintiffs' expert did not consider Planning Districts to be important when drawing maps.

41. Mr. Cooper's June 30, 2023, report's Figure 2 shows the state divided into eight "Key Cultural Regions."

42. But, again, if plaintiffs' expert actually considered these true "key regions," the illustrative map would cross the region boundaries no more than twice (as one entry split and one exit split might be necessary to balance populations in a given region and the bordering region).

43. Analysis of the 2023 Illustrative House Map shows that each "Cultural Region" border is crossed once (the unnamed Southeast Cultural Region), twice (Ark-La-Tex and Florida Parishes), three (Delta), five (unnamed area between Ark-La-Tex and Acadiana), or seven (Acadiana) times.

44. Analysis of the 2023 Illustrative Senate Map shows that each "Cultural Region" border is crossed three (Ark-La-Tex, Delta, and Florida), four (unnamed southeast region), five (unnamed area between Ark-La-Tex and Acadiana), or eight (Acadiana) times.

45. Again, one or two districts crossing can be explained by the need to equalize populations, but five or eight crossings prove even plaintiffs' expert did not consider these to actually be "key regions" for redistricting.

46. Similarly, plaintiffs' expert's 2023 Illustrative Maps do not respect or follow Metropolitan Statistical Area, or MSA, boundaries[7] – the other geographic regions for which plaintiffs' expert provides racial and ethnic data in his discussion of key regions. As with "Key Cultural Regions" and Planning Districts, in the 2023 Senate Illustrative Map only one MSA has just the one or two border crossings arguably required for population balancing (Lake Charles, with two border crossings). The other eight MSA borders are crossed three, four, five and even six times by districts in the 2023 Senate Illustrative Map. In the 2023 House Illustrative Map, the Baton Rouge MSA border is crossed by eight different districts, while the Lafayette MSA border is crossed in seven places by six different districts (HD50 crosses the Lafayette MSA border twice). Clearly, the 2023 House and Senate Illustrative Maps do not consider MSA boundaries communities of interest whose boundaries should be respected.

Plaintiffs' Expert's "Enacted Maps" are not the Actual Enacted Maps

47. A comparison of the official House and Senate enacted map population figures to the population figures plaintiffs' expert says are from the "official" enacted maps reveals that he has misdrawn or miscounted numerous House and Senate districts in the maps he claims are the enacted maps. Mr. Cooper's reported population totals do not match the actual population totals in all of the following districts:

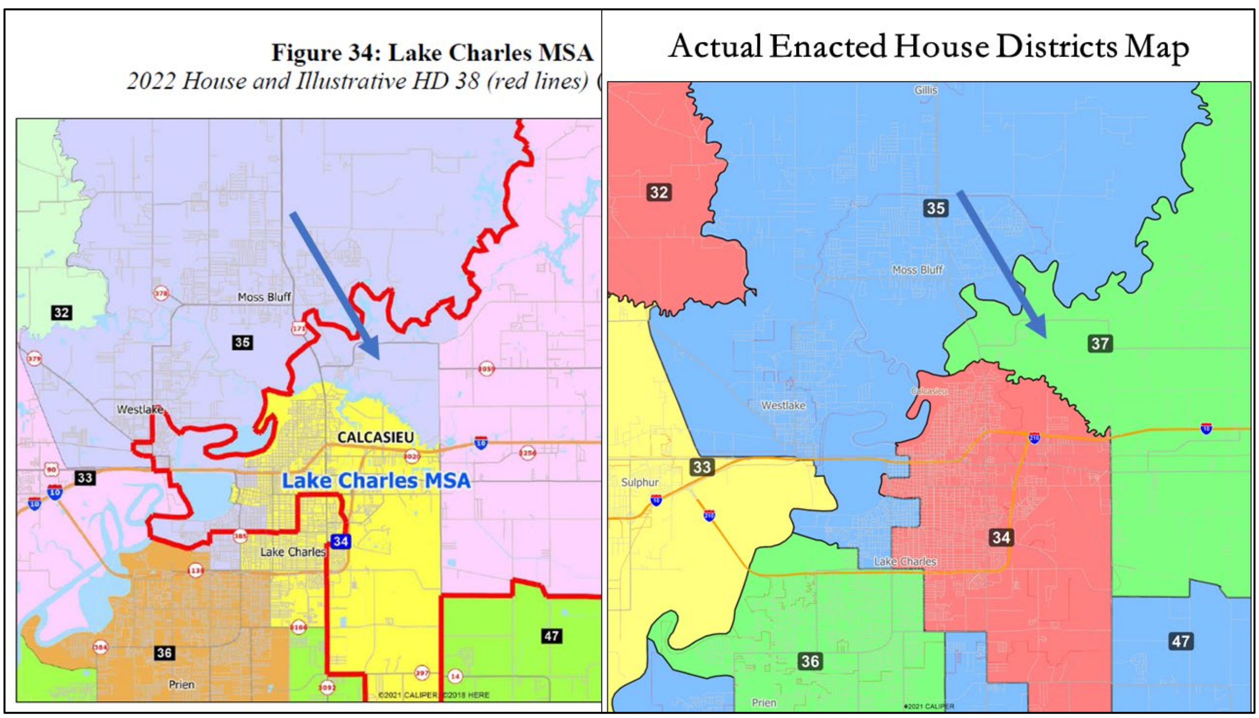
a. House: HDs 19, 21, 24, 30, 32, 35, 37, 48 and 49

b. Senate: SDs 6, 17, 22, 23, 24, 28, 30 and 37

[7] Plaintiff's expert did not provide any MSA geographic file. I downloaded the national Core Based Statistical Areas shapefile from Data.gov and exported the Louisiana MSAs out of that file: https://catalog.data.gov/dataset/tiger-line-shapefile-2020-nation-u-s-core-based-statistical-areas-cbsa

48. In the Senate maps, the population differences range from 33 to 1,428. In the House maps, the population differences range from 113 to 697. Those population differences flag where there are problems, but they do not indicate the scale of the problem. For example, as shown in Figure 8 below, plaintiff's expert's Figure 34 clearly shows the wrong lines for House Districts 36 and 37. on the left is a cropped screen shot of plaintiff's expert's Figure 34. On the right is an image I prepared showing the actual enacted border between House Districts 35 and 37. The clearly visible error is highlighted by the blue arrow, which is placed in the same spot over both images:

Figure 8



49. The blue arrow indicates the region plaintiffs' expert thinks is part of the enacted House District 35 (purple-colored in his map), but this area is actually in House District 37.

50. There are 805 people in the erroneously-assigned area. plaintiffs' expert's version of the "enacted" map draws 805 more people into House District 35 than are there in the actual

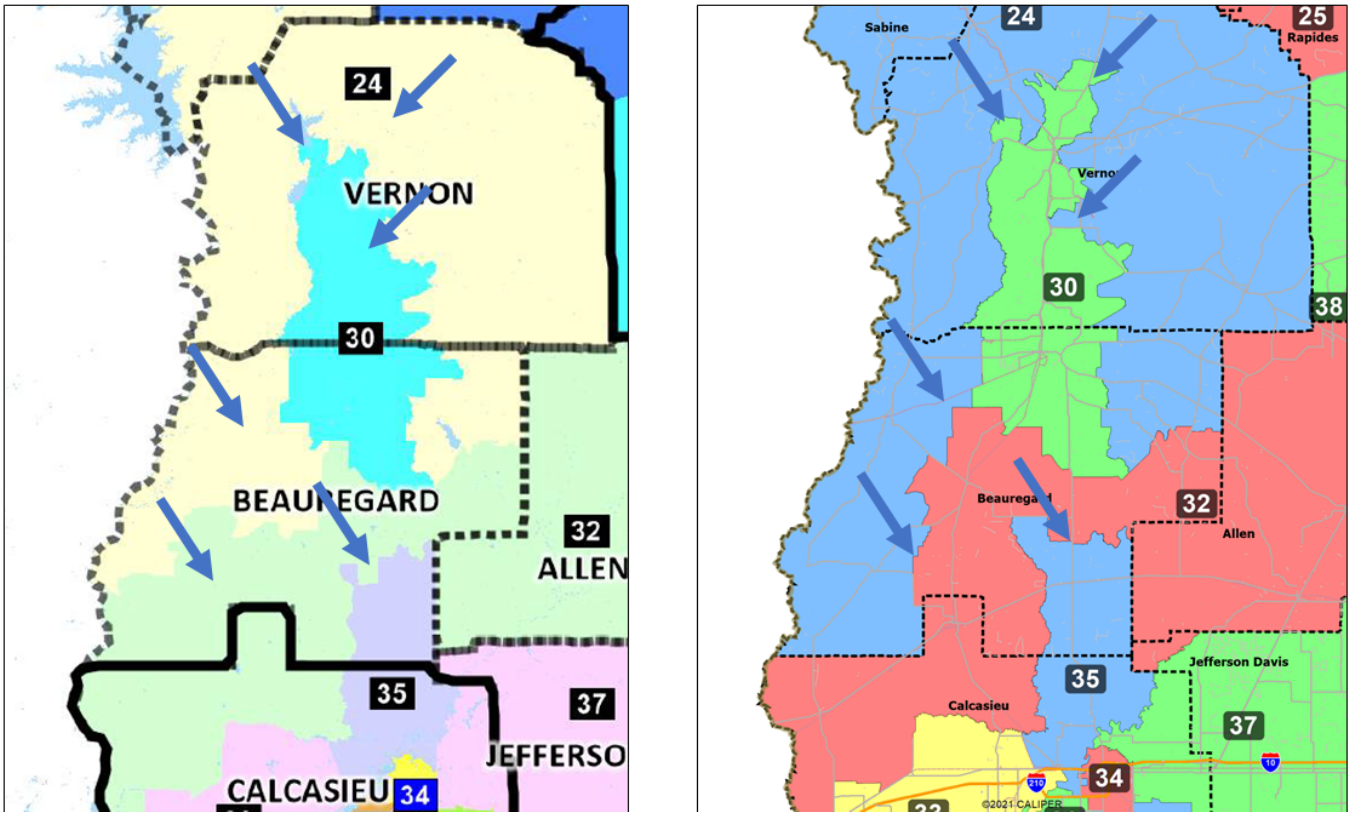
enacted map. But the population numbers in Mr. Cooper's June 30, 2023, Exhibit I-1 report that House District 35 is over by only 113 people (compared to the actual enacted map). The population differences prove that somewhere else in his map is one or more additional errors in the boundaries of these districts, though those errors cannot be seen in the cropped view of the District he included in his Figure 34.

51. Normally identifying all the differences between two maps in the Maptitude software is easy, using the Maptitude files for each plan. But in this project I cannot run that analysis because plaintiffs' expert did not provide the computer files that he used to draw what he erroneously called the "enacted" maps. In the absence of those computer files any analysis is limited to just what can be seen in the blurry enlargements of the statewide PDF-format maps provided in plaintiff's expert's exhibits.

52. Looking at plaintiffs' expert's statewide map of House Districts (Mr. Cooper's June 30, 2023, report's Exhibit I-2) does provide a bit more insight, as in the area at the north end of House District 35 and around House District 30 there are at least six errors visible in plaintiff's expert's version of the "enacted" map, again with blue arrows highlighting the visible errors:

Figure 9

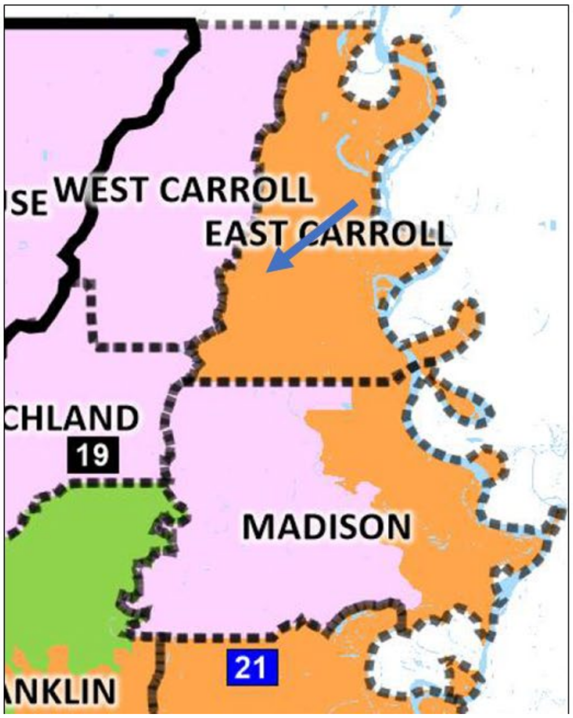
Mr. Cooper's Exhibit I-2 — Actual Enacted House Districts Map



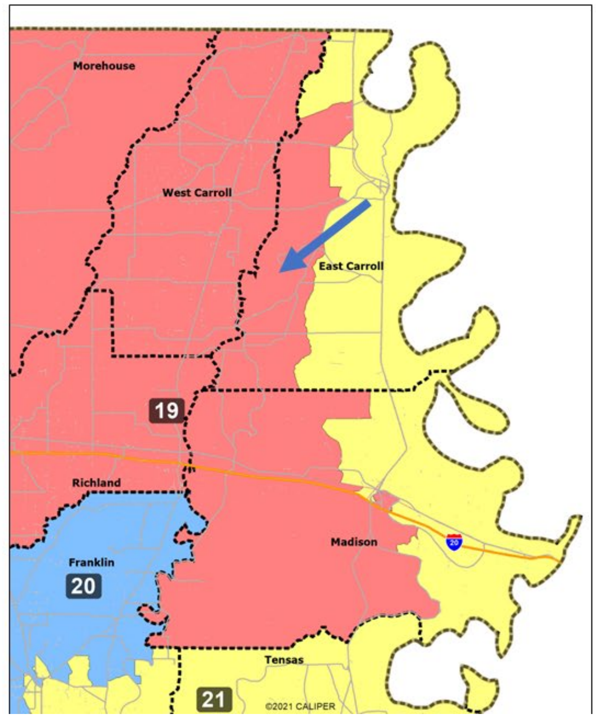
53. Here are the similar errors between House Districts 19 and 21, showing the incorrect assignment nearly half the territory of East Carroll County:

Figure 10

Mr. Cooper's Exhibit I-2



Actual Enacted House Districts Map

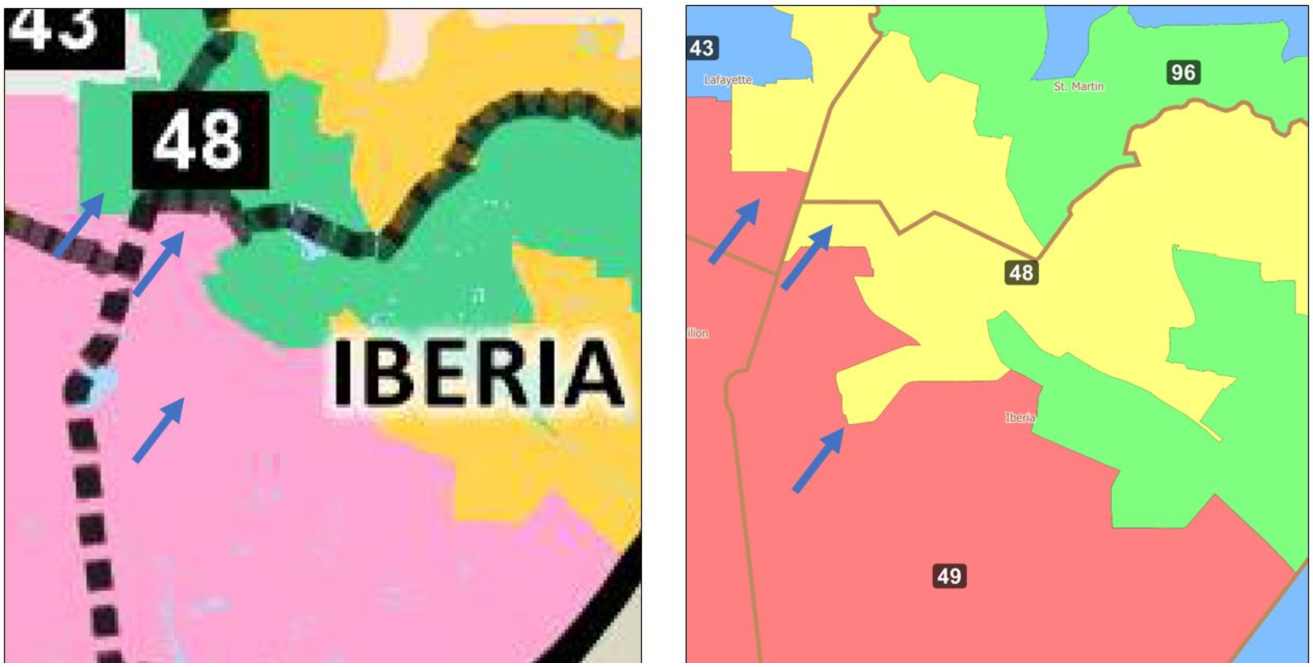


54. Finally (for the House map), here are the visible errors between House Districts 48 and 49:

Figure 11

Mr. Cooper's Exhibit I-2
(HD49 is shown in pink)

Actual Enacted House Districts Map



55. This area is another good example of how those numbers fail to capture the scale of the error: while the net difference between the official populations of HD48 and 49 and plaintiff's expert's version of these two districts is only 697 people, plaintiff's expert's map of HD48 and HD49 has 6,700 people assigned to the wrong districts. The area indicated by the northwesternmost arrow in Figure 11, which plaintiffs' expert assigns to HD48 but is officially in HD49, mistakenly shifts over 3,000 people from HD49 to HD48. The yellow "foot" of HD48 indicated by the southernmost arrow is an area of 1,700 people mistakenly shifted by plaintiff's expert from HD48 to HD49. And the middle arrow highlights an area right along the border of the St. Martin and Iberia Parishes that is mistakenly assigned to HD49 instead of HD48. This area includes over 2,000 people. While the total district population numbers report a net error of 697 between these two House Districts, in fact the

errors involve the erroneous assignment of 6,700 Louisiana residents – fifteen percent (15%) of the population of a full House District.

Figure 12

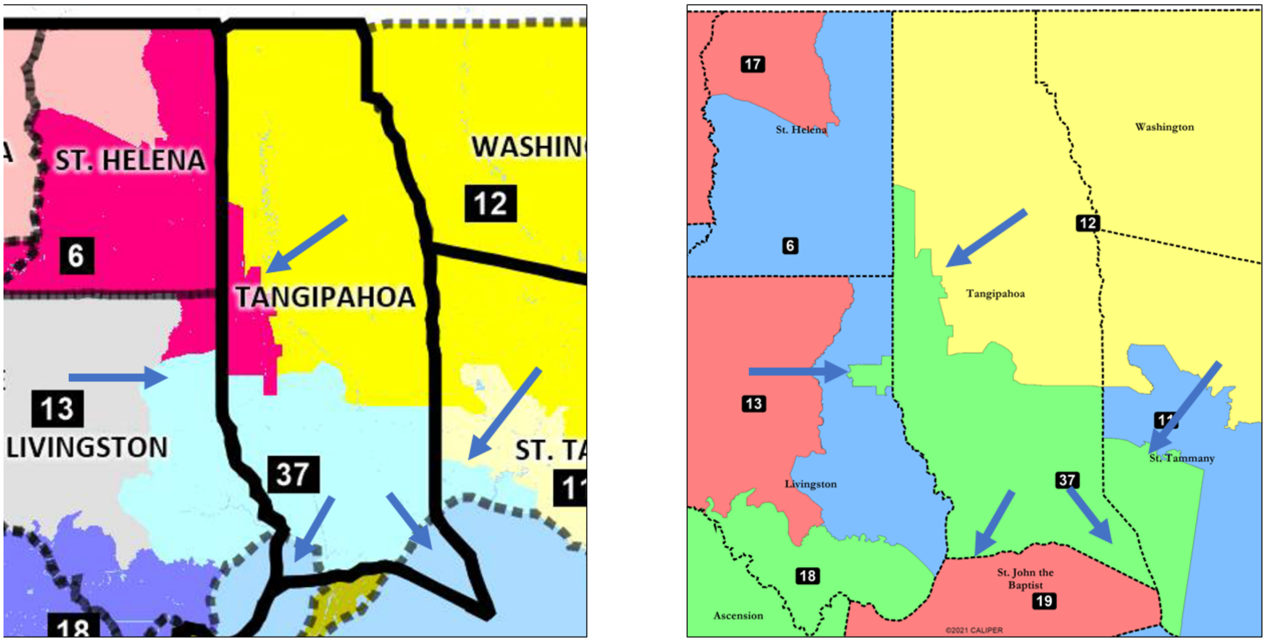
	Cooper Ex. I-1	NDC Fields	
District	2020 Pop.	Official Pop	Net Diff.
19	42,717	43,183	466
21	44,795	44,329	-466
24	42,460	42,692	232
30	42,952	42,313	-639
32	42,415	42,409	-6
35	46,088	45,975	-113
37	45,146	45,672	526
48	44,642	45,339	697
49	46,367	45,670	-697

56. Plaintiffs' expert's exhibits and data related to what he calls the Enacted Senate map are similarly erroneous. The following images show zoomed-in details of Mr. Cooper's Exhibit H-2, which he claims show the 2022 Enacted Senate Districts, compared to the actual 2022 Enacted Senate Districts. The images are followed by a table showing the population differences between his erroneously labeled "Enacted" Senate Districts and the actual Enacted Senate Districts, similar to the table above for House Districts. The errors among the Senate Districts are larger than, and represent an even higher percentage of the total number of Senate Districts than, his errors in the House Districts.

57. The map below shows the clear visible errors between what plaintiffs' expert presents as the Enacted Senate map of Senate Districts 6 and 37 and the actual Enacted Senate map of Senate Districts 6 and 37:

Figure 13

Mr. Cooper's Exhibit H-2 **Actual Enacted Senate Districts Map**



58. Plaintiffs' expert's portrayal of the eastern end of SD6 bears very little resemblance to the actual eastern end of Enacted SD6: where plaintiffs' expert shows SD6 going into Tangipahoa Parish with a small piece of Livingston Parish, the actual enacted SD6 never enters Tangipahoa Parish and travels all the way through Livingston County to the St. John the Baptist Parish border.

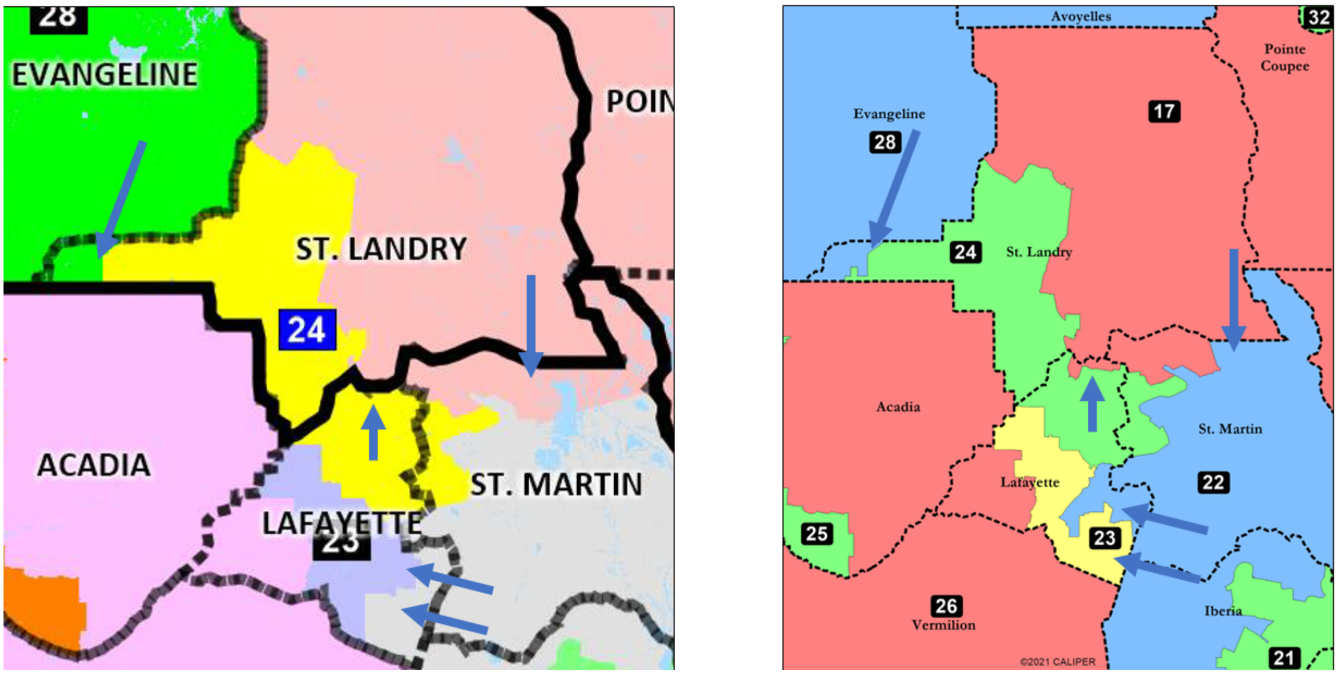
59. Plaintiffs' expert also shows what he says is Enacted SD37 with a major portion of Livingston Parish, a narrow arm into St Tammany Parish, and not including the southwestern and southeastern corners of Tangipahoa Parish, while the actual Enacted SD37 has only a geographically small piece of Livingston Parish, covering the entire southern end of Tangipahoa Parish, and with a much geographically larger pieces of St. Tammany Parish.

60. Mr. Cooper's map of what he says are the Enacted Senate Districts around Lafayette show even larger errors:

Figure 14

Mr. Cooper's Exhibit H-2
(SD17 is shown in pink, SD22 in Grey)

Actual Enacted Senate Districts Map



61. On the smaller scale of errors, the population numbers (shown below) reflect an error in SD30 that Mr. Cooper's Exhibit H-1 does not contain enough detail to identify. Had plaintiffs' expert provided his computer files for what he claims are the Enacted Senate Districts that error could be identified, but he did not provide those files.

62. The next-smallest error is the visibly clear differences in the borders of SD24 and 28 at the western end of SD24 in St. Landry Parish.

63. Plaintiffs' expert claimed "Enacted SD" map also fails to reflect the actual Enacted SD17's inclusion of territory and population from the north edge of Lafayette Parish, which plaintiffs' expert's map erroneously shows as being entirely in SD24.

64. Getting into much geographically larger errors, plaintiffs' expert's map shows the entire northern section of St. Martin Parish inside SD17 (the pink SD in his Exhibit H-2 map shown on the left in the side-by-side image above), but in reality SD22 goes all the way north to the St. Landry Parish border east of the BYU Portage and Henderson Levee Road.

65. Finally, and most significantly from a 'wrong population' perspective, plaintiffs' expert's version of the Senate District borders between SD23 and SD22 in Lafayette are off by tens of thousands of people. Again, exact numbers are impossible to calculate in the absence of plaintiffs' expert's computer file for whatever he thought was the Enacted map, but it appears that he has nearly 30,000 Lafayette Parish residents in SD23 who actually reside in SD22, and vice versa.

66. So where the table below shows the total population of SD23 in plaintiffs' expert's version of the map varies from the actual enacted map by only -33 people, that is a NET error – in reality tens of thousands of people are in his version of SD23 who do not belong there, while tens of thousands of people who do belong there are not included – nearly half of the actual population of Enacted SDs 22 and 23 are not in plaintiffs' expert's versions of SD22 and 23.

67. As a result of these foregoing errors, the figures, data, and analysis of the 2022 enacted plans that are reported in plaintiffs' expert's two expert reports are unreliable.

Figure 15

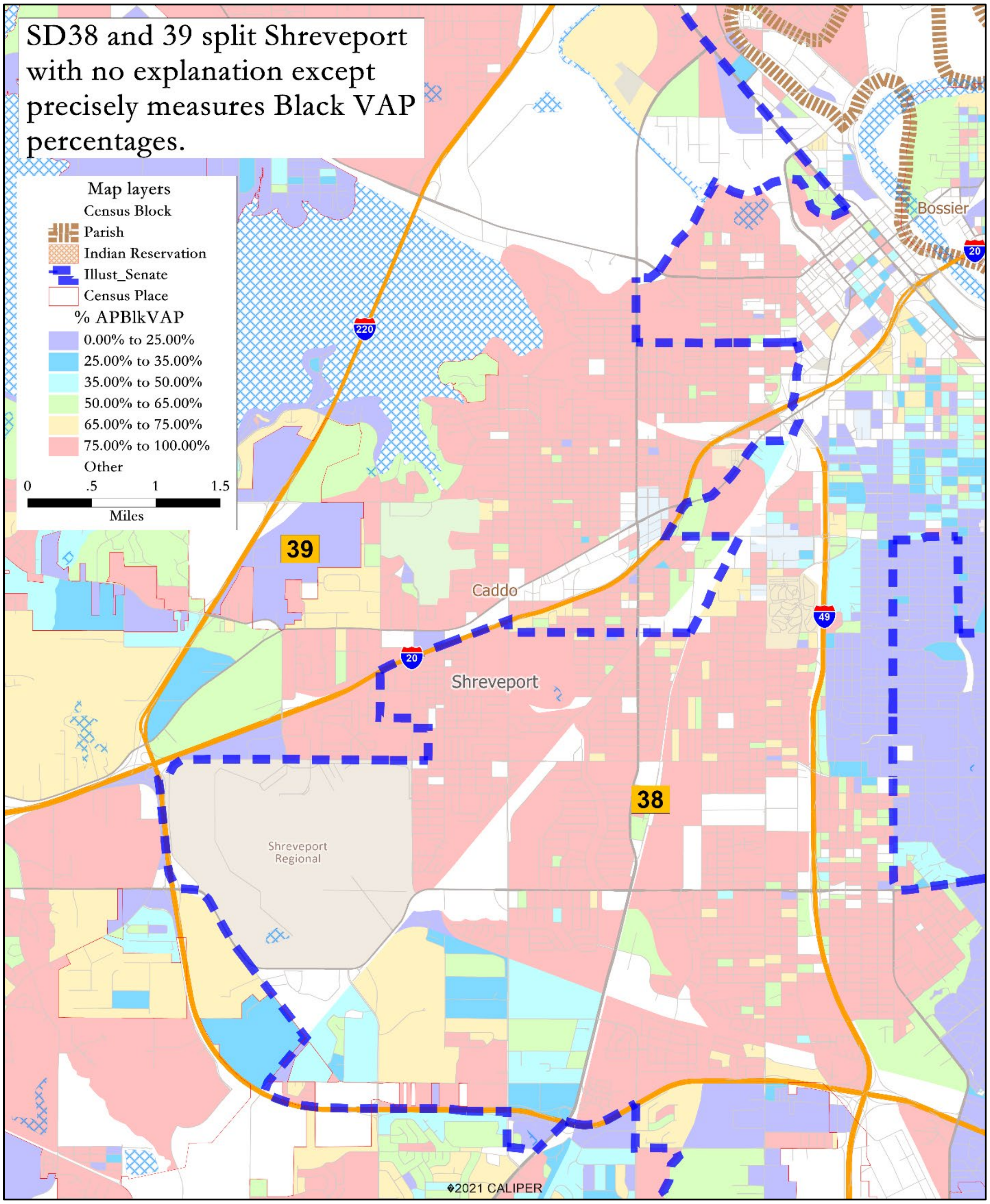
	Cooper H-1	NDC Data	
District	2020 Pop.	Official Pop	# Diff
6	116,653	117,595	942
17	113,778	114,040	262
22	123,858	125,286	1428
23	125,047	125,014	-33
24	125,094	124,799	-295
28	115,710	114,358	-1352
30	113,747	113,737	-10
37	114,442	113,500	-942

Correlation of Race and the Illustrative Plan District Lines

68. As a professional political scientist and demographer, I have created or analyzed many hundreds of districting plans in my career in jurisdictions throughout the country, including in jurisdictions with significant minority voting-age populations. Leveraging this training and experience, I analyzed plaintiffs' expert's 2022 and 2023 House and Senate Illustrative Plans to assess the degree to which the racial characteristics of the plan correlated to, and drove, the district boundaries employed in those plans.

69. Plaintiffs' expert clearly drew his "new" majority-Black SD38 by precisely dividing the Black population of Shreveport along lines that provide the precise racial percentages needed to make Senate Districts 38 and 39 majority-Black – without any reference to compactness, major roads, communities, neighborhoods, clear visible features or any other traditional redistricting principle. The only reason Mr. Cooper provides for drawing the line where he drew it is race:

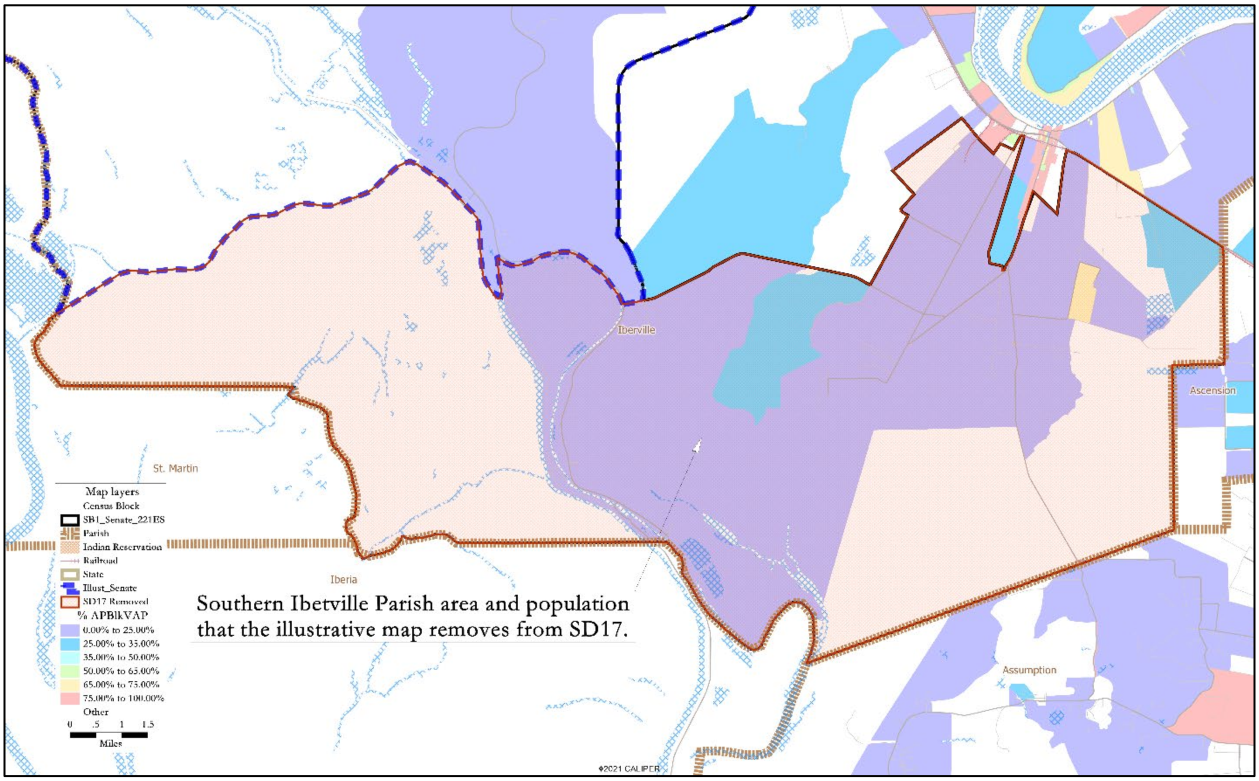
Figure 16



70. Similarly, plaintiffs' expert carves the southern portion of Iberville Parish out of illustrative Senate District 17 with no explanation and following no traditional redistricting principle

– the only explanation is race, as this change carves a region with few Blacks out of his majority-Black illustrative District 17:[8]

Figure 17



71. Plaintiffs' expert's third and final new majority-Black Senate District in his illustrative plan (Senate District 19) also has no explanation except a predominate reliance on race in deciding where to draw the District's boundary lines. Of particular note is the use of the Mississippi River as the District's northern border – except where concentrations of Black population on the north side of the river lead plaintiffs' expert to subordinate following the river to his predominate consideration (race). With no explanation other than race, plaintiffs' expert draws the district line across the river to precisely follow the Census Blocks containing higher densities of Black voters.

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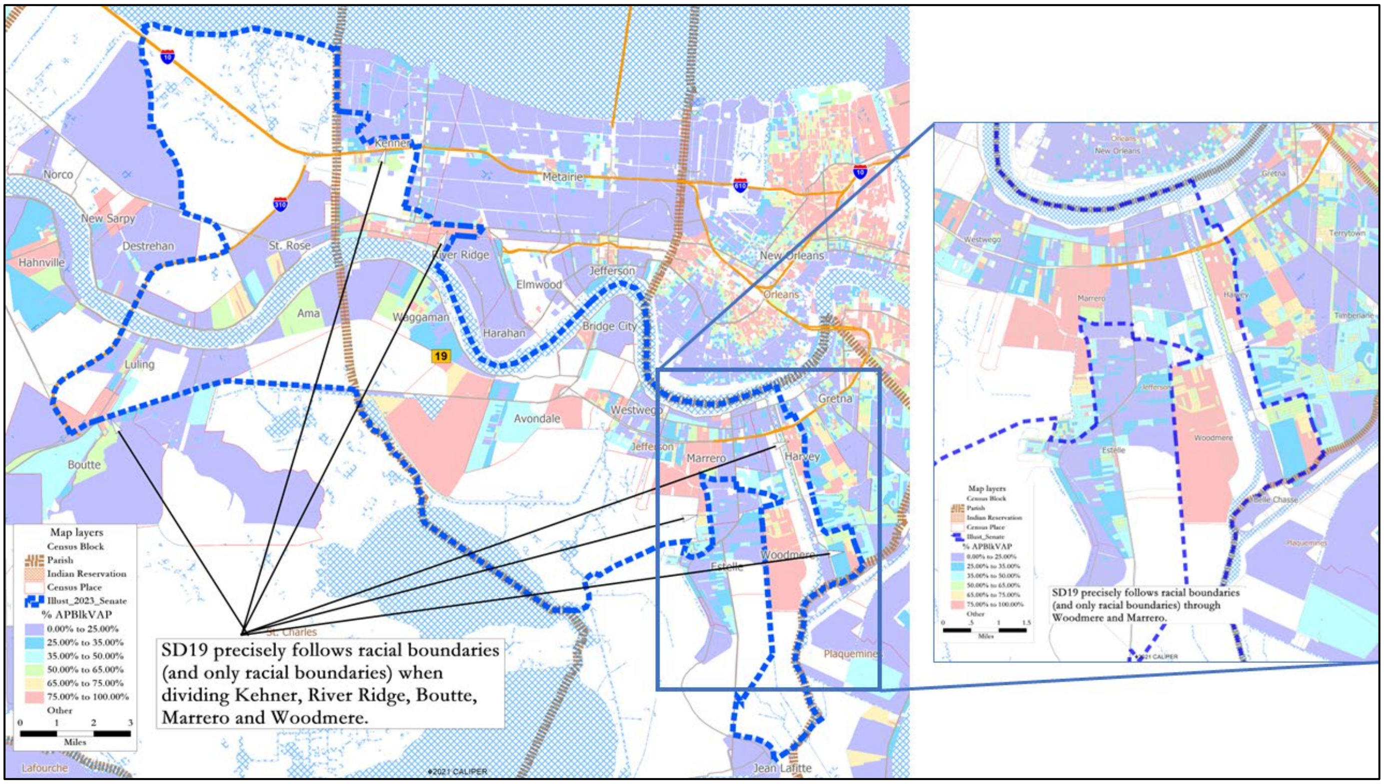
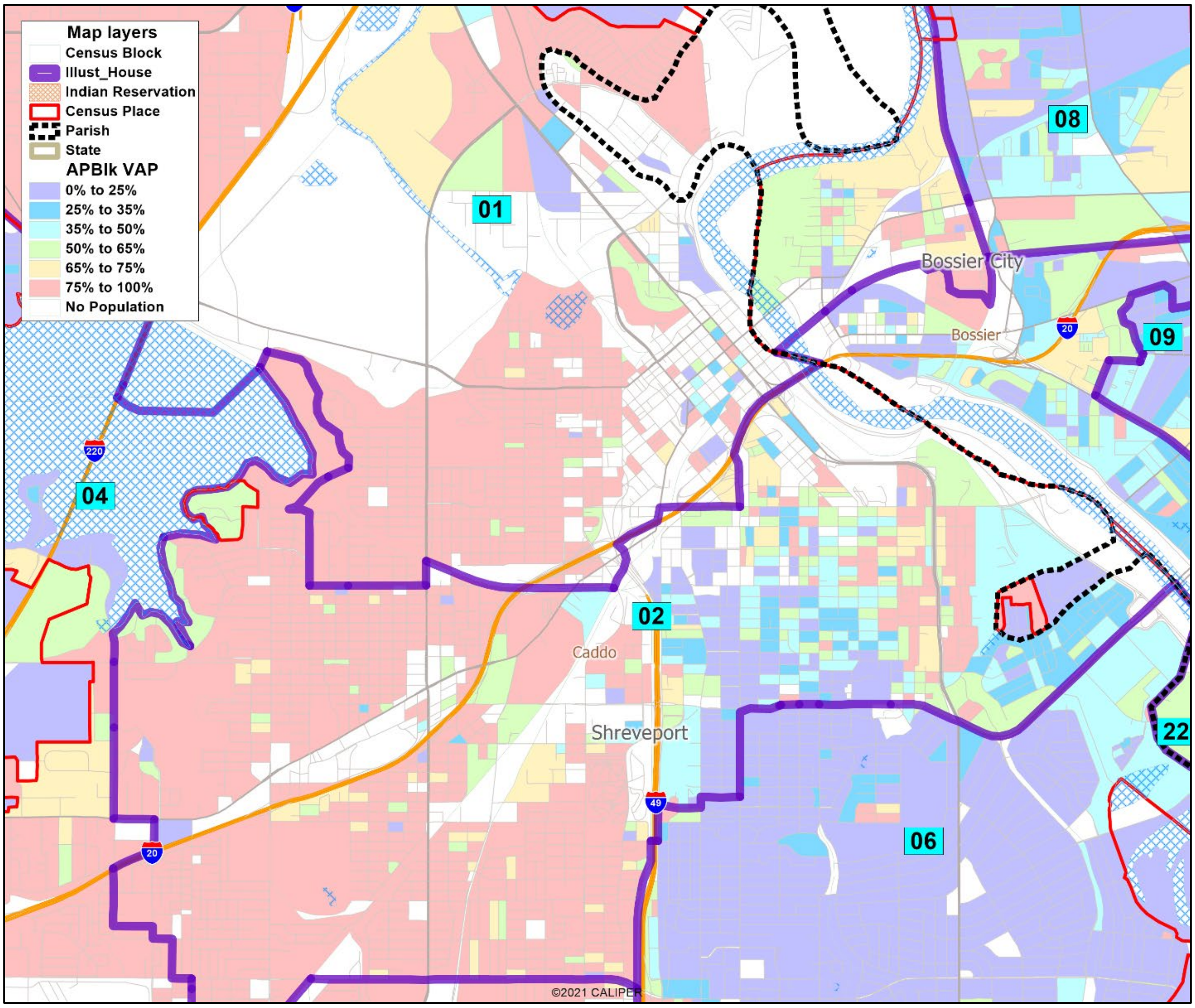
[8] Of the 1,727 total population in the highlighted area (which is removed from SD17 in the illustrative map), only 2.52% is AP Blk VAP.

Figure 18



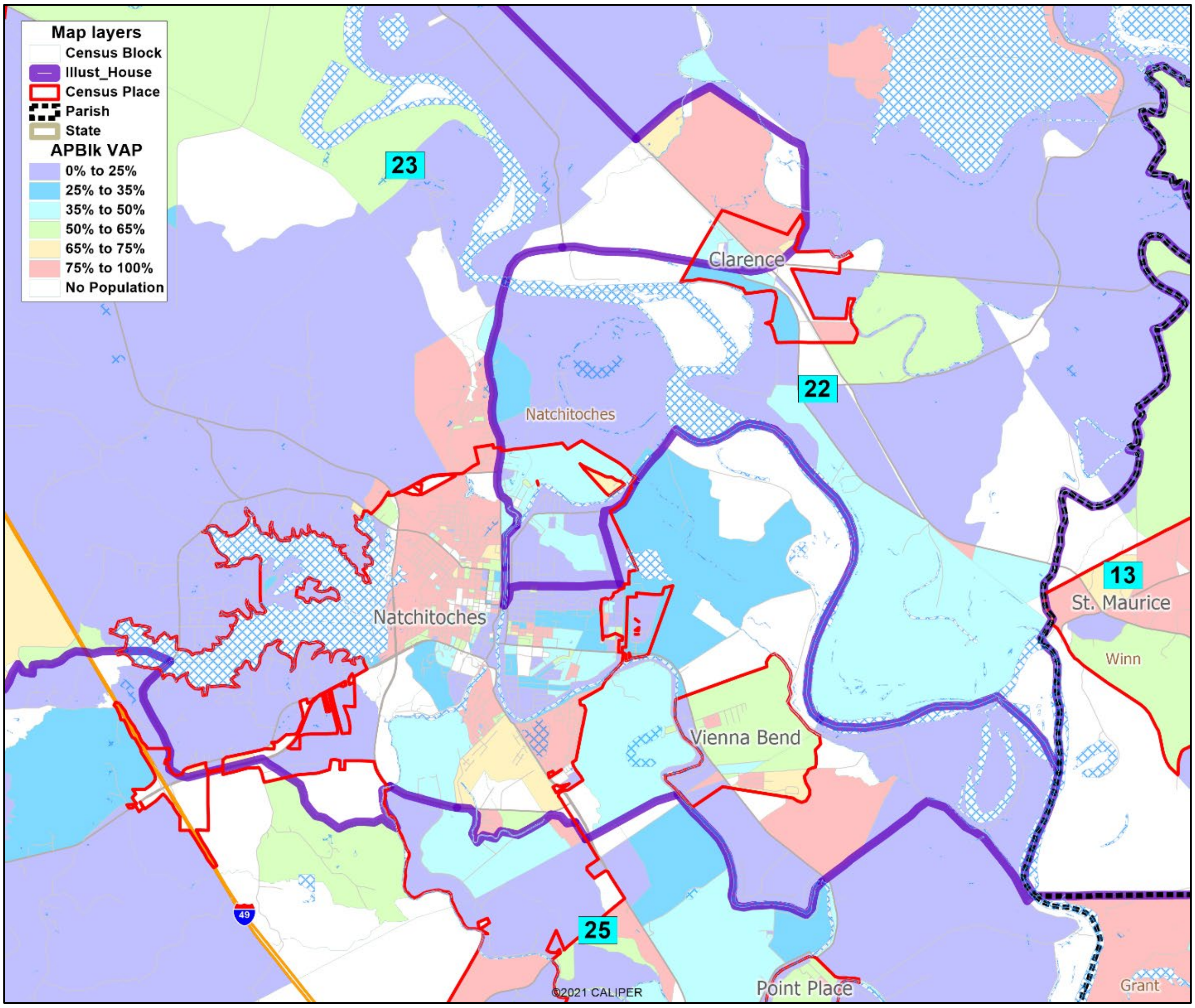
72. Plaintiffs' expert drew his "new" majority-Black HD1 by precisely dividing the Black population of Shreveport along lines that provide the precise racial percentages needed to make Senate Districts 38 and 39 majority-Black – without any reference to compactness, major roads, communities, neighborhoods, clear visible features or any other traditional redistricting principle. The only reason plaintiffs' expert provides for drawing the line where he drew it is race, with the majority-Black area carefully carved up to ensure both HD1 and HD2 end up as majority-Black, as a simple look at the map disproves any claim that the boundaries follow major roads, rivers, city borders, parish borders and even the socio-economic data plaintiff's expert spends so much time discussing (but did not provide in his disclosures, since they were not in his redistricting database):

Figure 19



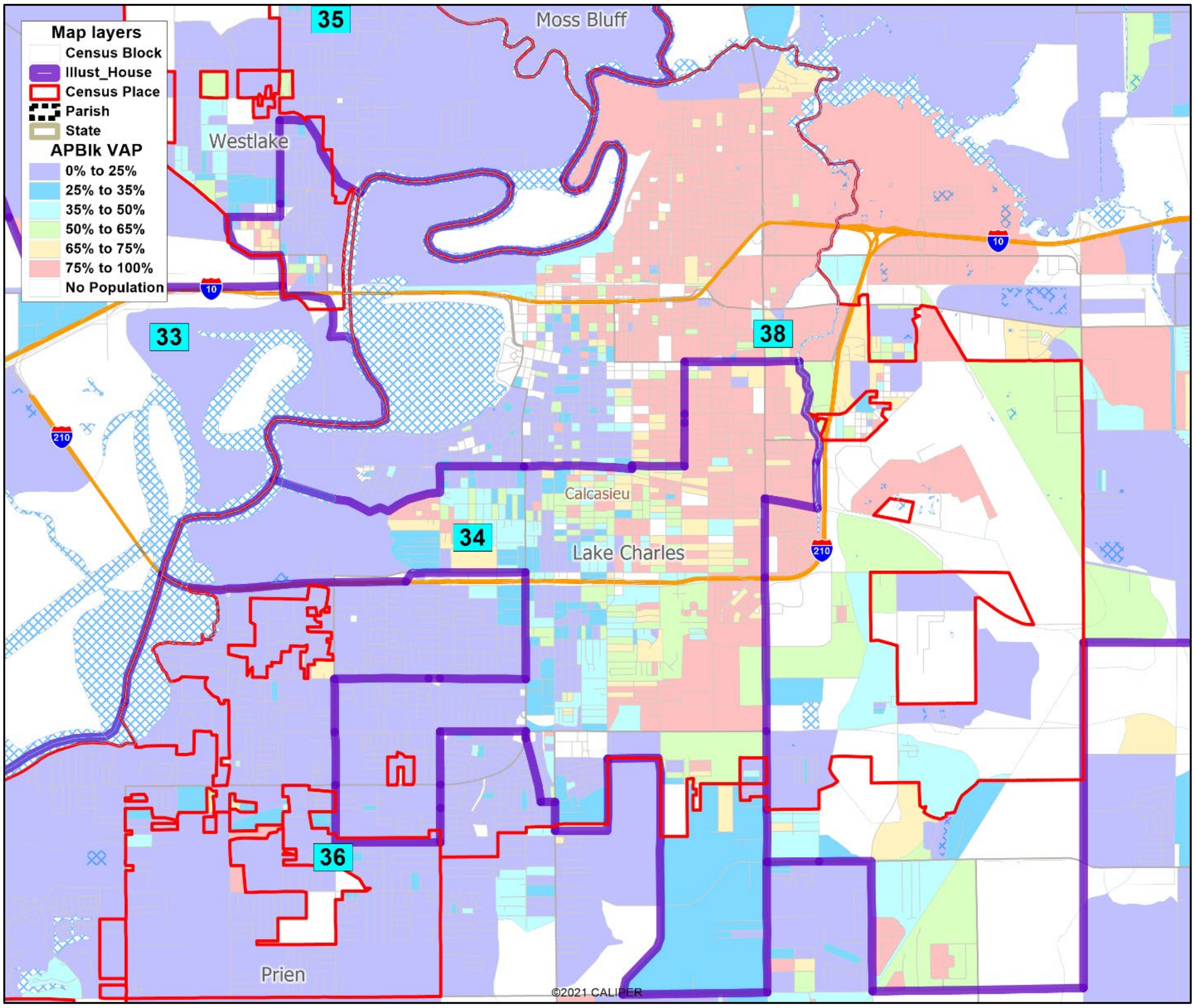
73. Just to the south, in Natchitoches, HD23 similarly wanders across City and community boundaries, ignoring the freeway and other major roads, to focus on including majority-Black Census Blocks:

Figure 20



74. In Lake Charles Parish, Illustrative HD38 sweeps west to carve the majority-Black Census Blocks out of Westlake, sweeps south out of Lake Charles to pull in a few majority-Black Census Blocks, again ignoring City borders, freeways, communities, and even socio-economic data, and then carefully carves through the city to ensure that both HD38 and HD34 end up just barely majority-Black at 50.8% and 50.3% AP Black18+, respectively:

Figure 21



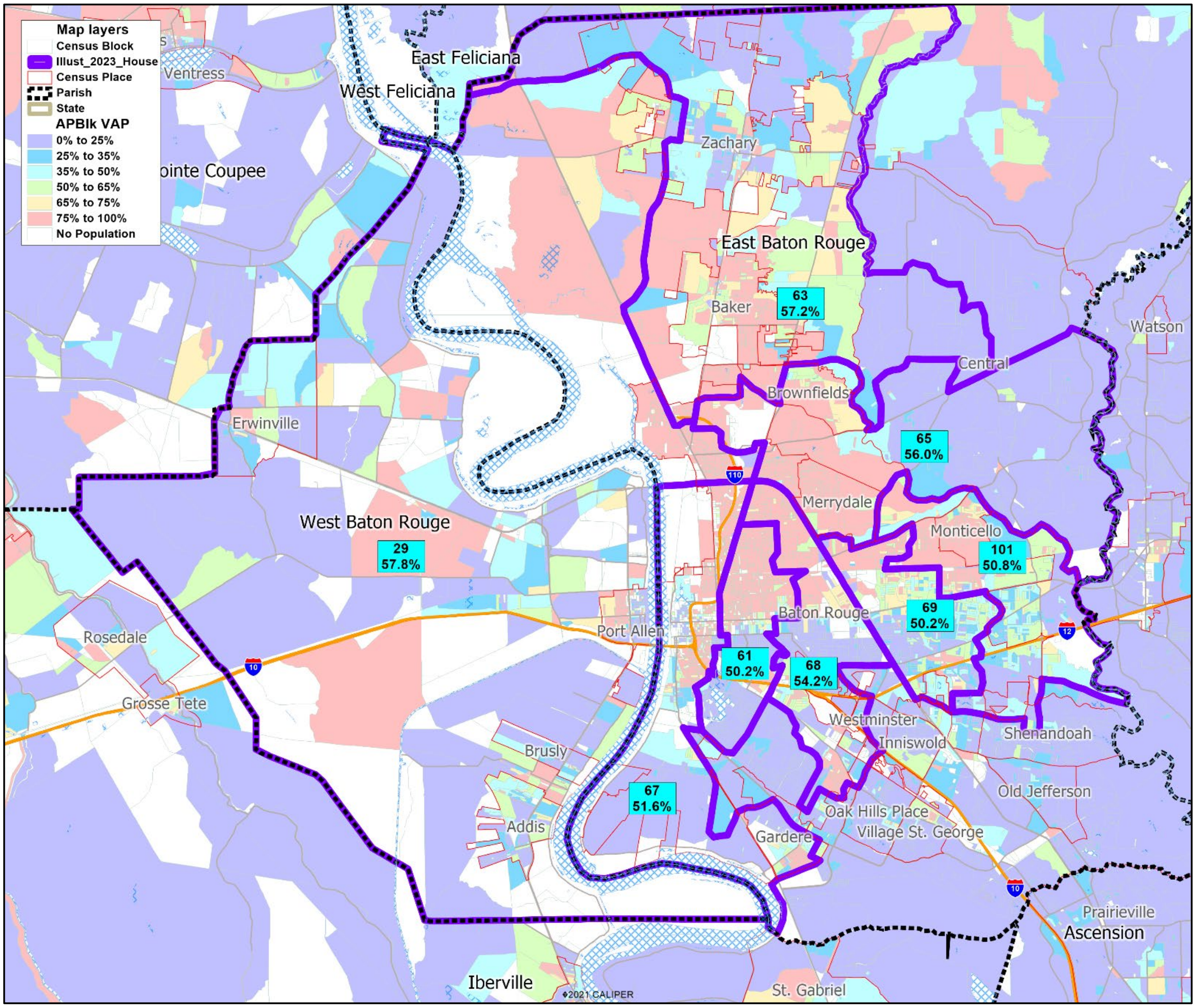
75. The 2023 Illustrative House Plan's divisions of the East Baton Rouge Parish starkly illustrates the blatant use of race as the predominate factor when carving up the region in a "pinwheel" fashion to maximize the number of House Districts that are just barely over 50% AP Black18+%. The following map shows each Illustrative House District's number and its AP Black18+%. Each district clearly carves into the most-Black areas of East Baton Rouge without regard to city borders, community boundaries, major roads, socio-economic areas or community boundaries – clearly only the careful division of the Black population

to get as many districts as possible just over 50% drove the decisions on where to draw the lines.[9]

76. With only 29,565 residents, Central is only two-thirds the size of a single House district. Population density is just one of the differences between relatively rural Central and nearby Baton Rouge, as Central has 472 residents per square mile while Baton Rouge has 2,567. The Enacted House Map leaves Central intact, entirely in HD65, while Mr. Cooper's Illustrative 2023 House map splits it into three districts (HD62, 63 and 65). Two of the Illustrative Districts each combine just roughly one-third of Central with the much more densely populated Baton Rouge or Baker (population density: 1,481 per square mile) across the Comite River (the Comite River is the western border of Central). The lack of attention paid to any consideration other than race is clearly illustrated by the fate of the City of Central in plaintiffs' expert's 2023 Illustrative House map:

[9] As will be discussed below, with the new "differential privacy" introducing margins of error into the 2020 Census data, there is a good chance these carefully-fine-tuned districts are not actually over 50% AP Black VAP.

Figure 22



77. While this report highlights how racial considerations predominated in the drawing of the illustrative maps' claimed new majority-Black districts, those new districts are only the beginning of plaintiffs' expert's reliance on race as his predominate factor. It is logically obvious that if plaintiffs' expert is using race as the predominate factor when drawing the new districts, by definition plaintiffs' expert is also using race as the predominate facor in drawing the (many more) districts surrounding the "new" districts.

Racial Percentage Targets Drove the Drawing of the New Illustrative Districts

78. Plaintiffs' expert claims the 2023 Illustrative Plans shows the Legislature could have drawn three more majority-Black Senate Districts (Mr. Cooper's June 30, 2023, report at paragraph 73, claiming new majority-AP Black VAP SDs 17, 19 and 38) and six more majority-Black House Districts (paragraph 103, claiming new majority-AP Black VAP HDs 1, 23, 38, 60, 65 and 68).

79. Unfortunately, plaintiffs' expert's data are incorrect. As his own June 30, 2023, report's Exhibit N-1 shows, HD23 is already majority-Black in the Enacted Map:

Figure 23

Population Summary Report
Louisiana State House -- Illustrative Plan

District	2020 Pop.	% Deviation	18+ Pop	18+ AP Black	% 18+ AP Black	18+_NH White	% 18+ NH White	18+ Latino	% 18+ Latino	2016-2020 NH SR BCVAP	July 2021 Registered Black Voters
01	44473	0.25%	33473	18520	55.33%	13,247	39.58%	873	2.61%	58.65%	57.09%
02	42776	-3.57%	32912	22164	67.34%	8,142	24.74%	1,717	5.22%	67.78%	71.86%
03	45006	1.46%	33115	19487	58.85%	11,725	35.41%	938	2.83%	61.40%	58.46%
04	46232	4.22%	35104	20197	57.53%	12,928	36.83%	1,052	3.00%	55.16%	57.10%
05	42708	-3.72%	35751	18183	50.86%	12,647	35.38%	4,012	11.22%	59.90%	53.59%
06	46262	4.29%	36840	5889	15.99%	27,343	74.22%	1,390	3.77%	17.10%	13.48%
07	43102	-2.84%	33286	5987	17.99%	23,596	70.89%	1,014	3.05%	15.48%	17.93%
08	45325	2.18%	33068	6571	19.87%	22,697	68.64%	1,875	5.67%	20.59%	17.31%
09	43401	-2.16%	31974	6742	21.09%	20,834	65.16%	2,669	8.35%	20.82%	20.81%
10	44137	-0.50%	34617	11395	32.92%	21,696	62.67%	557	1.61%	33.15%	31.75%
11	43867	-1.11%	35553	19749	55.55%	14,068	39.57%	980	2.76%	59.48%	57.66%
12	45007	1.46%	35392	6685	18.89%	26,166	73.93%	1,393	3.94%	20.26%	18.58%
13	44864	1.14%	35197	8507	24.17%	23,649	67.19%	2,017	5.73%	28.74%	25.44%
14	42319	-4.60%	32389	12217	37.72%	18,584	57.38%	798	2.46%	39.40%	38.10%
15	43211	-2.59%	32579	2695	8.27%	27,392	84.08%	1,003	3.08%	7.95%	6.82%
16	42314	-4.61%	32063	19160	59.76%	11,021	34.37%	678	2.11%	56.47%	62.64%
17	43007	-3.05%	31497	17158	54.48%	11,636	36.94%	1,765	5.60%	57.80%	61.13%
18	46417	4.64%	35794	7310	20.42%	26,708	74.62%	1,047	2.93%	20.24%	21.16%
19	42229	-4.80%	32254	4250	13.18%	26,052	80.77%	642	1.99%	12.58%	11.68%
20	43964	-0.89%	33646	12053	35.82%	20,538	61.04%	522	1.55%	33.94%	36.03%
21	42463	-4.28%	32737	17771	54.28%	13,990	42.73%	571	1.74%	54.32%	57.40%

80. And plaintiffs' expert also fails to mention that his 2023 House Illustrative Map eliminates a majority-Black VAP district: HD62, as shown in his June 30, 2023, report's own Exhibit I-1 and N-1:

Figure 24

Population Summary Report
Louisiana State House -- Illustrative Plan

District	2020 Pop.	% Deviation	18+ Pop	18+ AP Black	% 18+ AP Black	18+_NH White	% 18+ NH White	18+ Latino	% 18+ Latino	2016-2020 NH SR BCVAP	July 2021 Registered Black Voters
61	43938	-0.95%	35532	17836	50.20%	15,550	43.76%	1,204	3.39%	50.47%	55.95%
62	45595	2.78%	37162	10271	27.64%	24,940	67.11%	1,125	3.03%	38.89%	30.43%
63	43863	-1.12%	32530	18656	57.35%	12,270	37.72%	904	2.78%	58.90%	57.31%

Population Summary Report
Louisiana State House -- 2022 Plan

District	2020 Pop.	% Deviation	18+ Pop	18+ AP Black	% 18+ AP Black	18+_NH White	% 18+ NH White	18+ Latino	% 18+ Latino	2016-2020 NH SR BCVAP	July 2021 Registered Black Voters
61	44049	-0.70%	33624	25314	75.29%	6,273	18.66%	1,531	4.55%	72.11%	75.90%
62	42969	-3.14%	33763	18597	55.08%	13,972	41.38%	634	1.88%	57.12%	56.01%
63	44638	0.63%	33586	23394	69.65%	8,793	26.18%	875	2.61%	72.13%	69.53%

81. In summary, plaintiffs' expert's claimed list of "six additional majority-Black districts" incorrectly includes HD23 as an "additional" district, when HD23 was already majority-AP Black VAP in the enacted map. And plaintiffs' expert's claimed list also fails to acknowledge that the 2023 House Illustrative Map also eliminates majority-AP Black VAP HD62.

82. Plaintiffs' expert also fails to note that a portion of the AP Black VAP used to create the "new" majority-AP Black VAP House Districts were taken out of some already-narrowly-majority districts. In fact, there are seven House Districts that (1) were already majority-AP Black VAP in the enacted map and (2) are between 50% and 53% AP Black VAP in the 2023 House Illustrative Map, and all seven had their AP Black share of Voting Age Population reduced. The smallest reductions were tiny 0.3% reductions in HD67 (now 51.6% AP Black VAP in the 2023 House Illustrative Map) and in HD23 (now 50.6% AP

Black VAP in the 2023 House Illustrative Map). But the other reductions were significant: already-borderline HD72 went from just 52.7% AP Black VAP in the Enacted Map to just 50.6% AP Black VAP in the 2023 House Illustrative Map. And HD58, HD101, HD34, and HD61 all went from solidly majority-AP Black VAP to well within the margin-of-error of no longer being majority-AP Black VAP:

Figure 25

% AP Black VAP			
HD	Enacted	2023 Illust.	Change
67	51.9%	51.6%	-0.3%
23	50.9%	50.6%	-0.3%
72	52.7%	50.6%	-2.1%
58	56.8%	51.3%	-5.5%
101	60.2%	50.8%	-9.5%
34	72.6%	50.0%	-22.5%
61	75.3%	50.2%	-25.1%

83. As shown in the maps shown earlier in this report, plaintiffs' expert uses race as a predominate factor to draw the lines that create these districts. It is worth noting how precisely race has been used: In the 2023 Illustrative Map, eleven majority-AP Black VAP House Districts are less than 53% AP Black VAP. That is 8 more than the 3 such borderline House Districts in the Enacted Map. The 2023 Senate Illustrative Map is even more extreme: eleven of the Senate map's sixteen majority-AP Black VAP districts are just barely majority-AP Black VAP at less than 53% AP Black VAP.

84. One significant risk associated with drawing districts so close to the 50% "line" as plaintiffs' expert does is the impact of a new statistical method employed in 2020 by the Census Bureau called "differential privacy." This policy was intended to protect

respondent privacy.[10] The methodology adds noise, or "blurring," to the Census data, which means that Census data now has a "margin of error" in its population counts. The Census Bureau estimates the margin of error to be very roughly 1% for total population counts at the Congressional level, with higher margins of error in smaller geographic areas (such as legislative districts) and for racial or ethnic counts within that total population figure. And the margin of error grows significantly for sub-groups within a geographic area, such as the ethnic breakdowns within each district. With plaintiffs' expert's carefully tailored razor-thin majority-Black percentages, there is a statistically significant chance that some or even many of those districts are in fact <u>not</u> 50% Black.

85. There is also the sensitivity analysis to consider. Plaintiffs' expert uses 50% AP Black VAP as his target for a district likely to elect the candidate preferred by Black voters, without citing any support for that number. Even if 50% is a statistically-estimated figure, any polarized voting analysis used to calculate that "likely to elect" percentage is a statistical analysis with a margin of error and chance of mischaracterizing the data.[11]

86. As a simple illustration of this concept, suppose that the true "effective" percentage is 53% AP Black VAP for all the districts in the State. In that hypothetical example, the enacted Senate map would elect more Black-preferred candidates (10) than the 2022 and 2023 Senate Illustrative plans (6 and 5, respectively).

87. In Mr. Cooper's 2023 Illustrative House plan, nearly one-third – 11 of his 35 claimed "majority-Black" districts – are less than 53% AP Black VAP. So, if 53% is the real-world

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[10] For the Census Bureau's explanation of differential privacy, see https://www.census.gov/programs-surveys/decennial-census/decade/2020/planning-management/process/disclosure-avoidance/differential-privacy.html (last accessed May 29, 2023).

[11] One proof of this is the result of the *LULAC* case in Texas, where a Section 2 case ordered a Congressional District redrawn to elect a Latino-preferred (Democratic) candidate, and a Republican won the redrawn district.

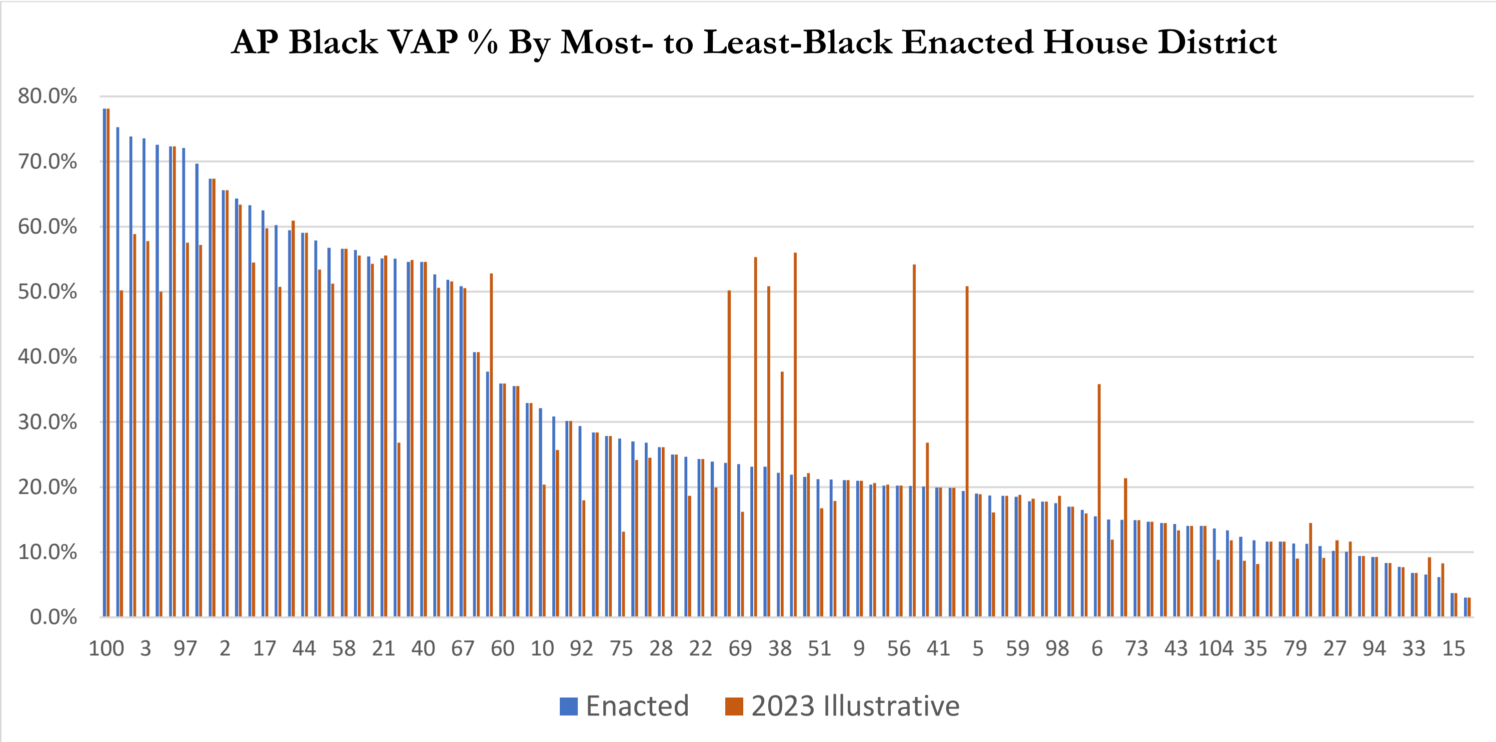
"effective" percentage, the Enacted Senate Map would elect 26 Black-voter-preferred candidates, compared to only 22 in the 2022 House Illustrative Map and only 24 in the 2023 House Illustrative Map.

88. Given the margin of error in the Census's "differential privacy" 2020 Census data, the AP Black VAP Census data could easily be off by at least one to three percent, and the statistical margin of error in any polarized voting analysis could easily be 3% or more.

89. A sensitivity analysis in the other direction – asking how many districts would elect the Black-preferred candidate if the true effectiveness percentage is 45% AP Black VAP instead of 50% – finds that there are no districts where the AP Black VAP percentage is between 41 and 50 percent in the Enacted Map, in the 2022 Illustrative Map, or in the 2023 Illustrative Map. This means that, as noted above, a Census or polarized voting error that under-estimates the "effective" percentage could have a major impact on the number of effective districts in the 2022 and 2023 Illustrative House Maps and leave the House and Senate Illustrative Maps with fewer effective districts than the Enacted Maps. But a Census or polarized voting error that over-estimates the "effective" percentage would have to be larger than a 9% error before it changed the number of "effective" districts in any of the Enacted or Illustrative maps.

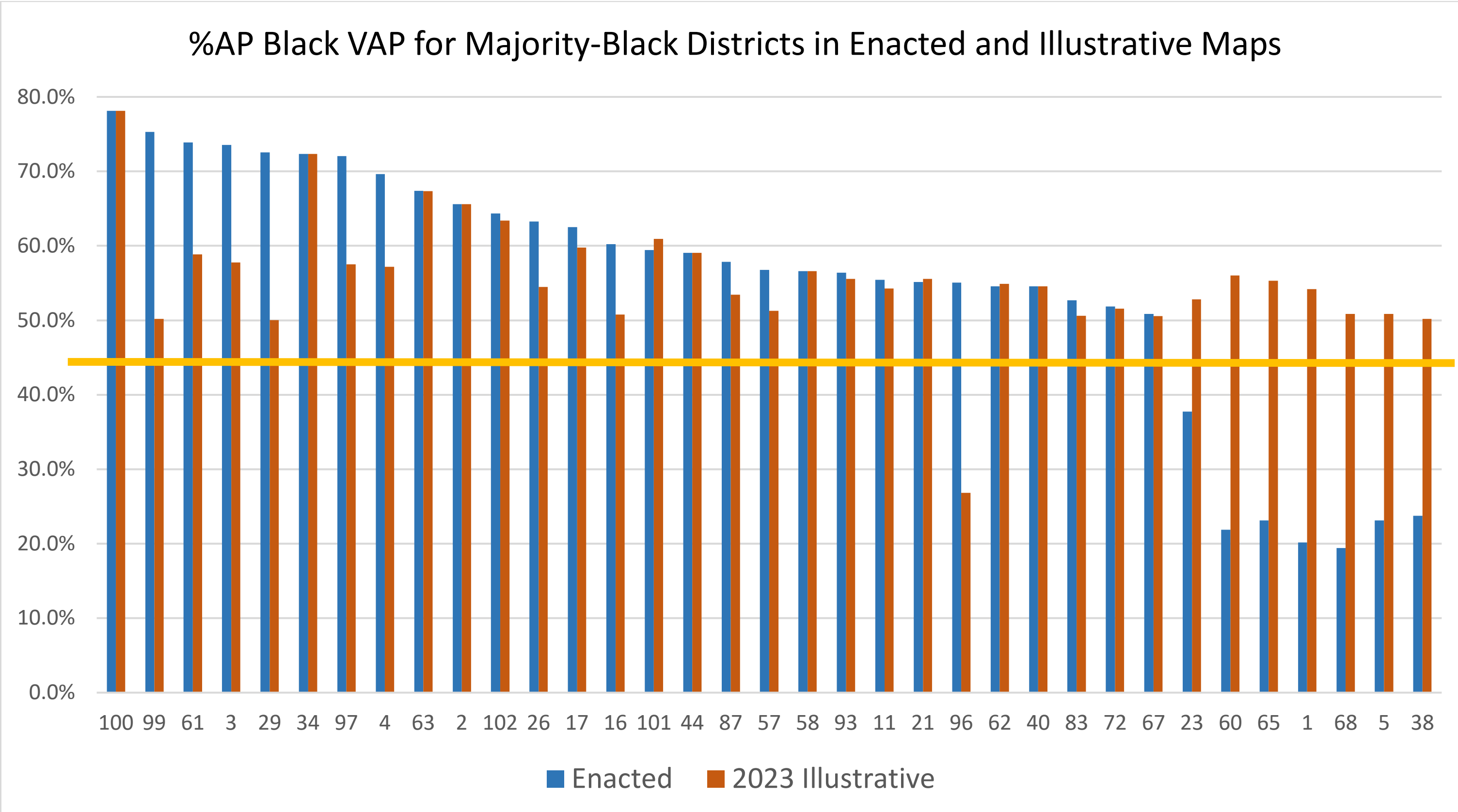
90. The chart below shows the AP Black VAP percentage of all House districts in the enacted (blue bars) and illustrative (orange bars) plans.

Figure 26



91. The chart below shows the same data, but has been simplified to show only the districts that are majority-AP Black VAP in either plan. The way the majority-AP Black VAP districts were drawn to just-barely cross the 50% line is clear, as the grouping of districts precisely above 50% makes clear the predominate consideration of race in drawing the illustrative map:

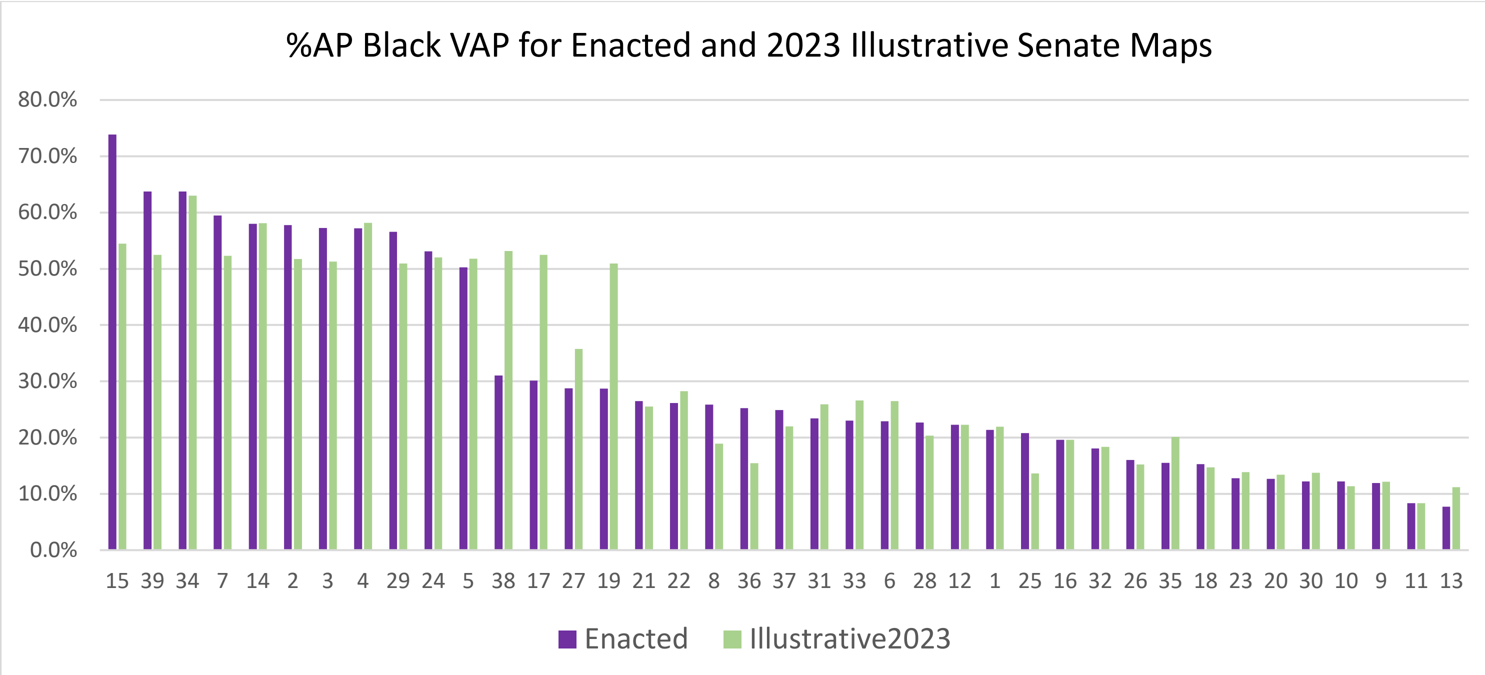
Figure 27



92. The same precision targeting on 50% AP Black VAP occurs in the illustrative Senate map. If anything the illustrative Senate map is even more racially focused than the illustrative House map, as the illustrative Senate map are even more precisely drawn just above 50% AP Black than the illustrative House districts (and thus are even more vulnerable to inaccuracies in the Census data resulting from the differential privacy "noise" in the data).

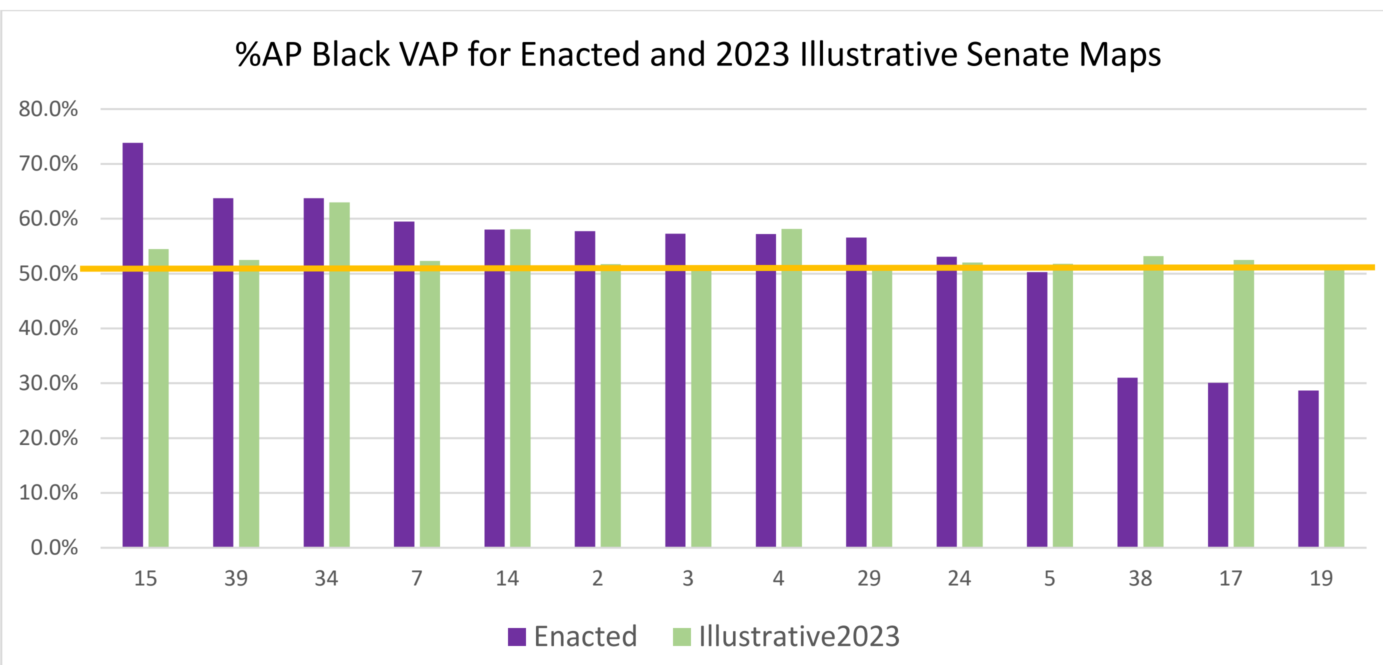
93. The enacted map performs much better in a sensitivity / robustness test. In the hypothetical case where the true effectiveness level is 53% AP Black VAP, only 5 districts in the 2023 Illustrative Senate Plan would elect the Black-preferred candidate, compared to 10 Senate districts in the Enacted Map that would elect the Black-preferred candidate in that hypothetical case.

Figure 28



94. As the full chart above and the more focused chart below reveal, the illustrative districts are drawn to just barely exceed the 50 percent line.

Figure 29



All opinions in this report are subject to amendment in the event additional relevant information is received.

I declare under penalty of perjury that the foregoing is true and correct.

Executed this 28th day of July, 2023.

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Douglas Johnson, Ph.D.