

REPORT OF STEPHEN ANSOLABEHHERE IN RESPONSE TO THOMAS B. HOFELLER

I. Statement of Inquiry

1. I have been asked to evaluate the rebuttal report issued by Dr. Thomas B. Hofeller in this case.

II. Background and Qualifications

2. My background and qualifications are discussed in my initial report, signed December 23, 2013.

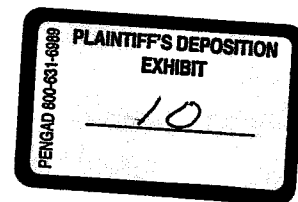
III. Sources

3. I relied on data and tables available through the North Carolina General Assembly website: <http://www.ncleg.net/representation/redistricting.aspx>.

IV. Findings

A. Geographic Characteristics of CDs 1 and 12

4. Dr. Hofeller states that the reduction in compactness in CDs 1 and 12 is not substantial. Specifically, he states that a reduction of the Reock score from .116 to



.071 in CD 12 and from .394 to .296 in CD 1 is small compared with the difference between those districts' scores and the Reock score of the ideal square district (.637) or ideal circular district (1.00). (Paragraphs 35-38 of his report.)

5. This observation underscores the fact that CD 12 was highly non-compact in the 2001-2011 map, and the new map, rather than improving on the district's compactness, only made it worse. Dr. Hofeller concedes that "both versions of the 12th District have miserable scores." (Paragraph 37) A Reock score can never go above 1 or below 0. It is the ratio of the area of a given district to the area of the most compact district of the same length (i.e., the inscribing circle). The lower the Reock score the smaller the area covered by the district relative to the most compact district of the same length. The smaller area actually covered for a given length, the less compact the district is. Or to put it another way, comparing two districts of the same area, the district that has a longer perimeter to encompass that area is less compact. Previous CD 12, the least compact district in the 2001 to 2011 map, had a very low Reock score of .116. The Reock of new CD 12 is even closer to the lower bound of 0.

6. New CD 1 has a Reock compactness score that is 37 percent lower than the Reock score of previous CD 1. That is, the new version of CD 1 reduced by 37 percent the area covered by CD 1 relative to the smallest inscribing circle around the district. New CD 12 has a Reock compactness score that is 25 percent lower than that of

Previous CD 12. These are noticeable reductions in the area of these districts, relative to the ideal district of the same length (i.e., the smallest inscribing circle).

7. Dr. Hofeller does not discuss the alternative measure of compactness offered in my report, which is the ratio of the area of a district to its perimeter. See Table 1 in my original report. The Area to Perimeter measure offers a somewhat different score of compactness. Comparing two districts of the same area, the district that has a longer perimeter to encompass that area is less compact. Or alternatively, the district that covers less area per mile of perimeter is less compact.

8. The new version of CD 1 has a ratio of Area to Perimeter of 6896, compared with 11098 in the previous version. In other words, each mile of perimeter in new CD 1 incorporates or encompasses 6,896 miles of land area. By comparison, each mile of perimeter in Previous CD 1 incorporates or encompasses 11,098 miles of land area. That is a 38% reduction in the compactness as measured by the Area to Perimeter metric (i.e., $(11098-6898)/11098$). This is the second largest reduction in the ratio of area to perimeter in the map.

9. The new version of CD 12 has a ratio of Area to Perimeter of 1839, compared with 2404 in the old version. In other words, each mile of perimeter in new CD 12 incorporates or encompasses 1,839 miles of land area. By comparison, each mile of perimeter in old CD 12 incorporates or encompasses 2,404 miles of land area. That is a 24% reduction in the compactness as measured by the Area to Perimeter metric

(i.e., (2404-1839)/2404). CD 12 already had, by far, the lowest ratio of Area to Perimeter, and it has the fifth largest reduction in this compactness measure in the map.

10. Dr. Hofeller points out that four other districts are highly non-compact according to the Reock measure. These are new CDs 4, 6, 9, and 11. (Paragraph 38) New CDs 4, 6, and 9 border new CDs 1 and 12 and are likely affected by the non-compact configurations of CDs 1 and 12. New CD 11 covers most of western North Carolina, and much of its shape is defined (and constrained) by the border of the state.

11. Both Reock and Area to Perimeter scores reveal that the map reduced the compactness of CDs 1 and 12 substantially, and CD 12 was already highly non-compact. Compactness is a traditional redistricting principle. Neither new CD 1 nor new CD 12 were constructed to improve their compactness.

B. Obama Vote, Black Registration, and Black VAP

12. Dr. Hoffeler states that the vote for Obama in 2008 was used as the main indicator in drawing district boundaries. He suggests that the Obama vote in 2008 was used to achieve partisan purposes, but offers no supporting evidence that these data had primarily partisan and not racial effects. (Paragraphs 36-39, 59-64)

13. What was the effect of using the Obama 2008 vote as an indicator to draw CD 1 and CD 12 in North Carolina? It is problematic and unusual to choose a single election with a Black candidate as an indicator of partisan performance. The reason that one wants to avoid using only one election in which one of the candidates is Black candidate in order to determine the partisanship of the vote is that it is difficult to infer whether the vote for that candidate was based on race or party. The relevant question is what is the effect of one of these factors (race or party) controlling for the other on the likelihood that an individual voter was included in either CD 1 or CD 12.

14. My initial report revealed that the effect of race controlling for party was substantial and much larger than the effect of party given race on the likelihood that an individual was included in CDs 1 or 12.

15. Further analysis of VTD level data reveals that the Obama vote is very highly correlated with Black Registration, and that analysis of Census data would have masked that association. Dr. Hofeller notes that the increase in TBVAP in CD 12 is nearly identical to the increase in 2008 vote for Obama (see his paragraph 63).

16. Table 1 presents the correlations between percent Black VAP or percent White VAP and percent vote for Obama in 2008. Statewide, the correlation between Black VAP and Obama vote is .60. Obama vote is correlated with Census racial data, but the correlation is not very high.

17. Table 1 also presents the correlations between percent Black Registration or percent White Registration and percent vote for Obama in 2008. Statewide, the correlation between Black VAP and Obama vote is very high, .80.

18. In this particular circumstance, then, registration data reflecting race are a stronger correlate with Obama 2008 Vote than are Census data. Specifically, Black and White percent of voting age population in Census data are more weakly correlated with Obama vote than are Black and White Percent of Registered Voters in the State of North Carolina. If one were to look only at the association between Census data and Obama vote in North Carolina, then the effect on Black registered voters of using the Obama vote as an indicator in districting would be obscured.

19. The correlations between Black (or White) Registration and the Obama vote are particularly high in CDs 1 and 12. I further divided the VTDs in the state into those VTDs that are or were in new or previous CD 1, new or previous CD 12, and all other VTDs. The correlations between Black (or White) Registration and the Obama vote are .82 (or -.87 for Whites) in CD 1 and .92 (or -.93 for Whites) in CD 12. These are extremely high correlations. In the VTDs in CD 12, the correlation between the Obama vote and Black Registration is approaching 1. The Obama vote, then, is an extremely strong positive indicator of the location of Black registered voters in the areas around CDs 1 and 12. It is extremely strong negative indicator of the location of White registered voters in the areas around CDs 1 and 12.

20. Thus, Dr. Hofeller's statement that he only used the Obama vote to draw congressional districts does not undermine the conclusion that race predominated over party as a factor in drawing CDs 1 and 12. Whatever indicator or indicators were used by the map drawers, the measures had the effect of making Black registered voters of each partisan group much more likely to be included in CDs 1 and 12 than White registered voters of the same partisan group. And those indicators had relatively little effect on making Democratic registered voters of each racial group more likely to be included in a district than Republican registered voters of that same racial group.

C. Methodology for assessing racial and partisan patterns

21. A central question is whether race or party was the predominant factor in explaining or predicting which voters were included in CDs 1 or 12. In order to make this determination, one wants to gauge the effect of race controlling for party and party controlling for race. Otherwise, the vote for a candidate who is, say, a Democrat and Black may be interpreted as either an indicator of Democratic vote or of Black vote.

22. The methodology that I employed addresses that question in three steps. First, I ascertained the extent to which race of the registrant predicts the likelihood of being included in CD 1 or CD 12, holding constant the party of the registrant. The

effect of race given party equals the difference between the likelihood that a Black voter of a given party is included in a district and the likelihood that a White voter of that same party is included in that district. Second, I ascertained the extent to which party of the registrant predicts the likelihood of being included in CD 1 or CD 12, holding constant the race of the registrant. The effect of party given race equals the difference between the likelihood that a Democrat of a given race is included in a district and the likelihood that a Republican of that same race is included in that district. Third, I compared the effect of race given party with the effect of party given race. I examined the relationship between race and party on the likelihood that different types of registered voters are included in CD 1 or CD 12. This approach is suggested elsewhere in the literature on racial voting, such as Gary King, *A Solution to the Ecological Inference Problem: Reconstructing Individual Behavior from Aggregate Data*, Princeton University Press: Princeton, NJ, 1997, pages 12-14 generally and Chapter 10, on registration specifically. Dr. Hofeller is critical of this approach (e.g., paragraphs 27, 33, and 52).

1. General Criticisms

23. Dr. Hofeller states (paragraph 27) that the analysis offered shows nothing more than that there is higher Black Voting Age Population in the areas moved into CDs 1 and 12 than then areas moved out. In fact, my analysis goes further than that, as it estimates the effect of race controlling for party and party controlling for race. The simple Census data only state whether there are more Blacks or more Whites in CD1

or CD12, not whether the increase in Black population was due to an increase in Democrats who happened to be Black or an increase in Blacks across all party groups. My analysis showed that it was the latter.

24. Dr. Hofeller suggests that a better approach would be to look at the relationship between Census demographic data and the vote for Obama in 2008. (Paragraph 55) He never states what sort of analysis exactly is to be performed or how those data could be used to separate the effects of race and party in estimating the likelihood of inclusion in CD 1 or CD 12.

25. He offers no such analysis of the VTD-level data. He offers no assessment of the likelihood that a Black or White voter of a given party was included in CDs 1 or 12. He offers no assessment of the likelihood that a Democrat or Republican of a given race was included in CDs 1 or 12.

2. Use of Registration Data

26. Dr. Hofeller questions the use of registration data to perform this analysis, rather than election results. (paragraphs 33 and 55)

27. The unique advantage of registration data in this particular circumstance is that it allows us to measure separately the effect of party given race and the effect of race given party on the likelihood that an individual is included in CD 1 or CD 12. North

Carolina is one of a handful of states that lists race and party on the voter registration lists. By counting the numbers of White and Black Democrats, White and Black Republicans, and White and Black Unaffiliated registrations we can estimate the effect of race given party and party given race. Those estimates were offered in my initial report. (See Tables 9 and 10 in that report.)

28. The individual level data allow analysis of the question at hand without resorting to ecological regression, ecological inference or other more complicated methods.¹ My original analysis estimated the effect of race controlling for party and of party controlling for race using data on individual registered voters in the State of North Carolina and in the areas of the districts in question.

29. Dr. Hofeller offers no alternative methodology or analyses using aggregate Census and election data, such as at the level of the VTD, to address this matter.

30. Dr. Hofeller suggests, but offers no evidence, that registration is not tightly related to election results. (Hofeller, paragraph 33)

31. Registration is highly correlated with actual election results in the State of North Carolina. The correlation between Democratic share of party Registration and the Obama Vote is .78. The correlations were even higher with respect to the other

¹ See Gary King, *A Solution to the Ecological Inference Problem: Reconstructing Individual Behavior from Aggregate Data*, Princeton University Press: Princeton, NJ, 1997, especially Chapters 1 and 10.

statewide elections in 2008. The correlation between Democratic share of party Registration and the Democratic share of vote for Governor in 2008 is .90, and the correlation Democratic share of party Registration and the Democratic share of vote for United States Senate in 2008 is .83.² These correlations reveal that registration is in fact a strong predictor of electorate choice in the State of North Carolina. It is further worth noting that the Obama vote in 2008 has the weakest correlation with party registration of the three statewide elections that year, suggesting that it may have been the least useful of the three elections to use as a pure indicator of party. And, the correlation between Black registration and the Obama vote is slightly stronger (.80) than the correlation between Democratic registration and Obama vote (.78).

32. Party registration is itself an electoral choice in the State of North Carolina. Party registration in the State of North Carolina restricts in which party's primary a person can vote.

33. As demonstrated in Table 1, Black Registration, not Black VAP, is a much stronger correlate of the Obama vote. Given Dr. Hofeller's claim that the Obama vote is the relevant indicator, the strength of correlation of Black Registration suggests that the analysis of registration is highly informative of voting behavior, and more indicative of the electoral effects on Black voters than would be an analysis of the association of Obama vote with Black VAP. Hence, I conclude that analysis of

² Correlations are weighted correlations, and VTDs are weighted by the total number of presidential ballots in 2008.

registration data is highly relevant to understanding the effects of the new CDs 1 and 12 on Black voters. And, the analysis in my original report revealed that race controlling for party is a much stronger indicator of inclusion in those CDs than is party controlling for race.

3. Areas of Analysis

34. I offer two separate analyses of the target areas or populations for the location of CDs 1 and 12. One such analysis examines all registered voters in the counties in which the CDs are located – called the envelope of counties. The other analysis examines sets of VTDs that were in either new CD 1 or previous CD 1 (or new CD 12 or previous CD 12).

35. Dr. Hofeller questions my use of the counties in which CDs are located and states that such a choice is highly unusual. (paragraph 52)

36. Analysis of racial voting patterns at the county level and of the counties in which a district is situated is quite common in voting rights cases. The wide use of counties in performing ecological regressions informed my decision to use counties as a target area. Other expert reports in cases concerning the 2011 North Carolina redistricting, including a report filed by Defendants' expert in the state court case, also examine county-level racial voting data to assess the likely effects of the districts. See the reports of Thomas Brunell, "Report on Racially Polarized Voting in

North Carolina,” June 14, 2011. 11 CVS 16896, 11 CVS 16940, and Ray Block, Jr., “Polarized Voting in 2006, 2008, and 2010 in North Carolina State Legislative Contests,” Case 1:13-cv-00949-WO-JEP. Filed 1/17/14.

37. Crossing of county lines is sometimes used as an indicator of respect for natural or other political geographies in the process of drawing lines. Hence, counties are sometimes treated as a relevant unit of analysis in understanding the locus of districts.

38. Other researchers have used VTDs in and neighboring a district as the target areas for the analysis of the racial effects of a districting plan. See the report of Gary King and Benjamin Schneer to the Arizona Independent Redistricting Commission; Gary King and Benjamin Schneer, “Analysis of the Arizona Independent Redistricting Commission Congressional Map” http://gking-projects.iq.harvard.edu/AZ-DOJ/az_report_cd.pdf.

D. District Population Growth

39. Dr. Hofeller states that, in addition to partisanship and preclearance, an important policy goal of the legislature was guarding against the underpopulation of CD 1 in the future. (Paragraph 71.)

40. Dr. Hofeller states that CD 1 was moved away from slow growing rural counties and into urban areas in order to create a district that would likely retain its population over the coming decade. He discusses the rural counties in his rebuttal report. (Paragraphs 20 and 51) However, he does not state what data or population forecasts were used for the district in 2020. He does not state the process for deciding which urban areas (especially which VTDs) to *include* in CD 1.

41. To assess the claim that the areas added to CD 1 were included primarily to counteract population declines, and were not racially motivated, I examined the changes to CD 1 in the City of Durham and County of Durham. CD 1 in the 2001-2011 map did not include any part of the City or County of Durham. New CD 1 includes 159,691 persons from this county, which accounts for 21.8% of the population of the New CD 1.

42. Population growth data for the VTDs are not available in the North Carolina State Legislature's Redistricting website. Population and registration counts by race, however, are available at that website. I analyzed those data to see if the Voting Age Population and registered voters in the portions of the City and County of Durham that were included in CD 1 were disproportionately Black.

43. Table 2 presents the racial composition of the City of Durham and the County of Durham and the racial composition of the portions of these jurisdictions that were added to CD 1. Each cell presents the number of persons in that category. In the

City of Durham, for example, 69,454 persons of Voting Age are Black alone, and the VTDs in the City of Durham that were included in CD 1 contain 55,265 persons who are Black alone.

44. Comparison of the percent of Blacks and percent of Whites who were included in CD 1 from the City of Durham and the County of Durham reveals that Blacks in these jurisdictions were disproportionately likely to be added to CD 1. The majority of Whites in these jurisdictions were included in other CDs.

45. Using the data in Table 2, one can calculate the percent of a given group in the City or County of Durham that was included in CD 1. For example 79.6 percent ($55,265/69,454$) of all people in the City of Durham who considered themselves to be Black (and no other race) were included in CD 1. Similar calculations can be made for each racial group and for Voting Age Population and Registered Voters.

46. In the City of Durham, 79.6 percent of the Black Voting Age Population was included in CD 1. 48.4 percent of the White Voting Age Population was included in CD 1.

47. In the City of Durham, 80.5 percent of Black Registered Voters were included in CD 1. 44.2 percent of White Registered Voters were included in CD 1.

48. In the County of Durham, 77.6 percent of the Black Voting Age Population was included in CD 1. 43.3 percent of the White Voting Age Population was included in CD 1.

49. In the County of Durham, 78.5 percent of Black Registered Voters were included in CD 1. 38.9 percent of White Registered Voters that were included in CD 1.

50. The boundary of CD 1 in the City and County of Durham was disproportionately more likely to incorporate Blacks than Whites. Black registered voters in the County of Durham were twice as likely as Whites to be included in CD 1.

E. Population Equality

51. Dr. Hofeller states that equalizing population was one of the four major policy objectives of the State Legislature in the construction of new CDs 1 and 12. This is a legal requirement under the United States Constitution as interpreted by the Supreme Court of the United States.

52. In the case of CD 12, this requirement did not appear to exert much of a constraint on the extent to which the State Legislature shifted populations among districts in the process of drawing the Rucho-Lewis map.

53. Previous CD 12 needed few changes in order to equalize population. According to the 2010 Census enumeration statistics provided by the North Carolina Legislative Redistricting site, the district had only 2,847 more persons than the ideal district of 733,500. In other words, prior to redistricting, CD 12 needed to have only 2,847 people removed from the district in order to achieve the equal population objective.

54. The Rucho-Lewis map, however, added 239,064 people to CD 12 and removed 241,911 people from CD 12. And, the populations added to new CD 12 were disproportionately Black compared with the areas removed from previous CD 12. Of the 239,064 people added to CD 12, 105,132 people (44%) were Black. Of the 241,911 people removed from CD 12, 56,046 people (23%) were Black. In other words, the changes in CD 12 from the 2001-2011 map to the Rucho-Lewis map increased the number of Black persons in CD 12 by 49,086 (i.e., 105,132 minus 56,046). The change in the Black population far surpasses the changes in the district needed to maintain equal population.

	Entire State	CD 1	CD12	Districts Other than CD 1 and CD 12
Black VAP	+0.60	+0.47	+0.65	+0.46
White VAP	-0.64	-0.54	-0.69	-0.50
Black R.V.	+0.80	+0.82	+0.92	+0.69
White R.V.	-0.81	-0.87	-0.93	-0.69

City of Durham				
	Voting Age Population		Registered Voters	
	All Areas	In CD 1	All Areas	In CD 1
Black Alone	69,454	55,265	62,768	50,570
White Alone	80,598	39,010	75,664	33,442
Total	176,435	111,769	152,297	92,492
County of Durham				
	Voting Age Population		Registered Voters	
	All Areas	In CD 1	All Areas	In CD 1
Black Alone	75,440	58,560	69,542	54,610
White Alone	103,053	44,624	94,725	36,867
Total	207,266	121,895	179,309	100,189



Stephen Ansolabehere

January 29, 2014

Cambridge, Massachusetts

Exhibit 1 - Ansolabehere Report