IN THE SUPREME COURT OF PENNSYLVANIA
MIDDLE DISTRICT

No. 159 MM 2017

LEAGUE OF WOMEN VOTERS OF PENNSYLVANIA, *et al.*,

Petitioners,

v.

THE COMMONWEALTH OF PENNSYLVANIA, *et al.*,

Respondents.

BRIEF OF AMICI CURIAE
ADELE SCHNEIDER and STEPHEN WOLF
IN SUPPORT OF PROPOSED REMEDIAL DISTRICTING PLANS

On the Recommended Findings of Fact and Conclusions of Law of the Commonwealth Court of Pennsylvania entered on 12/29/18 at No. 261 MD 2017

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STATEMENT OF INTEREST OF AMICI CURIAE

Adele Schneider is a 40-year Pennsylvania resident and has been a medical geneticist at the Einstein Medical Center Philadelphia for the past 28 years. She has lived at her current address in the community of Wynnewood in Montgomery County since 1980 and has been a registered voter since becoming a naturalized U.S. citizen in 1981. Having grown up in apartheid-era South Africa, where the right to vote was granted or denied based on the color of one's skin, she believes strongly in ensuring the fairness of our nation's electoral systems—fairness that is undermined by partisan gerrymandering.

Dr. Schneider has long been active in public life in the commonwealth. She has treated patients in inner city hospital settings for conditions such as Down syndrome, autism, and Tay-Sachs disease. She has also studied genetic diseases, with a particular focus on anophthalmia and microphthalmia (both disorders of the eye). In addition, she helped parents in Philadelphia establish a local Down syndrome support organization, the Philadelphia Parents of Individuals with Down Syndrome, and helped the parents of children with anophthalmia create their own support group, the International Children's Anophthalmia Network.

Dr. Schneider earned her medical degree from the University of the Witwatersrand in Johannesburg, South Africa, in 1973 and undertook her pediatric residency at the Wilmington Medical Center in Delaware from 1976 to 1978. She

completed her fellowship in medical genetics at the Children's Hospital of

Philadelphia in 1981.

Stephen Wolf is an elections writer for the political news site Daily Kos and

a nationally recognized authority on redistricting. Each week, he publishes a

widely read newsletter, the Voting Rights Roundup,[1] which covers important

voting rights developments around the country, with a special emphasis on

redistricting. He has published analyses of dozens of district maps, at both the

congressional and legislative level, and has drawn hundreds of hypothetical maps

of his own. In particular, he has focused on redistricting using nonpartisan criteria

and has published a series of nonpartisan maps[2] for each of the 43 states that

contain more than one congressional district.

Wolf's work on redistricting has been cited by many publications and

organizations, including *The Washington Post*,[3] *The New York Times*,[4] Vox,[5]

MSNBC,[6] and the Brennan Center for Justice.[7] His work has also appeared in *The*

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[1] Voting Rights Roundup archive available at http://bit.ly/2EtKgmd.
[2] Stephen Wolf, *Gerrymandering could cost Democrats the House in 2016. Why? Because it probably did in 2012*, Daily Kos, Oct. 18, 2016, available at http://bit.ly/2nZuUeJ.
[3] Christopher Ingraham, *How to gerrymander your way to a huge election victory*, Washington Post, Oct. 28, 2016, available at http://bit.ly/2o7fcxl.
[4] David Leonhardt, *Democracy, on the March*, New York Times, Feb. 7, 2018, available at http://bit.ly/2BYpedr.
[5] Dylan Matthews, *Democrats should worry less about Trump and more about the House and Senate*, Vox, Nov. 7, 2016, available at http://bit.ly/2F3C6h9.
[6] Chris Hayes, *All In with Chris Hayes*, MSNBC, Feb. 1, 2018, available at http://bit.ly/2Bw9m12.
[7] *January Redistricting Round-Up: Redistricting Reforms and Litigation*, Brennan Center Jan. 30, 2017, available at http://bit.ly/2spTiuw.

New Republic[8] and will appear in a forthcoming paper to be published in *The American Political Science Review* with Profs. Anthony J. McGann, Charles Anthony Smith, Michael Latner, and Alex Keena, who are the co-authors of the book *Gerrymandering in America*.[9] Wolf earned a B.A. in political science from the University of North Carolina in Chapel Hill, North Carolina in 2015. (Wolf is of no relation to Gov. Tom Wolf.)

Wolf's work on this brief has been undertaken as part of his employment with Daily Kos. Daily Kos is a partisan political organization dedicated to electing Democrats. However, Daily Kos, like amici, is also dedicated to a belief in fair elections and strongly supports nonpartisan redistricting nationwide. Both districting plans put forth in this brief reflect that belief and rely solely on nonpartisan criteria.

In furtherance of that aim, we took no partisan data into account when crafting these plans. However, after completing our plans, we calculated their partisan characteristics, which we discuss in greater detail below. We note here that, according to one of the most straightforward and commonly used measured to assess partisanship, the 2016 presidential vote by district, both of our plans would create 11 districts won by Republican Donald Trump and seven won by Democrat

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[8] Stephen Wolf, *Why Is the U.S. Electorate So White? Because Our Voting System Is Broken. Here's How to Fix It*, The New Republic, Dec. 23, 2014, available at http://bit.ly/2EqUbEN.
[9] Cambridge University Press, March 2016.

Hillary Clinton. Under the current (now-invalidated) map, as well as the proposal

from legislative leaders,[10] 12 districts were won by Trump and six by Clinton.

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[10] Christopher Ingraham, *Pennsylvania Republicans have drawn a new congressional map that is just as gerrymandered as the old one*, Washington Post, Feb. 11, 2018, available at http://bit.ly/2EuFiW7.

INTRODUCTION

Because redistricting is of paramount importance to the public, amici, acting independently of any party to this case or Pennsylvania political organization, propose two districting plans[11] that remediate the constitutional violations found in the Pennsylvania Congressional Redistricting Act of 2011 (the "2011 Plan"). In creating these districting plans, we have adhered strictly and solely to nonpartisan criteria, including those laid out by the Court and other traditional nonpartisan redistricting criteria. We have not considered partisan criteria in any way.

In its Order of Jan. 22, 2018 (the "Order"), the Court instructed that, to comply with this Order,

> any congressional districting plan shall consist of: congressional districts composed of compact and contiguous territory; as nearly equal in population as practicable; and which do not divide any county, city, incorporated town, borough, township, or ward, except where necessary to ensure equality of population.

Order at 3. We have therefore endeavored to adhere to these principles in formulating our remedial districting plans.

In addition, in its Order of Jan. 26, 2018 appointing Prof. Nathaniel Persily as the Court's advisor (the "Special Master Order"), the Court specified that any districting plan submitted to the Court should include "[a] report detailing the

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[11] The two plans are identical in most respects. The first plan ("Plan A") would create two districts based in Philadelphia where black voters would be expected to elect their preferred candidates. The second plan ("Plan B") creates one such district but splits two fewer counties than Plan A.

number of precincts split by each district and the plan as a whole." Special Master Order at 3. Interpreting this statement to mean that the Court believes that a compliant districting plan does not divide precincts except where necessary, we have also sought to minimize the number of split precincts except to ensure equality of population or to maintain district contiguity.

The Special Master Order also specified that any districting plan submitted to the court should include "[a] report detailing the compactness of the districts …." Special Master Order at 2. We have therefore sought to promote geographic compactness where possible, although "compactness" is a term that has no single legal definition, nor can it. However, persons living closer to one another can often reasonably be inferred to have more in common with one another from the standpoint of communities of interest than those living further apart, differences in urbanization and other demographic factors notwithstanding. Compactness should not predominate over other nonpartisan criteria, especially in circumstances when persons living in geographic proximity to one another possess starkly different demographic characteristics and interests.[12]

Furthermore, as the Court's Opinion of Feb. 7, 2018 (the "Opinion") stated, "Nothing herein is intended to suggest that congressional district maps must not also comply with federal law, and, most specifically, the Voting Rights Act, 52

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[12] See Appendix B for compactness scores for all districts in both Plan A and Plan B.

U.S.C. § 10301." Opinion at 123, n.72. In crafting our districting plans, we have complied with federal law, including the Equal Protection Clause of the 14th Amendment to the United States Constitution and Section 2 of the Voting Rights Act regarding the use of race to ensure that minorities have an equal opportunity to elect their candidate choices, and that race does not predominate over all other neutral criteria in violation of *Shaw v. Reno*, 509 U.S. 630 (1993), and its progeny. We have calculated the estimated racial composition of each proposed district using both the 2010 census voting age population ("VAP") and the 2011-2015 American Community Survey estimates of the citizen voting age population ("CVAP").

We have also sought to adhere to an additional set of nonpartisan criteria in formulating our remedial plans. (The ordering of these criteria below does not reflect any particular prioritization of one criterion over another.)

1. **Contiguity**: We have sought to maintain district continuity, with districts having internal transportation connections to the greatest extent feasible, and have avoided the use of water contiguity if possible.

2. **Nonpartisanship**: We have ignored data concerning partisanship, including election results and voter registration statistics. We did not measure any partisan data until after we drew our remedial plans, but we have included it should the Court wish to use it to assess the fairness of each plan.

3. **Communities of interest**: We have sought to unite communities of interest defined by: 1) common geography, such as mountain ranges or rivers, or Census Bureau-defined metropolitan areas; 2) shared culture and history; 3) similar socio-economic status, which we have measured using the American Community Survey's 2012-2016 estimates of median household income ("income") and the proportion of adults age 25 or older who have a bachelor's degree or higher ("college-educated adults").[13] Race can be used—with caution—to define communities of interest so long as it does not violate the Voting Rights Act or predominate over other neutral criteria in violation of *Shaw* and its progeny.

4. **Jurisdictional integrity**: In compliance with the Order, we have sought to minimize the number of divided cities, counties, and other municipalities, with city integrity taking precedence. If divisions must be made to attain equal population, we have sought to preserve the population cores of cities and urban counties within a given metropolitan area. We have prioritized the division of more populous jurisdictions over smaller ones and more diverse jurisdictions over more homogeneous ones only *after* considering whether the cores of urban areas have been preserved.

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[13] Because it is not possible to aggregate median income levels with available census data in order to calculate income level at the district level, we present maps below to demonstrate regional income level.

5. **Ignoring incumbency**. We have ignored incumbency in developing our districting plans. While the United States Supreme Court has held that a legislature may draw district lines to avoid the pairing of incumbents in appropriate circumstances, in a remedial case such as this one, protecting incumbents elected on the basis of an unconstitutional districting plan would only further entrench the harmful effects of the constitutional violations in those plans.[14] Further to this criterion, we have ignored the share of the population that would move between districts, since aiming to minimize the number of voters moved for its own sake would only further perpetuate the harms of the unconstitutional plan.

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PROPOSED REMEDIAL DISTRICTING PLANS

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Below, we present two different remedial districting plans for the court's consideration. The first plan ("Plan A") would create two districts based in Philadelphia where black voters would be expected to elect their preferred candidates, doubling the number of such districts compared to the 2011 Plan. The second plan ("Plan B") splits two fewer counties than Plan A, but in doing so it

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[14] While the United States Supreme Court has not directly addressed this issue, four justices have stated that whether "the goal of protecting incumbents is legitimate, even where, as here, individuals are incumbents by virtue of their election in an unconstitutional racially gerrymandered district … is a questionable proposition." *Easley v. Cromartie*, 532 U.S. 234, 262 n.3 (2001) (Thomas, J., dissenting).

does not create a second Philadelphia-based district where black voters would be

expected to elect their preferred candidates.

PLAN A – MAP AND SUMMARY

The map below shows our statewide districting plan under Plan A, with a close-up inset of southeastern Pennsylvania.[15]

Nonpartisan Pennsylvania Congressional Map Plan-A
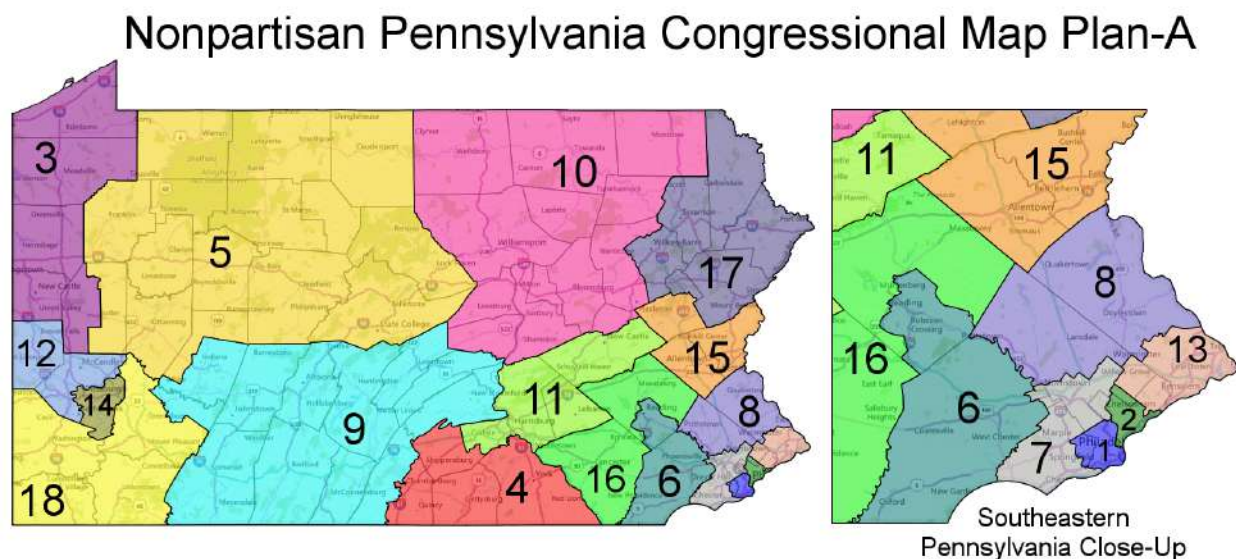
In Plan A, both of the districts where black voters would be expected to elect their preferred candidates (numbered 1 and 2) would split no municipalities apart from the city of Philadelphia. In total, Plan A divides 15 counties, 15 municipalities, eight wards, and 21 precincts.[16] The total population deviation among the districts is only two persons above the mathematical minimum of five persons. Reducing this deviation by two additional persons would not be possible without splitting additional municipalities and precincts and undermining other criteria.

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[15] ESRI shapefiles, census block equivalency files, and spreadsheets containing data calculations for each district in both Plan A and Plan B have also been filed with the Court.
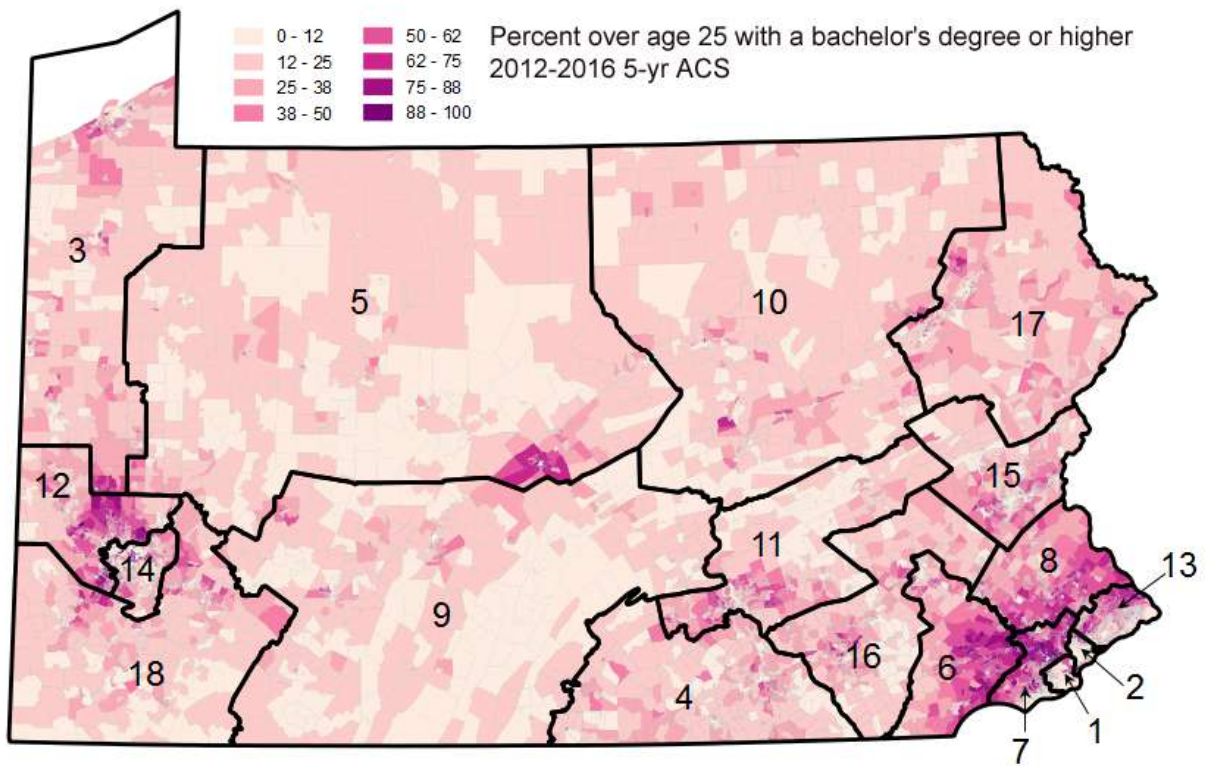
[16] See Appendix A for charts listing all such divisions.

The chart below displays the deviation from the ideal population for each district; the proportion of the voting age population and citizen voting age population broken down by race for each district; and the share of adults with college degrees for each district.
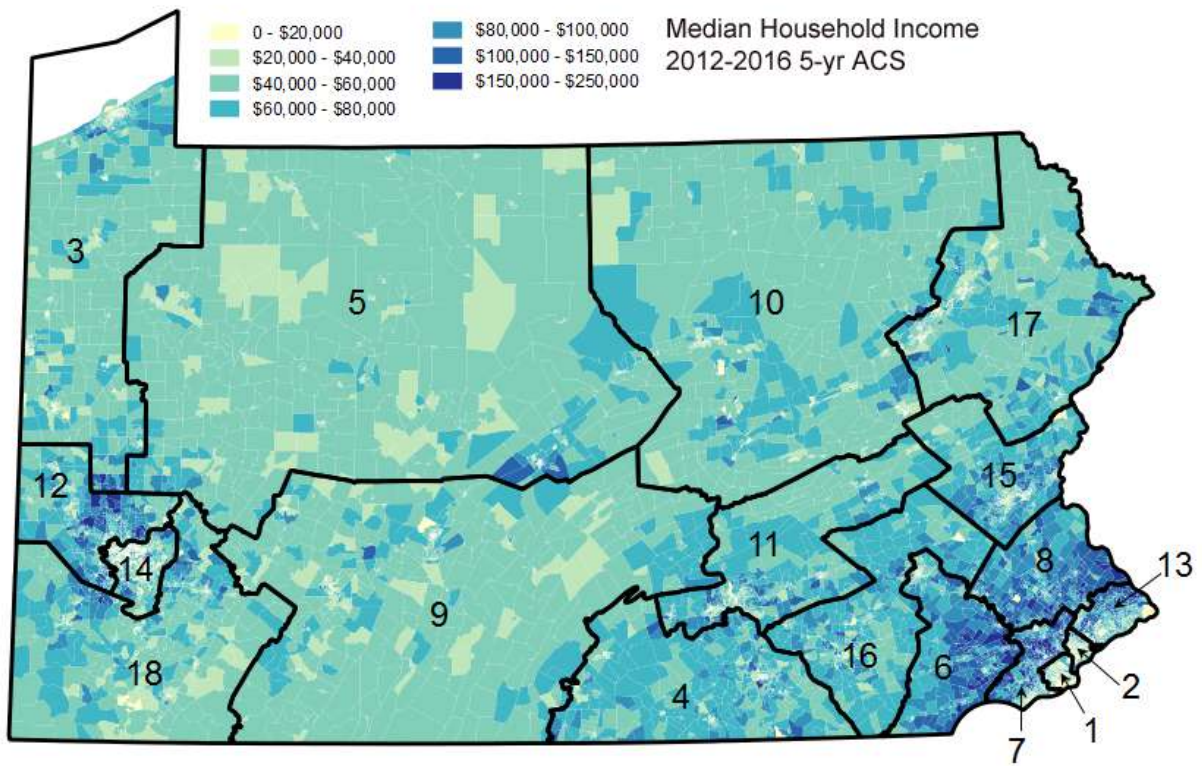
Plan-A		2010 Census Voting Age Population						Citizen Voting Age Population / Edu Attainment						
CD	Dev.	White	Black	Latino	Asian	Native	Other	White	Black	Latino	Asian	Native	Other	College
Statewide		81.8	9.7	4.6	2.7	0.1	1.0	83.8	9.7	3.8	1.7	0.1	0.8	29.3
1	0	37.5	48.9	3.9	7.6	0.2	1.8	40.1	50.5	2.7	5.2	0.2	1.3	28.7
2	-1	30.4	44.0	17.8	5.8	0.2	1.7	31.5	46.1	17.1	3.8	0.2	1.2	23.1
3	0	92.6	4.1	1.5	0.9	0.1	0.8	93.3	4.0	1.4	0.5	0.1	0.7	26.5
4	0	90.2	3.6	4.1	1.0	0.2	0.9	91.8	3.6	3.1	0.7	0.1	0.8	22.5
5	0	94.6	1.8	1.3	1.5	0.1	0.6	95.7	1.8	1.2	0.7	0.1	0.5	21.7
6	0	79.6	5.8	10.8	2.7	0.1	0.9	83.8	6.0	7.4	1.9	0.1	0.9	41.1
7	-1	80.3	10.5	3.6	4.4	0.1	1.1	82.9	10.6	2.4	3.0	0.1	0.9	48.3
8	0	87.5	3.9	2.8	4.9	0.1	0.8	90.1	3.7	2.1	3.4	0.1	0.7	42.7
9	-1	95.5	2.3	1.1	0.5	0.1	0.6	96.0	2.3	0.9	0.3	0.1	0.5	17.4
10	-1	93.4	2.3	2.9	0.6	0.1	0.6	94.6	2.4	1.9	0.4	0.1	0.5	19.2
11	-1	84.7	7.4	4.4	2.4	0.1	1.0	86.4	7.4	3.8	1.4	0.1	0.9	27.3
12	-1	92.6	3.5	1.0	2.1	0.1	0.7	93.6	3.6	0.8	1.2	0.1	0.7	39.8
13	0	82.9	5.8	4.5	5.4	0.1	1.2	85.0	6.1	3.9	4.1	0.0	0.8	32.8
14	0	75.9	18.2	1.5	2.8	0.1	1.4	77.5	18.2	1.4	1.4	0.1	1.4	33.9
15	0	81.4	3.9	11.2	2.4	0.1	1.0	83.7	3.8	9.9	1.7	0.1	0.8	27.3
16	0	88.9	2.6	6.0	1.6	0.1	0.7	90.2	2.5	5.4	1.2	0.1	0.7	25.3
17	0	87.3	4.8	5.5	1.4	0.1	0.9	88.7	4.7	4.7	0.9	0.1	0.8	23.8
18	1	95.1	2.8	0.8	0.6	0.1	0.7	95.3	2.8	0.8	0.4	0.1	0.7	25.1

We have also created illustrations that impose the boundaries of our two districting plans over maps of income and educational attainment levels by census block group. The educational attainment maps range from light pink to dark magenta, with lighter colors indicating lower education levels and darker colors higher levels. The income maps range from yellow to green to blue, with the yellow block groups having the lowest income levels and the bluest block groups the highest. The maps for Plan A are below.

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Education Levels - Plan A

Percent over age 25 with a bachelor's degree or higher
2012-2016 5-yr ACS

0 - 12	50 - 62
12 - 25	62 - 75
25 - 38	75 - 88
38 - 50	88 - 100

Income Levels - Plan A

Median Household Income
2012-2016 5-yr ACS

Legend:
- 0 - $20,000
- $20,000 - $40,000
- $40,000 - $60,000
- $60,000 - $80,000
- $80,000 - $100,000
- $100,000 - $150,000
- $150,000 - $250,000

The map below shows our statewide districting plan under Plan B, with a close-up inset of southeastern Pennsylvania.
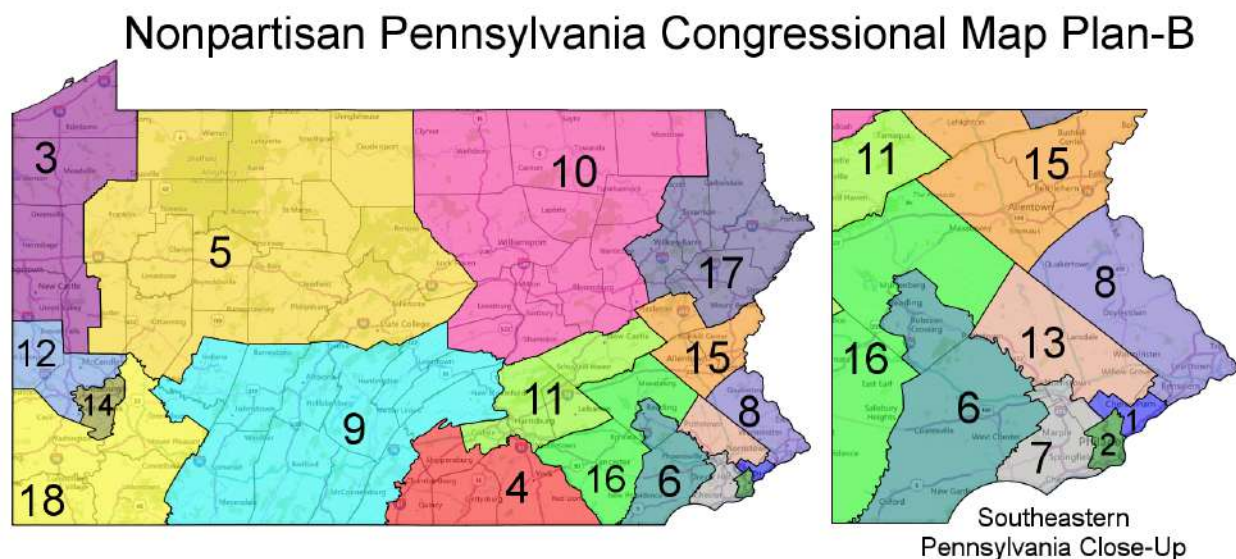
Plan B splits two fewer counties than Plan A, but in doing so it does not create a second Philadelphia-based district where black voters would be expected to elect their preferred candidates. Only districts 1, 2, 7, 8, and 13 differ between the two plans. In total, Plan B divides 13 counties, 15 municipalities, seven wards, and 18 precincts.[17] As with Plan A, the total population deviation among the districts in Plan B also is only two persons above the mathematical minimum of five persons. As with Plan A, reducing Plan B's deviation by two persons would

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[17] See Appendix A for charts listing all such divisions.

not be possible without splitting additional municipalities and precincts and

undermining other criteria.

The chart below displays the deviation from the ideal population for each

district; the proportion of the voting age population and citizen voting age
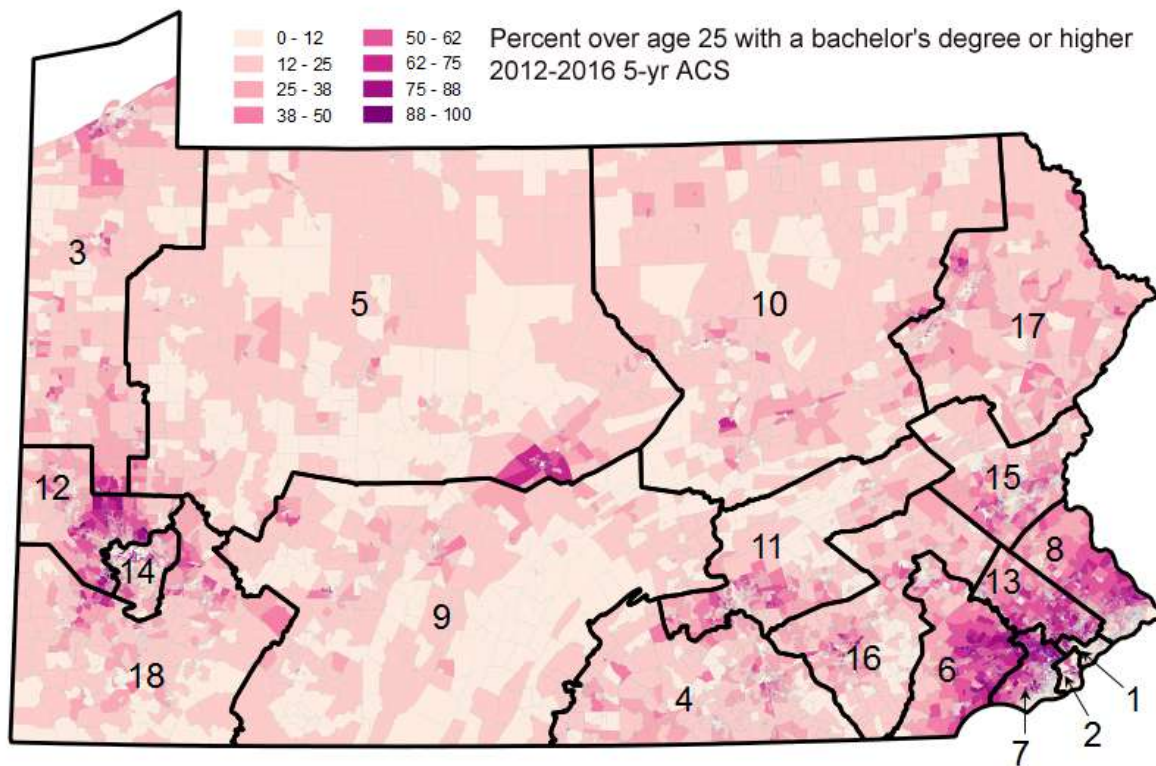
population broken down by race for each district; and the share of adults with
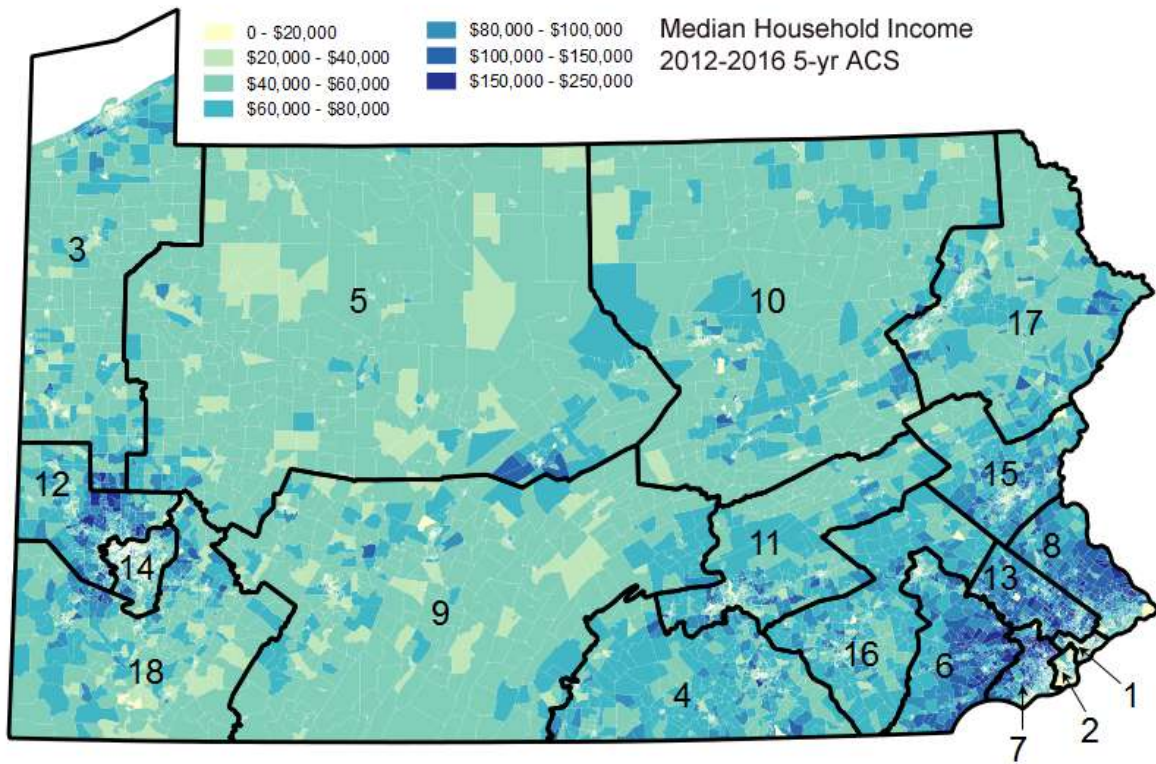
college degrees for each district.

Plan-B		2010 Census Voting Age Population						Citizen Voting Age Population / Edu Attainment						
CD	Dev.	White	Black	Latino	Asian	Native	Other	White	Black	Latino	Asian	Native	Other	College
Statewide		81.8	9.7	4.6	2.7	0.1	1.0	83.8	9.7	3.8	1.7	0.1	0.8	29.3
1	0	42.1	34.1	16.3	5.6	0.2	1.7	43.6	35.8	15.4	3.9	0.2	1.1	21.4
2	0	33.5	51.1	6.0	7.3	0.3	1.8	35.1	53.5	5.1	4.7	0.2	1.3	31.4
3	0	92.6	4.1	1.5	0.9	0.1	0.8	93.3	4.0	1.4	0.5	0.1	0.7	26.5
4	0	90.2	3.6	4.1	1.0	0.2	0.9	91.8	3.6	3.1	0.7	0.1	0.8	22.5
5	0	94.6	1.8	1.3	1.5	0.1	0.6	95.6	1.8	1.2	0.7	0.2	0.5	21.3
6	0	79.6	5.8	10.8	2.7	0.1	0.9	83.8	6.0	7.4	1.9	0.1	0.9	41.1
7	0	73.7	16.2	3.7	5.1	0.1	1.2	77.2	15.9	2.3	3.5	0.1	1.0	41.5
8	-2	87.9	3.4	3.7	3.9	0.1	1.0	89.8	3.3	2.9	3.2	0.1	0.7	36.6
9	-1	95.5	2.3	1.1	0.5	0.1	0.6	96.0	2.3	0.9	0.3	0.1	0.5	17.4
10	-1	93.4	2.3	2.9	0.6	0.1	0.6	94.6	2.4	1.9	0.4	0.1	0.5	19.2
11	-1	84.7	7.4	4.4	2.4	0.1	1.0	86.4	7.4	3.8	1.4	0.1	0.9	27.3
12	-1	92.6	3.5	1.0	2.1	0.1	0.7	93.8	3.5	0.8	1.2	0.1	0.7	39.3
13	0	82.6	7.2	2.7	6.3	0.1	1.0	85.4	7.3	2.4	4.1	0.1	0.8	45.0
14	0	75.9	18.2	1.5	2.8	0.1	1.4	77.5	18.2	1.4	1.4	0.1	1.4	33.9
15	0	81.4	3.9	11.2	2.4	0.1	1.0	83.7	3.8	9.9	1.7	0.1	0.8	27.3
16	0	88.9	2.6	6.0	1.6	0.1	0.7	90.2	2.5	5.4	1.2	0.1	0.7	25.3
17	0	87.3	4.8	5.5	1.4	0.1	0.9	88.7	4.7	4.7	0.9	0.1	0.8	23.8
18	1	95.1	2.8	0.8	0.6	0.1	0.7	95.3	2.8	0.8	0.4	0.1	0.7	25.1

Illustrations that impose the district boundaries of Plan B over maps of

income and educational attainment levels by census block group are below.

Education Levels - Plan B

Percent over age 25 with a bachelor's degree or higher
2012-2016 5-yr ACS

Legend:
- 0 - 12
- 12 - 25
- 25 - 38
- 38 - 50
- 50 - 62
- 62 - 75
- 75 - 88
- 88 - 100

Income Levels - Plan B

0 - $20,000	$80,000 - $100,000	Median Household Income
$20,000 - $40,000	$100,000 - $150,000	2012-2016 5-yr ACS
$40,000 - $60,000	$150,000 - $250,000	
$60,000 - $80,000		

PLAN A – DESCRIPTIONS AND ANALYSIS OF EACH DISTRICT

Below, we illustrate and discuss our reasoning for drawing each individual district as we did. We begin with Plan A.

District 1

District 1 is composed of part of the city of Philadelphia, as well as whole cities and townships in eastern Delaware County.
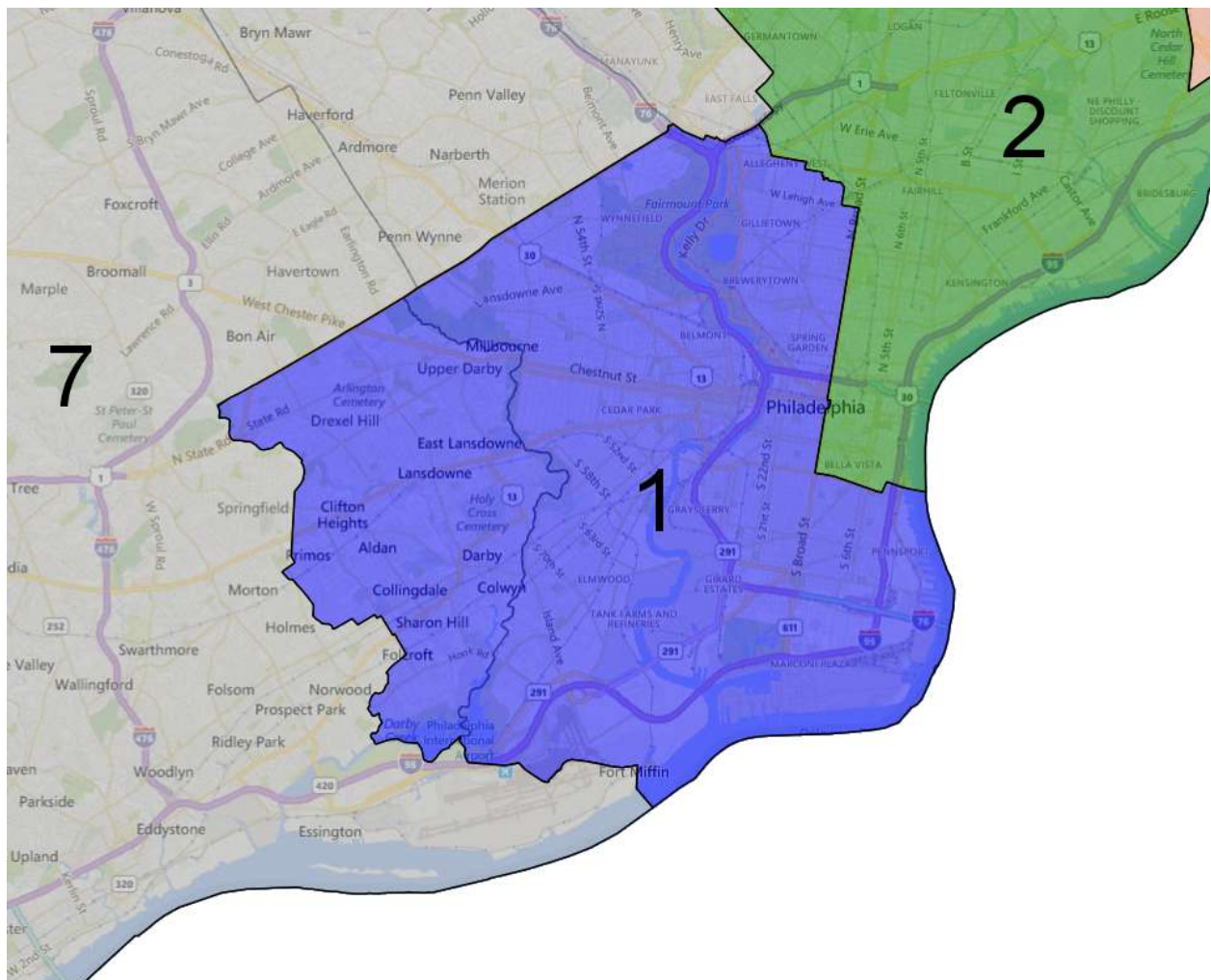
District 1 unites heavily black communities into a compact district that has a black CVAP of 50.5 percent and where black voters can be expected to be able to

elect their candidates of choice in compliance with Section 2 of the Voting Rights Act. District 1 divides Philadelphia wards 2, 11, and 38, and Philadelphia precincts 11-18, 38-12, 38-15, 38-17. Although that is more than the bare minimum of split precincts theoretically needed to attain equal population as between Districts 2 and 7, this division allows for greater compactness and a more balanced proportion of minority residents in both Districts 1 and 2. This splitting of precincts also enables us to avoid splitting any further wards.

District 2

District 2 is composed of parts of Philadelphia, as well as the entirety of Cheltenham Township in Montgomery County. This district splits Philadelphia wards 2, 11, 38, and 65, along with precincts 11-18, 38-17, 65-07, and 65-22 to attain equal population and to balance District 2's minority population with both District 1 and District 7 to ensure that black voters can elect their preferred candidates in both District 1 and District 2.
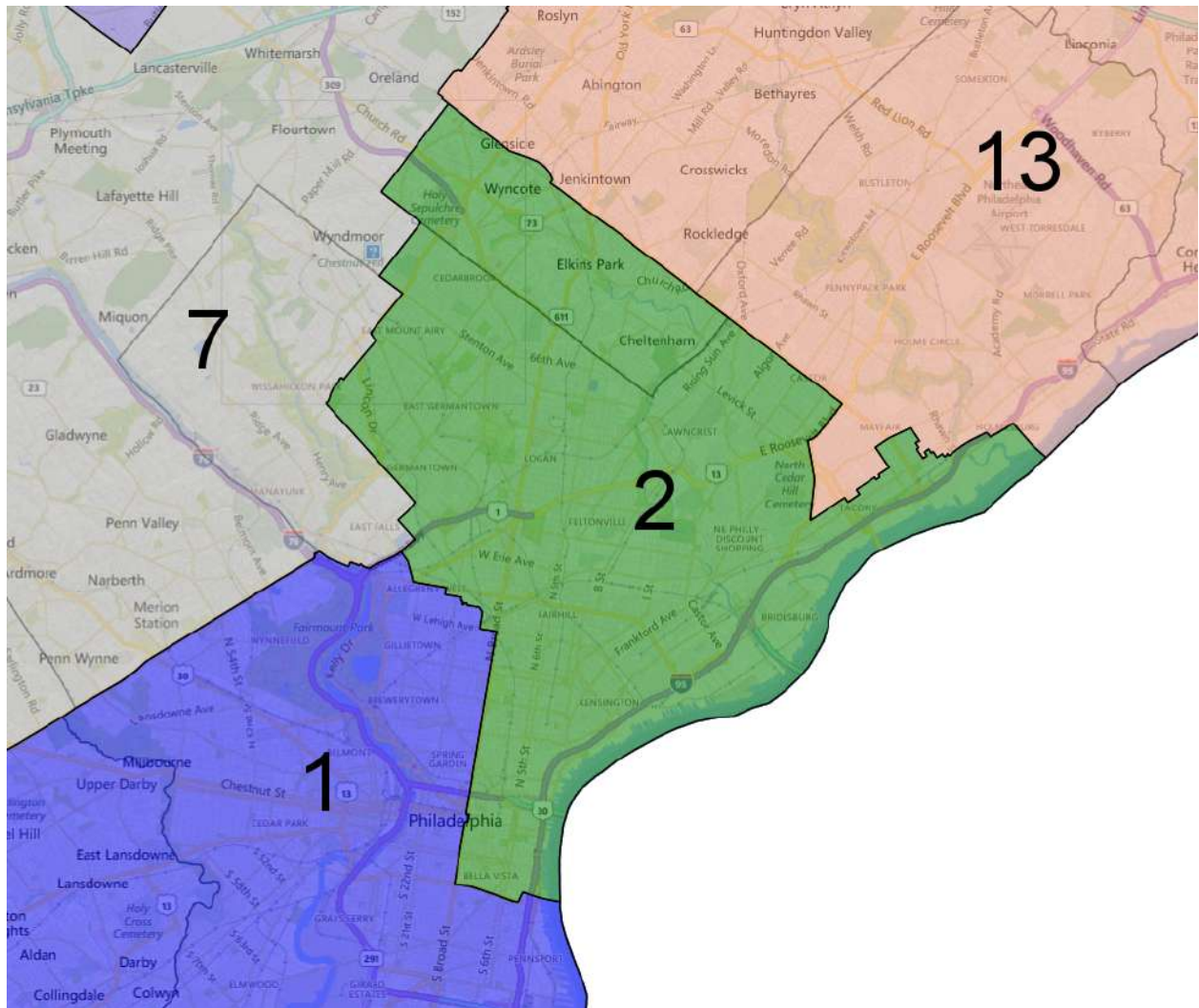
District 2 has a black CVAP of 46.1 percent, while Latinos make up 17.1 percent of the CVAP. Although the black population proportion is slightly shy of a majority, whites make up just 31.5 percent of the CVAP. Black voters would almost certainly make up a sizable majority of the electorate in a Democratic primary, thanks to the much greater propensity of white voters in the area to favor Republican candidates and the tendency for Latino citizens to turn out to vote at a

lower rate than black or white citizens. Black voters would therefore likely be able to elect their preferred candidates.

District 3

District 3 is composed of the entirety of Crawford, Erie, Lawrence, and Mercer Counties, as well as parts of Butler County. Our proposed District 3 splits just a single municipality of Cherry Township and the precinct of Cherry Township in Butler County solely to attain equal population.
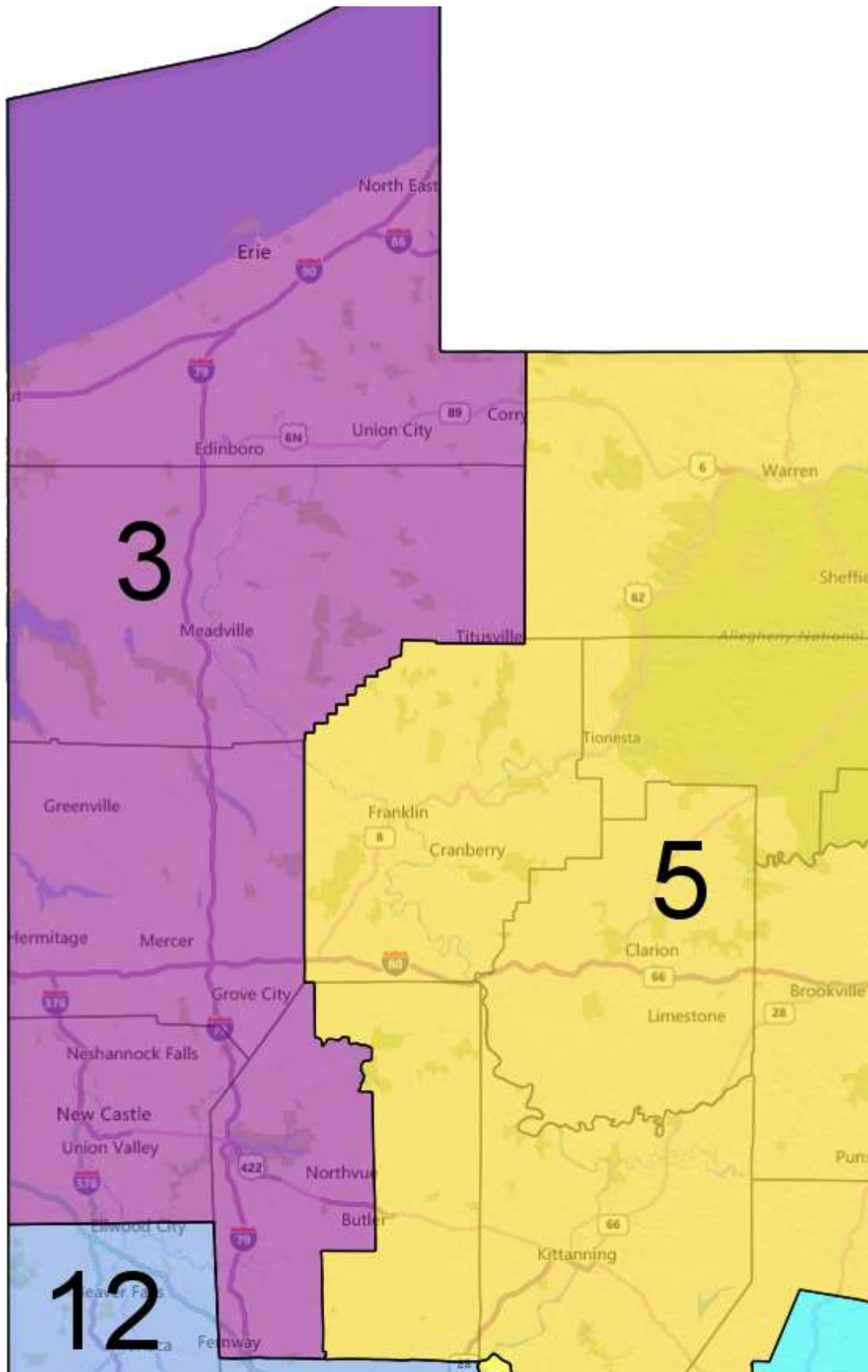
This proposed district is focused on Erie County and the unglaciated portion of the Allegheny Plateau—in other words, the portions of northwestern Pennsylvania that are less culturally and geographically a part of Appalachia and have more demographic commonality with the Mahoning Valley region, which spans Pennsylvania and Ohio (defined by the Census Bureau as Mercer County in Pennsylvania and Mahoning and Trumbull Counties in Ohio). This district is designed to avoid venturing further eastward into Appalachian Pennsylvania. In doing so, it allows District 12 to center more on suburban Allegheny County by avoiding a three-way division of that county.

District 4

District 4 is composed of the entirety of Adams and York Counties and parts of Cumberland and Franklin Counties. This proposal splits the municipalities of Hamilton Township in Franklin County and South Middletown Township in Cumberland County, as well as Hamilton Township Precinct 1 and South

Middleton Township Precinct 3, in order to attain equal population.
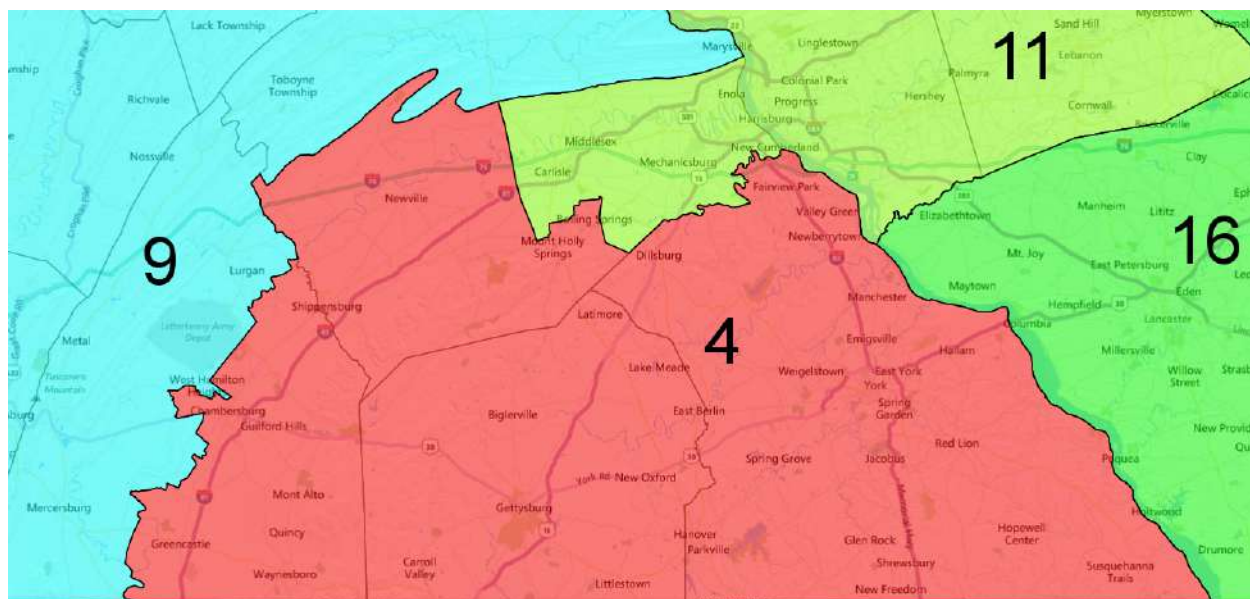
This district is designed to focus on York County and the Piedmont region of Pennsylvania to its west. Unlike the 2011 Plan's now-invalidated District 4, our proposal does not include any part of the core of the Harrisburg-Carlisle metropolitan area, and it stops just short of the Harrisburg suburb of Carlisle in Cumberland County. It also uses the Susquehanna River as a natural border to its east.

District 5

District 5 is composed of the entirety of Armstrong, Cameron, Centre, Clarion, Clearfield, Clinton, Elk, Forest, Jefferson, McKean, Potter, Venango, and Warren Counties, as well as parts of Butler and Indiana Counties. It splits the municipalities of Cherry Township in Butler County and Conemaugh Township in Indiana County, along with the precincts of Conemaugh Township Voting District

2 and Cherry Township, to attain equal population.
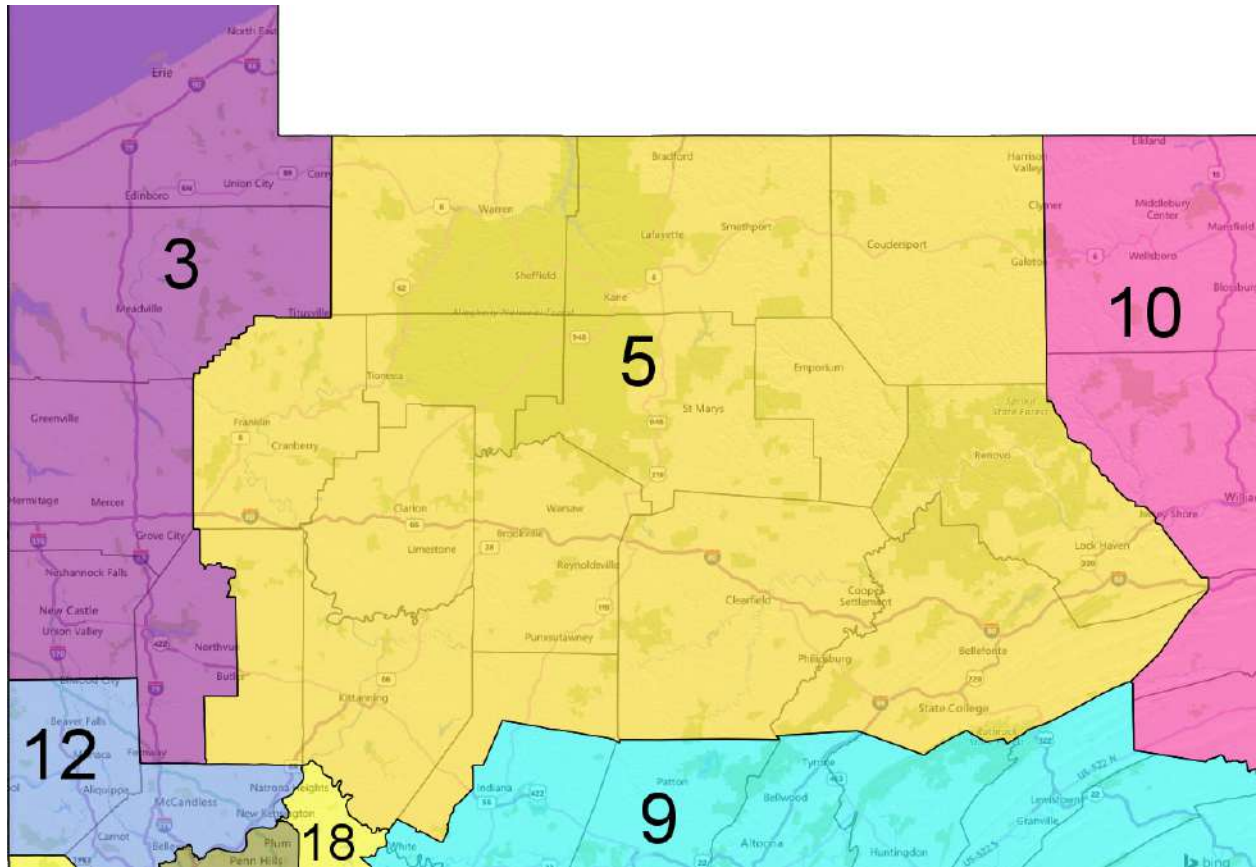
District 5 is designed to be relatively rural while remaining compact. Both District 5 and District 9 were balanced to minimize the extent to which the Pittsburgh metropolitan area falls within either of them so as to give central Pennsylvania two districts that are anchored within the region as much as possible.

District 6

District 6 is composed of parts of Berks and Chester Counties. It splits the municipalities of Douglas Township in Berks County and Tredyffrin Township in Chester County, along with the precincts Douglas Township Precinct 1 and Tredyffrin Township VTD ED 6, to attain equal population.

District 6 takes in roughly 88 percent of the residents of suburban Chester County, which was previously divided among three districts under the 2011 Plan, with each district containing a substantial portion of Chester County's population.

This districting plan creates a much clearer delineation between districts containing the census-defined Philadelphia metropolitan area and the rest of Southeastern Pennsylvania compared to a hypothetical alternate configuration that

would place almost all of Berks County in District 6 while giving the District 16 portions of Chester County. This hypothetical alternate configuration would be undesirable, though, as it would place a substantial portion of the population in Chester County into three different districts and draw an additional district into the Philadelphia metropolitan area compared to our proposal.

Our proposed division of Berks County places relatively rural areas that have socioeconomic demographics similar to those of neighboring Lancaster County in District 16. That enables our proposal to keep suburban areas in Chester County that share socioeconomic similarities with one another largely in District 6, while District 7 comprises only a small share of Chester County and District 16 contains none at all. These patterns are illustrated in the maps just below.

Education Levels - Plan A

0 - 12	50 - 62	Percent over age 25 with a bachelor's degree or higher
12 - 25	62 - 75	2012-2016 5-yr ACS
25 - 38	75 - 88	
38 - 50	88 - 100	

Income Levels - Plan A

	Median Household Income
0 - $20,000	$80,000 - $100,000	2012-2016 5-yr ACS
$20,000 - $40,000	$100,000 - $150,000	
$40,000 - $60,000	$150,000 - $250,000	
$60,000 - $80,000		
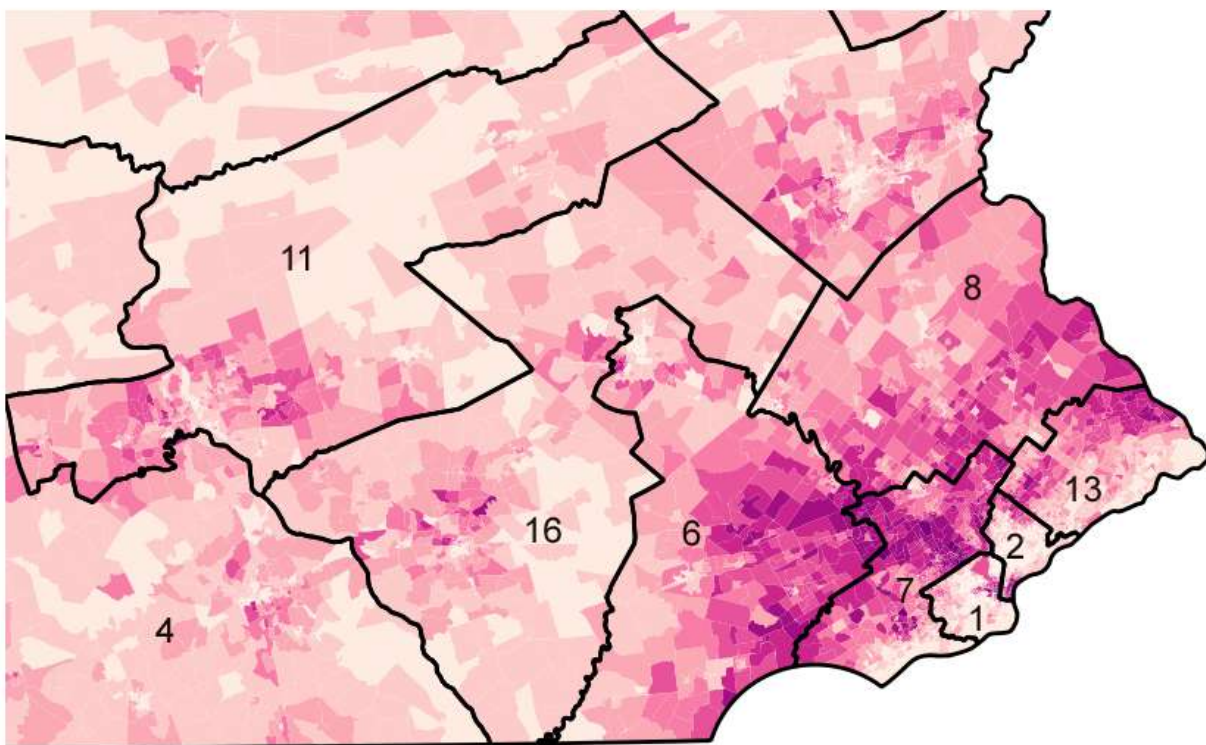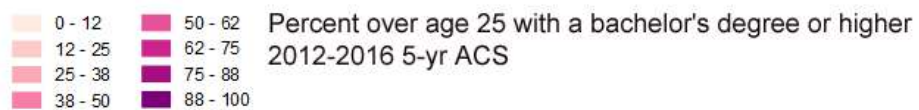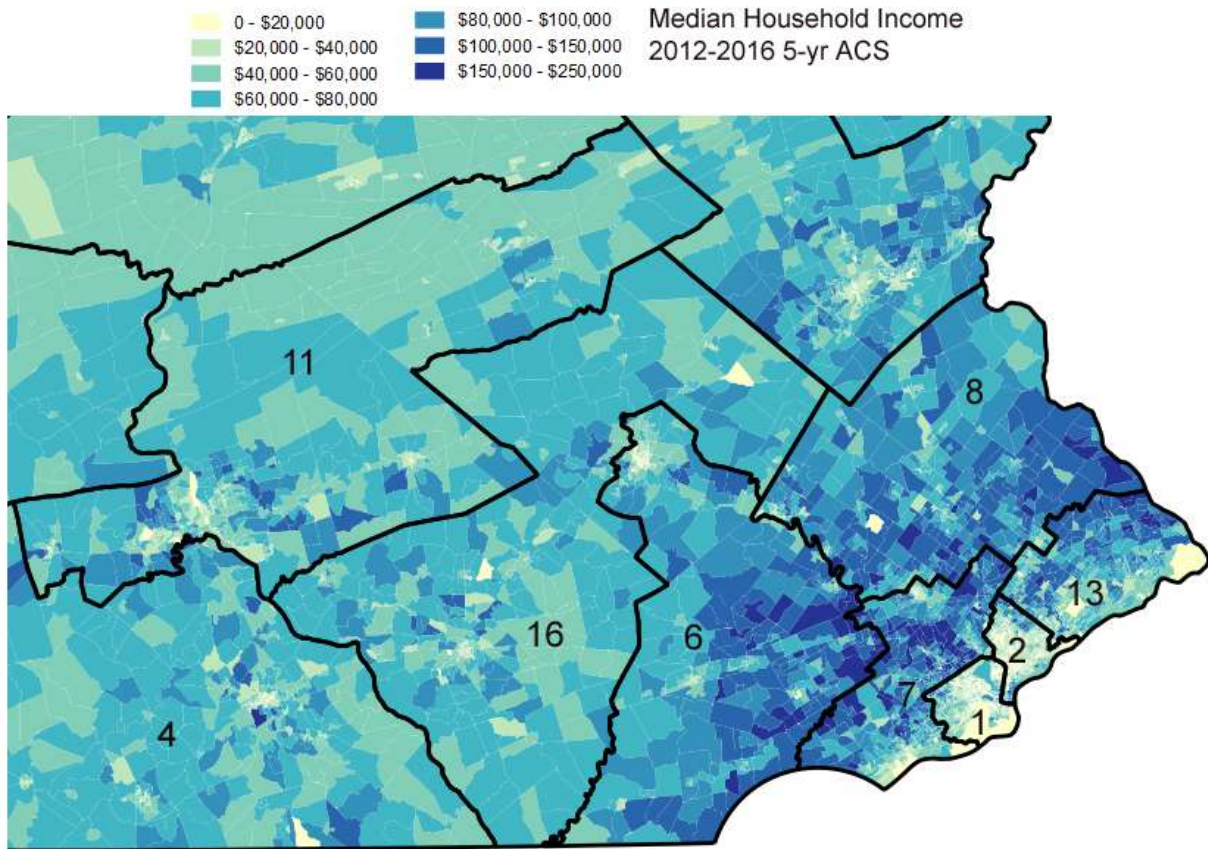
District 7

District 7 is composed of parts of Chester, Delaware, Montgomery and Philadelphia Counties. It splits the municipalities of Philadelphia and Tredyffrin Township in Chester County, Philadelphia ward 38, Tredyffrin Township VTD ED 6, and Philadelphia precincts 38-12, 38-15, and 38-17, to attain equal population and to balance the black population of District 7 with District 1 and District 2 to

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ensure that black voters can elect their preferred candidates in the latter two

districts.[18]
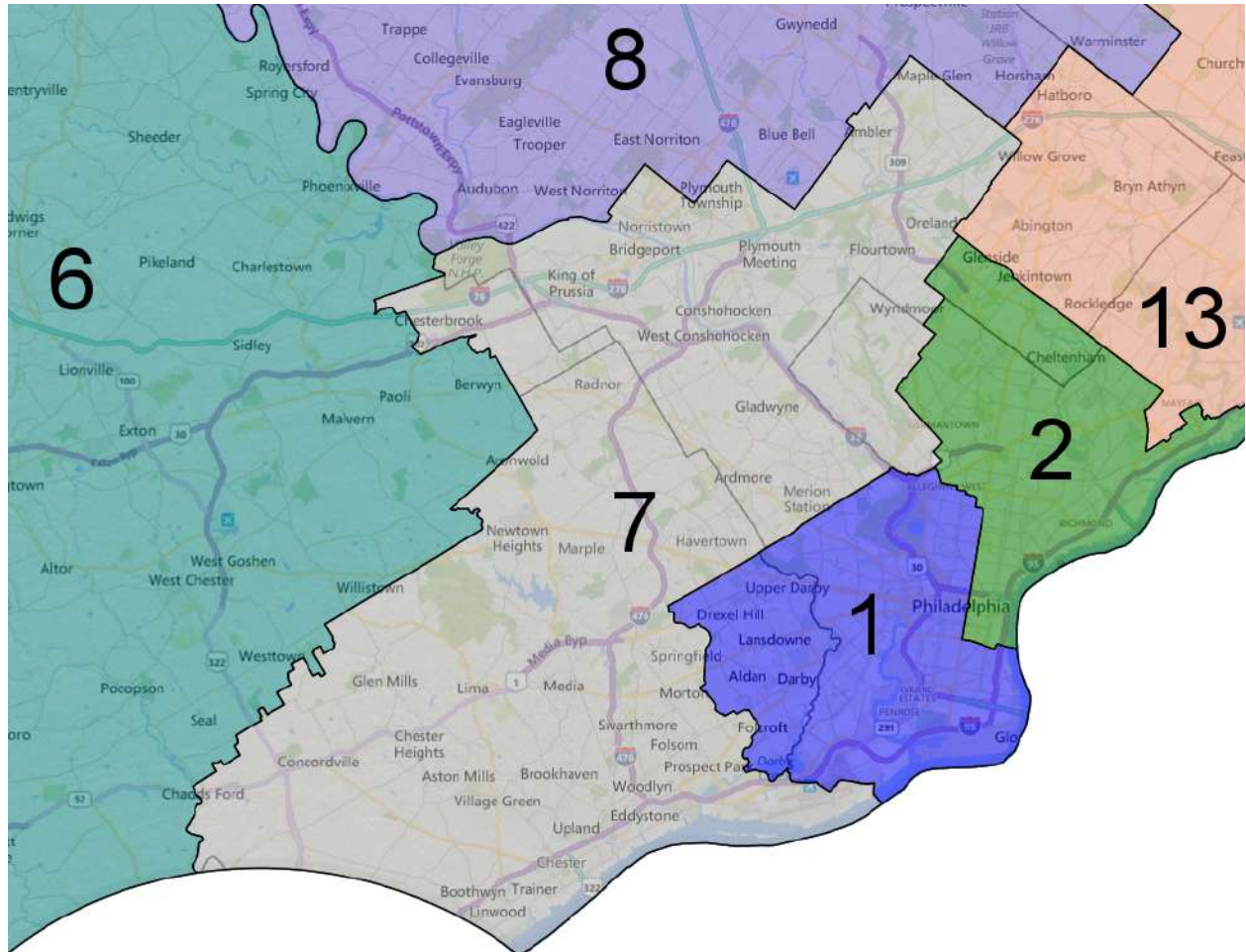
District 7 no longer has bizarrely shaped appendages, as the district of the

same number in the 2011 Plan does. Instead, it is centered on Delaware County

and the inner suburbs west of Philadelphia, commonly known as the Main Line.

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[18] District 7 also includes small uninhabited portions of Birmingham Township in Chester County and West Norriton Township in Montgomery County. However, the divisions of both of those townships are designed to maintain contiguity, including the avoidance of water contiguity, and do not move any persons between districts. Therefore, both townships and their respective precincts should be considered undivided for the purposes of political representation.

District 8

District 8 is composed of parts of Bucks and Montgomery Counties. It splits the municipality of Northampton Township in Bucks County and Northampton Township Precinct 8 to attain equal population.
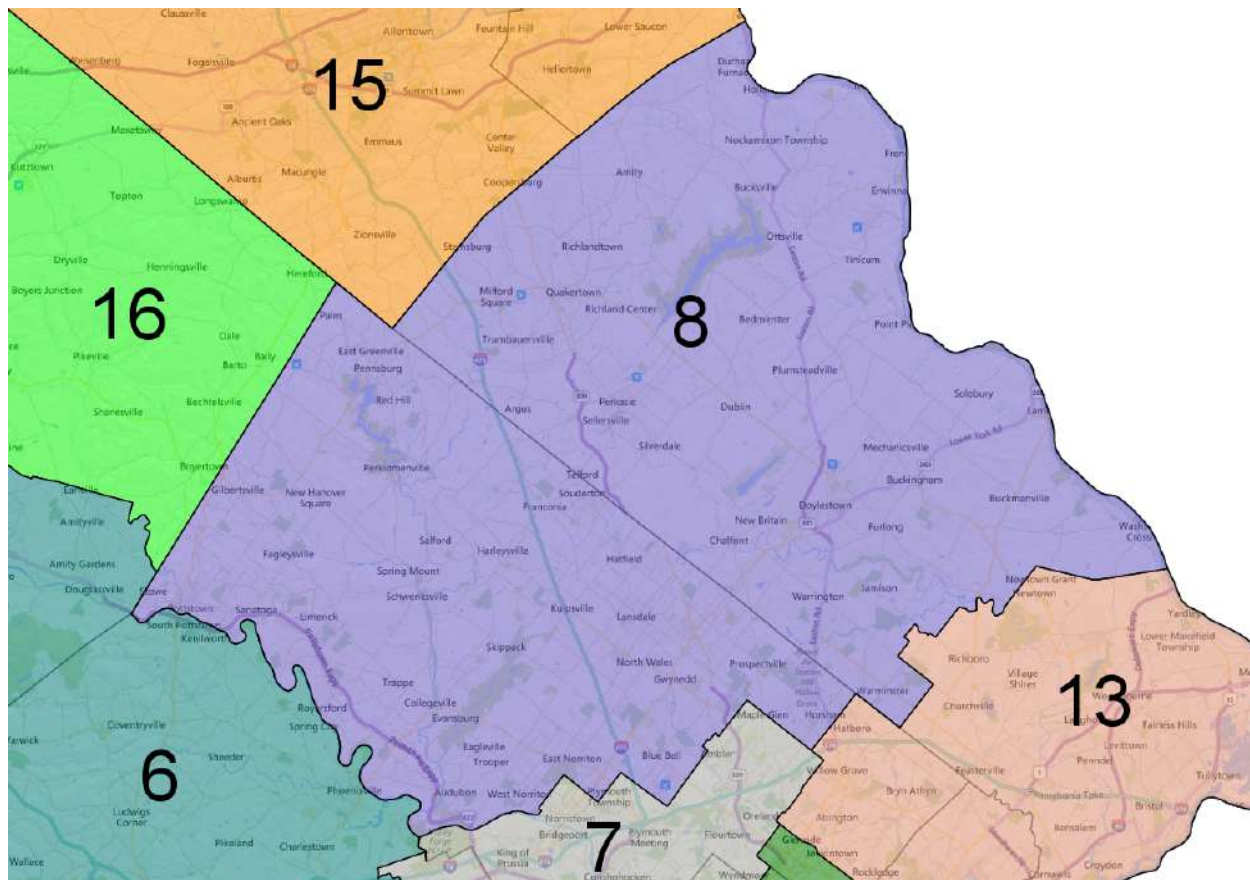
While Bucks County has traditionally remained undivided and has not been split between districts since the late 1880s,[19] this division allows for the creation of more compact districts overall while also establishing two compact Districts 1 and

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[19] Jeffrey B. Lewis, Brandon DeVine, Lincoln Pitcher, and Kenneth C. Martis, "Digital Boundary Definitions of United States Congressional Districts, 1789-2012," available at http://bit.ly/2EpeAtL.

District 2 based in Philadelphia where black voters would be able to elect their preferred candidates.

If Bucks County were to remain undivided and placed in a hypothetical District 8, such a district would still fall 80,439 persons short of equal population. This hypothetical district would therefore be required to take the remaining difference in population from either Montgomery County or Philadelphia. However, because the Philadelphia portion our proposed District 13 contains 245,932 persons, a District 8 containing an undivided Bucks County could not take all of the portions of northeastern Philadelphia located in our proposed District 13. Such a choice would therefore leave 174,493 persons in northeastern Philadelphia in District 13 while increasing the number of districts that divide the city from four to five.

To avoid splitting Philadelphia further while still keeping Bucks County undivided in District 8 would require District 13 to combine suburban areas in Montgomery County with portions of northeastern Philadelphia that have dissimilar socioeconomic demographics. It would also make both districts considerably less compact.

By contrast, under Plan A, splitting both Bucks and Montgomery Counties along a north-to-south line means our proposed District 8 consists heavily of outer suburban areas that share greater demographic similarities with one another, while

District 13 contains areas closer to Philadelphia's urban core that likewise share greater demographic similarities with one another.

District 9

District 9 is composed of the entirety of Bedford, Blair, Cambria, Fulton, Huntingdon, Juniata, Mifflin, Perry and Somerset Counties, as well as parts of Franklin, Indiana, and Westmoreland Counties. It splits the municipalities of Hamilton Township in Franklin County, Derry Township in Westmoreland County, and Conemaugh Township in Indiana County, along with the precincts of Hamilton Township Precinct 1, Derry Township VTD Scalp Level, and Conemaugh Township Precinct 2 to attain equal population.
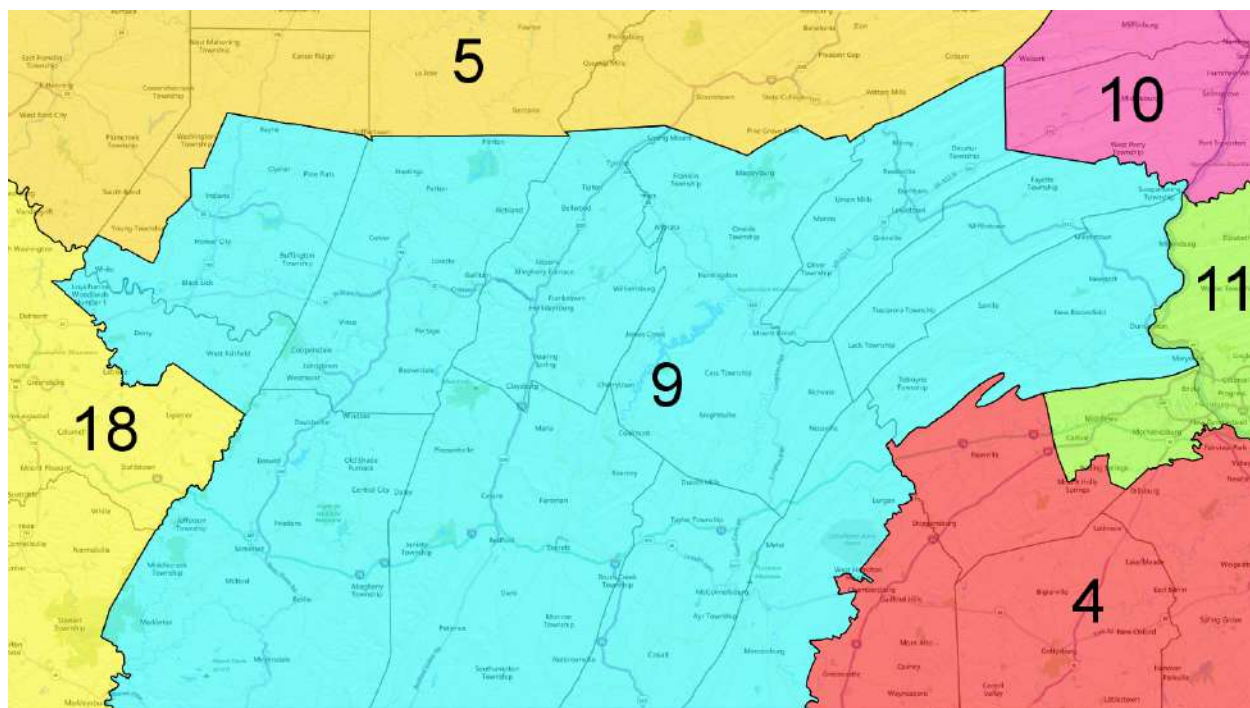
This district is designed to cover the south-central part of Pennsylvania while also balancing with District 5 to minimize the portion of the Pittsburgh metropolitan area that each district takes in so that voters in rural Pennsylvania will have significant sway over both districts.

District 10

District 10 is composed of the entirety of Bradford, Columbia, Lycoming, Montour, Northumberland, Snyder, Sullivan, Susquehanna, Tioga, Union, and Wyoming Counties, as well as parts of Luzerne and Schuylkill Counties. It divides the municipalities of Kingston Township in Luzerne County and Butler Township in Schuylkill County, along with the precincts of Kingston Township ward 3 and Butler Township Northeast VTD to attain equal population.
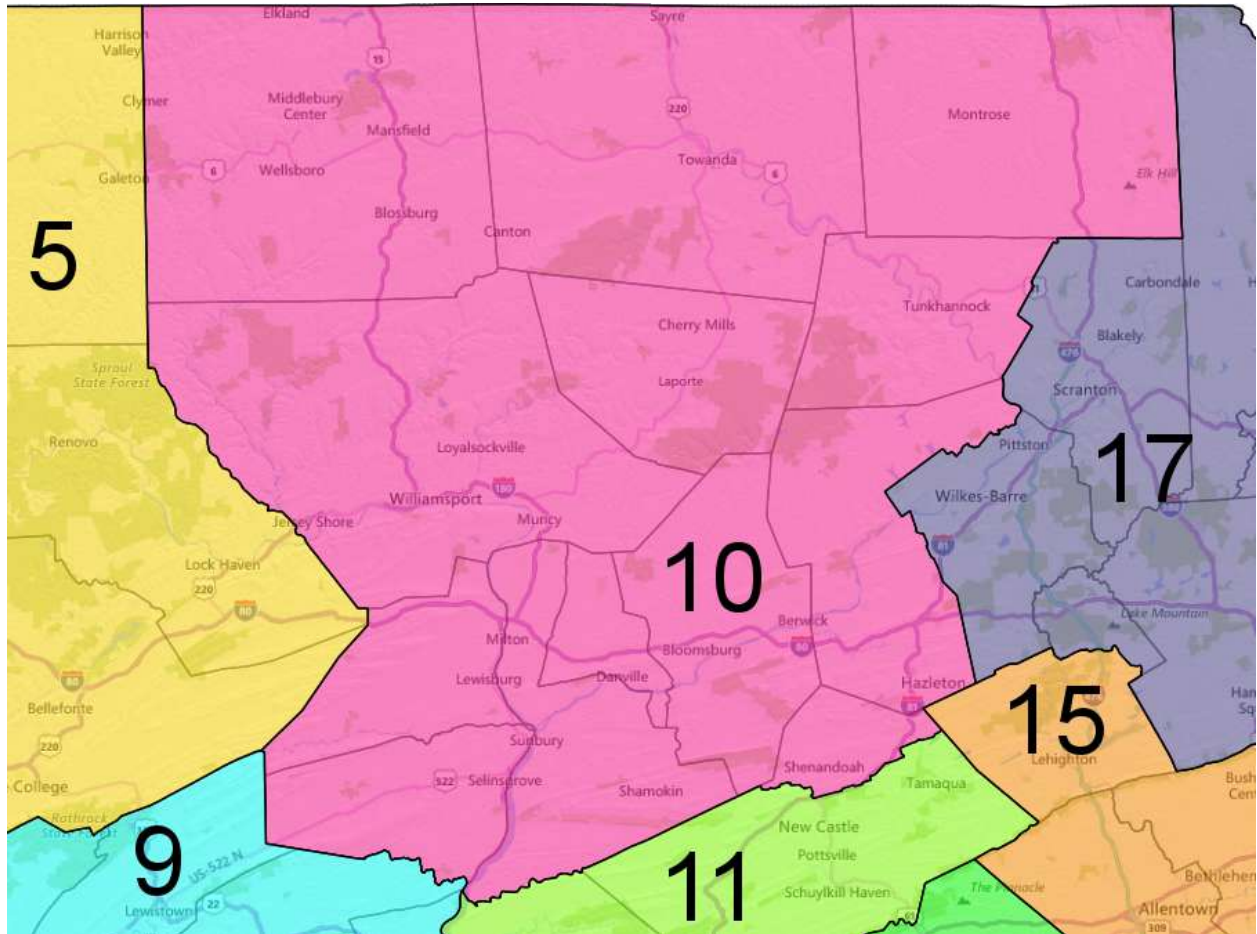
District 10 is designed to cover rural northeastern Pennsylvania outside the
urban core of the Wyoming Valley, also known as the Scranton/Wilkes-Barre
metropolitan area defined by the Census Bureau as Lackawanna, Luzerne, and
Wyoming Counties.

District 11

District 11 is composed of the entirety of Dauphin and Lebanon Counties, as
well as parts of Berks, Cumberland and Schuylkill Counties. It divides the
municipalities of Butler Township in Schuylkill County, Hamilton Township in
Franklin County, and Bethel Township in Berks County, as well as the precincts of

Butler Township Northeast VTD, Hamilton Township Precinct 1, and Bethel

Township to attain equal population.
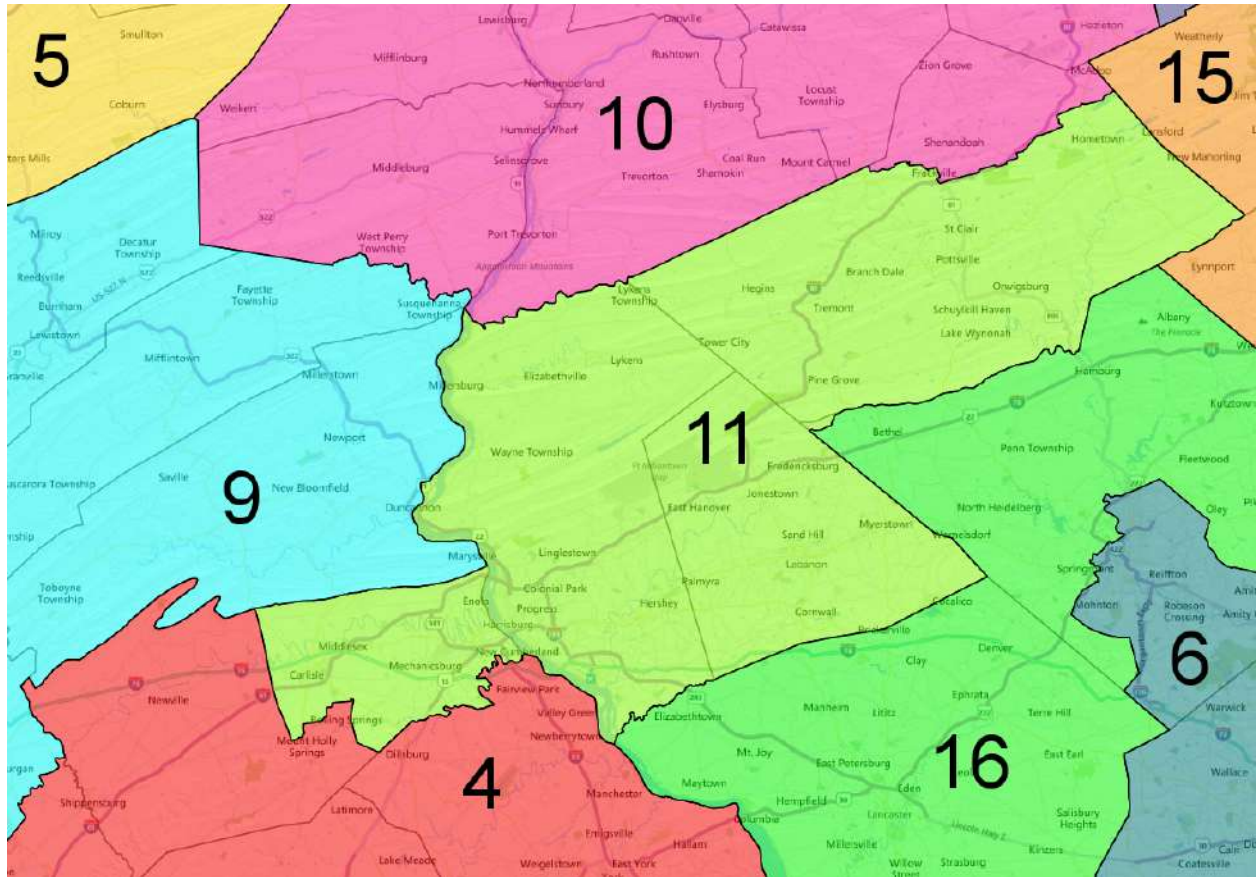
This district contains the core of the Harrisburg metropolitan area in

Cumberland and Dauphin Counties, which is currently divided between District 4,

District 11, and District 15 under the 2011 Plan. It also includes the more distant

Harrisburg-area cities of Carlisle in Cumberland County and Lebanon in Lebanon

County, the latter of which is part of the greater Harrisburg combined statistical

area according to the Census Bureau.

Although this District 11 creates a three-way division of Berks County, this division includes only 67 persons in District 11, meaning 99.98 percent of the county would be placed into Districts 6 and 16. Consequently, the hypothetical alternate configuration discussed above regarding District 6 would not only split Chester County three ways but would place a substantial portion of the population in each district, whereas under this proposal only a handful of Berks County voters would be placed in a third district.

District 12

District 12 consists of the entirety of Beaver County and parts of Allegheny and Westmoreland Counties. It divides the city of Pittsburgh in Allegheny County solely to attain equal population while keeping smaller suburbs intact, but 99.8 percent of the city remains in the 14th District. It splits Pittsburgh ward 12, along with Pittsburgh precinct 12-12, solely to eliminate the use of water contiguity, otherwise we could achieve equal population with just a single ward and precinct division. The city of New Kensington in Westmoreland County, Pittsburgh ward 26, New Kensington ward 7, Pittsburgh precinct 26-14, and New Kensington

precinct 07-02 are split solely to attain equal population.
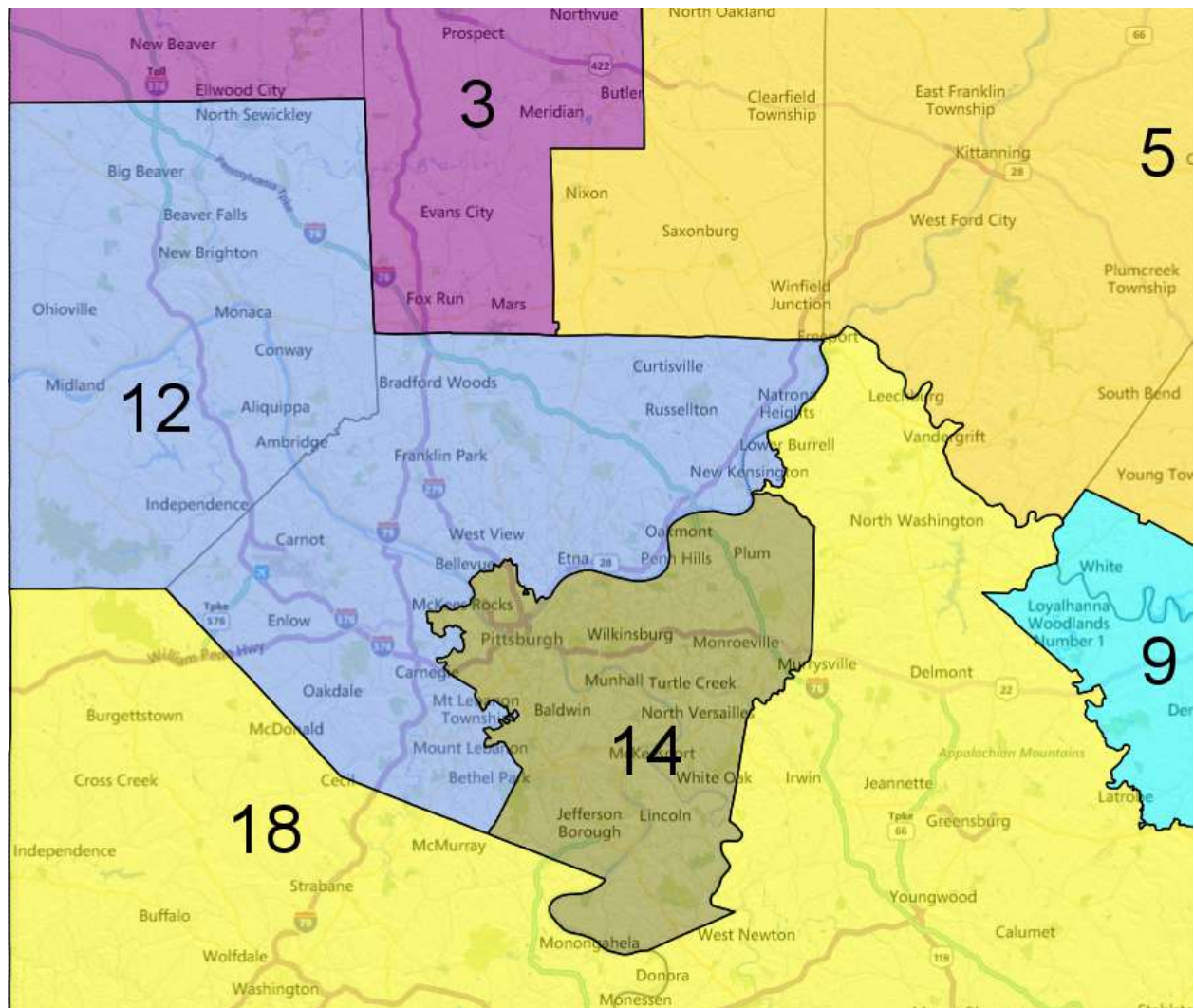
District 12 is composed of the suburbs of Pittsburgh located to that city's north, west, and southwest that have socioeconomic similarities with each other. Allegheny County, which comprises the core of the Pittsburgh metropolitan area, should not be divided three ways as it is under the 2011 Plan or the Legislative

Leaders' Proposal.[20] Splitting Allegheny County only two ways allows District 14 to take in almost all of Pittsburgh and the city's eastern and southeastern suburbs, whose socioeconomic demographics are more similar to those of Pittsburg itself than they are to those suburbs in Allegheny County that are placed in District 12.

Under the since-invalidated 2011 Plan, District 18 placed several of Pittsburgh's inner suburbs in the south of Allegheny County, such as the borough of Bethel Park, into a district dominated by the more rural counties to the south and east that have relatively dissimilar socioeconomic demographics. Dividing Allegheny County in the manner we have here places these inner suburbs into a district where the majority of the population is also contained within inner suburbs that have greater socioeconomic similarities with each other. Consequently, District 18 would be contained within the outer suburbs and exurbs of Pittsburgh (those located outside of the city's metropolitan core in Allegheny County), which also lets it unite areas that have more socioeconomic similarities with each other than with Pittsburgh's inner suburbs. These patterns are illustrated in the maps just below.

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[20] Brief of Respondents Michael Turzai and Joseph Scarnati in Support of Proposed Remedial Congressional Districting Map (Feb. 9, 2018), Attachments A and B.

Education Levels
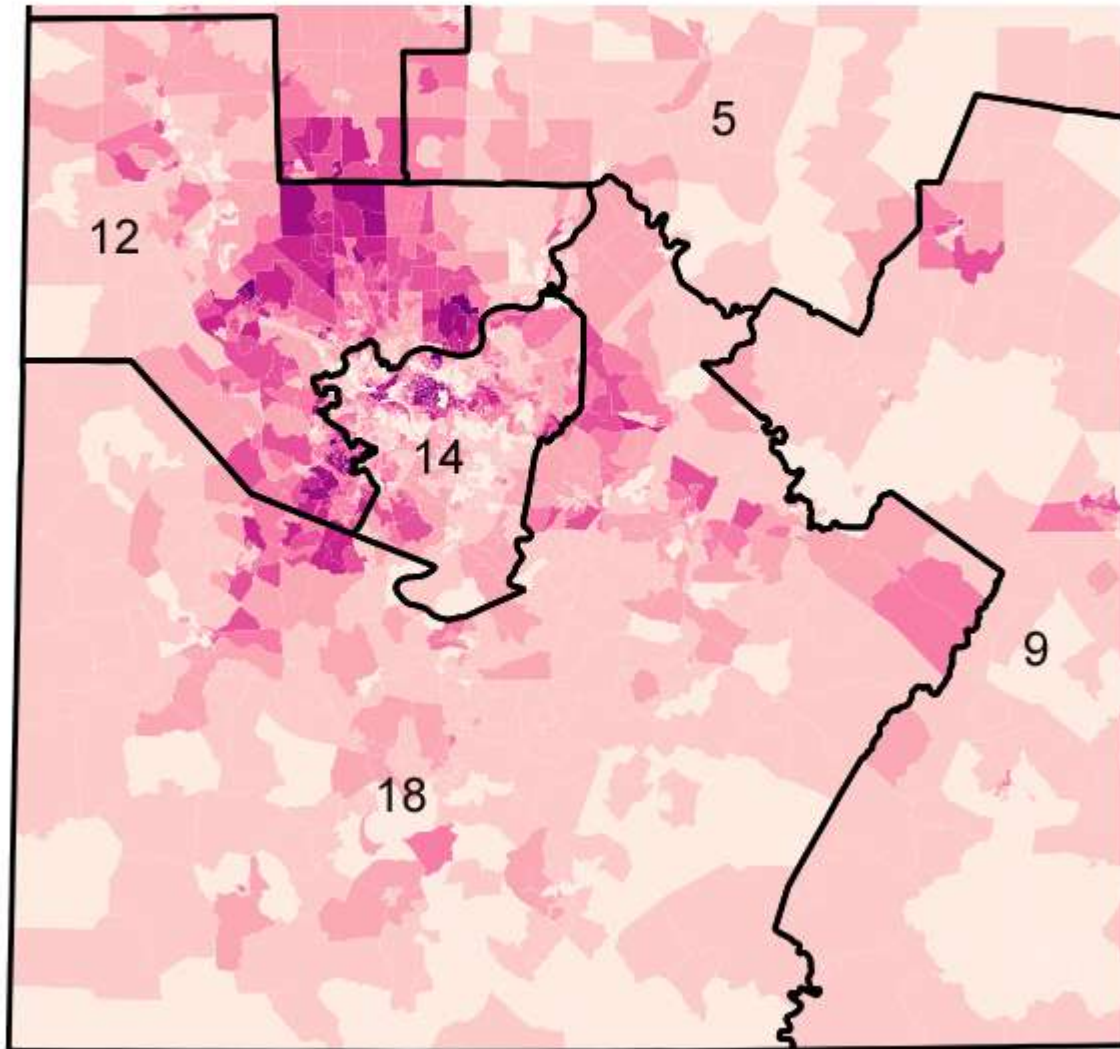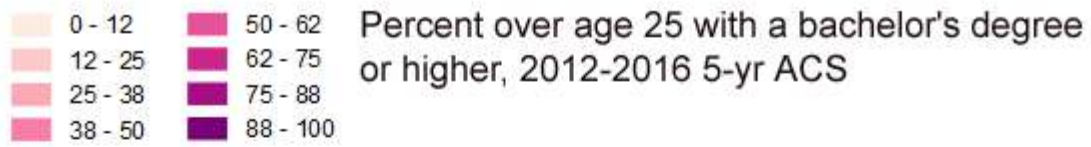
0 - 12	50 - 62
12 - 25	62 - 75
25 - 38	75 - 88
38 - 50	88 - 100

Percent over age 25 with a bachelor's degree or higher, 2012-2016 5-yr ACS

Income Levels

Legend:
- 0 - $20,000
- $20,000 - $40,000
- $40,000 - $60,000
- $60,000 - $80,000
- $80,000 - $100,000
- $100,000 - $150,000
- $150,000 - $250,000

Median Household Income
2012-2016 5-yr ACS
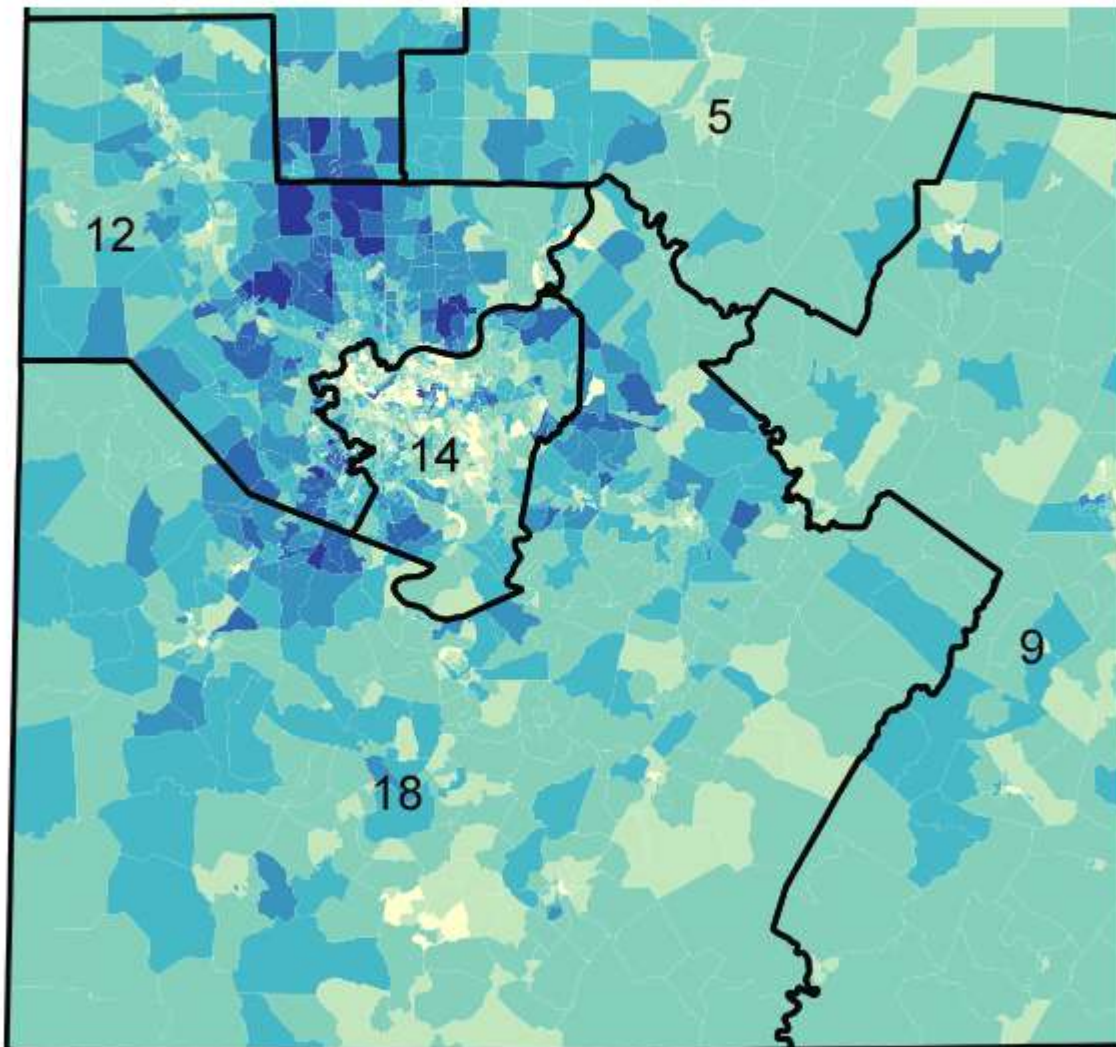
District 13

District 13 consists of parts of Bucks, Montgomery, and Philadelphia

Counties. It splits Philadelphia ward 65 and divides Philadelphia precincts 65-07

and 65-22 to attain equal population and to ensure a sufficient minority population

in District 2 so that black voters can elect their preferred candidates in that latter

district. District 13 also divides the municipality of Northampton Township in

Bucks County and Northampton Township Precinct 8 solely to attain equal

population.
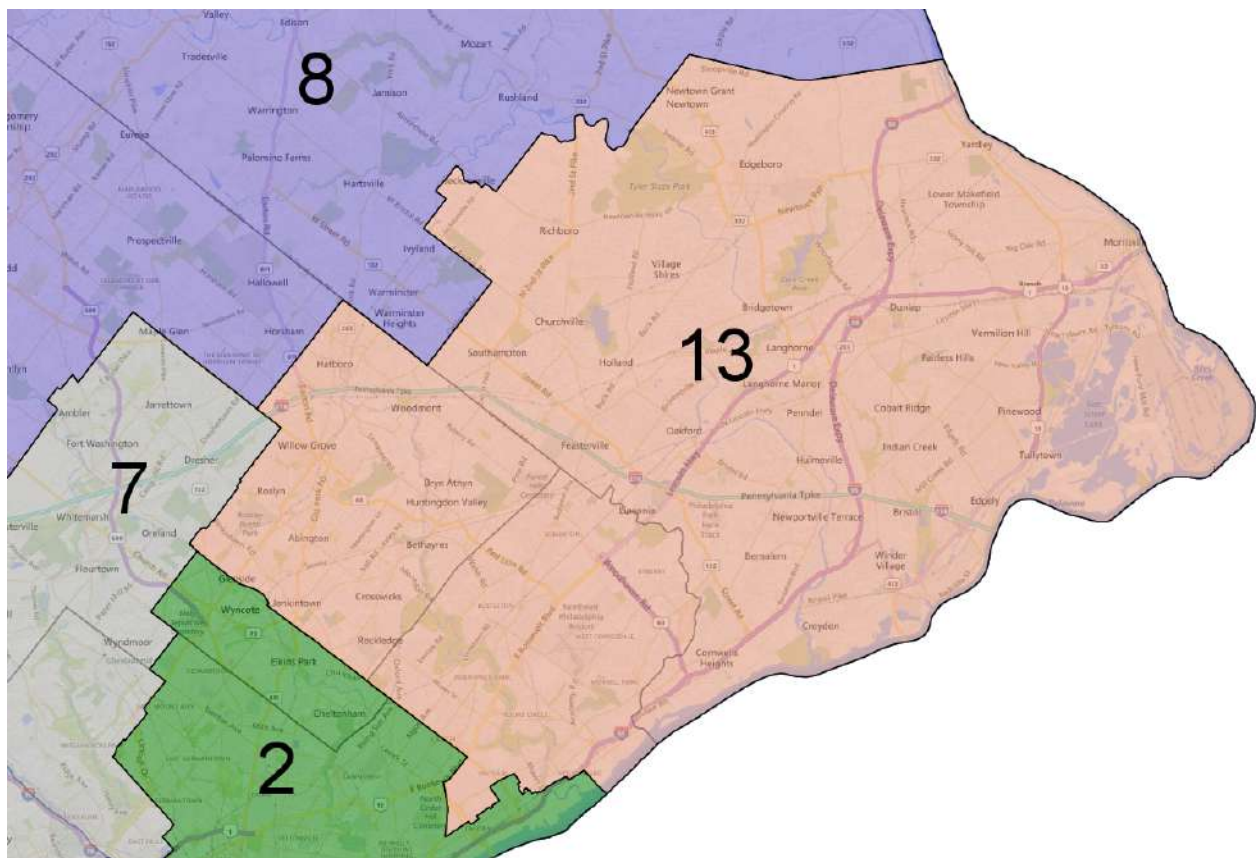
District 13 comprises a natural community of interest defined by the

socioeconomic similarities between northeastern Philadelphia and southeastern

Bucks County. While Bucks County, as noted above in our discussion of District 8, has traditionally been undivided, its southern portion contains regions that share more in common demographically with northeastern Philadelphia, while its northern regions align more closely on socioeconomic indicators with northern Montgomery County.

District 14

District 14 consists of part of Allegheny County, including almost the entirety of the city of Pittsburgh and the suburbs to its south and east. It divides the city of Pittsburgh to attain equal population, but 99.8 percent of the city remains in District 14. District 14 splits Pittsburgh ward 12 and Pittsburgh precinct 12-12 solely to eliminate the use of water contiguity where that precinct crosses the Allegheny River without any transportation connection. District 14 splits

Pittsburgh ward 26 and Pittsburgh precinct 26-14 solely to attain equal population.
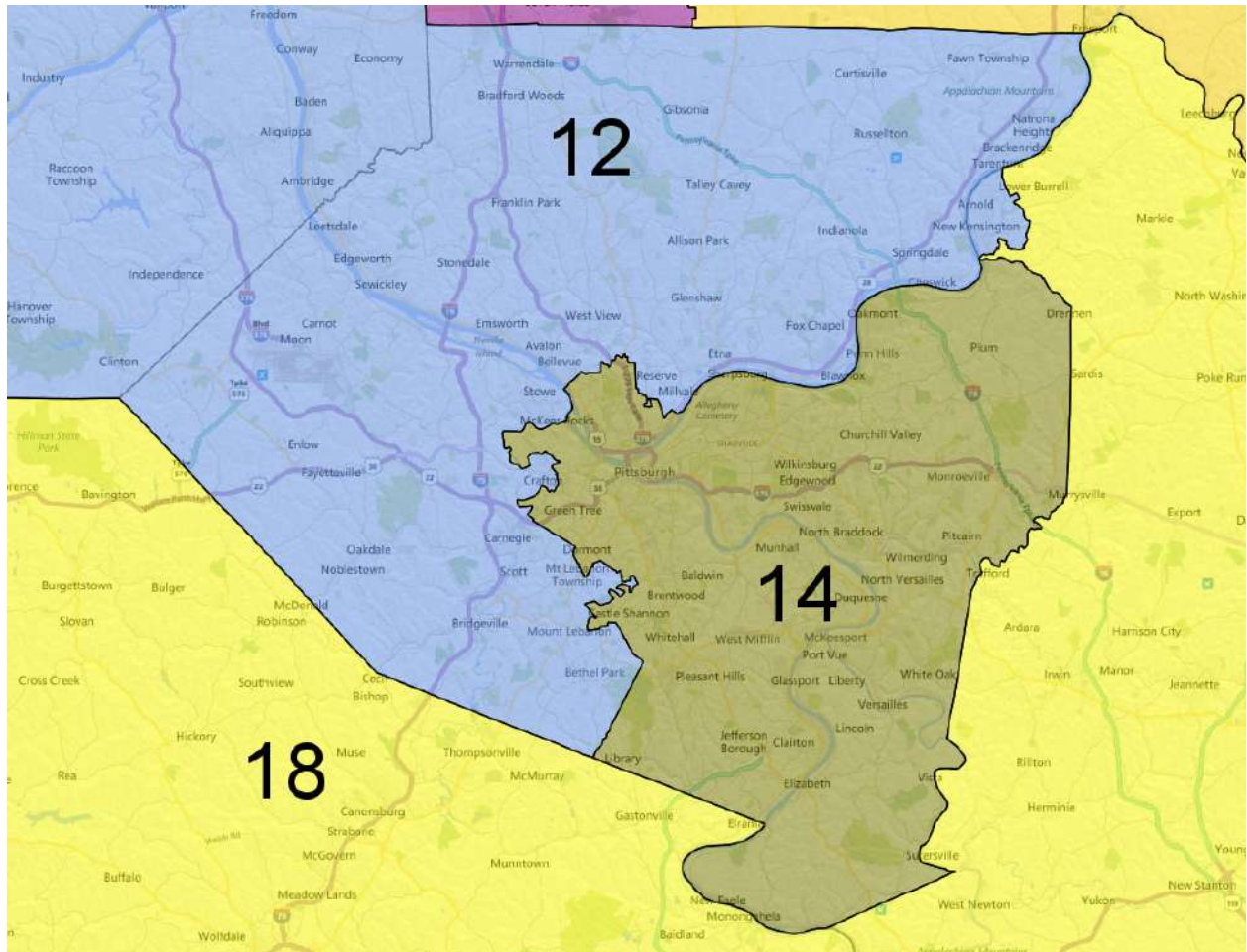
District 14 uses the Allegheny River as a natural border to its north, except

where transportation connections span the river to link the portions of Pittsburgh

located on the north bank with those areas further south. The suburbs south and

east of Pittsburgh included in District 14 have greater socioeconomic similarities

with the city itself than the suburbs located north and west have with the city. This

configuration allows for Allegheny County to be split just two ways instead of

three (as it is under the 2011 Plan and the Legislative Leaders' Proposal) and

enables a clearer delineation of the Pittsburgh metropolitan area. District 14 contains the urban core, District 12 consists largely of inner suburbs, and District 18 consists mainly of more exurban and rural areas.

District 15

District 15 consists of Lehigh and Northampton Counties and part of Carbon County. It splits the municipality of Penn Forest Township in Carbon County and the precinct of Penn Forest Township Northeast solely to attain equal population.
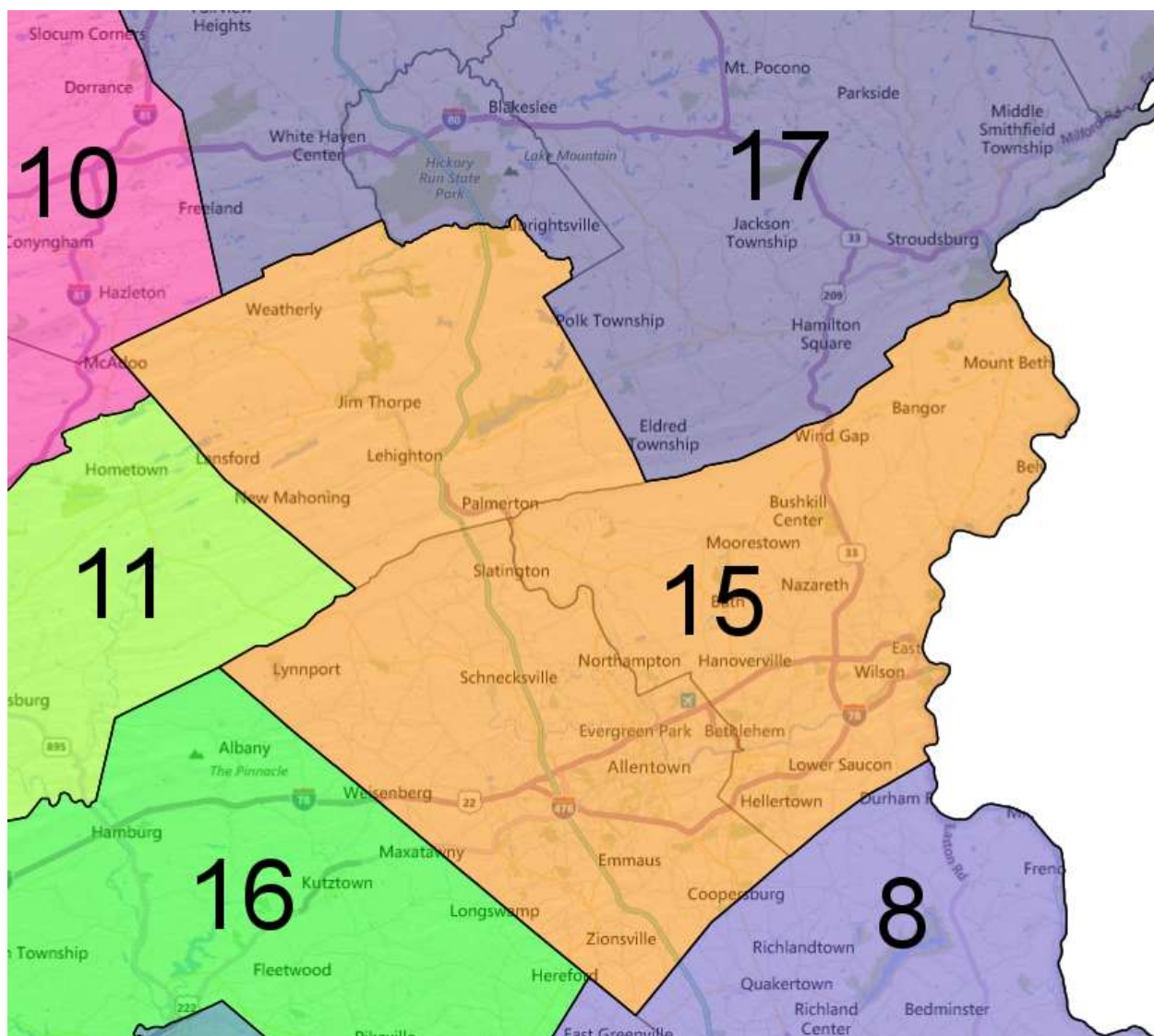
District 15 represents a very well-defined community of interest. It is located solely within the Pennsylvania portions of the Lehigh Valley and contains 99 percent of the population of the state's part of this region. The Census Bureau defines this region as the Allentown-Bethlehem-Easton metropolitan area and includes the entirety of Carbon, Lehigh, and Northampton Counties.

District 16

District 16 is composed of Lancaster County and parts of Berks County. It splits the municipalities of Bethel Township and Douglas Township in Berks County, as well as the precincts of Bethel Township and Douglas Township District 1 solely to attain equal population.
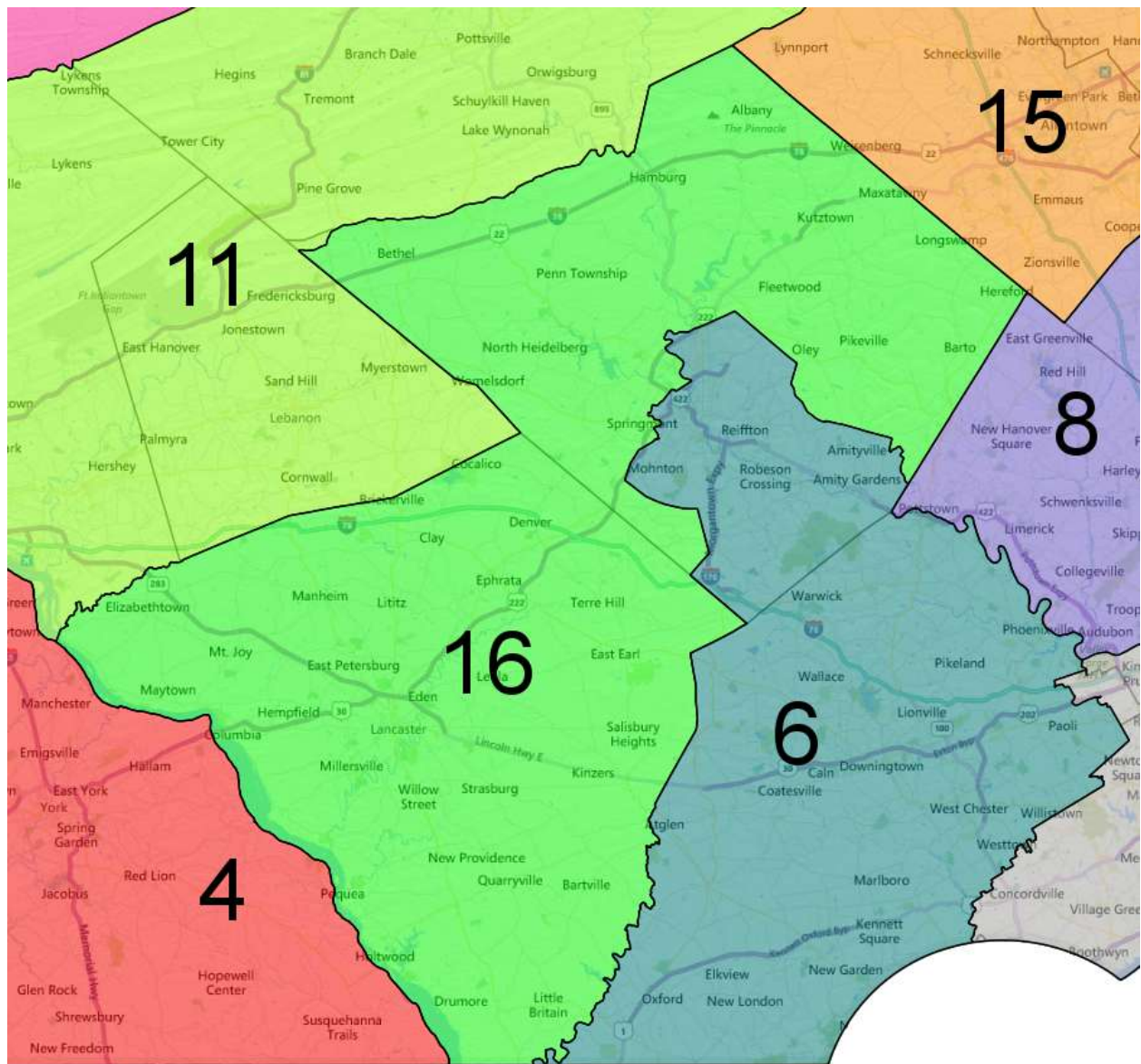
This district contains the entirety of the Lancaster metropolitan area and the rural portions of the Reading metropolitan area. Placing the rural portion of Berks County in District 16 and the more urban portions, including Reading, in District 6 does divide the Reading metropolitan area. However, doing so allows us to put the community of interest represented by Chester County almost entirely in District 6.

Furthermore, while we split Berks County between three districts, just 67 persons are located in District 11.

A hypothetical alternate configuration could see District 6 take in the entirety of District 16's portion of Berks County, but doing so would substantially divide Chester County between three districts rather than superficially divide Berks between three. This hypothetical alternate configuration would also draw District 16 into the census-defined Philadelphia metropolitan area, something that our districting plans avoid.

District 17

District 17 includes Lackawanna, Monroe, Pike, and Wayne Counties, and parts of Carbon and Luzerne Counties. It splits the municipalities of Penn Forest Township in Carbon County and Kingston Township in Luzerne Counties, along with the precincts of Penn Forest Township Northeast and Kingston Township Ward 3 solely to attain equal population.
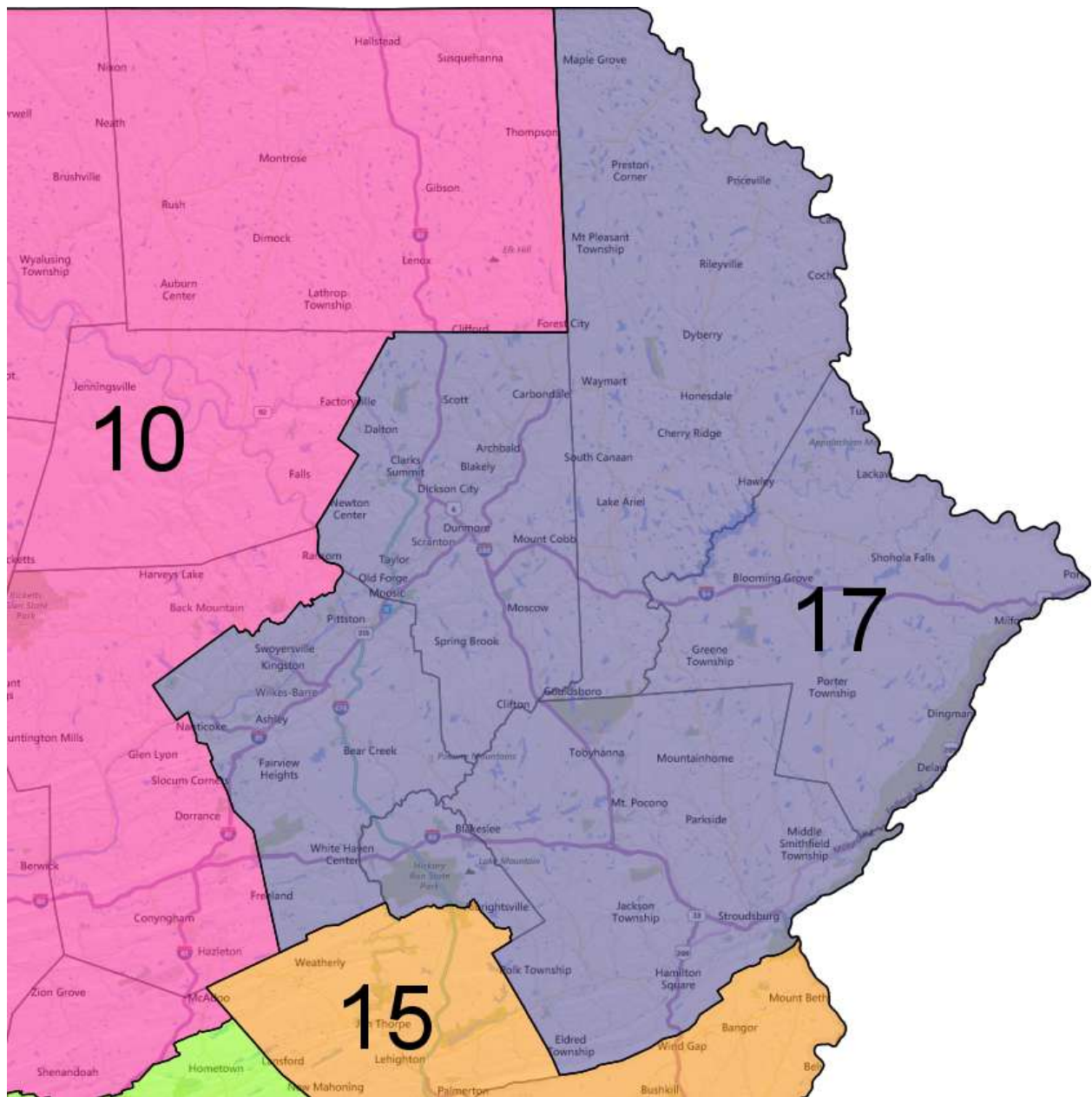
This district was designed to take in the core of the Wyoming Valley,

otherwise known as the Scranton/Wilkes-Barre metropolitan area, which consists

of Luzerne, Scranton, and Wyoming counties.

District 18

District 18 includes Fayette, Greene, and Washington Counties, along with parts of Westmoreland County. It divides the municipalities of Derry Township and New Kensington City in Westmoreland County, along with the precincts of Derry Township VTD Scalp Level and New Kensington 07-02 solely to attain equal population.
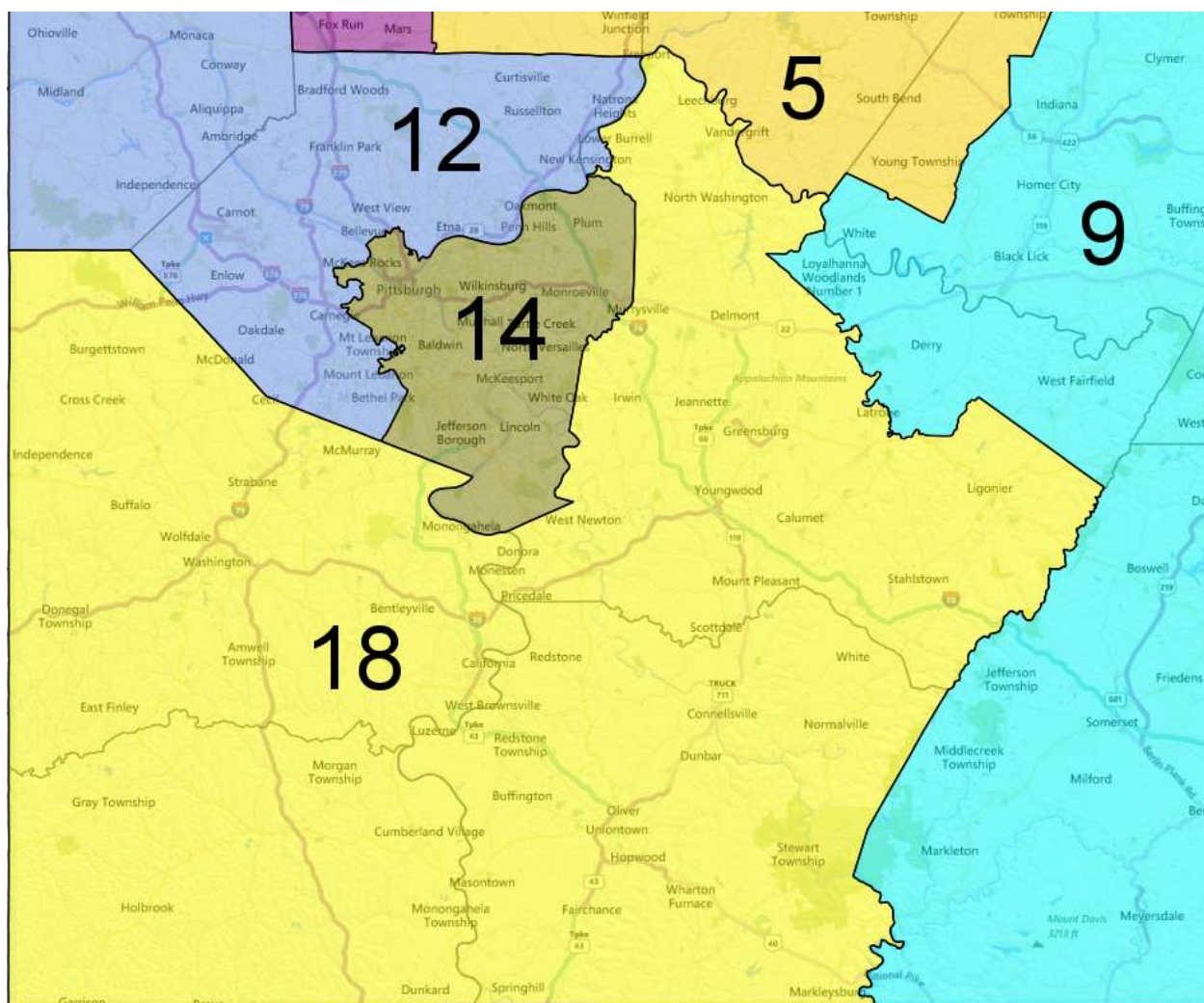
This district contains the suburbs and exurbs of Pittsburgh to the city's south and east. Compared to the 2011 Plan, it drops the inclusion of inner suburbs in

Allegheny County that have greater socioeconomic similarities with other parts of Allegheny County than they do with Fayette, Greene, Washington, and Westmoreland Counties, which have greater demographic similarities with each other.

While District 12 divides Westmoreland County three ways, we did so to place most of New Kensington, a more densely populated suburb of Pittsburgh, in District 12, and to place more distant rural areas further from the core of the Pittsburgh area in District 9.

A hypothetical alternate configuration would place District 9's portions of Westmoreland County in District 18 to eliminate a three-way division of the county. However, that would require District 3 or District 5 to take in closer-in parts of the Pittsburgh metropolitan area, which would consequently require splitting an additional county (Beaver County) or require splitting Allegheny County three ways rather than two.

In a different hypothetical alternate configuration, placing District 12's portion of Westmoreland County in District 18 would require splitting an additional county, Washington County, by dividing it between District 12 and District 18. Doing so would also add relatively rural areas to the predominantly suburban District 12.

Therefore, among the options available, we conclude that dividing Westmoreland three ways, with 88 percent of its population in District 18, is preferable to hypothetical alternate configurations that would split other counties three ways or split a greater number of counties than our proposal does overall. Unlike possible three-way divisions of Allegheny County, our three-way split of Westmoreland more neatly creates three districts that differ from each other in their socioeconomic demographics and levels of urbanization. The various regions that make up each district also share similar urbanization level and socioeconomic demographics with one another.

PLAN B – DESCRIPTIONS AND ANALYSIS OF EACH DISTRICT

The following districts are identical in Plan A and Plan B: 3, 4, 5, 6, 9, 10, 11, 12, 14, 16, 17, and 18. The only districts that differ are 1, 2, 7, 8, and 13. The only counties that contain any differences are Montgomery, Philadelphia, Bucks, and Delaware, the latter two of which would no longer be divided between multiple districts. Below, we illustrate and discuss our reasoning for drawing each individual district as we did for Plan B.

District 1

District 1 is located entirely in part of the city of Philadelphia. It splits

Philadelphia wards 12 and 63, along with Philadelphia precincts 12-07 and 63-25,

solely to attain equal population.[21]

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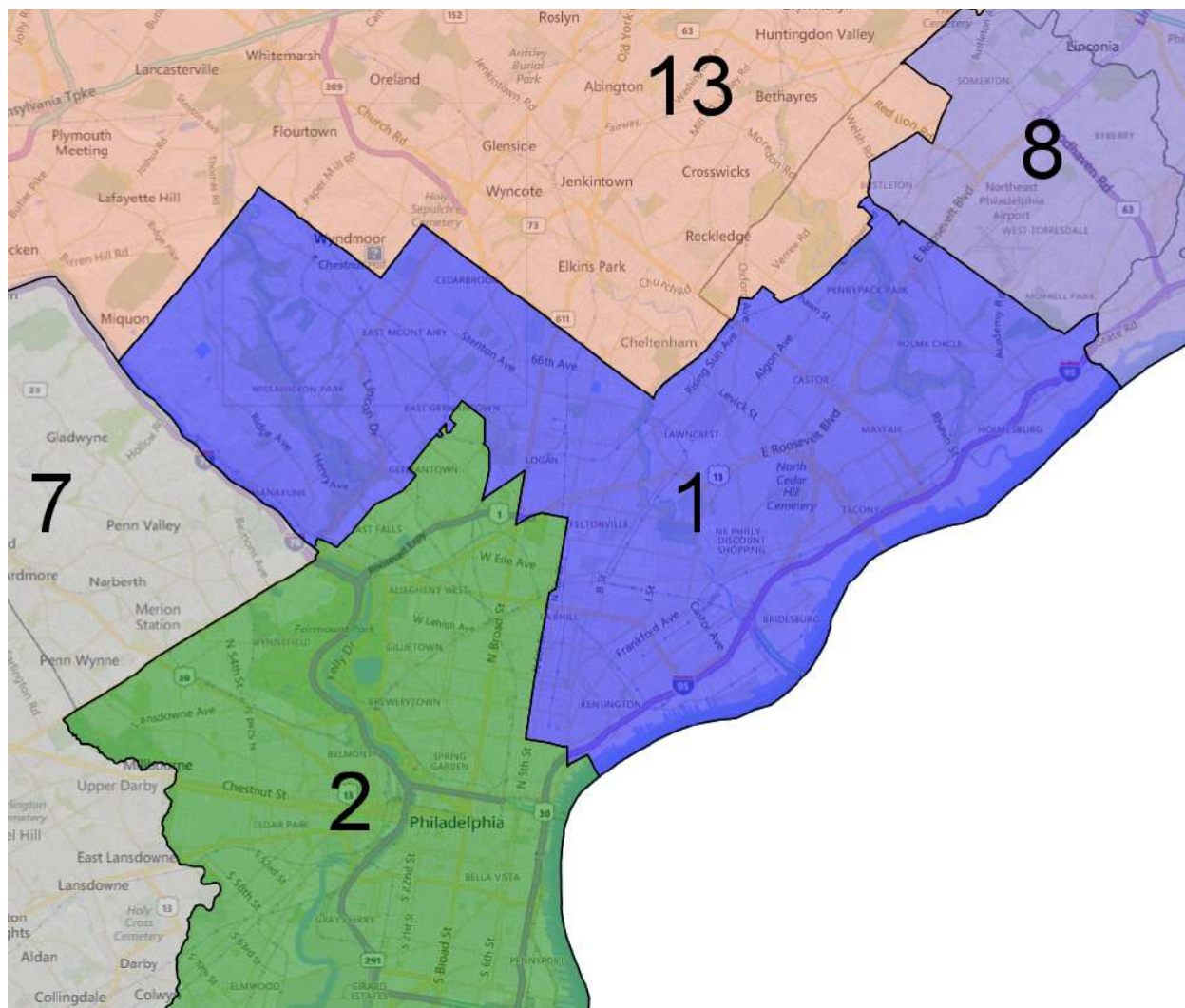
[21] 2011 redistricting GIS files from Pennsylvania's Legislative Reapportionment Commission (available at http://bit.ly/2GedrWI) indicate that our proposed District 1 splits ward 43 and precinct 43-01, covering 13 persons. However, the GIS files and precinct boundaries maintained by the Office of the Philadelphia City Commissioners (available at http://bit.ly/2surfKu) show that this is not the case due to boundary revisions between precinct 43-01 and neighboring precinct 49-05. We believe that we have faithfully split just a single precinct between District 1 and District 2.

This district is majority-minority, just as it is under Plan A. However, because both the District 1 and District 2 in Plan B are located entirely within the city of Philadelphia, District 1's black population is no longer larger than its white population as it is in Plan A. Whites make up a plurality of 43.6 percent of the CVAP, while the black CVAP is 35.8 percent, and Latinos make up 15.4 percent. Although this configuration is not as compact as it is under Plan A, District 1's "jagged edges" where it meets District 2's northern boundary are solely a consequence of our desire to minimize the number of divided wards and precincts while ensuring that black voters can continue to elect their chosen candidates in District 2.

District 2

District 2 is composed entirely of parts of the city of Philadelphia. It splits Philadelphia ward 12 and Philadelphia precinct 12-07 solely to attain equal population.
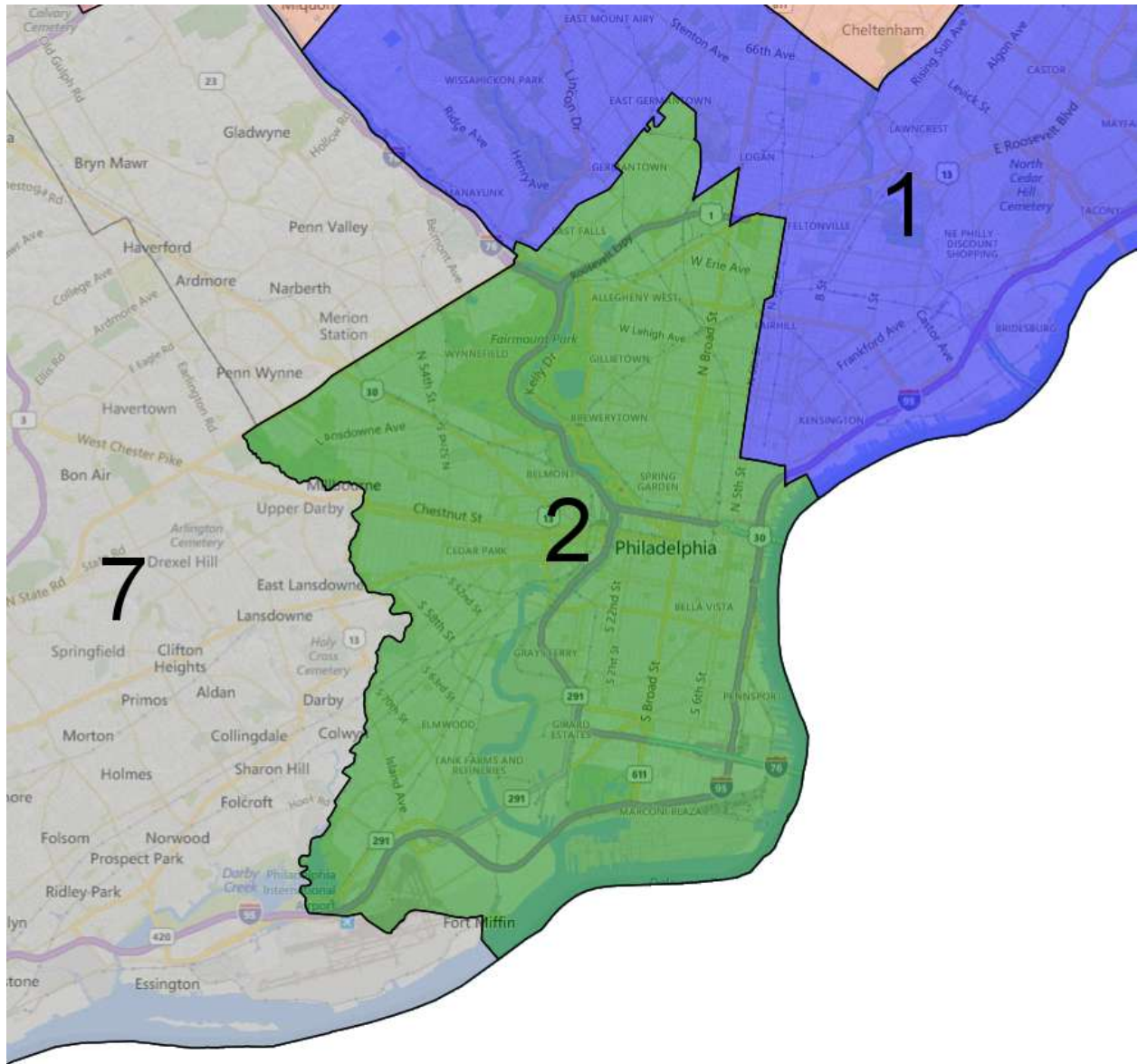
Our proposed District 2 has a black CVAP of 53.5 percent, while whites comprise 35.1 percent. Black voters would be expected to continue to be able to elect their preferred candidates in a Democratic primary and general election, especially since white voters vote Republican in much higher numbers, leading the Democratic primary electorate to have a substantial black majority.

District 7

District 7 consists of Delaware County and parts of Chester and Montgomery Counties. It splits Tredyffrin Township in Chester County and Norristown in Montgomery County, along with the precincts of Tredyffrin Township VTD ED 6 and Norristown VTD 01 ED 03, solely to attain equal population.[22]

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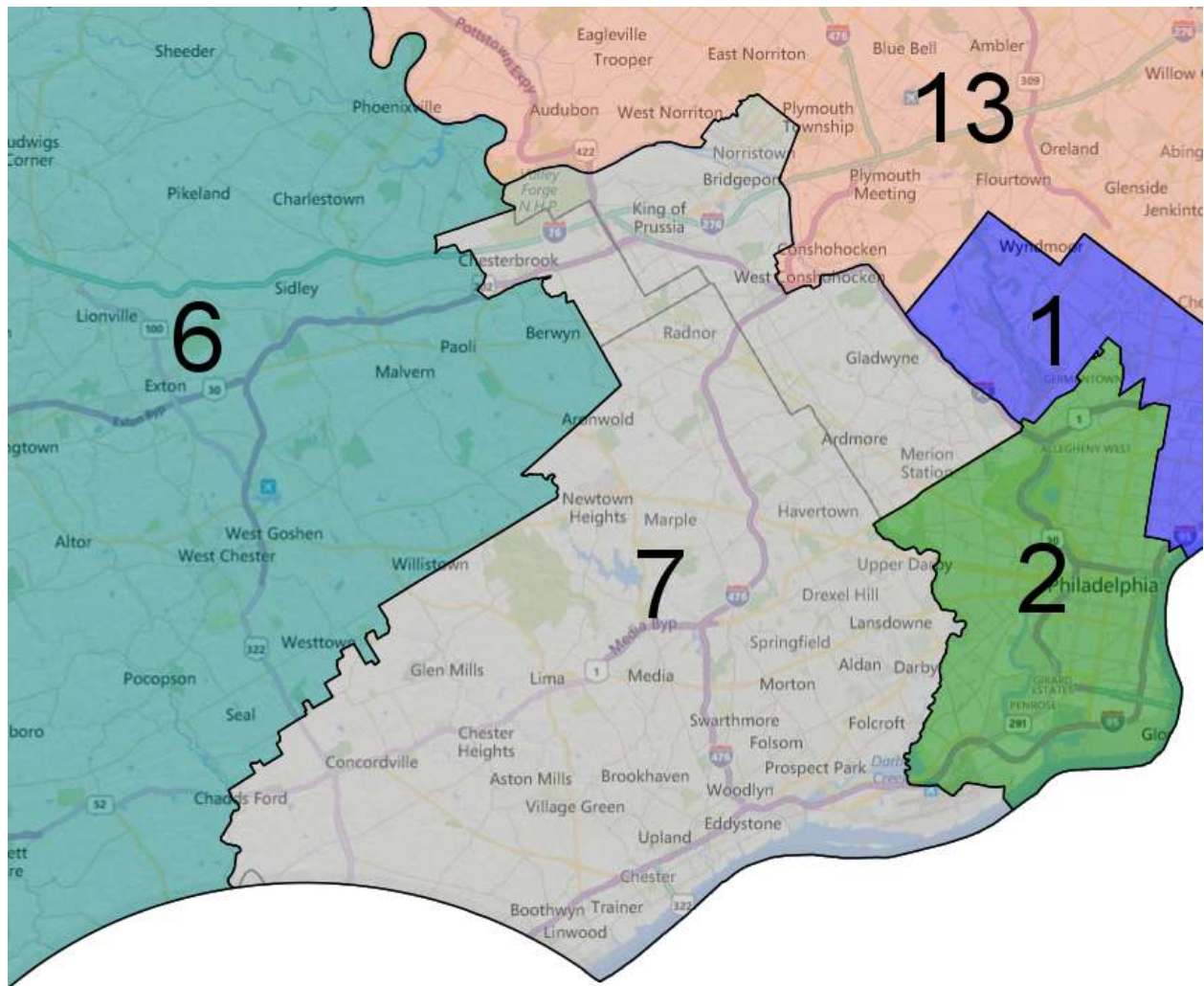
[22] Footnote 18 applies here as well.

This district, like District 7 in Plan A, would be located solely in

Philadelphia's inner western suburbs, colloquially known as the Main Line.

District 8

District 8 is composed of Bucks County and parts of the city of Philadelphia.

It splits Philadelphia ward 58 and Philadelphia precinct 58-21 solely to attain equal

population.
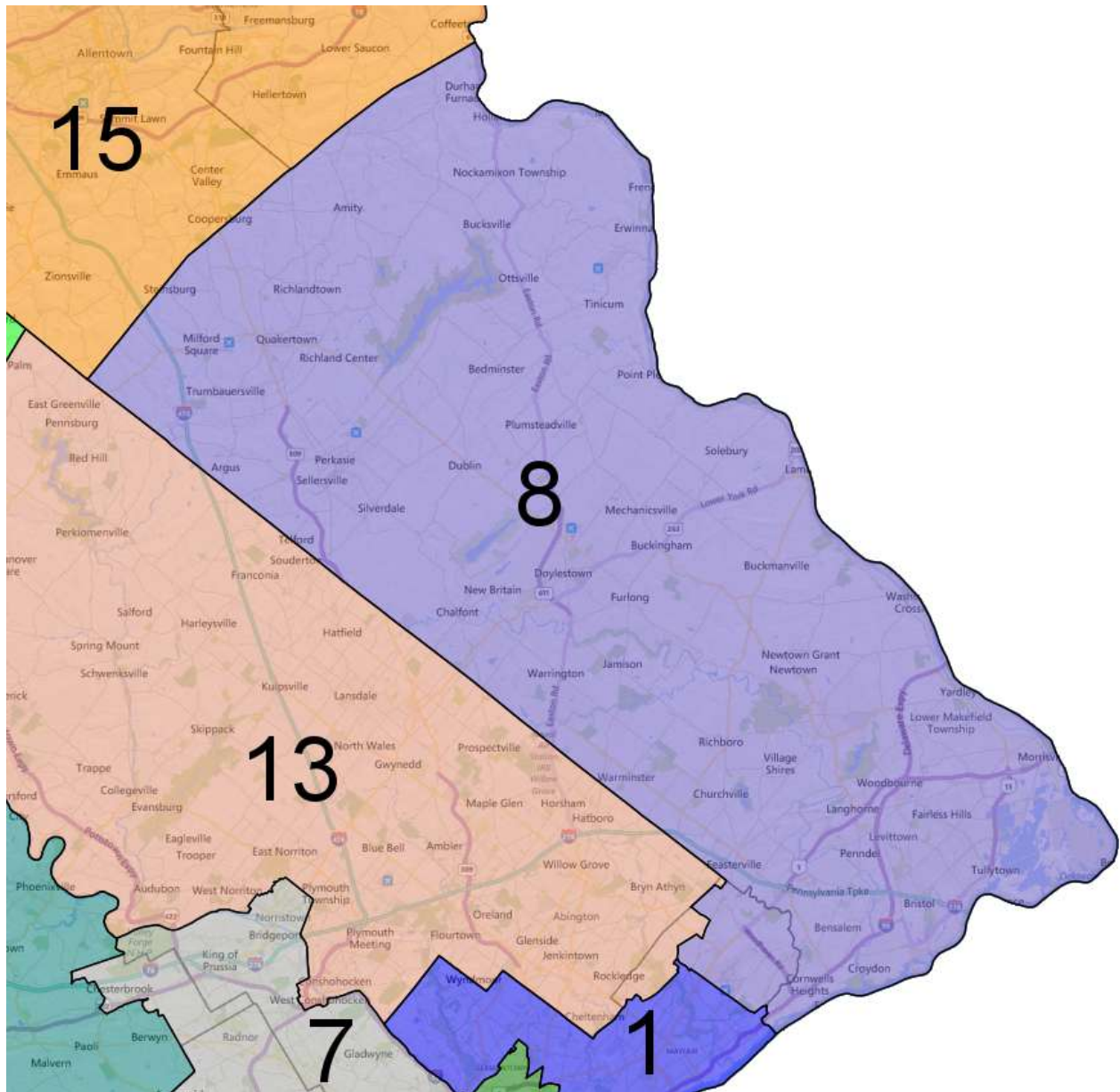
Our proposed District 8 restores portions of northeastern Philadelphia to a district containing the entirety of Bucks County, similar to previous iterations of Pennsylvania's congressional districts that were in place prior to the adoption of the 2011 Plan. The creators of the 2011 Plan added outer Philadelphia suburbs in Montgomery County to District 8 that have relatively dissimilar socioeconomic

demographics than do northeastern Philadelphia and southern Bucks County. Our proposal in Plan B more clearly delineates District 8 and neighboring District 13 along the lines of socioeconomic demographics than the 2011 Plan's District 8 by placing regions in each district that are demographically more similar to other regions in their respective districts. These patterns are illustrated in the maps just below.

Education Levels - Plan B

0 - 12	50 - 62	Percent over age 25 with a bachelor's degree or higher
12 - 25	62 - 75	2012-2016 5-yr ACS
25 - 38	75 - 88	
38 - 50	88 - 100	

Income Levels - Plan B

0 - $20,000	$80,000 - $100,000	Median Household Income
$20,000 - $40,000	$100,000 - $150,000	2012-2016 5-yr ACS
$40,000 - $60,000	$150,000 - $250,000	
$60,000 - $80,000		
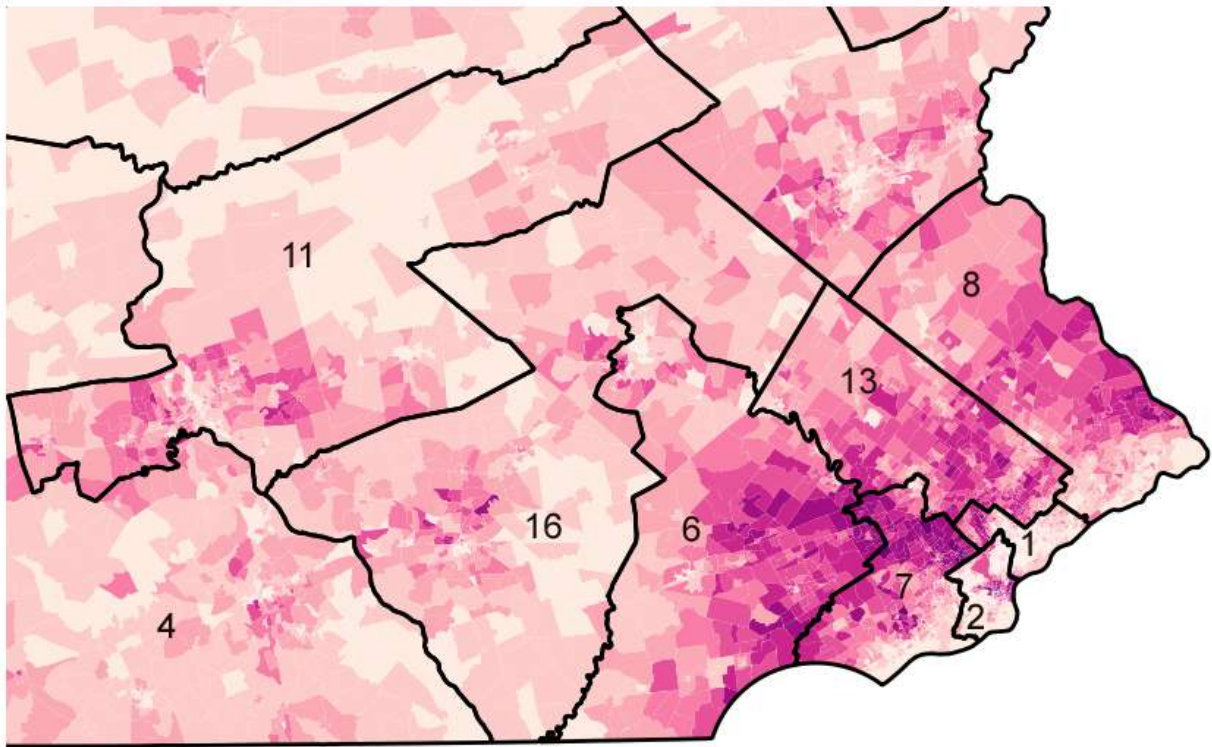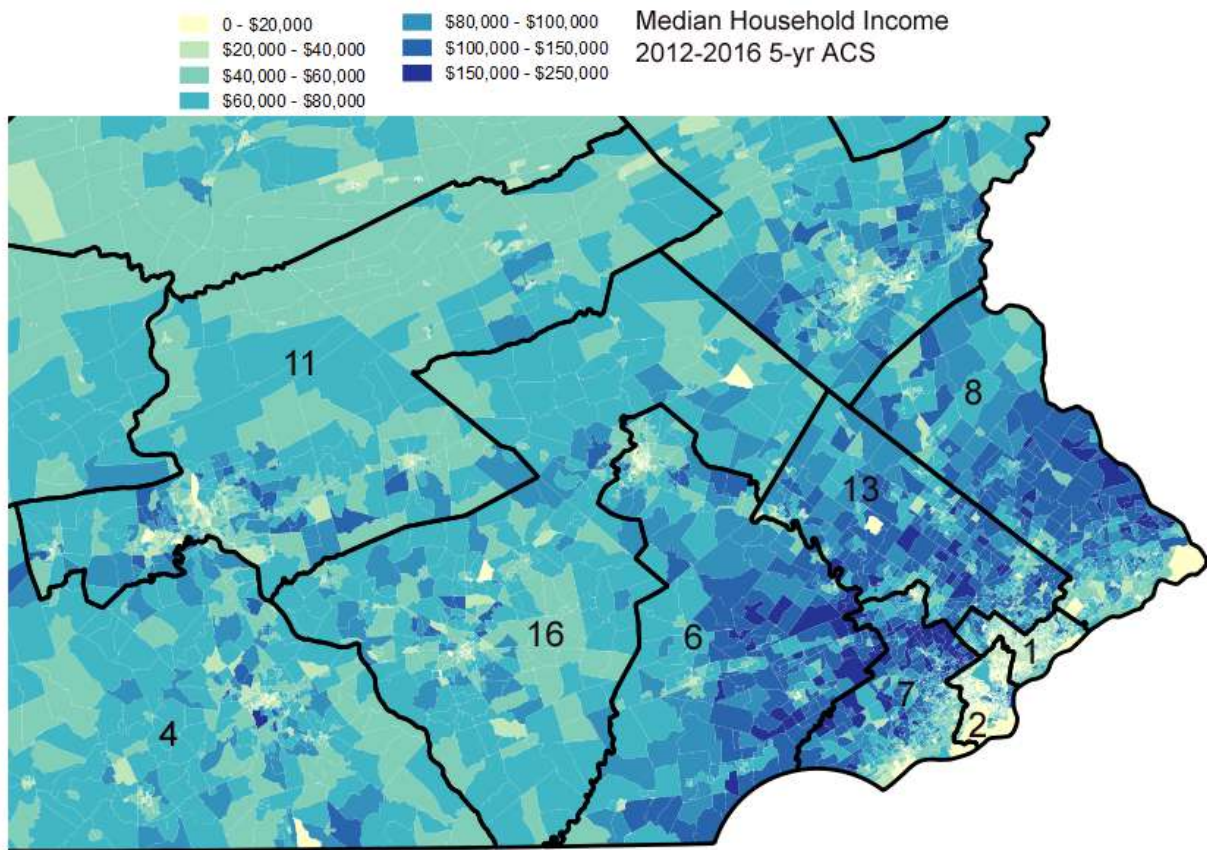
District 13

District 13 is composed of parts of Montgomery County and the city of Philadelphia. It splits Norristown in Montgomery County, Philadelphia ward 58, and the precincts of Philadelphia 58-21 and Norristown VTD 01 ED 03 solely to attain equal population. While the Philadelphia portions of this district are not contiguous with one another, they are still contiguous with the entire district via the Montgomery County portion of District 13. This choice was made solely to

avoid splitting more than one precinct within Ward 58. It could likely be avoided at the cost of an additional precinct division.
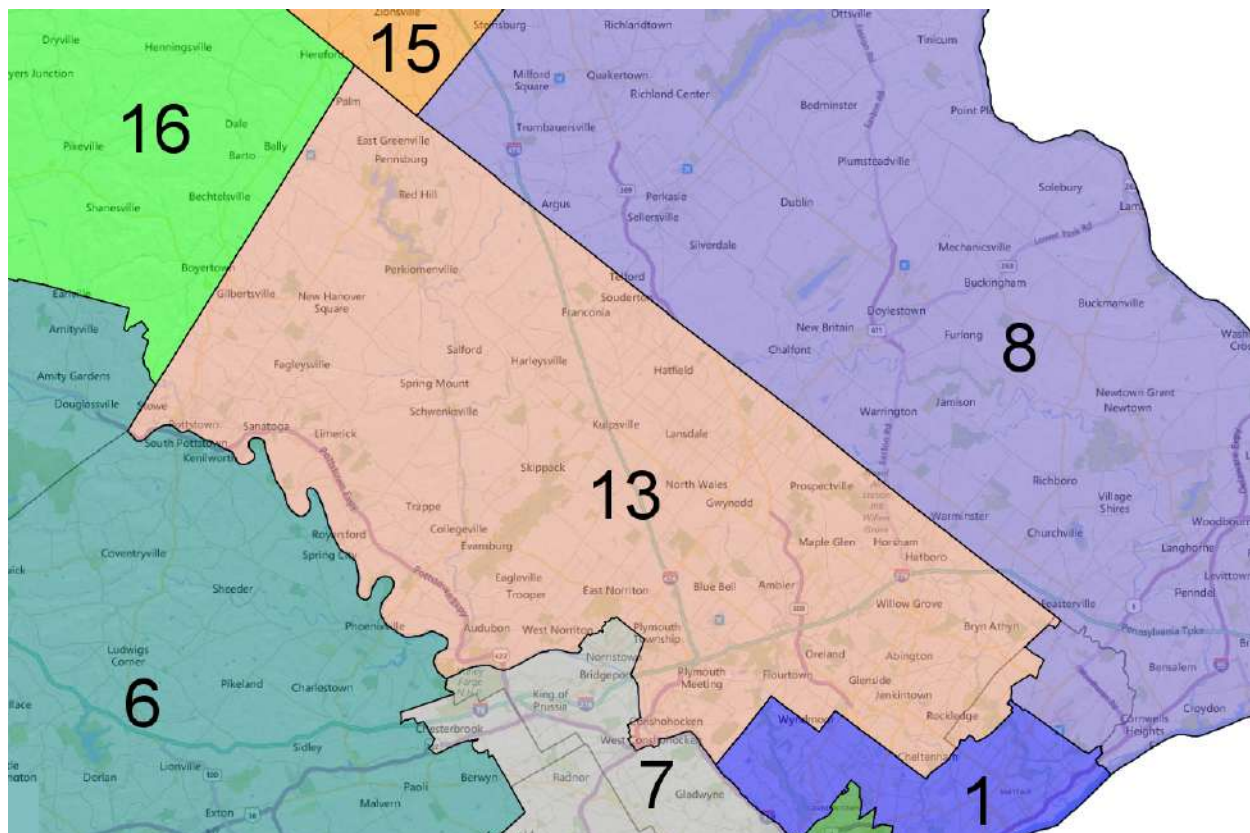
Under Plan B, Montgomery County is split between only two districts, and the county would also make up 95 percent of District 13's population. That stands in stark contrast to both the since-invalidated 2011 Plan and the Legislative Leaders' Proposal, which divided Montgomery County five ways and four ways, respectively, with substantial portions of the county's population dispersed among several districts.

ANALYSIS OF PARTISAN CHARACTERISTICS

As a service to the court, we have also analyzed the partisan characteristics of both Plan A and Plan B. Again, we emphasize that we took none of the data described in this section into account when crafting our districting plans. We only calculated this data after our districting plans were complete.

We have calculated the results of the 2016 and 2012 presidential elections for each district. We have also calculated the results of Pennsylvania's 2016, 2014, and 2012 down-ballot statewide elections for the offices of United States Senate, governor, state attorney general, state treasurer, and state auditor and have constructed a down-ballot average that takes the mean result weighted equally by year, for each district.[23] The table below displays this data.

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[23] These calculations do not account for divided precincts due to data limitations. However, these estimations (which are based on whole precincts) are likely accurate to within fractions of a percent.

Plan A

Plan A District	2016 President		2012 President		Down-Ballot Average	
	Clinton	Trump	Obama	Romney	Dem	Rep
Statewide	47.9	48.6	52.1	46.7	53.7	46.3
1	84.9	13.0	86.7	12.5	87.0	13.0
2	88.2	9.9	90.3	9.1	90.5	9.5
3	38.3	57.5	47.1	51.5	47.5	52.5
4	31.5	64.4	36.9	61.7	38.7	61.3
5	30.1	65.9	37.3	61.0	41.2	58.8
6	52.1	43.8	51.2	47.6	51.5	48.5
7	61.9	34.8	59.7	39.2	60.4	39.6
8	48.5	47.5	47.8	51.0	48.6	51.4
9	24.3	72.5	32.4	66.1	38.4	61.6
10	28.1	68.1	37.9	60.4	39.3	60.7
11	40.1	55.8	44.5	54.1	45.6	54.4
12	45.5	50.8	45.8	53.1	50.0	50.0
13	53.3	43.4	56.4	42.4	58.2	41.8
14	64.0	32.7	66.1	32.6	69.5	30.5
15	47.1	49.1	52.0	46.8	53.1	46.9
16	36.7	58.3	40.0	58.4	40.8	59.2
17	44.8	52.0	56.4	42.4	58.2	41.8
18	33.4	63.4	40.0	58.9	45.8	54.2

Plan B

Plan B District	2016 President		2012 President		Down-Ballot Average	
	Clinton	Trump	Obama	Romney	Dem	Rep
Statewide	47.9	48.6	52.1	46.7	53.7	46.3
1	80.5	17.4	83.9	15.4	84.7	15.3
2	89.3	8.7	90.8	8.5	91.5	8.5
3	38.3	57.5	47.1	51.5	47.5	52.5
4	31.5	64.4	36.9	61.7	38.7	61.3
5	30.1	65.9	37.3	61.0	41.2	58.8
6	52.1	43.8	51.2	47.6	51.5	48.5
7	62.1	34.8	61.1	37.9	60.9	39.1
8	48.4	48.0	50.4	48.4	51.5	48.5
9	24.3	72.5	32.4	66.1	38.4	61.6
10	28.1	68.1	37.9	60.4	39.3	60.7
11	40.1	55.8	44.5	54.1	45.6	54.4
12	45.5	50.8	45.8	53.1	50.0	50.0
13	56.1	40.1	54.7	44.2	56.1	43.9
14	64.0	32.7	66.1	32.6	69.5	30.5
15	47.1	49.1	52.0	46.8	53.1	46.9
16	36.7	58.3	40.0	58.4	40.8	59.2
17	44.8	52.0	56.4	42.4	58.2	41.8
18	33.4	63.4	40.0	58.9	45.8	54.2

MEASURES OF PARTISAN BIAS

We have also calculated the partisan bias of our plans using three common measures: the "mean-median gap," the "efficiency gap," and the "partisan asymmetry" measure. The first two measures were cited by the Court (Opinion at 46, 52), while the third was developed by Prof. Bernard Grofman, whose amicus brief was also cited by the Court (Opinion at 86). The table below summarizes these measures using the results of the 2016 presidential election, the 2012 presidential election, our average of down-ballot statewide elections in Pennsylvania in 2012, 2014, and 2016, and an average of all three of these sets of election results. The table includes these measures for Plan A, Plan B, and the 2011 Plan.

Comparison of Measures of Partisan Bias				
Mean-Median Gap				
Districting Plan	Average of All Three	2016 President	2012 President	2012-2016 Down-Ballot Average
Plan A	3.9%	2.9%	4.7%	4.3%
Plan B	3.0%	2.9%	3.3%	2.8%
2011 Plan	5.1%	4.2%	5.0%	5.9%
Efficiency Gap				
Districting Plan	Average of All Three	2016 President	2012 President	2012-2016 Down-Ballot Average
Plan A	7.9%	8.1%	9.8%	5.8%
Plan B	3.7%	8.1%	3.6%	-0.6%
2011 Plan	23.8%	14.3%	27.3%	29.8%
Partisan Asymmetry (Grofman-King)				
Districting Plan	Average of All Three	2016 President	2012 President	2012-2016 Down-Ballot Average
Plan A	14.8%	11.1%	16.7%	16.7%
Plan B	14.8%	11.1%	16.7%	16.7%
2011 Plan	18.5%	11.1%	22.2%	22.2%

CONCLUSION

Both Plan A and Plan B rigorously adhere to nonpartisan redistricting criteria and would remediate the flaws of the 2011 Plan. Either A or Plan B would lead to much fairer elections for the citizens of the entire commonwealth and preserve their constitutional rights. For the foregoing reasons, we respectfully urge the Court to adopt either Plan A or Plan B.

Respectfully submitted,

Dated: Feb. 15, 2018

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REPORT OF SPLIT COUNTIES, MUNICIPALITIES, WARDS, AND PRECINCTS

Plan A

Plan A - County Divisions (15 Total)																		
	District																	
County	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny												X		X				
Berks						X					X					X		
Bucks								X					X					
Butler			X		X													
Carbon															X		X	
Chester						X	X											
Cumberland				X							X							
Delaware	X						X											
Franklin				X	X				X									
Indiana				X					X									
Luzerne											X						X	
Montgomery							X						X					
Philadelphia	X	X						X					X					
Schuylkill											X	X						
Westmoreland									X				X					X

Plan A - Municipality Divisions (15 Total)																			
		District																	
County	Municipality	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny	Pittsburgh city												X		X				
Berks	Bethel township											X					X		
Berks	Douglass township						X										X		
Bucks	Northampton township								X					X					
Butler	Cherry township			X		X													
Carbon	Penn Forest township															X		X	
Chester	Tredyffrin township						X	X											
Cumberland	South Middleton township				X							X							
Franklin	Hamilton township				X					X									
Indiana	Conemaugh township						X			X									
Luzerne	Kingston township											X						X	
Philadelphia	Philadelphia city	X	X						X					X					
Schuylkill	Butler township											X	X						
Westmoreland	Derry township									X									X
Westmoreland	New Kensington city													X					X

Plan A - Ward Divisions (8 Total)

County	Municipality	Ward	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny	Pittsburgh city	12												X		X				
Allegheny	Pittsburgh city	26												X		X				
Luzerne	Kingston township	3									X							X		
Philadelphia	Philadelphia city	2	X	X																
Philadelphia	Philadelphia city	11	X	X																
Philadelphia	Philadelphia city	38	X	X					X											
Philadelphia	Philadelphia city	65		X											X					
Westmoreland	New Kensington city	7												X						X

Plan A - Precinct or VTD Divisions (21 Total)

County	Municipality	Precinct or VTD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny	Pittsburgh	Wd 12 Dist 12												X		X				
Allegheny	Pittsburgh	Wd 26 Dist 14												X		X				
Berks	Bethel Twp	Bethel Twp											X					X		
Berks	Douglass Twp	Dist 01						X										X		
Bucks	Northampton Twp	Dist 08								X					X					
Butler	Cherry Twp	Cherry Twp			X		X													
Carbon	Penn Forest Twp	Dist North East															X		X	
Chester	Tredyffrin Twp	Vtd Middle Ed 06						X	X											
Cumberland	South Middleton Twp	3				X							X							
Franklin	Hamilton Twp	Dist 01				X					X									
Indiana	Conemaugh Twp	Vtd 02					X				X									
Luzerne	Kingston Twp	Dist 03 07										X						X		
Philadelphia	Philadelphia	Wd 11 Pct 18	X	X																
Philadelphia	Philadelphia	Wd 38 Pct 12	X						X											
Philadelphia	Philadelphia	Wd 38 Pct 15	X						X											
Philadelphia	Philadelphia	Wd 38 Pct 17		X					X											
Philadelphia	Philadelphia	Wd 65 Pct 07		X											X					
Philadelphia	Philadelphia	Wd 65 Pct 22		X											X					
Schuylkill	Butler Twp	Vtd Northeast									X	X								
Westmoreland	Derry Twp	Vtd Scalp Level									X									X
Westmoreland	New Kensington	Wd 07 Pct 02												X						X

Plan B

Plan B - County Divisions (13 Total)

County	District																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny												X		X				
Berks						X					X					X		
Butler			X		X													
Carbon														X		X		
Chester						X	X											
Cumberland				X							X							
Franklin				X	X				X									
Indiana					X				X									
Luzerne											X						X	
Montgomery							X						X					
Philadelphia	X	X						X					X					
Schuylkill											X	X						
Westmoreland									X				X					X

Plan B - Municipality Divisions (15 Total)

County	Municipality	District																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny	Pittsburgh city												x		x				
Berks	Bethel township											x					x		
Berks	Douglass township						x										x		
Butler	Cherry township			x		x													
Carbon	Penn Forest township														x		x		
Chester	Tredyffrin township						x	x											
Cumberland	South Middleton township				x							x							
Franklin	Hamilton township				x					x									
Indiana	Conemaugh township					x				x									
Luzerne	Kingston township										x							x	
Montgomery	Norristown borough							x						x					
Philadelphia	Philadelphia city	x	x						x					x					
Schuylkill	Butler township										x	x							
Westmoreland	Derry township									x									x
Westmoreland	New Kensington city													x					x

Plan B - Ward Divisions (7 Total)

County	Municipality	Ward	District																	
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny	Pittsburgh city	12												X		X				
Allegheny	Pittsburgh city	26												X		X				
Luzerne	Kingston township	3										X							X	
Philadelphia	Philadelphia city	12	X	X																
Philadelphia	Philadelphia city	58	X												X					
Philadelphia	Philadelphia city	63								X					X					
Westmoreland	New Kensington city	7													X					X

			District																		
County	Municipality	Precinct or VTD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Allegheny	Pittsburgh	Wd 12 Dist 12												X		X				
Allegheny	Pittsburgh	Wd 26 Dist 14												X		X				
Berks	Bethel Twp	Bethel Twp											X					X		
Berks	Douglass Twp	Dist 01						X										X		
Butler	Cherry Twp	Cherry Twp			X		X													
Carbon	Penn Forest Twp	Dist North East															X		X	
Chester	Tredyffrin Twp	Vtd Middle Ed 06						X	X											
Cumberland	South Middleton Twp	3				X							X							
Franklin	Hamilton Twp	Dist 01				X					X									
Indiana	Conemaugh Twp	Vtd 02					X				X									
Luzerne	Kingston Twp	Dist 03 07										X							X	
Montgomery	Norristown	Vtd 01 Ed 03								X					X					
Philadelphia	Philadelphia	Wd 12 Pct 07	X	X																
Philadelphia	Philadelphia	Wd 58 Pct 21								X					X					
Philadelphia	Philadelphia	Wd 63 Pct 25	X												X					
Schuylkill	Butler Twp	Vtd Northeast										X	X							
Westmoreland	Derry Twp	Vtd Scalp Level									X									X
Westmoreland	New Kensington	Wd 07 Pct 02												X						X

Plan B - Precinct or VTD Divisions (18 Total)

APPENDIX B

MEASURES OF COMPACTNESS

Plan A

Plan A - Measures of Compactness					
Indicator	Polsby-Popper	Inverse Schwartzberg	Min. Convex Polygon	Reock	Population Polygon
Mean:	0.36	0.60	0.80	0.47	0.75
Min:	0.23	0.48	0.68	0.27	0.36
Max:	0.53	0.72	0.88	0.67	0.92
Std. Dev.	0.10	0.08	0.06	0.11	0.15
District	Polsby-Popper	Inverse Schwartzberg	Min. Convex Polygon	Reock	Population Polygon
1	0.52	0.72	0.88	0.67	0.88
2	0.35	0.59	0.74	0.40	0.77
3	0.44	0.66	0.82	0.27	0.88
4	0.29	0.54	0.87	0.42	0.82
5	0.53	0.72	0.88	0.61	0.77
6	0.28	0.53	0.77	0.41	0.84
7	0.23	0.48	0.68	0.35	0.51
8	0.43	0.66	0.86	0.56	0.81
9	0.30	0.55	0.81	0.47	0.66
10	0.48	0.69	0.88	0.55	0.61
11	0.23	0.48	0.74	0.31	0.83
12	0.32	0.57	0.76	0.48	0.57
13	0.47	0.68	0.88	0.57	0.84
14	0.29	0.54	0.80	0.49	0.81
15	0.39	0.63	0.78	0.51	0.91
16	0.24	0.49	0.71	0.40	0.63
17	0.39	0.62	0.80	0.48	0.92
18	0.31	0.56	0.77	0.54	0.36

Plan B

Plan B - Measures of Compactness					
Indicator	Polsby-Popper	Inverse Schwartzberg	Min. Convex Polygon	Reock	Population Polygon
Mean:	0.35	0.59	0.80	0.45	0.76
Min:	0.23	0.48	0.70	0.27	0.36
Max:	0.53	0.72	0.89	0.61	1.01
Std. Dev.	0.09	0.07	0.06	0.08	0.15
District	Polsby-Popper	Inverse Schwartzberg	Min. Convex Polygon	Reock	Population Polygon
1	0.29	0.54	0.70	0.38	0.76
2	0.40	0.64	0.80	0.43	0.83
3	0.44	0.66	0.82	0.27	0.88
4	0.29	0.54	0.87	0.42	0.82
5	0.53	0.72	0.88	0.61	0.77
6	0.28	0.53	0.77	0.41	0.84
7	0.27	0.52	0.72	0.47	0.68
8	0.47	0.68	0.83	0.42	1.01
9	0.30	0.55	0.81	0.47	0.66
10	0.48	0.69	0.88	0.55	0.61
11	0.23	0.48	0.74	0.31	0.83
12	0.32	0.57	0.76	0.48	0.57
13	0.38	0.62	0.89	0.43	0.74
14	0.29	0.54	0.80	0.49	0.81
15	0.39	0.63	0.78	0.51	0.91
16	0.24	0.49	0.71	0.40	0.63
17	0.39	0.62	0.80	0.48	0.92
18	0.31	0.56	0.77	0.54	0.36

CERTIFICATE OF COMPLIANCE

We hereby certify that the foregoing brief complies with the word limit of Pa.R.A.P 531. It contains 6,988 words, as counted by Microsoft Word 2011, the word-processing software used to prepare this filing.

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