memo

To: The Chief Justice and Justices of the Supreme Court of Virginia
From: Bernard Grofman, Ph.D. and Sean Trende
CC:
Date: 12/7/2021*
Re: Redistricting maps

INTRODUCTION

We are pleased to present this Court with three draft maps for its review. As described in this Court's Redistricting Appointment Order ("Redistricting Order"), we have proposed "a single redistricting map for the Virginia House of Delegates, a single redistricting map for the Senate of Virginia, and a single redistricting map for Virginia's representatives to the United States House of Representatives." Redistricting Order at 1-2.

We are also pleased to report that we have "work[ed] together to develop any plan to be submitted to the Court for its consideration," Code § 30-399(F). These maps reflect a true joint effort on our part. We agreed on almost all issues initially, and the few issues on which we initially disagreed were resolved by amicable discussion.

When drawing these maps, we have worked diligently to craft maps that comply with the statutory and constitutional provisions enumerated by this Court. *See* Redistricting Order at 2-3. The purpose of this memo is to relate our approach to the various constitutional provisions to this Court, and then to explain the reasoning for choices that we made in the specific districts. We

**With typos and clerical errors corrected thereafter as discovered.*

further anticipate that when we release the plans for public comment, the Court may wish to include this memo with that release.

We first emphasize, however, that our prime directive for drawing these maps comes not from the constitutional or statutory provisions described by this Court, but rather from the Court's order itself. In particular, we took seriously the Court's command that, although we were nominated by the political parties, we would behave in "an apolitical and nonpartisan manner." *Id* at 3. Our duty is owed not to the parties that nominated us, but rather to the Court that appointed us and to the residents of the Commonwealth that it serves.

SPECIFIC CONSTITUTIONAL AND STATUTORY PROVISIONS

This Court commanded us to comply fully with:

- Article I § 2 of the United States Constitution and the 14th Amendment to that constitution;
- The Voting Rights Act of 1965 ("VRA"), as amended;
- Article II §§ 6 to 6-A of the Constitution of Virginia;
- Code §§ 30-399(E) and 24.2-304.04;
- Other applicable federal and state constitutional and statutory provisions.

Although we were instructed to first follow the 14th Amendment, followed by the VRA, we begin instead with the requirements of Code § 24.2-304.04 (hereinafter "Statutory Criteria"), which provides the standards and criteria for congressional and legislative districts. We do so because the equal protection provisions of the 14th Amendment and the VRA are inextricably linked with the requirements of the Statutory Criteria, while the 14th Amendment's equal population requirements are listed first in the Code. We also note at the outset that the Statutory Criteria comprise a wide range of considerations, which can only be implemented when taken in

conjunction with one another. In our work, however, we followed the Court's command and prioritized federal constitutional and statutory requirements, as well as those in the Virginia Constitution.

To summarize our approach: we carefully drew districts that met constitutional and statutory population requirements. In doing so, we minimized county and city splits, while respecting natural boundaries and communities of interest ("COIs") to the extent possible. We attempted to draw compact districts, although equal population requirements and Virginia's geography often conspired to limit our ability to do so. While we were mindful of federal and state requirements to draw districts that would elect the minority candidate of choice, we did so within the confines of the criteria above. In other words, we drew districts that would elect the candidate of choice of a minority group only if the district could be drawn in a compact fashion that did not needlessly split counties. Despite these strictures, we believe we have drawn more districts where minority groups will be empowered to elect their candidate of choice than exist under the current maps.

Equal Representation: Clause 1 of the Statutory Criteria commands that "[d]istricts shall be so constituted as to give, as nearly as is practicable, representation in proportion to the population of the district. A deviation of no more than five percent shall be permitted for state legislative districts." This mirrors the constitutional command that congressional districts must be drawn with populations "as nearly as practicable" to equality. *Karcher v. Daggett*, 462 U.S. 725 (1983), see also *Gray v. Sanders*, 372 U.S. 368, 381 (1963); *Wesberry v. Sanders*, 376 U.S. 1 (1963). We worked diligently to ensure that the congressional districts were reasonably close to equipopulous.

The maximum five percent deviation the Statutory Criteria describe for state legislative districts fits well within the 10% deviation guideline that the Court has allowed for state

legislative districts, *Brown v. Thompson*, 462 U.S. 835 (1983), and therefore does not raise immediate constitutional concerns. The ideal population of a state senate district is 215,785. Therefore, populations for state senate districts were kept in a range between 210,390 and 221,179. The ideal population of a House of Delegates district is 86,314. Therefore, populations for House of Delegates districts were kept in a range between 84,157 and 88,471. We were, however, mindful that deviations from absolute equality must still be justified by a legitimate governmental objective. *Cox v. Larios*, 542 U.S. 947 (2004).

Equal Protection and Ability-to-Elect Districts: The next Statutory Criteria requires that "[d]istricts shall be drawn in accordance with the requirements of the Constitution of the United States, including the Equal Protection Clause of the Fourteenth Amendment, and the Constitution of Virginia; federal and state laws, including the federal Voting Rights Act of 1965, as amended; and relevant judicial decisions relating to racial and ethnic fairness." This is covered in the succeeding paragraph.

> No district shall be drawn that results in a denial or abridgement of the right of any citizen to vote on account of race or color or membership in a language minority group. No district shall be drawn that results in a denial or abridgement of the rights of any racial or language minority group to participate in the political process and to elect representatives of their choice. A violation of this subdivision is established if, on the basis of the totality of the circumstances, it is shown that districts were drawn in such a way that members of a racial or language minority group are dispersed into districts in which they constitute an ineffective minority of voters or are concentrated into districts where they constitute an excessive majority. The extent to which members of a racial or language minority group have been elected to office in the state or the political subdivision is one circumstance that may be considered. Nothing in this subdivision shall establish a right to have members of a racial or language minority group elected in numbers equal to their proportion in the population.

The subsequent Statutory Criteria is related; it demands that "[d]istricts shall be drawn to give racial and language minorities an equal opportunity to participate in the political process

and shall not dilute or diminish their ability to elect candidates of choice either alone or in coalition with others."

We therefore endeavored, where practicable to do so consistently with the 14th Amendment, to draw districts that would elect a minority group's candidate of choice, without placing an excessive number of minority group members within the district. We note that the statutory language here suggests more than simply drawing districts in areas where the drawing of a minority opportunity district would be required by the VRA Section 2 feasible litigation threshold of a minimum 50% minority Citizens Voting Age Population ("CVAP") as set down in *Bartlett v. Strickland*.

We are mindful, however, that the Supreme Court of the United States has repeatedly held that the use of race in drawing legislative districts can trigger strict scrutiny. *Shaw v. Reno*, 509 U.S. 630 (1993). Strict scrutiny is triggered when race is the "predominant factor" in drawing district lines. The U.S. Supreme Court has assumed, without deciding, that compliance with the VRA reflects a compelling governmental interest; thus when the VRA preconditions established in *Thornburg v Gingles*, 478 U.S. 30 (1986), are met and the totality of the circumstances would demand race-conscious drawing, the 14th Amendment would allow it. The Supreme Court has not, to our knowledge, held that compliance with state statutory or constitutional requirements can satisfy strict scrutiny.

To avoid this question, we simply drew districts without race as the predominant interest. Instead, we began by drawing districts that comply with traditional good government districting criteria (contiguity, minimizing splits in counties and cities, and where feasible in census designated places, compactness, etc.) and considered race only after we had drawn a map fully subject to the constraints of those traditional factors. Indeed, we sought to limit splits of counties and cities to as close as feasible to the mathematical minimum possible. As shown below, we

believe we have provided maps that do at least as well or better as the current map in terms of creating districts where the minority community has a *realistic* opportunity to elect a candidate of choice, while at the same time creating plans that are far superior in terms of limiting county and city splits and in terms of vastly improved compactness. We add that there is also no issue of using politics as a proxy for race, since we only considered political data after the maps were drawn, to see if the districts drawn were indeed ability-to-elect districts.

Communities of Interest ("COIs"): The Statutory Criteria next provide that "[d]istricts shall be drawn to preserve communities of interest. For purposes of this subdivision, a 'community of interest' means a neighborhood or any geographically defined group of people living in an area who share similar social, cultural, and economic interests. A 'community of interest' does not include a community based upon political affiliation or relationship with a political party, elected official, or candidate for office."

This is obviously a broad definition of communities of interest. We sought to add some additional specificity to this to this based on the history, demography, and topography of the Commonwealth of Virginia. First and foremost, we carefully reviewed the communities of interest submitted by Virginia's residents to the Virginia Redistricting Commission. While it was not possible to respect every user-submitted community, we did attempt to incorporate them where possible. Second, we reviewed Virginia data from Representable, a non-profit organization that allows individuals to draw their communities of interest and then stores those communities of interest in digital form.

Third, we were mindful of the Supreme Court of the United States' attempts at defining communities of interest. While there has never been a formal definition given, that Court has listed "shared broadcast and print media, public transport infrastructure, and institutions such as schools and churches" as part of its definition of a community of interest. *Bush v. Vera*, 517 U.S.

952 (1996). We have attempted to incorporate those considerations into our districts as much as possible.

In particular, we were mindful of the Blue Ridge Mountains as an important geographic divider in Virginia's history. We also considered the course of the Shenandoah Valley (served largely by I-81), the federal definition of Appalachia, the historic importance of Southside Virginia and the Piedmont region in general and the Fall Line as important geographic markers. We also were mindful of the Commonwealth's major metropolitan areas and the travel arteries that feed them: Northern Virginia, greater Richmond, and the Hampton Roads area, as defined both by the United States Census Bureau and major media markets. This is not an exclusive list, but simply serves to illustrate to the Court how we interpreted the term "communities of interest" in Virginia.

Finally, we acknowledge there are likely other communities of interest of which we are not aware. We look forward to receiving the commentary of this Court and of the public to help improve the map in this regard.

Contiguity: Clause 6 of the Statutory Criteria provides that "Districts shall be composed of contiguous territory, with no district contiguous only by connections by water running downstream or upriver, and political boundaries may be considered." We identified two potential definitions of contiguity: "census" and "functional" contiguity. Census contiguity includes the broader definition of contiguity, which simply requires that census blocks or Voting Tabulation Districts ("VTDs") be connected to each other by shared borders without regard to the underlying geographic features.

Functional contiguity is more demanding. It effectively requires that a representative be able to travel between any two points within a district without leaving the district.

The Statutory Criteria fall somewhere between this, requiring, under our reading, that we avoid using a river as a connector without also including populations on the banks. We have nevertheless opted to draw districts that are functionally contiguous to the extent possible. We observe, however, that the goals of maintaining functional contiguity, maximizing compactness, minimizing county splits, and adhering to one-person-one-vote standards are often at odds with each other.

Finally, we sought to avoid "fracking," which occurs when a single district traverses a county line more than once (i.e., when two tendrils extend into the county from a neighboring county).

Prisoners: The Statutory Criteria state that prisoners should be counted as residents of the locality where they resided before their incarceration. We understand this to be implemented in Legislative Services' data.

Partisanship: The Statutory Criteria also require that "[a] map of districts shall not, when considered on a statewide basis, unduly favor or disfavor any political party." First, by adhering to the statutory criteria described above, we minimize the risk of any undue favoritism toward either party. It would be difficult to draw gerrymanders under these constraints had we wanted to.

Second, *once the maps were drawn*, we examined the political data in their totality, with particular attention to the median district. Our rough goal was to see if the median district in a Congressional map approximated Joe Biden's and Donald Trump's statewide vote shares for 2020, and if it approximated the Democrats' statewide results for 2017 for state legislative

districts.[1] This is called the "mean-median" standard in discussions of gerrymandering.[2] It was our agreed-upon understanding, however, that since the standard asked that maps not "unduly" favor one party or the other, we would leave the maps in place unless the results were both (a) truly egregious and (b) able to be remedied while adhering to the other criteria above.

[1] We would have preferred to have available the 2021 data. In most counties and independent cities, the data on mail-in and absentee votes in the 2021 election are centrally collected in each county and has not yet been projected back into that county's voting precincts. Indeed, given that ballots were frequently not marked with the precinct in which the voter who cast them resided, that task may never be accomplished with precision. Because of this, we were unable to use the 2021 election results to assess partisanship in the districts we drew. However, because the pro-Republican vote swing in 2021 affected (increased) both the statewide mean and the statewide median Republican vote, we expect that our analyses of the mean minus median gap would not be substantially different from those we calculated using earlier statewide odd-number year elections.

[2] We chose to focus on this metric because it is easily understood and does not require computer-based simulations of counterfactuals. We have also examined the most widely accepted (but more complex) measures of partisan bias, the Tufte-King approach to measuring partisan symmetry (*see e.g.*, Grofman, Bernard and Gary King. 2007. Partisan Symmetry and the Test for Gerrymandering Claims after *LULAC v. Perry*. *Election Law Journal,* 6 (1):2-35) and reached the same conclusion about the political neutrality of the three maps we drew. Although the partisan symmetry approach is the only one to have been given an axiomatic mathematical justification, no single measure is perfect. Accordingly, we examined a variety of other metrics as well, but all we have examined lead to similar conclusions that the maps we draw were neutrally drawn. We would also note that we are evaluating the degree of neutrality from a political science standpoint, with respect to what might be expected, in principle, were a computer programmed to draw a huge set of possible maps for Virginia without any political information in its data set and relying entirely on standard good government redistricting criteria for map-making. Such simulation results are based upon the actual electoral geography of the state and will be affected by the degree to which the two party's electoral strength is differentially concentrated with respect to geography. (*See e.g.*, Nicholas Eubank & Jonathan Rodden (2020) Who Is My Neighbor? The Spatial Efficiency of Partisanship, *Statistics and Public Policy*, 7:1, 87-100, DOI:10.1080/2330443X.2020.1806762). Thus, we would not expect a mean level of zero partisan bias even in a set of neutrally drawn computer drawn maps. But, of course, the legal judgement as to whether any map satisfies the state's constitutional requirement (§ 24.2-304.04) that "[a] map of districts shall not, when considered on a statewide basis, unduly favor or disfavor any political party" is one that must be made by this Court.

Nesting: Although not explicitly a Statutory Criteria, we agreed to "nest" our districts. That is to say, to the extent practicable, we carved our Senate districts out of U.S. House districts (with a little less than four complete Senate districts in a House district), and then drew the House of Delegates districts out of Senate districts (with roughly five House districts created out of two Senate districts). There are a variety of reasons for this, the most important of which is that having overlapping jurisdictions helps to ensure that the communities of interest that underlay the House of Delegates districts have multiple layers of representation. In other words, a community of interest that lies at the heart of one district is unlikely to be an "add-on" attached to a different Senate district for equal population purposes.

Once again, it was impossible to adhere to this standard religiously in light of competing criteria, but it did guide us when drawing districts. In particular, we tried to adhere to drawing roughly 25 contiguous State House of Delegates districts within an area encompassed by 10 contiguous Senate districts, and to the extent made feasible by geographic constraints we chose the Senate districts to represent areas of the state with similar communities of interest. For example, we sought to draw both Senate and House districts within the Shenandoah Valley, the D.C. Metro area, the Richmond area and the Hampton Roads area.

Incumbency: The Statutory Criteria make no mention of protecting incumbents. *We therefore maintained ignorance about the residences of incumbents*. Even as we submit these plans to the Court, we do not know which incumbents have been placed in districts with other incumbents, with one exception described below. We plan on maintaining that ignorance until the maps are finally approved, unless otherwise instructed by the Court.

Numbering: When the districts are approved by this Court, our preference would be to renumber the districts in a sensible manner. For now, we have opted to retain the traditional regional numbering of the districts for Congressional Districts to facilitate public comment.

Specific descriptions of the districts and highlights of key features of those districts follows.

UNITED STATES CONGRESS

District Descriptions

Districts 8 and 11 (Fairfax and Arlington counties, Alexandria, Fairfax and Falls

Church cities: We began our congressional map drawing with the realization that the counties of Fairfax and Arlington, when paired with the cities of Fairfax, Falls Church, and Alexandria, had a population sufficient to hold two congressional districts entirely, with only 18,000 residents left over.

Taken together, these counties are roughly 50% non-Hispanic White, so we checked to see if a reasonably compact district where a minority group would have the ability to elect a candidate of choice was possible to draw here. We quickly discovered that the minority groups are quite dispersed throughout these counties, and that while it is possible to draw a minority-majority district, it is difficult to push any minority group above even a third of the population. In the absence of evidence that minority groups in Fairfax County routinely form political coalitions and share interests, we concluded that we could not usefully consider race as a factor here.

We examined possible districts that split Fairfax County roughly upon a North/South line but concluded that this configuration split too many communities of interest. We then examined districts that kept one district entirely within the Capital Beltway (District 8). This district was necessarily underpopulated by about 158,000 residents. We examined adding communities of interest toward the west, effectively creating an "Orange Line" district that extended westward from Arlington along I-66. While there was much to commend the "Orange Line" district, the remaining Fairfax district (the 11th) was rendered excessively non-compact. We therefore opted to send the 8th district southward along I-395 and U.S. 1. This version of the 8th had too many people, so we moved Springfield and Franconia into the Fairfax district, with a few precincts

around Lorton moved into the Prince William County district (the newly created 7th district). Finally, a few VTDs were split to smooth the lines, and to assure roughly equal population.

Districts 6 and 9 (Appalachia, Shenandoah Valley)

We next proceeded to draw the 6th and 9th districts. We agreed almost immediately that the Blue Ridge Mountains served as a natural dividing line for communities of interest, especially given the paucity of easy crossings of those mountains. A problem immediately became apparent, however: the population of those counties is approximately 150,000 residents short of supporting two full districts.

We considered having a district that crossed the Blue Ridge in Prince William County (along I-66) as well as one that crossed near Charlottesville (along I-64). We observed, however, that the entire Valley of Virginia from Winchester to Roanoke fit almost perfectly within a district bordered by the Blue Ridge, and that the counties west of the Blue Ridge that remained constituted almost all of the counties in Virginia classified as part of Appalachia by the U.S. Government. (About the Appalachian Region - Appalachian Regional Commission (arc.gov)). We also examined historical maps of Virginia and noted that before the Civil War, the Blue Ridge was typically utilized to divide Virginia's districts, although districts sometimes crossed it to the south. *See generally* Kenneth C. Martis, *The Historical Atlas of United States Congressional Districts:1789-1983* (1982). After the Civil War, the Commonwealth was less solicitous of the Blue Ridge, but this likely reflected an effort to dilute Republican voting strength in the Shenandoah and in southwest Virginia.

We therefore opted to place the counties north of Roanoke and west of the Blue Ridge in a single district representing the Valley of Virginia. Salem is moved back into the same district as Roanoke, and most of the smaller towns surrounding Roanoke were placed in that district as

well. The 9th district retains most of the panhandle and is composed of almost all of the counties in Virginia classified as Appalachian. A few counties east of the Blue Ridge are added for purposes of population equality.

Districts 2 and 3 (Hampton Roads and Virginia Beach)

The Hampton Roads area presently contains one district that consistently elects the candidate of choice of the African-American population. Ultimately, we opted to draw a compact district comprised of the four major cities in the Hampton Roads area: Norfolk, Newport News, Hampton and Portsmouth. We then split the City of Chesapeake roughly at the Hampton Roads Beltway in order to maintain the district's compactness while achieving population equality.

Having drawn a compact district that respected county and city lines to the extent possible, we then examined racial and political data. The district is approximately 44.5% African-American, which is only marginally lower than the current 3rd district's 47.2%. It routinely gives Democratic presidential candidates around two-thirds of the vote. Even under implausible assumptions (such as African-Americans in the region splitting 70-30 between the Democratic and Republican party) African-American voters should still comprise a comfortable majority of voters in the Democratic primary.

This left few options for the 2nd District, which was redrawn to include the Eastern Shore, all of Virginia Beach, and the remainder of Chesapeake City. Suffolk City and Isle of Wight County were added as the next counties out, as were Franklin City and a small portion of Southampton County for population equality reasons. The district loses functional contiguity in the cities of Suffolk and Chesapeake, but the Great Dismal Swamp makes issues of functional contiguity inevitable in that portion of the state.

Districts 4 and 5 (Richmond and Southside)

We next drew metro Richmond. We initially looked at a compact district that included only Richmond City and Henrico/Chesterfield counties, but this district would cause dilution problems under the Statutory Criteria. African-Americans would total a little more than a third of the population, and their candidate of choice might not emerge from the Democratic primary. We ultimately opted for a district that is reasonably compact and that still respects county borders. It picks up the remainder of Southampton County left over from district 2, and then splits only the large suburban counties of Henrico and Chesterfield along east-west lines, roughly at the Fall Line. Some additional smaller counties in the South are added for geographic and population equality purposes. The newly constructed 4th has a 45.3% Black CVAP, which is higher than the 40% Black CVAP in the 4th as presently constituted and would likely continue to elect the African-American population's candidate of choice.

The 5th district continues Virginia's lengthy tradition of placing a district in Southside Virginia. Historically anchored in Danville, today the equal population requirement demands that the district stretch up to Charlottesville and into the Richmond suburbs in Chesterfield County.

Districts 1, 7, and 10 (North Tidewater and outer Northern Virginia)

Both the Selection Committee and the Redistricting Commission opted to use the eight regions identified by the University of Virginia's Weldon Cooper Center. Under this map, Northern Virginia consists of Arlington, Fairfax, Loudoun, Prince William, Clarke, Warren, Rappahannock, Culpeper, Spotsylvania, Stafford and King George counties, as well as the independent cities of Fairfax, Alexandria, Falls Church, Manassas, Manassas Park, and

Fredericksburg. These counties' populations combine for almost exactly four congressional districts. Yet the current map spreads their populations over seven districts, with six of them taking in substantial portions of the region's population.

We sought to remedy this. As noted above the 8th and 11th congressional districts are now placed entirely within Fairfax County and those localities closer to Washington, D.C. We sought to place two additional districts almost entirely within the remainder of Northern Virginia. Our exploration of the area mostly consisted of variants on two basic approaches. The first approach involved a district that traveled across Prince William County into southern Loudoun County, while a second district took in the extended outer areas of Northern Virginia. We referred to this as the "ringed approach." The second approach contained a district wholly anchored in Loudoun County, and one in Prince William County. In this approach, the Prince William District extended southward along I-95 to Fredericksburg, while the Loudoun District turned south down US-29 toward Charlottesville.

We ultimately opted for the second approach, which we thought better reflected travel patterns and communities of interest in the area. But switching over to the ringed approach, if the Court preferred it, would be a trivial task. The remainder of the state fell nicely into a single district that is anchored in the northern Tidewater area, but which then takes in the northern Richmond suburbs and a few lightly populated counties in the northern Piedmont area.

Assessment of Congressional Districts Under Statutory Criteria

Equal Representation: The ideal population size for a Congressional district in Virginia is 784,672. The largest positive deviation from the ideal population comes in district 10, which is overpopulated by 1,797 residents. The largest negative deviation from the ideal population comes in district 1, which is underpopulated by 1,259 residents. All absolute percentage deviations are under 0.25%.

Evaluation of Equal Population Criteria, Draft Virginia Congressional Districts

District	Population	Deviation	Pct. Deviation
1	783,413	−1,259	−0.16%
2	784,453	−219	−0.03%
3	784,353	−319	−0.04%
4	784,366	−306	−0.04%
5	785,740	1,068	0.14%
6	783,436	−1,236	−0.16%
7	783,613	−1,059	−0.13%
8	784,141	−531	−0.07%
9	786,021	1,349	0.17%
10	786,469	1,797	0.23%
11	785,388	716	0.09%

Equal Protection and Ability-to-Elect Districts: The following table provides racial breakdowns for the draft Congressional Districts. Districts three and four are minority-majority districts, and Black voters represent 44.5% and 45.26% of the populations, respectively. We believe this is sufficient to elect a Black candidate of choice in both districts. These minority proportions are very similar to those drawn by the federal court in *Personhuballah v. Alcorn*, No. 3:13cv678 (E.D. Va.).

Evaluation of Racial Criteria, Draft Virginia Congressional Districts							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
1	77.57%	22.43%	2.96%	15.35%	3.13%	0.83%	0.83%
2	65.04%	34.96%	5.09%	23.68%	4.94%	0.86%	0.86%
3	45.99%	54.01%	5.20%	44.50%	2.88%	1.05%	1.05%
4	48.04%	51.96%	3.53%	45.26%	2.06%	0.97%	0.97%
5	73.14%	26.86%	2.12%	22.02%	1.98%	0.71%	0.71%
6	86.52%	13.48%	3.08%	8.33%	1.32%	0.58%	0.58%
7	56.74%	43.26%	12.77%	21.74%	7.36%	0.73%	0.73%
8	62.87%	37.13%	11.17%	13.52%	11.35%	0.59%	0.59%
9	90.51%	9.49%	1.44%	6.32%	1.05%	0.56%	0.56%
10	72.89%	27.11%	6.37%	10.64%	9.09%	0.64%	0.64%
11	62.89%	37.11%	8.55%	8.46%	19.15%	0.59%	0.59%

Contiguity: The districts are all contiguous under the census standard for contiguity (described above). As noted above, there is one minor deviation from functional contiguity in the 2nd district, which is demanded by Virginia landforms.

Compactness: Below are the Reock and Polsby-Popper scores for the districts. These are two commonly used measures of spatial compactness. To simplify greatly, Reock scores measure how "stretched" a district is, while Polsby-Popper scores measure how "dimpled" the district is. Under both metrics, higher scores are better.

Districts 2, 6, and 9 score relatively poorly using Reock scores. This is to be expected, given the geographic constraints placed upon them. All of the districts perform well under the Polsby-Popper metric.

Evaluation of Compactness Criteria, Draft Virginia Congressional Districts	
Reock	Polsby-Popper
0.3198	0.3138
0.2320	0.2111
0.4345	0.3377
0.4979	0.3036
0.4754	0.3378
0.2213	0.2220
0.3997	0.2593
0.5273	0.4020
0.1647	0.2020
0.3769	0.2535
0.5711	0.3957

However, since we are drawing a whole map for the state, the most important compactness comparison is for the state as whole. Dave's Redistricting App provides a composite compactness score for a whole map. The Special Masters' ("SMs") congressional map is more compact than the current congressional map, a value of 51 for the SMs map as compared to a value of only 25 for the current map. In other words, we have effectively doubled the degree to which the congressional map is a compact one.

Partisanship: A summary of the average Democratic performance in Virginia statewide races from 2016 to 2020 is provided below. The results are sorted by Democratic vote share. Over this time, the average Democratic performance was 54.01% to the Republicans' 44%. The median district, district 10, went for Democrats by, on average, a seven-point margin, making it a little more than a point more Republican than the Commonwealth overall. In a very good

Republican year, Republicans could win a majority of the seats in Virginia's delegation. Generally, however, we would expect to see a 6-5 Democratic edge in Virginia's delegation. In very good Democratic years, Democrats might perhaps achieve the same 7-4 advantage that they now enjoy from having won two highly competitive seats in 2020. Overall, this map is well-balanced, does not unduly favor any party, and does not require further adjustment.

2016-2020 Composite Election Results, Draft Virginia Congressional Districts

Average Dem Performance = 54.01%

District	Democratic	Republican
8	75.8%	21.8%
3	68.3%	29.8%
11	67.3%	30.5%
4	66.7%	31.6%
7	58.5%	39.5%
10	52.6%	45.3%
2	49.6%	48.3%
5	44.6%	53.6%
1	43.8%	54.2%
6	38.5%	59.5%
9	30.8%	67.6%

SENATE OF VIRGINIA

As explained in greater detail above, our approach was to base state senate districts on congressional districts. Forty does not divide evenly by 11, so we were unable to achieve this goal exactly; it was simply a guiding principle. Because these districts closely adhere to the Congressional District boundaries, these descriptions are briefer.

District Descriptions

Districts 1-7 (Appalachia, Shenandoah Valley)

Each of these districts is anchored in a small city or cities in the region. District 1 is anchored in Winchester. District 2 is anchored in Harrisonburg. District 3 is anchored in Staunton and Waynesboro. District 4 is anchored in Roanoke. District 5 is anchored in Radford and Blacksburg. District 6 is anchored in Bristol and Norton. District 7 is anchored in Galax and Martinsville.

Special care was taken to place Staunton and Waynesboro in the same district, as they form a community of interest. We attempted to place Roanoke, Salem and Blacksburg in the same district, to reflect what some have reported as a community of interest. We were unable to do so given equal population constraints.

Districts 8-17 (Southside and Richmond)

Districts 8, 9, 11, and 17 are all anchored by Southside and south-central cities: Lynchburg in the 8th, Danville and the US-58/US-360 corridors in the 9th, Charlottesville and the US-29 corridor for the 11th and Franklin/Emporia for the 17th.

Districts 10 and 12-16 are all anchored in the Richmond area. We worked to have one district based in the Henrico County suburbs, one in the Chesterfield County suburbs, and one in the exurbs of Goochland and Powhatan counties. Unfortunately, competing considerations forced a split of Hanover County.

Districts 13, 14 and 15 are minority opportunity districts. We forced ourselves to draw these districts within the constraints placed on other districts: Compactness, minimization of county splits and attention to communities of interest. In particular, we anchored these districts in distinct areas that contain minority populations with different needs: The 13th is based in Petersburg and Hopewell, the 14th is based in eastern Chesterfield County, and the 15th is based in Richmond and Henrico counties.

Districts 18-24 (Hampton Roads)

These were among the most difficult districts to draw in the commonwealth, as they require a careful balancing of competing considerations based upon geography, community, and race. District 20 contains the Eastern Shore, crosses over into Virginia Beach, and then takes in a small sliver of northern Norfolk. District 19 contains southern Virginia Beach and the main city of Chesapeake. District 22 includes western Virginia Beach, while 18 and 21 take in the majority of Portsmouth and Norfolk, respectively. We are able to avoid crossing the Monitor-Merrimack Bridge or the Hampton Roads Bridge-Tunnel. We were thus able to keep the Virginia Peninsula intact. District 23 includes the City of Hampton and southern Newport News, while district 24 includes the remainder of the Peninsula up to Williamsburg.

Districts 25 and 26 (Tidewater)

Commentators emphasized the importance of the Northern Neck and Middle Peninsula as communities of interest. These were combined into a single Senate district, along with James City County. West Point was added to the 26th to enable functional contiguity. The 25th includes most of the remaining Tidewater area.

Districts 27-32 (Outer Northern Virginia)

These districts follow naturally from the decisions made on how to draw Congressional Districts 7 and 10. We simply started in northern Prince George County, and drew counter-

clockwise, with some smoothing for population equality and respecting locality boundaries. District 31 could be made more compact by having District 32 adhere more religiously to the Loudoun/Fairfax border, but that would require more aggressive splitting of locales like Ashburn.

Districts 33-40 (Inner Northern Virginia)

Finally, we drew districts approximating Congressional Districts 8 and 11. We ultimately opted to anchor one district in each major census designated place and city. District 40 is anchored in Arlington/Falls Church (we acknowledge some debate in the COIs about whether to place Falls Church with Arlington or with Fairfax). District 39 is anchored in Alexandria. District 38 is anchored in Reston and McLean. District 37 is anchored in Oakton, Tyson's Corner and the City of Fairfax. District 36 is anchored in Centreville. District 35 is anchored in Annandale and Burke. District 34 is anchored in Franconia and Springfield. District 33 crosses into Prince William County, and is built around Lorton, Woodbridge, and the Potomac River banks.

Assessment of Senate Districts Under Statutory Criteria

Equal Representation: The ideal population size for a senate district in Virginia is 215,785. The largest positive deviation from the ideal population comes in district 32, which is overpopulated by 5,141 residents. The largest negative deviation from the ideal population comes in district 28, which is underpopulated by 5,213 residents. All absolute percentage deviations are under 2.5%, as required by Virginia law.

Evaluation of Equal Population Criteria, Draft Virginia Senate Districts 1-20			
District	Population	Deviation	Pct. Deviation
1	219,464	3,679	1.70%
2	213,860	−1,925	−0.89%
3	215,770	−15	−0.01%
4	218,232	2,447	1.13%
5	219,146	3,361	1.56%
6	213,557	−2,228	−1.03%
7	217,620	1,835	0.85%
8	214,868	−917	−0.42%
9	214,702	−1,083	−0.50%
10	212,752	−3,033	−1.41%
11	215,978	193	0.09%
12	219,101	3,316	1.54%
13	213,623	−2,162	−1.00%
14	219,329	3,544	1.64%
15	220,199	4,414	2.05%
16	218,175	2,390	1.11%
17	216,724	939	0.44%
18	213,095	−2,690	−1.25%
19	212,136	−3,649	−1.69%
20	218,607	2,822	1.31%

Evaluation of Equal Population Criteria, Draft Virginia Senate Districts 21-40			
District	Population	Deviation	Pct. Deviation
21	214,208	−1,577	−0.73%
22	213,170	−2,615	−1.21%
23	215,570	−215	−0.10%
24	211,657	−4,128	−1.91%
25	217,082	1,297	0.60%
26	212,878	−2,907	−1.35%
27	213,276	−2,509	−1.16%
28	210,572	−5,213	−2.42%
29	216,720	935	0.43%
30	215,164	−621	−0.29%
31	220,345	4,560	2.11%
32	220,926	5,141	2.38%
33	212,814	−2,971	−1.38%
34	213,696	−2,089	−0.97%
35	214,667	−1,118	−0.52%
36	216,066	281	0.13%
37	220,175	4,390	2.03%
38	215,783	−2	0.00%
39	215,194	−591	−0.27%
40	214,492	−1,293	−0.60%

Equal Protection and Ability-to-Elect Districts: The following table provides racial breakdowns for the draft senate districts. We note at the outset that we do not have as many minority-majority districts as the existing plans. We believe that this is the incorrect inquiry under both Virginia and federal law. Rather, the emphasis is upon districts where minority groups would have the ability to elect their candidates of choice. In this respect, we believe that

we improve over existing law by creating an additional "ability to elect" district in the Richmond area.

The plan may draw criticism for not drawing minority-majority districts in the northern Virginia area. The Statutory Criteria do require that we draw districts where minority groups are able to elect their candidates of choice, either alone or in coalition with other groups. This follows the approach of a majority of federal circuits, which require such coalition districts. *See Campos v. City of Baytown*, 840 F.2d 1240 (5th Cir.), *reh'g denied*, 849 F.2d 943 (1988), *cert. denied*, 492 U.S. 905 (1989). *But see Nixon v. Kent County*, 76 F.3d 1381 (6th Cir. 1996) (en banc) (concluding that coalition districts are not required by the VRA).

Federal courts, however, require evidence that the minority groups placed in coalition districts are cohesive and frequently work together toward common ends. This definition seems implicit in the state requirement that the different minority groups form actual coalitions. While we could conceivably draw coalition districts, as discussed above, the minority groups in Fairfax County are dispersed across the county roughly evenly. We also have no record of groups working and voting together, particularly in primaries. We note that the state senators from coalition districts in Northern Virginia under the current maps are non-Hispanic Whites. While non-Hispanic Whites can, of course, be the minority candidate of choice, in the absence of any other record evidence suggesting that such coalitions are effective in Northern Virginia, we opted instead to honor the competing interests of compactness and nesting of districts.

We also note that, while we are generally ignorant of incumbent residences, one of our able research assistants noted that two minority state Senators are paired together in the Richmond area in the same district. After some discussion we concluded that the statutory guarantee is not to have particular incumbents elected, but rather the ability of minority groups to

elect a candidate of choice from a field of candidates. We did, however, want to bring this to the Court's attention.

Evaluation of Racial Criteria, Draft Virginia Senate Districts 1-20							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
1	89.13%	10.87%	3.64%	5.32%	1.21%	0.63%	0.02%
2	89.52%	10.48%	4.12%	4.36%	1.35%	0.55%	0.06%
3	89.90%	10.10%	1.75%	6.75%	0.95%	0.55%	0.08%
4	78.83%	21.17%	2.46%	15.56%	2.24%	0.56%	0.03%
5	91.07%	8.93%	1.55%	4.61%	1.96%	0.51%	0.09%
6	95.04%	4.96%	0.91%	3.08%	0.37%	0.55%	0.02%
7	85.62%	14.38%	1.80%	11.53%	0.44%	0.62%	0.01%
8	79.55%	20.45%	2.09%	16.49%	1.15%	0.74%	0.02%
9	63.65%	36.35%	1.43%	33.71%	0.49%	0.72%	0.04%
10	77.77%	22.23%	1.68%	18.98%	0.75%	0.76%	0.04%
11	78.93%	21.07%	2.52%	14.45%	3.29%	0.69%	0.04%
12	76.44%	23.56%	2.92%	16.13%	3.72%	0.75%	0.02%
13	42.61%	57.39%	3.42%	51.85%	1.03%	0.99%	0.07%
14	48.27%	51.73%	2.22%	45.97%	2.41%	0.89%	0.01%
15	47.76%	52.24%	5.40%	42.97%	2.77%	1.02%	0.07%
16	71.75%	28.25%	3.61%	16.06%	7.62%	0.52%	0.06%
17	53.40%	46.60%	2.45%	41.84%	1.24%	1.23%	0.02%
18	47.79%	52.21%	3.58%	44.79%	2.48%	1.14%	0.11%
19	72.22%	27.78%	5.27%	16.72%	4.61%	0.90%	0.12%
20	74.15%	25.85%	4.63%	16.45%	3.50%	0.81%	0.09%

Evaluation of Racial Criteria, Draft Virginia Senate Districts 21-40							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
21	44.82%	55.18%	6.14%	44.33%	3.29%	1.09%	0.05%
22	54.17%	45.83%	7.39%	27.64%	9.27%	0.70%	0.07%
23	40.73%	59.27%	4.49%	50.95%	2.52%	0.88%	0.13%
24	64.23%	35.77%	6.23%	23.97%	4.12%	0.99%	0.17%
25	76.98%	23.02%	3.40%	16.73%	1.65%	1.03%	0.05%
26	77.53%	22.47%	2.88%	17.46%	1.22%	0.79%	0.02%
27	68.41%	31.59%	7.46%	19.35%	3.39%	0.88%	0.07%
28	82.71%	17.29%	3.82%	11.22%	1.21%	0.85%	0.08%
29	51.54%	48.46%	13.95%	26.03%	7.01%	0.79%	0.15%
30	57.99%	42.01%	15.14%	15.08%	10.66%	0.45%	0.04%
31	75.00%	25.00%	7.29%	7.29%	9.58%	0.53%	0.09%
32	54.64%	45.36%	10.22%	10.28%	23.69%	0.47%	0.10%
33	49.58%	50.42%	13.56%	23.79%	11.55%	0.68%	0.13%
34	55.94%	44.06%	12.47%	18.01%	12.30%	0.64%	0.11%
35	57.48%	42.52%	12.75%	8.68%	20.28%	0.62%	0.09%
36	61.84%	38.16%	7.53%	6.21%	23.35%	0.68%	0.09%
37	62.62%	37.38%	9.51%	7.50%	19.30%	0.68%	0.04%
38	69.10%	30.90%	7.26%	7.14%	15.79%	0.35%	0.03%
39	61.09%	38.91%	10.41%	20.12%	7.15%	0.68%	0.03%
40	72.71%	27.29%	9.19%	8.05%	9.16%	0.52%	0.09%

Contiguity: The districts are all contiguous under the census standard for contiguity (described above). To our knowledge, they are contiguous under functional contiguity as well.

Compactness: Below are the Reock and Polsby-Popper scores for the districts. These are two commonly used measures of spatial compactness. To simplify greatly, Reock scores measure

how “stretched” a district is, while Polsby-Popper scores measure how “dimpled” the district is. Under both metrics, higher scores are better.

Districts 2, 3, 6, and 7 score relatively poorly using Reock scores. This is to be expected, given the geographic constraints placed upon them. All of the districts perform well under the Polsby-Popper metric.

Evaluation of Compactness Criteria, Draft Virginia Senate Districts 1-20

District	Reock	Polsby-Popper
1	0.3745	0.4002
2	0.2564	0.2493
3	0.2515	0.2093
4	0.3527	0.2035
5	0.3402	0.2451
6	0.2509	0.2898
7	0.2332	0.2985
8	0.4159	0.3181
9	0.3268	0.3734
10	0.3581	0.2079
11	0.2742	0.2644
12	0.3853	0.3010
13	0.5010	0.2871
14	0.3205	0.2222
15	0.3088	0.1653
16	0.4649	0.2839
17	0.2757	0.2549
18	0.4424	0.4223
19	0.3812	0.4630
20	0.3244	0.3882

Evaluation of Compactness Criteria, Draft Virginia Senate Districts 21-40		
District	Reock	Polsby-Popper
21	0.5470	0.5411
22	0.5694	0.4124
23	0.3648	0.3497
24	0.3029	0.2435
25	0.3903	0.1461
26	0.5008	0.2372
27	0.5667	0.3387
28	0.4884	0.3234
29	0.3389	0.2190
30	0.4421	0.3111
31	0.3985	0.2480
32	0.4623	0.3658
33	0.3524	0.2829
34	0.4183	0.4092
35	0.4093	0.2617
36	0.5147	0.2501
37	0.3060	0.2548
38	0.3123	0.3527
39	0.4743	0.4465
40	0.2930	0.3470

However, since we are drawing a whole map for the state, the most important compactness comparison is for the state as whole. Dave's Redistricting App provides a composite compactness score for a whole map. The Special Masters' ("SMs") Senate map is more compact than the current Senate map, a value of 52 for the SMs map as compared to a

value of 9 for the current Senate map. In other words, we have effectively more than quintupled the degree to which the Senate map is a compact one.

Partisanship: Because state races occur in the off-years, which can have very different turnout patterns from presidential and midterm election years, we determined that it was important not to use elections from presidential or midterm elections to evaluate partisanship. Instead, we used data from Virginia Attorney General elections. A summary of the Democratic performance in the 2017 Attorney General election is provided below. The results are sorted by Democratic vote share. The average Democratic performance in this race was 53.3% to the Republican's 46.6%. As you can see below, the median districts, 31 and 17, gave the Democrat 54.3% of the vote and 53.2% of the vote, respectively. Thus, each party will have to win an election in "unfriendly" territory in order to control the state senate. Overall, this map is well-balanced, does not unduly favor any party, and does not require further adjustment.

2017 Attorney General Election Results, Draft Virginia Senate Districts 1-20

Average Dem Performance = 53.33%

District	Democratic	Republican
14	79.5%	20.4%
39	78.9%	21.0%
40	78.7%	21.2%
21	74.8%	25.1%
23	71.0%	28.9%
37	70.5%	29.4%
34	69.7%	30.2%
38	67.8%	32.1%
35	67.7%	32.2%
18	65.0%	34.9%
33	65.0%	34.9%
32	63.9%	36.0%
15	62.4%	37.5%
36	62.3%	37.6%
11	62.1%	37.8%
13	62.0%	37.9%
29	60.1%	39.7%
22	57.4%	42.5%
30	54.9%	45.0%
31	54.3%	45.7%

2017 Attorney General Election Results, Draft Virginia Senate Districts 21-40

Average Dem Performance = 53.33%

District	Democratic	Republican
17	53.2%	46.8%
16	52.3%	47.6%
24	51.6%	48.2%
4	47.8%	52.1%
27	47.6%	52.2%
20	46.1%	53.8%
12	43.1%	56.8%
19	42.1%	57.8%
26	41.1%	58.9%
9	39.6%	60.3%
25	37.2%	62.7%
28	37.0%	62.8%
1	36.4%	63.5%
5	36.3%	63.6%
3	35.9%	64.0%
10	35.9%	64.0%
2	33.2%	66.7%
8	31.8%	68.1%
7	30.6%	69.3%
6	23.3%	76.6%

VIRGINIA HOUSE OF DELEGATES

Because there are so many districts, we will not endeavor to describe each one. Because the senate districts are the bases for these districts, their basic underlying motivation should be familiar.

Statutory Criteria

Equal Representation: The ideal population size for a House of Delegates district in Virginia is 86,314. The largest positive deviation from the ideal population comes in district 75, which is overpopulated by 2,149 residents. The largest negative deviation from the ideal population comes in district 27, which is underpopulated by 2,101 residents. All absolute percentage deviations are under 2.5%, as required by Virginia law.

Evaluation of Equal Population Criteria, Draft Virginia House Districts 1-25			
District	Population	Deviation	Pct. Deviation
1	84,957	−1,357	−1.57%
2	85,400	−914	−1.06%
3	86,887	573	0.66%
4	85,616	−698	−0.81%
5	86,826	512	0.59%
6	84,634	−1,680	−1.95%
7	85,669	−645	−0.75%
8	87,350	1,036	1.20%
9	86,572	258	0.30%
10	87,624	1,310	1.52%
11	87,486	1,172	1.36%
12	87,285	971	1.12%
13	86,448	134	0.16%
14	85,572	−742	−0.86%
15	88,051	1,737	2.01%
16	86,208	−106	−0.12%
17	86,477	163	0.19%
18	87,324	1,010	1.17%
19	85,437	−877	−1.02%
20	85,244	−1,070	−1.24%
21	86,571	257	0.30%
22	84,270	−2,044	−2.37%
23	84,720	−1,594	−1.85%
24	84,934	−1,380	−1.60%
25	87,209	895	1.04%

Evaluation of Equal Population Criteria, Draft Virginia House Districts 26-50			
District	Population	Deviation	Pct. Deviation
26	87,291	977	1.13%
27	84,213	−2,101	−2.43%
28	87,454	1,140	1.32%
29	87,418	1,104	1.28%
30	85,420	−894	−1.04%
31	87,054	740	0.86%
32	85,347	−967	−1.12%
33	87,217	903	1.05%
34	86,651	337	0.39%
35	87,055	741	0.86%
36	86,397	83	0.10%
37	87,329	1,015	1.18%
38	87,965	1,651	1.91%
39	86,896	582	0.67%
40	86,918	604	0.70%
41	85,276	−1,038	−1.20%
42	86,234	−80	−0.09%
43	86,222	−92	−0.11%
44	87,779	1,465	1.70%
45	85,313	−1,001	−1.16%
46	84,739	−1,575	−1.82%
47	85,689	−625	−0.72%
48	84,443	−1,871	−2.17%
49	84,673	−1,641	−1.90%
50	84,359	−1,955	−2.26%

Evaluation of Equal Population Criteria, Draft Virginia House Districts 51-75			
District	Population	Deviation	Pct. Deviation
51	85,784	−530	−0.61%
52	87,218	904	1.05%
53	86,080	−234	−0.27%
54	88,305	1,991	2.31%
55	86,747	433	0.50%
56	86,862	548	0.63%
57	86,076	−238	−0.28%
58	84,577	−1,737	−2.01%
59	85,634	−680	−0.79%
60	85,394	−920	−1.07%
61	84,921	−1,393	−1.61%
62	87,359	1,045	1.21%
63	84,966	−1,348	−1.56%
64	85,980	−334	−0.39%
65	87,139	825	0.96%
66	85,065	−1,249	−1.45%
67	85,966	−348	−0.40%
68	85,450	−864	−1.00%
69	87,386	1,072	1.24%
70	88,236	1,922	2.23%
71	84,328	−1,986	−2.30%
72	88,033	1,719	1.99%
73	87,751	1,437	1.66%
74	88,305	1,991	2.31%
75	88,463	2,149	2.49%

Evaluation of Equal Population Criteria, Draft Virginia House Districts 76-100			
District	Population	Deviation	Pct. Deviation
76	85,270	−1,044	−1.21%
77	87,759	1,445	1.67%
78	87,774	1,460	1.69%
79	87,800	1,486	1.72%
80	85,693	−621	−0.72%
81	84,718	−1,596	−1.85%
82	86,012	−302	−0.35%
83	86,459	145	0.17%
84	87,624	1,310	1.52%
85	87,829	1,515	1.76%
86	85,949	−365	−0.42%
87	87,516	1,202	1.39%
88	86,371	57	0.07%
89	86,704	390	0.45%
90	87,890	1,576	1.83%
91	87,076	762	0.88%
92	86,158	−156	−0.18%
93	85,906	−408	−0.47%
94	84,653	−1,661	−1.92%
95	84,324	−1,990	−2.31%
96	85,578	−736	−0.85%
97	86,997	683	0.79%
98	86,690	376	0.44%
99	85,558	−756	−0.88%
100	84,937	−1,377	−1.60%

Equal Protection and Ability-to-Elect Districts: The following table provides racial breakdowns for the draft House districts. We note at the outset that we do not have as many minority-majority districts as the existing plans. We reiterate our conclusion from our Senate analysis that this is the incorrect inquiry under both Virginia and federal law. Rather, the emphasis is upon districts where minority groups would have the ability to elect their candidates of choice. In this respect, we believe that we improve over the current map. We reiterate that we do not believe we have sufficient evidence before us to intentionally draw coalition districts, although such districts may naturally occur in the course of drawing compact districts that minimize county splits.

Evaluation of Racial Criteria, Draft Virginia House Districts 1-25							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
1	79.98%	20.02%	6.95%	4.66%	7.83%	0.31%	0.02%
2	71.88%	28.12%	9.24%	7.35%	10.38%	0.59%	0.19%
3	60.73%	39.27%	14.15%	15.02%	8.99%	0.73%	0.03%
4	46.87%	53.13%	11.98%	31.12%	9.03%	0.24%	0.03%
5	72.61%	27.39%	7.04%	14.12%	4.85%	1.05%	0.02%
6	76.46%	23.54%	3.50%	2.13%	17.48%	0.28%	0.00%
7	72.74%	27.26%	7.65%	7.49%	11.33%	0.22%	0.00%
8	55.70%	44.30%	9.77%	10.73%	22.72%	0.81%	0.09%
9	58.17%	41.83%	9.65%	6.05%	25.19%	0.51%	0.02%
10	62.24%	37.76%	6.79%	7.26%	22.49%	0.82%	0.18%
11	62.30%	37.70%	8.50%	9.66%	18.38%	0.76%	0.08%
12	65.41%	34.59%	8.45%	5.49%	19.75%	0.54%	0.00%
13	56.64%	43.36%	14.57%	8.07%	19.74%	0.62%	0.09%
14	50.74%	49.26%	14.38%	10.56%	23.69%	0.26%	0.14%
15	63.91%	36.09%	10.33%	6.82%	17.98%	0.98%	0.03%
16	63.30%	36.70%	11.75%	15.86%	8.09%	0.63%	0.06%
17	49.30%	50.70%	13.30%	23.28%	12.29%	0.76%	0.20%
18	60.03%	39.97%	9.97%	10.49%	18.59%	0.41%	0.07%
19	41.62%	58.38%	17.84%	28.88%	10.10%	0.58%	0.06%
20	52.33%	47.67%	21.50%	15.85%	9.19%	0.46%	0.03%
21	60.81%	39.19%	11.29%	15.43%	11.54%	0.31%	0.03%
22	69.31%	30.69%	9.35%	11.83%	8.25%	0.80%	0.04%
23	42.51%	57.49%	13.67%	34.76%	7.19%	0.77%	0.25%
24	45.24%	54.76%	16.37%	28.16%	8.72%	0.76%	0.19%
25	51.33%	48.67%	13.89%	24.54%	8.69%	0.90%	0.14%

Evaluation of Racial Criteria, Draft Virginia House Districts 26-50							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
26	48.36%	51.64%	7.10%	11.31%	31.54%	0.62%	0.15%
27	56.70%	43.30%	13.45%	8.84%	20.07%	0.51%	0.15%
28	65.12%	34.88%	10.06%	8.62%	15.39%	0.34%	0.04%
29	69.52%	30.48%	8.44%	8.96%	12.27%	0.53%	0.10%
30	82.33%	17.67%	4.56%	6.01%	6.29%	0.52%	0.06%
31	89.33%	10.67%	3.28%	5.59%	1.09%	0.62%	0.02%
32	86.89%	13.11%	4.01%	6.89%	1.66%	0.62%	0.04%
33	93.91%	6.09%	2.95%	1.84%	0.51%	0.68%	0.04%
34	84.33%	15.67%	6.79%	5.53%	2.79%	0.38%	0.02%
35	91.76%	8.24%	2.45%	4.56%	0.44%	0.64%	0.08%
36	88.38%	11.62%	2.25%	7.83%	0.78%	0.58%	0.16%
37	91.84%	8.16%	1.45%	5.22%	0.90%	0.57%	0.02%
38	62.57%	37.43%	3.21%	30.87%	2.18%	0.65%	0.03%
39	89.75%	10.25%	1.38%	7.28%	1.10%	0.57%	0.00%
40	87.34%	12.66%	1.99%	7.63%	2.12%	0.51%	0.05%
41	88.23%	11.77%	2.38%	3.97%	4.63%	0.58%	0.02%
42	90.35%	9.65%	1.71%	6.11%	1.20%	0.28%	0.05%
43	95.49%	4.51%	0.86%	2.67%	0.32%	0.55%	0.04%
44	95.86%	4.14%	0.86%	2.34%	0.34%	0.58%	0.01%
45	93.51%	6.49%	0.91%	4.45%	0.46%	0.54%	0.03%
46	94.05%	5.95%	1.05%	3.90%	0.39%	0.54%	0.12%
47	91.92%	8.08%	1.79%	5.51%	0.30%	0.50%	0.00%
48	68.58%	31.42%	2.08%	27.86%	0.46%	0.96%	0.05%
49	57.93%	42.07%	1.63%	38.87%	0.50%	1.01%	0.03%
50	64.74%	35.26%	1.32%	32.74%	0.74%	0.47%	0.03%

Evaluation of Racial Criteria, Draft Virginia House Districts 51-75							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
51	85.85%	14.15%	1.26%	11.66%	0.62%	0.78%	0.03%
52	69.33%	30.67%	3.10%	25.14%	1.64%	0.70%	0.01%
53	82.50%	17.50%	1.78%	13.95%	0.76%	0.98%	0.03%
54	72.39%	27.61%	3.48%	17.35%	5.95%	0.55%	0.01%
55	86.87%	13.13%	1.84%	8.78%	1.95%	0.55%	0.07%
56	73.07%	26.93%	1.43%	24.09%	0.60%	0.81%	0.04%
57	75.48%	24.52%	3.05%	10.09%	10.58%	0.54%	0.01%
58	79.57%	20.43%	3.29%	11.27%	5.35%	0.49%	0.03%
59	78.34%	21.66%	1.95%	15.91%	2.52%	0.88%	0.00%
60	86.34%	13.66%	1.56%	9.36%	1.61%	0.93%	0.03%
61	85.50%	14.50%	3.66%	8.03%	1.82%	0.90%	0.05%
62	79.62%	20.38%	3.67%	14.78%	0.88%	0.87%	0.09%
63	77.88%	22.12%	5.30%	13.63%	2.05%	0.64%	0.07%
64	65.65%	34.35%	9.47%	18.70%	4.59%	0.97%	0.11%
65	70.39%	29.61%	5.81%	20.27%	2.30%	0.94%	0.02%
66	68.67%	31.33%	4.89%	23.02%	2.12%	0.91%	0.13%
67	70.91%	29.09%	3.31%	24.22%	0.77%	0.70%	0.01%
68	78.15%	21.85%	2.71%	17.14%	0.70%	1.08%	0.04%
69	74.17%	25.83%	5.67%	15.93%	2.93%	0.72%	0.26%
70	53.70%	46.30%	6.79%	34.05%	3.83%	1.10%	0.13%
71	78.06%	21.94%	4.01%	13.93%	2.80%	1.20%	0.00%
72	77.78%	22.22%	1.77%	18.21%	1.84%	0.29%	0.07%
73	80.11%	19.89%	2.90%	11.45%	5.00%	0.58%	0.00%
74	68.26%	31.74%	3.38%	25.13%	2.11%	0.72%	0.06%
75	56.49%	43.51%	6.15%	32.88%	3.23%	0.90%	0.16%

Evaluation of Racial Criteria, Draft Virginia House Districts 26-50							
District	Non-Hispanic White	Total Minority	Hispanic	Black	Asian	Native	API
76	51.96%	48.04%	6.89%	37.31%	2.96%	0.84%	0.11%
77	44.52%	55.48%	3.47%	48.84%	1.83%	1.60%	0.07%
78	74.48%	25.52%	2.44%	18.50%	3.48%	0.60%	0.01%
79	26.12%	73.88%	1.90%	69.35%	1.53%	1.12%	0.01%
80	39.43%	60.57%	4.11%	52.10%	3.01%	0.82%	0.12%
81	42.72%	57.28%	2.81%	52.00%	0.77%	1.66%	0.00%
82	46.10%	53.90%	2.51%	49.74%	1.11%	0.47%	0.04%
83	53.00%	47.00%	1.59%	43.69%	0.59%	1.37%	0.01%
84	53.12%	46.88%	2.74%	41.55%	1.67%	1.22%	0.04%
85	43.06%	56.94%	4.37%	49.08%	2.45%	0.59%	0.07%
86	64.64%	35.36%	4.78%	25.04%	4.29%	0.82%	0.18%
87	32.35%	67.65%	4.38%	59.67%	2.21%	1.11%	0.10%
88	43.00%	57.00%	3.78%	50.10%	1.61%	1.14%	0.19%
89	61.84%	38.16%	3.71%	30.23%	3.43%	0.73%	0.02%
90	73.51%	26.49%	4.11%	17.20%	3.97%	0.73%	0.15%
91	43.20%	56.80%	3.82%	48.94%	2.78%	1.01%	0.05%
92	39.69%	60.31%	3.93%	52.78%	2.18%	1.41%	0.02%
93	38.54%	61.46%	5.46%	50.88%	3.62%	1.11%	0.04%
94	63.53%	36.47%	8.19%	22.77%	3.79%	1.06%	0.08%
95	52.21%	47.79%	7.44%	33.08%	5.92%	0.60%	0.03%
96	48.56%	51.44%	8.30%	28.67%	12.77%	0.88%	0.01%
97	63.29%	36.71%	6.73%	21.54%	6.80%	1.09%	0.12%
98	75.78%	24.22%	5.95%	11.73%	5.38%	0.87%	0.17%
99	80.43%	19.57%	3.94%	10.83%	3.68%	0.63%	0.16%
100	71.45%	28.55%	4.12%	20.61%	2.77%	0.73%	0.04%

Contiguity: The districts are all contiguous under the census standard for contiguity (described above). To our knowledge, they are contiguous under functional contiguity as well.

Compactness: Below are the Reock and Polsby-Popper scores for the districts. Only a handful of districts perform poorly under the Reock metric, while all perform well under the Polsby-Popper metric. Looking at the map as a whole using the metric in Dave's Redistricting App the Special Masters' ("SMs") House map is more compact than the current House map, a value of 50 for the SMs map as compared to a value of 34 for the current House map. In other words, compactness in the proposed map is nearly 1.5 times that of the current House map.

Evaluation of Compactness Criteria, Draft Virginia House Districts 1-25		
District	Reock	Polsby-Popper
1	0.3532	0.3944
2	0.2987	0.3636
3	0.3258	0.4172
4	0.5920	0.4342
5	0.4773	0.4299
6	0.3002	0.3190
7	0.4644	0.4180
8	0.3985	0.2730
9	0.4258	0.2892
10	0.4282	0.3087
11	0.5047	0.2864
12	0.4651	0.4225
13	0.4055	0.3700
14	0.3088	0.3625
15	0.5496	0.2912
16	0.5991	0.3435
17	0.4008	0.3424
18	0.2401	0.1828
19	0.3333	0.3030
20	0.4053	0.2472
21	0.4546	0.3548
22	0.4097	0.2424
23	0.2937	0.2150
24	0.3646	0.3240
25	0.3215	0.2372

Evaluation of Compactness Criteria, Draft Virginia House Districts 26-50		
District	Reock	Polsby-Popper
26	0.3565	0.2649
27	0.2201	0.2795
28	0.4628	0.3288
29	0.4388	0.3025
30	0.3872	0.2941
31	0.4249	0.3050
32	0.3951	0.2975
33	0.4441	0.2838
34	0.3476	0.2749
35	0.3534	0.2405
36	0.3706	0.2259
37	0.3585	0.2932
38	0.5652	0.2847
39	0.5604	0.3187
40	0.3254	0.1642
41	0.3242	0.1652
42	0.4278	0.1939
43	0.2108	0.2210
44	0.4157	0.5079
45	0.2414	0.2815
46	0.3541	0.3031
47	0.4170	0.2797
48	0.3287	0.2489
49	0.2936	0.2619
50	0.5403	0.3644

Evaluation of Compactness Criteria, Draft Virginia House Districts 51-75		
District	Reock	Polsby-Popper
51	0.2930	0.2405
52	0.4074	0.3101
53	0.2978	0.2068
54	0.4827	0.3124
55	0.3641	0.2827
56	0.3319	0.2743
57	0.2877	0.2656
58	0.4107	0.3229
59	0.3156	0.2503
60	0.2959	0.1781
61	0.3927	0.3311
62	0.2850	0.2468
63	0.4321	0.3886
64	0.3499	0.3106
65	0.4605	0.2728
66	0.4118	0.2028
67	0.2321	0.1991
68	0.3129	0.2365
69	0.2061	0.1396
70	0.3304	0.2576
71	0.3202	0.1584
72	0.5226	0.2916
73	0.5351	0.3079
74	0.4351	0.3665
75	0.3916	0.1766

Evaluation of Compactness Criteria, Draft Virginia House Districts 76-100		
District	Reock	Polsby-Popper
76	0.4152	0.3846
77	0.3409	0.2858
78	0.2761	0.2205
79	0.3078	0.2349
80	0.2617	0.2236
81	0.3001	0.2181
82	0.2051	0.2037
83	0.2805	0.2561
84	0.2388	0.1770
85	0.2800	0.3213
86	0.5226	0.5063
87	0.3463	0.3023
88	0.4524	0.4121
89	0.2984	0.2447
90	0.5333	0.4835
91	0.2538	0.1600
92	0.3579	0.2764
93	0.4740	0.2882
94	0.3017	0.3996
95	0.3990	0.3057
96	0.3406	0.4120
97	0.2774	0.2391
98	0.5686	0.5319
99	0.5905	0.5286
100	0.3046	0.4166

Partisanship: Because state races occur in the off-years, we determined that it was important not to use elections from presidential or midterm elections to evaluate partisanship. Instead, we used data from Virginia Attorney General elections. A summary of the Democratic performance in the 2017 Attorney General election is provided below. The results are sorted by Democratic vote share. The average Democratic performance in this race was 53.3% to the Republican's 46.6%. As you can see below, the median districts, 97 and 65, gave the Democrat 52.6% and 51.2%, respectively, in that race. This gives Republicans a slight advantage. However, it is difficult to eliminate this advantage given Virginia's political geography. Moreover, there are nine districts within five points of the statewide average on the Republican side, compared to only five on the Democratic side. In other words, although Republicans may find it slightly easier to win a majority, Democrats will have a tendency to enjoy larger majorities when they win. But overall, this map is well-balanced, does not unduly favor any party and did not need to be adjusted.

2017 Attorney General Election Results, Draft Virginia House Districts 1-25

Average Dem Performance = 53.33%

District	Democratic	Republican
79	91.6%	8.2%
4	81.2%	18.7%
3	81.1%	18.7%
2	79.6%	20.3%
54	79.3%	20.6%
92	78.6%	21.3%
87	77.8%	22.0%
1	77.5%	22.4%
80	76.8%	23.1%
93	76.7%	23.2%
5	76.0%	23.9%
13	73.9%	26.1%
77	72.6%	27.3%
78	72.6%	27.3%
17	72.0%	27.9%
91	71.7%	28.2%
12	71.4%	28.5%
7	71.0%	28.8%
23	69.7%	30.2%
14	69.4%	30.5%
85	69.0%	30.9%
8	68.9%	30.9%
16	68.6%	31.3%
19	68.3%	31.6%
88	68.0%	31.8%

2017 Attorney General Election Results, Draft Virginia House Districts 26-50

Average Dem Performance = 53.33%

District	Democratic	Republican
11	67.8%	32.1%
81	67.0%	32.9%
24	65.3%	34.5%
26	65.2%	34.8%
15	64.3%	35.5%
27	64.2%	35.7%
25	63.8%	36.1%
18	63.3%	36.7%
38	63.2%	36.8%
9	62.6%	37.3%
28	61.9%	38.0%
10	61.6%	38.4%
6	61.3%	38.6%
95	61.2%	38.7%
76	60.8%	39.2%
29	59.5%	40.5%
96	59.1%	40.8%
70	58.6%	41.2%
20	58.1%	41.8%
55	57.4%	42.5%
94	56.5%	43.4%
82	55.8%	44.1%
84	55.8%	44.2%
21	52.9%	47.0%
97	52.6%	47.3%

2017 Attorney General Election Results, Draft Virginia House Districts 51-75

Average Dem Performance = 53.33%

District	Democratic	Republican
65	51.2%	48.7%
89	51.1%	48.8%
41	51.1%	48.9%
58	49.6%	50.3%
86	48.8%	51.0%
71	48.6%	51.3%
83	48.3%	51.6%
22	48.2%	51.6%
66	47.8%	52.1%
30	47.7%	52.2%
75	47.4%	52.5%
57	47.3%	52.7%
34	46.1%	53.8%
100	45.8%	54.1%
64	45.6%	54.3%
69	45.4%	54.4%
49	44.6%	55.3%
52	44.2%	55.7%
99	44.2%	55.7%
40	42.5%	57.4%
73	42.4%	57.5%
74	41.6%	58.3%
50	41.2%	58.7%
59	41.2%	58.7%
98	41.1%	58.8%

2017 Attorney General Election Results, Draft Virginia House Districts 76-100

Average Dem Performance = 53.33%

District	Democratic	Republican
32	39.7%	60.2%
67	39.7%	60.2%
36	39.5%	60.4%
56	39.4%	60.5%
42	39.1%	60.8%
63	38.8%	61.1%
62	38.2%	61.7%
90	38.2%	61.7%
31	37.4%	62.5%
61	37.4%	62.5%
48	37.1%	62.8%
68	35.6%	64.3%
72	34.7%	65.2%
37	32.9%	67.0%
39	31.4%	68.5%
60	31.3%	68.5%
53	31.1%	68.8%
33	27.7%	72.2%
47	26.8%	73.1%
35	26.5%	73.4%
44	24.6%	75.3%
51	24.5%	75.4%
46	24.2%	75.7%
43	22.0%	77.9%
45	20.8%	79.1%