IN THE COMMONWEALTH COURT OF PENNSYLVANIA

League of Women Voters of Pennsylvania, Carmen Febo San Miguel, James Solomon, John Greiner, John Capowski, Gretchen Brandt, Thomas Rentschler, Mary Elizabeth Lawn, Lisa Isaacs, Don Lancaster, Jordi Comas, Robert Smith, William Marx, Richard Mantell, Priscilla McNulty, Thomas Ulrich, Robert McKinstry, Mark Lichty, Lorraine Petrosky,	)	
Petitioners,	)	
v.	)	No. 261 M.D. 2017
The Commonwealth of Pennsylvania; The Pennsylvania General Assembly; Thomas W. Wolf, In His Capacity As Governor of Pennsylvania; Michael J. Stack III, In His Capacity As Lieutenant Governor of Pennsylvania And President of the Pennsylvania Senate; Michael C. Turzai, In His Capacity As Speaker of the Pennsylvania House of Representatives; Joseph B. Scarnati III, In His Capacity As Pennsylvania Senate President Pro Tempore; Robert Torres, In His Capacity As Acting Secretary of the Commonwealth of Pennsylvania; Jonathan M. Marks, In His Capacity As the Commissioner of the Bureau of Commissions, Elections, and Legislation of the Pennsylvania Department of State,	)	Pages 322 - 694
Respondents.	)	

COMMONWEALTH COURT OF PENNSYLVANIA, Volume II

BEFORE: HONORABLE JUDGE KEVIN BROBSON

DATE: DECEMBER 12, 2017; 9:27 A.M.

PLACE: COMMONWEALTH COURT
PENNSYLVANIA JUDICIAL CENTER
601 COMMONWEALTH AVENUE
HARRISBURG, PA 17106

REPORTED BY: CINDY L. SEBO, RMR, CRR, RPR,

APPEARANCES:
ARNOLD & PORTER KAYE SCHOLER LLP
BY: DAVID P. GERSCH, ESQUIRE
BY: JOHN D. CELLA, ESQUIRE
BY: ELIZABETH S. THEODORE, ESQUIRE
BY: DANIEL JACOBSON, ESQUIRE
BY: JOHN ROBINSON, ESQUIRE
BY: JOHN A. FREEDMAN, ESQUIRE
601 Massachusetts Ave, Northwest
Washington, D.C. 20001
202.942.5000

AND

BY: ANDREW D. BERGMAN, ESQUIRE
700 Louisiana Street
Suite 4000
Houston, Texas 77002-2755
713.576.2430

AND

THE PUBLIC INTEREST LAW CENTER
BY: MARY (MIMI) MCKENZIE, ESQUIRE
BENJAMIN GEFFEN, ESQUIRE
United Way Building, 2nd Floor
1709 Benjamin Franklin Parkway
Philadelphia, Pennsylvania 19103
267.546.1319

FOR - PETITIONERS

CIPRIANI & WERNER, P.C.
BY: RUSSELL D. GIANCOLA, ESQUIRE
BY: KATHLEEN A. GALLAGHER, ESQUIRE
650 Washington Road, Suite 700
Pittsburgh, Pennsylvania 15228
412.715.8073

FOR - LEGISLATIVE RESPONDENTS and
MICHAEL C. TURZAI

APPEARANCES (Continued):
OBERMAYER REBMANN MAXWELL & HIPPEL LLP
BY: LAWRENCE J. TABAS, ESQUIRE
BY: TIMOTHY J. FORD, ESQUIRE
Centre Square West
1500 Market Street, Suite 3400
Philadelphia, Pennsylvania 19102-2101
215.665.3000
FOR - INTERVENORS

HANGLEY ARONCHICK SEGAL PUDLIN & SCHILLER
BY: MICHELE D. HANGLEY, ESQUIRE
BY: MARK A. ARONCHICK, ESQUIRE
One Logan Square, 27th Floor
Philadelphia, Pennsylvania 19103
215.568.6200

FOR - RESPONDENTS THOMAS W. WOLF,
ROBERT TORRES, JONATHAN M. MARKS

BAKER & HOSTETLER LLP
BY: PATRICK T. LEWIS, ESQUIRE
Key Tower, 127 Public Square
Suite 2000
Cleveland, Ohio 44114-1214
216.861.7096
AND
BY: ROBERT J. TUCKER, ESQUIRE
200 Civic Center Drive, Suite 1200
Columbus, Ohio 43215-4138
614.462.2680

FOR - LEGISLATIVE RESPONDENTS

APPEARANCES (Continued):
BLANK ROME LLP
BY: BRIAN S. PASZAMANT, ESQUIRE
One Logan Square
130 North 18th Street
Philadelphia, Pennsylvania 19103-6998
215.569.5791

FOR - RESPONDENTS JOSEPH B. SCARNATI, III and
MICHAEL C. TURZAI

HOLTZMAN VOGEL JOSEFIAK TORCHINSKY PLLC
BY: JASON TORCHINSKY, ESQUIRE
45 North Hill Drive, Suite 100
Warrenton, Virginia 20186
540.341.8808
FOR - RESPONDENTS JOSEPH B. SCARNATI, III and
MICHAEL C. TURZAI

STRADLEY RONON STEVENS & YOUNG, LLP
BY: KARL S. MYERS, ESQUIRE
BY: JONATHAN F. BLOOM, ESQUIRE
2005 Market Street, Suite 2600
Philadelphia, Pennsylvania 19103
215.564.8193

FOR - RESPONDENTS THE PENNSYLVANIA GENERAL
ASSEMBLY

APPEARANCES (Continued):
COHEN & GRIGSBY, P.C.
BY: CLIFFORD B. LEVINE, ESQUIRE
625 Liberty Avenue, 5th Floor
Pittsburgh, Pennsylvania 15222-3152
412.297.4998
FOR - RESPONDENT MICHAEL J. STACK

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P R O C E E D I N G S

Harrisburg, Pennsylvania
December 12, 2017; 9:27 a.m.

THE CLERK: Good morning, everyone. Welcome to Commonwealth Court. Just a reminder, make sure all cell phones and electronics are turned off, other than counsel.

Thank you.

(Pause.)

THE CLERK: All rise. The Commonwealth Court is now in session, the Honorable Judge Kevin Brobson presiding.

THE COURT: Please be seated, everyone. And good morning.

Is Dr. Chen still here?

We're ready to call him, or did somebody have anything they wanted to bring up at this point?

No?

Okay. Dr. Chen, will you please retake the stand?

- - -

JOWEI CHEN, PH.D.

after having been previously duly sworn, was examined and testified further as follows:

- - -

THE COURT: Dr. Chen, I will remind you that you are still under oath.

- - -

DIRECT EXAMINATION (RESUMED)

- - -

BY MR. JACOBSON:

Q. Good morning, Dr. Chen.

A. Good morning, sir.

Q. Dr. Chen, I believe you said yesterday that your simulation methodology involves independent simulations.

Could you remind us what that means?

A. Yes, sir. And that's really the key to understanding any statistical analysis of these simulated plans.

Q. I think she just wants you to talk into the mic.

A. So we start with the point that what the simulations do is run independently of one another. When the computer is generating simulated

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plans, it is following, every time, the same instructions; but every time -- out of those 1,000 plans, every time, it starts anew, building a districting plan that is completely independent of the previous one that is drawn.

So if you look at District Plan Number 2 -- Districting Plan Number 2, it's completely different from Districting Plan Number 1. That is the sense in which they are independent. They follow the same traditional districting criteria but are otherwise random; they are independent of one another.

And so starting from that point, then, what we need to understand is what do you need in order to be able to draw strong statistical conclusions from these independent simulated plans. And you can think of it with an analogy. Think of it as flipping a coin.

If you flip a coin 50 times, and you see that about half of the time -- times, it comes up as heads, and the other half, it comes up as tails, do you really need to flip it a 51st time in order to learn something new? Are you going to learn something new by flipping a coin a 51st time when you've already seen 50 flips of the coin?

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That's what we mean by drawing strong statistical conclusions. If you've already seen 50 independent samples, what are you going to gain by seeing a 51st sample?

So that's what we do when we construct samples. You construct a reasonable sample, 25 or more simulated plans, and you're able to draw strong statistical conclusions on the basis of that.

Now, of course, what we've seen in my report is the analysis of 1,000 different plans. So to put that more concretely, if you've already seen 1,000 different flips of a coin, do you really need to flip the coin 1,001st time to be able to draw strong statistical conclusions about whether or not this is a fair point?

That's what I mean by that.

Q. And, Dr. Chen, have you read a working paper by, I believe, a graduate student at Princeton named Benjamin Fifield?

A. Yes, sir. He's a graduate student at Princeton, and he has a working paper on his own completely different districting simulation algorithm.

Q. And in what context have you read that paper?

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A. Well, obviously, as a result of my own expertise on redistricting simulations, I'm frequently asked to review and to discuss and comment on other scholars' papers in the area. And I have multiple times -- on multiple occasions been asked to review and to discuss -- to offer comments on -- on his paper.

Q. And -- and how does the algorithm that Mr. Fifield uses to simulate -- you know, to assess redistricting issues -- how does that compare to the algorithm that you use?

A. Oh, it's a completely different one. He uses what's called a Monte Carlo/Markov chain algorithm. It's completely different. And -- although I don't want to speak for his work. Obviously, as I've said, I've read it in quite some detail and multiple times, and it's -- it's very different.

He is not conducting independent simulated districting plans in the way that I just described in response to your previous question, sir; he's using a Markov chain. This is the sort of algorithm that starts with a particular plan, an already-established plan. It doesn't particularly matter which plan it is, but he starts with a plan,

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and he makes iterative changes to it.

So the second simulation depends on where the first one ended up, and the third one is building on where the second one ended up. It's an iterative algorithm. They're not independent of one another. That's the nature of the Markov chain. That is completely, fundamentally different than the methodology in the simulation algorithm that I use. Those are two completely different things.

Q. So other than the fact that you guys both use a computer, would you say that your algorithms have anything in common, bear any resemblance to one another?

A. Yeah, that's about it: We both use a computer. We're both interested in districting questions. I think, in his paper, he studies completely different jurisdictions, different states. I don't remember if he studies Florida, but completely different states. I certainly don't think his -- his study was looking at Pennsylvania.

That's -- that's about it: We both use -- use computers. So -- so that's -- that's a similarity.

Q. Thank you, Dr. Chen.

On a final topic, did you review the

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expert report submitted by Legislative Respondents' expert Dr. McCarty in this case?

A. Yes, sir, I did.

Q. And, Dr. Chen, what is your understanding of the first step that Dr. McCarty takes to calculate the partisanship of each district in Pennsylvania?

A. Well, he has a couple of different convoluted measurements that he uses to look at the partisanship of districts. But in general, what he purports to do is to use the 2008 and 2012 presidential elections --

Q. Sorry. Which years did you say?

A. Well, let me -- let me just back up. Let me -- let me first start with how he measures the enacted plan.

Q. Yes.

A. Okay. So I'll start there, and I'll explain how Dr. McCarty, in his report, states that he measures the partisanship of the enacted plan -- of the enacted 2011 plan.

What Dr. McCarty states is that he uses the 2004 and 2008 presidential elections to evaluate the enacted plan. Now, he later goes back and uses a different set of elections to examine the

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partisanship of other districting plans around the country.

So I just want to make that distinction clear. He's got, actually, three different measures going on in his report that he uses at different times for different purposes.

Q. And what does he call -- you said he uses 2004 and 2008 to measure partisanship.

What does he call that? What's the term he uses for the partisanship of each district?

A. He calls it, sir, a "PVI," a partisan vote index. And that is -- again, that is the name of his measurement or what he calls the measurement of his -- his estimating the partisanship of the 2011 Pennsylvania Congressional districts.

Q. Now, Dr. McCarty, once he calculates his PVI for each, you know, Congressional district in Pennsylvania, plus one, minus one, you know, so on, does he stop there and just look at the PVI for each district in terms of estimating the probability that a Democrat or a Republican would win each district under the enacted plan?

A. No, sir, he doesn't. He goes into a convoluted methodology of giving us his estimate or his prediction about the probability that such a

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district would elect a Democrat versus a Republican.

Q. And -- and what does he do to do that?

A. He translates that PVI into his estimated probability of a Democratic victory. And the way that he does that is by looking at other districts around the country, outside of Pennsylvania, that he considers to be similar in partisanship.

So if he had a district in Pennsylvania with a PVI, for example, of 26 -- let's say 26 in favor of the Democrats, then what he would do -- what Dr. McCarty reports that he does in his report is he goes into other states, looks around the country and tries to find districts with a similar PVI, with the same PVI around the country, in other states, like New Mexico and Alaska, and he goes and finds other districts that he believes have a similar PVI or the same PVI.

And he then estimates the probability that those districts would elect a Democrat. In other words, he is trying to predict the partisanship outcome of Congressional elections in the State of Pennsylvania by looking to elections all around the country in places like New Mexico and Alaska.

Q. And what do you think of that sort

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of -- I'll call it a "conversion methodology," where he converts the PVI of Pennsylvania districts to a probability of winning based on election results across the country?

A. In a hypothetical world in which voters in Alaska and New Mexico are exactly like voters in Pennsylvania, that would be totally fine. Unfortunately, of course, as political scientists have known for decades, the realities of political dynamics in Congressional elections can vary quite a bit from state to state.

And so it's not really a reasonable or an accepted methodology to say I'm going to look just at a very narrow, particular band of districts around the country, chosen simply because they have a particular PVI, and make inferences about how districts in Pennsylvania will perform based on districts in other states, like New Mexico or Alaska.

Q. And -- and -- okay. Let's put that sort of issue to the side for a second, how he converts the PVI using results in other states, and let's just talk about how he actually calculates the PVI for each district in Pennsylvania.

Before we go into the details, Dr. Chen, do you have any general observations about

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Dr. McCarty's calculation of PVI both in the real enacted plan in Pennsylvania and in your simulated districts?

A. Well, that's just the thing, sir. It wasn't a single method of calculating the PVI; as I said, there were three different methods. There were a lot of different methods flying around in his report. And here's what I noticed about them: Not only were they completely different methods, he chose, for example, one method -- one very specific method using one set of elections to calculate the PVI of the enacted Pennsylvania 2011 Congressional districting plan.

And then he went back, though -- he looked at my simulated districting plans, the 1,000 plans in my report, and he didn't apply that same methodology and he didn't use the same elections. Instead, sir, he used a completely different methodology, a much more convoluted methodology. And he used a completely different set of elections as inputs into that very different methodology, his very different statistical method of calculating or estimating PVI.

So he used two completely different methods: one to estimate the PVI of the enacted plan

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in Pennsylvania; and then a second method, a completely different method, to analyze the PVI of the districts in all of my 1,000 simulated plans.

And what was striking was not simply that they used different methodologies and different elections, but it was the bias introduced by each of those methodologies. They had two very different skews or biases. One methodology that he used to evaluate the enacted plan had the effect -- the choices that he made had the effect of making that enacted plan, Pennsylvania's Congressional enacted plan -- the choice of methodology that he made had the effect of making that enacted plan seem to Dr. McCarty less Republican-leaning than it really was, less Republican-leaning than the 13-5 outcomes that have actually been merged, which, obviously, I spoke at great length yesterday.

So that was one choice that he made.

Now, if he had taken that methodology and consistently applied it throughout the report, that might not have been such a bad thing. At least he would have been using a consistent methodology with a consistent set of elections. But that's not what he reported that he did. Instead, he reported something completely different, a completely

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different methodology when he evaluated the 1,000 simulated plans from my report.

So he chose a completely different methodology based on a different set of elections as inputs. And what was so striking to me about this completely different methodology that he used in this part of his report looking at my simulated plans was that it generally had the effect of making the simulated districts in the simulated plans look more Republican-leaning than they actually were.

So there were two disparate effects here, two different methodologies with two different effects on his perception of PVI. The one choice that he made with respect to the enacted plan, that had the effect of making Dr. McCarty perceive the enacted plan as less Democratic-leaning than it really was -- I'm sorry -- it had the effect of making Dr. McCarty perceive the enacted plan as less Republican-favorable than it actually was.

But then different methodology that he used when he looked at all of my simulated plans, the ones following traditional districting criteria, he made a completely different choice that made him perceive those simulated plans to be more Republican-leaning than they actually were.

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And it was on that basis that he claims that he reached the crux of his conclusion, which was that he was unable to distinguish a very strong difference between the partisanship of the enacted plan versus the computer-simulated plans.

So that was what was so striking to me in reviewing the methodologies, the multiple methodologies employed by Dr. McCarty in the different parts of his report.

Q. Thank you, Dr. Chen.

And just to briefly explore those two different effects that you mentioned, what --

THE COURT: Briefly?

MR. JACOBSON: Relatively briefly.

BY MR. JACOBSON:

Q. -- what -- what elections did you say Dr. McCarty used to evaluate the PVI of each Congressional district under the enacted plan? Which presidential elections?

A. Dr. McCarty reported that he used the 2004 and 2008 elections -- presidential elections.

Q. And do you have an opinion on the suitability of using those particular elections to estimate PVI for the 2011 Congressional districting plan?

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A. Well, if we were trying to estimate the partisanship of the previous decade's plan, I think those would be, perhaps, reasonable elections to choose. But, generally, when we want to evaluate an enacted plan, we want to use recent elections. That is why I explained yesterday I used the 2008 and 2010 statewide elections. They were the most recent statewide elections available to the legislature when it drew the 2011 Plan. That's the importance of it; they were recent.

And as political scientists -- well, I mean, to be quite honest, you really don't need a political science Ph.D. to know this. Recent elections are obviously going to be a more accurate indicator of partisanship than elections that temporally occurred several years.

But the point is -- obviously, we know this as political scientists -- that you use more recent elections. And, certainly, I know, as a redistricting expert, that that is what legislatures use; they use more recent elections when they want to evaluate the partisanship. They weight more heavily recent election data when they want to evaluate the partisanship of a proposed or a hypothetical district.

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So that's what we know as political scientists, and that's what I know as a redistricting expert.

MR. JACOBSON: And if we can pull up Petitioners' Exhibit 34.

BY MR. JACOBSON:

Q. Dr. Chen, the six left-hand -- is it six or seven? -- it might be seven -- the seven left-hand columns here which are under a heading, McCarty calculations using 2008 and 2012 presidential elections, the data in those columns, where did those data come from?

A. Those came straight from a data file that Dr. McCarty turned over in connection with his report. It was a file called Intermed.DTA. So that was just the six columns -- or, actually, seven columns, I guess, reported in his file called Intermed.DTA, and they represent his calculations of the PVI of Pennsylvania's Congressional districts using 2008 and 2012 presidential votes.

Q. And did Dr. McCarty include that data and those calculations using 2008 and 2012 presidential elections -- did he include that in his report?

A. No, sir, he did not. He calculated it; he had a file with these calculations; he had saved the calculations, but he obviously chose not to include it in his report.

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Q. And if we look now to the column that says, PVI in McCarty report, 2004 and 2008, what does that column represent?

A. That column, sir, are the PVI numbers that Dr. McCarty actually did report in Table 1 of his report. Those were the PVI calculations he claimed he reached -- and I actually verified that -- that he, in fact, did have code and data that produced those calculations.

Q. And if we look down -- pick an example here -- District Number 7, what do you observe in comparing the PVI that Dr. McCarty calculated using 2012 data but didn't report versus the PVI that he actually used for purposes of his report?

A. Well, on the left side of this table, we see that using the 2008 and 2012 presidential elections -- this is the data that Dr. McCarty did not report -- did not include in his report -- in his final report. Dr. McCarty calculated a PVI of negative 2. That means it's a slightly Republican-leaning district, using his -- his index of PVI where higher numbers mean Democratic-leaning,

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lower numbers mean Republican-leaning. So, obviously, a negative 2 is a slightly Republican-leaning PVI.

That's what he calculated using the 2008 and 2012 presidential elections. And, again, he did not include this in his report.

What he actually did include in his report is on the right side on that column that you just alluded to, the one -- the column entitled PVI in McCarthy report. It was calculated using the 2004 and 2008 presidential elections.

So using those elections, Dr. McCarty calculated -- and I verified his numbers -- he calculated them using those elections. He allocated a PVI of zero. In other words, that is a PVI that makes that particular district look a little bit more Democratic-leaning than if he had used his other calculations.

So he produced two sets of calculations, and he reported the calculation that made the enacted District Number 7 look a little bit more Democratic-leaning.

MR. JACOBSON: And if we could pull up and look at the effect of this choice -- pull up Legislative Respondents'

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Exhibit Number 17, which is Dr. McCarty's report.

THE COURT: Can I ask a question? What exhibit was that? Was that yours or was that --

MR. JACOBSON: Petitioners' 34.

THE COURT: That was Petitioners' 34.

Now, you're pulling up a Legislative Respondents' exhibit?

MR. JACOBSON: Yes.

THE COURT: Which is what, again?

MR. JACOBSON: Exhibit 17, I believe, which is Dr. McCarty's report.

THE COURT: Okay.

MR. JACOBSON: And if we could scroll down to the very end, the appendix at the very end.

The next page, please.

BY MR. JACOBSON:

Q. Now, if we look -- this is going to get a little confusing, but how do the plus and minus signs on this report correspond to the ones we were just looking at, Dr. Chen?

A. Sure. This is Dr. McCarty's somewhat

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convoluted methodology, but I'll try and explain it as best as I can from my reading of his report.

Dr. McCarty looks at the negative 2 PVI that we saw in the left column in the previous exhibit that we had up here, and he sees that a negative 2 PVI would result in -- which is a slight --

Q. Is the sign --

A. The sign is flipped -- the sign is flipped, which is what makes -- makes Dr. McCarty's report a little bit confusing. But it's pretty clear what he was actually intending to do --

Q. Sure.

A. -- he has a district here of negative 2. And if he had used that left PVI in the previous exhibit, the left PVI -- which he did not -- but if he had used that one, the PVI of negative 2, using his methodology, his methodology estimates that such a district has a 27.7 percent probability of electing a Democrat.

So that number at the right column at the line -- at row that's labeled 2, that's 27.7 or .277, meaning that his methodology would have told him that the Democrats had a 27.7 percent chance of winning District Number 7 --

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Q. And what did he find -- what did he find using the PVI that he actually used for purposes of his report?

A. Again, the PVI that he actually used was zero, using the other methodology, using his other set of elections. Now, a PVI of zero leads him -- leads Dr. McCarty to predict, which he reported on, that such a district would have a 51.9 percent probability of electing a Democratic candidate. So that's a bit of a gap.

His choice to use the column on the right rather than the data on the left led him to upwardly estimate or to estimate a significantly higher probability of electing a Democrat in District Number 7.

Q. And if we can turn back to Petitioners' 34.

Did you see -- without going through, you know, each district, did you see the same -- I'll call it a "phenomenon" in other districts?

A. Yes, sir, consistent pattern, the same phenomenon in several of these districts. And what's so striking about it is that choice biases his estimates in a consistent direction. You can see that it's far more districts that are skewed one way

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rather than the other.

In other words, to put it in layman's terms, the consequence of Dr. McCarty's particular methodological choice here was to cause him to perceive the enacted plan -- the enacted Congressional districting plan in Pennsylvania --

MR. TUCKER: Your Honor, can I object?

THE COURT: You can.

MR. TUCKER: May I object? I think this is starting to get into speculation about what Dr. McCarty's methodology was. We haven't heard from Dr. McCarty yet as to what the purpose of his methodology was, and I think we're getting into a little bit of speculation here from Dr. Chen.

THE COURT: Overruled.

BY MR. JACOBSON:

Q. You can finish your answer, Dr. Chen.

A. Okay.

So the effect of Dr. McCarty's choice here of using the column on the right rather than the column on the left, in other words, the effect of his choice of using older elections rather than more recent elections, was to cause Dr. McCarty's

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estimates of the enacted plan to be more Republican-leaning and less Republican-favorable than if he had used the more recent elections, which he actually already calculated but chose not to report on.

So it was really clear what the directional bias of that choice was.

Q. Thank you.

MR. JACOBSON: Petitioners move to admit Exhibit 34 into evidence.

THE COURT: Any objection?

MR. TABAS: No, sir.

MR. GIANCOLA: No, sir.

MS. GALLAGHER: No objection.

MR. LEWIS: Petitioners' 34 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 34 was admitted into evidence.)

- - -

MR. JACOBSON: And moving to one final exhibit, I promise, Your Honor.

BY MR. JACOBSON:

Q. If we can now turn to how Dr. McCarty -- not how he calculated the partisanship

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of the enacted plan but of your simulated plans.

MR. JACOBSON: If we could pull up Petitioners' Exhibit 162.

BY MR. JACOBSON:

Q. Now, Dr. Chen, could you tell us, did Dr. McCarty calculate PVI in your simulated districts the same way that he calculated PVI for the enacted districts -- for the enacted plan?

A. No, sir, he did not. He used a completely different methodology for looking at my simulated districts.

Q. And -- and can you tell us the difference between the two methodologies that he used? You already described the methodology he used for the enacted districts.

So what was the methodology he used for your simulated districts?

A. Just to go back to the enacted districts, his methodology for the enacted districts was pretty simple: count the presidential vote from 2004 and 2008. It would have been very straightforward to do the same thing -- in fact, I did do the same thing -- but it would have been very straightforward to do the same thing for all of the simulated maps.

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Dr. McCarty is very proficient with computers, and that is a very straightforward task, but that's not what he actually did. So, instead, what he did was when he was looking at the simulated directing plans, he looked at the Republican vote share from the 2008 and 2010 statewide election, but then he constructed a convoluted regression model and a regression model that he claims would accurately predict what he thinks the PVI should have been.

Q. And did you go back and calculate -- using the exact methodology that he used for the enacted plan, did you calculate what the PVI would be in your simulated districts using that same methodology?

A. Yes, sir, I did. I followed Dr. McCarty's methodology as laid out in his report and has shown in his code, calculating these PVI of the enacted districts. And I followed that to a T. I -- because I -- as I said a minute ago, it was pretty straightforward to do. It's a pretty simple methodology. It just looks at 2004 and 2008 presidential elections. And I've explained why I don't think those are reliable, but I followed that methodology anyways. It was pretty straightforward to do.

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So, yes, I did.

Q. So now looking at Petitioners' 162, looking at the title of the chart, can you just tell us what -- what district -- is this -- what is this presenting -- what is this presenting data on? One of your simulated districts?

A. This is just one of the simulated districting plans, the 18 districts in one of the 1,000 simulated districting plans.

Q. And now looking at the column that's titled Correct PVI, what does the data in that column represent?

THE COURT: Counsel, can I just interrupt for a second?

Example from simulated Set 1, Plan Number 3, is that an exhibit that's in the record at this point?

MR. JACOBSON: Yeah -- it was turned over as part of our pretrial, and it was in the pretrial --

THE COURT: I haven't seen Plan Number 3.

MR. JACOBSON: Plan Number 3 is just one of the 500 simulations.

THE COURT: I understand. I -- I

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want -- as I'm looking at this, if I had Plan Number 3, I'd look at it.

But you're saying we don't have Plan Number 3?

MR. JACOBSON: We haven't specifically pulled up Plan Number 3, yes.

THE COURT: I just wanted to make sure. Thank you.

MR. JACOBSON: Sure.

BY MR. JACOBSON:

Q. Dr. Chen, if we look at the column that says, Correct PVI, can you tell us what the data in that column represents?

A. This column represents the calculation that Dr. McCarty would have arrived at, if he had actually employed the same methodology as he did when estimating the PVI of the enacted plan.

So it is the correct PVI in the sense that it follows what Dr. McCarty said he did for the enacted plan. And, here, I'm just estimating the PVI of the simulated districts, the 18 simulated districts in this particular simulated plan, using Dr. McCarty's methodology if he had actually used it correctly, as he said he did, for the enacted plan. But if he had done the same thing for this simulated

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plan, these are the numbers he would have arrived at.

Q. And how about the next column over, the one that says, McCarty Estimated PVI?

What does the data in that column represent?

A. That column represents Dr. McCarty's actual calculations using his regression methodology, which did not actually use the 2004 and 2008 presidential elections.

So this was his very different methodology that he used when looking at my simulated plans.

Q. And what do you notice when you compare the two columns that you just described?

A. Well, what I notice is a systematic bias here. And just to orient us on what these numbers mean, lower negative numbers mean more Democratic districts; higher positive numbers mean more Republican districts. That's what the Republican PVI is telling you using his scale here, which I understand is a little bit flipped around from what we were looking at previously. But as he reported these numbers, this was the scale that Dr. McCarty used.

So what I notice, once again, is a very

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systematic bias. It wasn't just that Dr. McCarty's estimated PVI made some errors that were sometimes in the positive direction and sometimes in the negative direction, no; they were systematic errors. They are systematically all but -- in all but one district, higher than the actual correct numbers.

In other words, the consequence of Dr. McCarty's different methodological choice here in looking at the simulated plans was to systematically make all but one of these districts in the simulated plan appear to be more Republican-leaning than they actually were if Dr. McCarty had used his own consistent methodology throughout his report.

And why do I say it has a systematic Republican bias? It's because if you look at the last column, which looks at difference between Dr. McCarty's own methodology versus the -- the numbers he would have arrived at if he had used the same methodology as he did for the enacted plan, those numbers are all positive except for District 7. But other than District 7, it's entirely a positive pro-Republican bias.

In other words, the consequence -- the partisan consequence of Dr. McCarty's choice to use this regression methodology, as opposed to the

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simpler methodology he used in evaluating the actual enacted plan -- the consequence of that choice was a systematic Republican bias in Dr. McCarty's perception of these simulated districts.

Now, why does that matter? Because that led Dr. McCarty to conclude -- this systematic bias led Dr. McCarty to conclude that the simulated plans were actually more Republican-favorable than they actually were. And, obviously, that led him to conclude that the enacted plan was not really such an extreme Republican outlier compared to this perception of the simulated plans.

Q. Thank you, Dr. Chen.

MR. JACOBSON: Petitioners move to admit Exhibit 162 into evidence.

THE COURT: Any objection?

MS. GALLAGHER: No objection.

THE COURT: Petitioners' Exhibit 162 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 162 was admitted into evidence.)

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BY MR. JACOBSON:

Q. Finally, just a couple of housekeeping

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items.

Dr. Chen, I believe, in your report, in one or two places, you might say that there were eight statewide elections in Pennsylvania in 2008 and 2010.

Was that correct?

A. I think that's a typographical mistake. I listed yesterday there were six statewide elections in 2008 and 2010.

Q. Thank you.

Dr. Chen, is Petitioners' 1 -- does that reflect a true and accurate copy of your expert report?

A. Yes, sir, it does.

MR. JACOBSON: Petitioners move to admit Exhibit 1, Dr. Chen's report, into evidence.

THE COURT: Any objection?

MR. TUCKER: Yeah, Your Honor. We object that the report itself is hearsay.

THE COURT: Response?

MR. JACOBSON: Your Honor, they have a full opportunity to cross-examine Dr. Chen on every word in that report if they want to. And, you know, obviously, if we admit

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his report, we would be willing to admit their full reports as well.

THE COURT: Objection overruled. Petitioners' Exhibit 1 is admitted.

- - -

(Whereupon, Petitioners' Exhibit Number 1 was admitted into evidence.)

- - -

MR. JACOBSON: Finally, Petitioners move to admit Exhibit 33, which is the e-mail from Legislative Respondents' counsel that transmitted the Turzai data files.

Your Honor, we would submit that this is a statement of a party opponent, so there's no hearsay issue.

THE COURT: Is that document of record in the Agre case?

MR. JACOBSON: Yes. The full text of the e-mail was reproduced in an exhibit -- a trial exhibit in the Agre case -- an expert report.

MR. TUCKER: Your Honor, that was not admitted in the Agre case. It is clear hearsay, and it cannot be used as a party opponent admission. It's from a lawyer.

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It's not from any party to this case. This document should absolutely not be admitted into evidence in this case.

MR. JACOBSON: Your Honor, I have the text of the expert report that has the text of the e-mail in it, which was both filed on ECF and admitted.

THE COURT: Okay. That's -- that's -- putting the text of the --

MR. JACOBSON: Sure.

THE COURT: -- there are people that might think I'm drawing a really fine distinction here, but -- but, again, we're trying to balance limitations expressly stated in the Pennsylvania Constitution that were not at play in the Federal litigation and that Federal Judges are not bound to follow.

I am -- I am trying to strike what I think is a fair balance here. If that e-mail communication that was a communication between one counsel in Agre and another counsel in Agre in the course of discovery itself is not an exhibit in the Agre case, then I'm not going to admit it

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here. That was a communication between counsel in a discovery matter, which I believe even the United States Supreme Court has said is not a matter of public record.

So you can tell me again.

Was that document that you want in -- is that document an actual exhibit in the Agre litigation?

MR. JACOBSON: Your Honor, if I may, I'll go back and confer with co-counsel, because I want to make sure I give you an accurate answer.

I know that the document was discussed -- the text of the document was read -- the e-mail was read in open court at trial, but I can go back and check whether it was actually an exhibit.

THE COURT: Please go ahead and -- and confer with your counsel on it.

MR. JACOBSON: Okay.

(Counsel confer.)

THE COURT: What was the number of that exhibit?

MR. JACOBSON: Thirty-three, Your Honor.

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Your Honor, what I'm told is that the expert report that I mentioned that reproduces the e-mail -- that was admitted as an exhibit in the Agre case.

THE COURT: Hold on.

The question -- what expert report was it?

MR. JACOBSON: Of Ms. Hanna, her supplemental report.

THE COURT: Is Ms. Hanna a witness here in this case?

MR. JACOBSON: No, Your Honor.

THE COURT: Okay. So based on that, since you haven't told me the actual e-mail is an exhibit, since it's not part of an expert report that's going to be produced in this case, I'm going to sustain the objection.

So Exhibit 33 is not admitted.

MR. JACOBSON: Thank you, Your Honor.

THE COURT: Are you tendering the witness? Are you tendering the witness?

MR. JACOBSON: Yes, yes, Your Honor.

THE COURT: Okay. Thank you.

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MR. JACOBSON: I can confirm.

THE COURT: Cross-examination.

MR. LEWIS: Your Honor, let me get my technology set up here.

(Pause.)

- - -

CROSS-EXAMINATION

- - -

BY MR. LEWIS:

Q. All right. Okay. Dr. Chen, good morning. My name is Patrick Lewis, and I represent Legislative Respondent Speaker Michael Turzai.

A. Good morning, sir.

Q. Good morning.

Your analysis relies upon computer-generated simulations, correct?

A. Yes, sir.

Q. Okay. Can you explain for me how your model -- the steps that your model takes -- your simulation model takes when it's actually generating a simulated map?

A. Sure, I'd be happy to explain that in some technical detail here. I'm going to first start, though, by explaining to you the basis of my answer, which is that I turned over all the computer

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code used in connection with this -- with this report, and so that computer code lays out in technical detail the step-by-step algorithm and explains exactly how the computer was instructed to generate these maps.

So that is where my answer is coming from, and I just wanted to -- to explain that as the basis of my answer. So it was all in the computer code, and all the computer code was turned over.

In addition to that, the outputs, the actual maps that resulted, were also turned over because I want the world to be able to scrutinize not only the actual output maps, the simulated maps, and see the sorts of maps that are produced, I also want the world to be able to see the entire computer code and the step-by-step algorithm that I'm going to try and explain to you as accurately as I can here without getting into too much technical detail, but I just wanted to lay that as the basis for the answer I'm about to give.

So here's how the algorithm works. It starts with census geographies. And the reason I start with census geographies is because that is generally what is used in the creation of Congressional districting plans, so specifically that

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means starting with census block geographies, that means starting with the computer representation of the geographic boundaries of every single census block in Pennsylvania. And there are a little over 420,000 census blocks in Pennsylvania.

Now, what the algorithm does is it starts with a geographic representation of these blocks, understanding the various characteristics of those geographies, so that's things like the population of each census block, as well as knowing which county every census block is within, which town, township, city, borough, which municipality every census block is within, as well as which precinct or VTD the municipality is within.

It also represents data on the contiguity, or the touches, of every census block, and that's because these are all going to be relevant pieces of information as the algorithm proceeds, as I'm about to explain.

So it has this various information, and it has the information, as well, on the length of the borders, and it starts with this information, and the computer begins by drawing a series of geographic boundaries by respecting the census blocks. So essentially what the computer is doing is following,

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at the very lowest level, census geography and draws districting boundaries, but every step along the way when the computer algorithm is instructed to draw boundaries, the computer is specifically instructed a certain hierarchy of considerations when those boundaries are drawn.

So the most important consideration is that districts have to be, Number 1, equally populated and, Number 2, geographically contiguous. That means that when a border is being drawn, it is not allowed to traverse in a way that would cut up a district into two disjointed, fragmented parts, and it's obviously not allowed to cut up a district in a way that would violate equal population.

And just to be clear, what I mean by "equal population" is that the resulting district from any traversing of that census geography, from any boundary, any new boundary that is drawn that creates a new district has the result in the district that is exactly 705,687 or -88 in population.

So those are the two central concerns, the two inviolable concerns when the district algorithm proceeds as I just started explaining here.

Now, as the district algorithm is proceeding and drawing these boundaries, it not only

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starts by looking at the contiguity and the equal population concerns, but it also is instructed to treat county boundaries in a very specific way, and I'm about to explain how that -- how that technically works.

Every time district boundaries are drawn, the computer is instructed that each additional district that is added, each new boundary that is drawn, a geographic boundary, is not allowed to split up more counties than are necessary to achieve the aforementioned criteria of equal population and contiguity. So that means that county splits -- avoiding county splits is subordinated only to these considerations of equal population and geographic contiguity when the algorithm is creating this -- this -- this district. So that is how the algorithm treats county splits.

And that's basically how the algorithm proceeds.

Now, every time it is drawing a new district boundary, it follows in a way to -- so as to then later consider municipal splits and geographic compactness as subordinated criteria. So there is a hierarchy here, and as I started explaining, the equal population -- the equal population

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consideration and contiguity are at the very top of this hierarchy; county splits falls next; and then lower down are municipal splits and geographic compactness.

So the way that works is, the algorithm, after having made sure that it has complied with the first three portions of the traditional districting criteria that I've just explained here, then looks at these latter two considerations of municipal splits and geographic compactness. And the way it specifically looks at it is, it's -- in drawing each additional district, each additional boundary -- geographic boundary that is put onto the map by the algorithm, it pays attention to both the municipal splits as well as the geographic -- the geographic compactness considerations, and it does so by attempting to draw each new boundary approximately 10 different ways.

And I say "approximately" because sometimes it will find out that a proposed boundary has accidentally violated one of the previous considerations, and obviously that's not, say, population equality. It has accidentally gone over the total population equality requirement, the population equality limit. And obviously that would

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be unacceptable, so the computer doesn't really -- doesn't really keep those possible boundaries.

So it tries to draw in 10 different ways each additional boundary that is added on by the algorithm, and each step along the way, it asks the following questions: How many new additional municipal splits would be introduced? And what would the resulting district look like in terms -- look like in terms of geographic compactness?

And so looking at a couple of different ways of drawing each additional boundary, each additional geographic boundary, it looks at a couple of different alternatives and picks the one that is not going to increase the number of municipal splits beyond what's reasonable, what's possible, and it picks the most compact of those that are possible in this very localized set.

So that's how the algorithm proceeds.

Now, essentially what that means is that there are a couple of different traditional districting criteria that I've talked about here, and the computer strictly follows those as much as is reasonably possible, but beyond those criteria -- beyond these criteria, I have not mentioned anything like race or partisan data. The computer completely

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ignores those.

And so beyond basic compliance with these traditional districting principles, what the computer is essentially doing is producing random districting plans or independent districting plans, all a little bit different -- all actually quite a bit different from one another, but all with the basic adherence to looking at these traditional districting principles.

So I apologize if that was a little bit more technical detail than you wanted, but I just wanted to explain that, again, all of the computer code here is code that I turned over in connection with the report, because I think it's extraordinarily important that scholars out in the world are able to look at, scrutinize, follow along and understand every last technical detail of my code and all -- every single line of my computer code. That's why I turned over the code, and it is all -- all those details are available for you to see in my computer code.

Q. So there's a lot there. Let's -- let's try to unpack it a little bit.

Your -- at the beginning, does your algorithm start with the existing -- or, in this

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case, it would have been the 2002 Map, or does it start with a completely blank canvas?

A. Absolutely, no, it would not start with the 2002 Map. As I said, it starts with census geography, and that is a fact that is very apparent in the computer code. The computer code starts with census log geographies.

So just to explain again, because I want -- this is such an important point, census block geographies are geographies that are set up by the U.S. Census Bureau, and Pennsylvania is divided into 420,000, or so, of these census blocks. And so these are the building blocks of districting plans, not just in Pennsylvania, but anywhere, really.

So the algorithm starts with those as the building blocks of the simulations. Never does the algorithm have as an input anything like the previous decade's enacted plan, the current decade's enacted plan, or any other enacted plan. That be would completely not relevant to a districting process that is simply trying to follow traditional districting criteria in Pennsylvania.

Q. In your experience, as a redistricting expert, do you often find that the people who actually draw the maps in different states do, at

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least, take the previous map into consideration when they're drawing a districting plan?

A. I mean, it's certainly possible. I acknowledge that sure, there certainly are, I'm sure, legislators that like to begin by looking at the previous decade's map and saying, Hey, I really like my district; I want to keep it together as much as possible. I acknowledge that might sometimes happen.

I really can't -- I really can't, as a factual matter, tell you whether or not that happened in Pennsylvania or in any other specific instance, but I certainly acknowledge that that's very possible, that legislators often -- incumbent legislators often really do like preserving their old districts and like keeping those districts exactly as they -- as they were drawn. That is certainly a very realistic possibility.

Q. So let's just return to your model -- and I think I may not have communicated my -- my question as clearly as I would like.

Let's walk through step by step. Your map -- your simulation begins. You have -- it knows the geography of Pennsylvania because you've fed it the boundaries of the 420,000 census blocks; is that correct?

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A. Yes, sir --

Q. Okay.

A. -- it starts with the geographic boundaries.

Q. It starts with the geographic boundaries. And at some point, it has to put pen to paper -- well, not really; it's a computer, but the analogy -- to start drawing a district line; is that correct?

A. Yes, sir. What the computer algorithm does is it draws a series of district boundaries.

Q. Okay. So for a single simulation, does -- at some point, it has to start with one block; is that correct? It's going -- it's going to proceed from a specific block that either you pick or it's picked at random; is that correct?

A. Well, it starts at a random point on the map --

Q. Okay.

A. -- so there are no -- no district is really just a block or a collection of blocks. It's a collection of blocks that satisfies certain criteria --

Q. Okay.

A. -- so any district is inevitably a

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very, very large number of census blocks.

Q. Okay. So it starts with a point, and then I heard you say that it -- it looks to -- is it fair to say that your algorithm then looks to the census blocks around that point and it starts generating its maps from there or starts generating its district boundaries, rather, from that point?

A. That's generally true, but let me just make a very important point here.

The districting algorithm isn't just traversing different census blocks willy-nilly, because it has to pay attention to all of these traditional districting principles. So, obviously, when you're grouping together census blocks, you've got to do so in order to follow traditional districting principles in a way that obviously, Number 1, doesn't violate geographic contiguity, Number 2, doesn't split up counties, except when necessary to equal -- to equalize population, things like that.

And what that effectively means is, you really don't want to be splitting up counties, just because doing so might result in a really random-looking, strange district. Traditional districting principles means that counties, things

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like counties, should be kept together as much as possible.

Q. Okay. And is your -- the computer model that you employed in this case, is that algorithm similar to the algorithms that you use in your academic work?

A. Oh. It's fundamentally quite similar. I mean, there are always -- you know, there are always going to be slight differences when I apply the algorithm to a particular expert report. And, for example, in my academic work, I generally would never conduct something like Simulation Set Number 2. That is the set of simulations in which I intentionally had the computer protect as many incumbents as possible by avoiding the double pairing of incumbent residences.

That is something that I normally would not do in my academic work because it's not a traditional districting principle. So there are going to be differences like that. There are inevitably differences like that that make it a little bit different from -- from my academic work.

Q. Okay. Okay. So is it fair to say, then, that your simulation model is a form of what's called a "Monte Carlo simulation model"?

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A. No, absolutely not.

Q. Okay. And what are the differences between your model and a Monte Carlo simulation?

A. Okay. So, you know, a Monte Carlo -- I'm just going to ask you if you can clarify to me what you -- what you're trying to mean by that term, because it's a very broad term that means a lot of different things in a lot of different contexts. So I'm just going to ask you to clarify your question.

Q. Sure, absolutely.

So, in other words, is your algorithm iteratively traversing the space and making -- and making choices between different moves as it's drawing its -- as it's drawing the districts?

A. Ah. Okay. I gotcha. What you're describing there is what's known in the statistical world or in the redistricting simulation world as a Monte Carlo/Markov chain, what you just described right there, sir.

So that is a very different sort of class of models that other scholars have used, and that is absolutely not what I am doing here. And let me just make this point clear because it is so important that -- that I want to make sure you understand this.

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What my algorithm does is, it independently is drawing maps, simulated maps, every time. So when I told the Court yesterday about these 1,000 different maps, those are 1,000 different maps. Map Number 1 completes, and Map Number 2 starts anew. It starts anew without reference to whatever iterative changes were in Map Number 1.

It's not an iterative process, and so that's what I think your confusion -- or your question was going, and so I -- I really just want to make sure you understand it because it's so important, that what my simulation process is doing is creating independent maps; it is not an iterative process where one map builds on where the previous map has gone.

THE COURT: Counsel, I'm -- I'm really -- I'm trying not to interrupt as much. I want to let you-all do your examination, but I also want to make sure I understand what -- Monte Carlo/Markov, all that stuff, I don't understand.

What I understood your question -- and, Dr. Chen, I apologize if I don't understand your answer -- but, I think of an Etch A Sketch.

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Do you know what an Etch A Sketch is?

THE WITNESS: Yes, Your Honor.

THE COURT: Okay. I think what the question was, is, Does your computer simulation essentially operate in the way that an Etch A Sketch does, meaning it starts at some point and everything's sort of connected? You can't cut and move over to one other spot on the Etch A Sketch board. It starts in one spot, and then it just grows out from that.

Now, I understood you testified that each simulation starts at a different point randomly, I think was your testimony.

THE WITNESS: Yes, sir.

THE COURT: The question is, Once it picks that spot, does it build the district around that spot and then, similar to an Etch A Sketch, would move out from that district, build another district, meaning there's some kind of a connectedness associated with it?

That's -- the Markov stuff and the fancy statistical words, I don't necessarily

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understand. Etch A Sketch, I get.

THE WITNESS: Okay. Thank you, Your Honor. I'll answer your question. I heard your question to be quite different than counsel's question, but I'll try and answer your question right now.

THE COURT: If it's different than what counsel asked, then I -- I was --

THE WITNESS: I am happy to answer your question as well, sir.

THE COURT: Okay.

THE WITNESS: And your -- your suggestion is essentially right, what the algorithm is doing is it's -- it's looking -- it's looking at one district boundary, and then it's building from that point. The first point, starting point, was a random one --

THE COURT: Okay.

THE WITNESS: -- but your question makes sense, and that is the answer to that. I wanted to separate that from the discussion of the Monte Carlo/Markov chain.

THE COURT: When -- when that word and that phraseology came up, that's when I

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came to have -- I was -- I was in Etch A Sketch mode until I heard that. But . . .

THE WITNESS: Thank you, Your Honor. I just wanted to answer your question, even though I think it was quite different than what counsel's question was.

THE COURT: Counsel, again, I'm going to try to minimize that, but given the circumstances we have, I really want to understand what's -- what's happening here.

MR. LEWIS: Absolutely. Absolutely, that's more than fine.

BY MR. LEWIS:

Q. Okay. So how did you -- I just wanted to confirm one thing.

You indicated in your report that your algorithm is designed to draw what you consider to be a valid districting plan. I just want to make sure that we're on the same page, that when you talk about a valid districting plan, you mean one that complies with the contiguity, the county and city splits and equal population criteria that you set forth in your report. Is that correct?

A. That's essentially correct, sir. My

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algorithm is making pretty reasonable attempts to comply with those traditional districting principles that I've -- I've laid out in detail in the last two days here.

Q. You've also described that your simulation optimizes on those traditional districting criteria in your report.

What -- what optimization algorithm did you select for choosing among -- as you've previously testified, when your model is trying to, you know, choose between whether it's going to split a county border, or how a particular choice affects compactness, how is your model optimizing among those different criteria?

A. Okay. I'm happy to answer that question in detail. I'm just going to start, once again, by saying that, you know, that's -- the building in of the criteria into the algorithm is laid out very clearly in all the computer code, and that is why I turn over the computer code. Just having said that as the basis of the answer I'm about to give you, now I'm going to give you the actual answer.

It is exactly as I laid out when I first explained to you this morning the technical

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details of how the algorithm proceeds. It starts by saying, Here are the two principles that cannot be violated: geographic contiguity and equal population. So in terms of the hierarchy, those are the very top. No district can ever violate those two principles, meaning literally that every district has to have a population of exactly 705,687 or -88; it is not allowed to deviate that by even one person.

So those two principles are at the very top of the hierarchy. Then, as I explained some time ago in response to one of your first questions, only after that do we consider county splits. So that tells you the hierarchy here. It's equal population and contiguity first. And then lower down, as a second tier, as a lower tier, county splits. And then even after that -- and I'm happy to go into that same technical answer again, but I'm not sure you really want me to do that, but I'm happy to if you want me to.

After that, it is municipal splits and then geographic compactness.

Again, all of this is very clearly laid out in the computer code that I turned over, and that's the reason I turned it over. I want people to be able to scrutinize and see exactly how it's laid

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out.

Q. Okay. You indicated that one of your traditional districting criteria was the -- and I'm paraphrasing -- you know, avoiding or minimizing county and municipal splits, correct?

A. Yes, sir, I mean, that's a traditional districting principle. And, you know, it's -- as I've described repeatedly this morning, that's one of the -- those are two of the principles I built into the algorithm.

Q. Okay. And you're aware, sir, that the Pennsylvania Constitution does not require the minimization of political subdivision splits in a Congressional Map, correct?

A. I'm certainly aware that the Pennsylvania Constitution -- Article II of the Pennsylvania Constitution doesn't say anything at all about Congressional districts in Pennsylvania.

I relied on the Pennsylvania Constitution, as it gives an indication of traditional districting principles, because it specifies principles to be followed in the drawing of state legislative, state House and state Senate districting plans.

Q. Okay. Would you agree with me,

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Dr. Chen, that legitimate state objectives in redistricting would include making districts compact, representing municipal boundaries, preserving the cores of prior districts and avoiding contests between incumbent representatives?

A. Okay. Well, there were four -- there are several things right there, and I'm happy to answer those one at a time. So let's just take those one at a time, and if you could just start at the top of the list, I'll be happy --

Q. Absolutely. The first, making districts compact, would you agree that that's a legitimate state objective in redistricting?

A. Here's what I understand that to be: That is a traditional districting criterion or a traditional districting principle. That is my understanding of traditional districting principles as a political scientist, as a redistricting expert. And so I just want to make sure I am communicating that to you in my terminology. It's a traditional districting principle.

Q. Okay. Obviously, respecting municipal boundaries, I suspect your answer will be yes. Right?

A. Yes, sir, same answer. I'm happy to

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tell the basis of that, but I suspect you already know the answer to that.

Q. All right. Would you agree that a legitimate state objective in redistricting is preserving the cores of prior districts?

A. No, sir, absolutely not. And I'm happy to explain that -- explain why -- why that is my understanding of traditional districting principles. If you'd like me to explain my answer, I'd be happy to.

Q. Your answer is your answer.

A. Okay.

Q. Sir, would you agree with me that a legitimate state objective in redistricting would include avoiding contests between incumbent representatives?

A. Avoiding contests between representatives, is what you said.

Q. Incumbent representatives.

A. Between incumbent representatives?

Q. Yes.

A. Okay. I mean, that's what we traditionally call, you know, incumbency protection. And the answer is, no, that is not a traditional districting principle. And I mean, I'll elaborate a

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little bit in my answer, and you can feel free to cut me off if you don't feel this is responsive to your question. But I'll just explain to you the basis of my last two answers here.

So as a political scientist -- as an expert on redistricting, I am an empirical scholar, and I've got to qualify all this by saying that none of what I'm giving you is a legal interpretation. It's my understanding as a political scientist, as a redistricting scholar on traditional redistricting principles.

Now, when I set forth to understand traditional redistricting principles, I look to those principles that are commonly practiced, commonly enshrined in state constitutions and in -- and in state statutes regarding -- regarding redistricting. And this is my understanding based on having worked on redistricting issues and redistricting cases in a wide variety of jurisdictions.

So the last two things that you mentioned, preserving the cores of districts and incumbency protection, they're not traditional districting principles. And here's the basis of my coming to my expert opinion on that: We don't see state constitutions require districts to be drawn to

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favor incumbents or to protect incumbents as much as possible.

That's just not something that we see in state constitutions that say something about redistricting. But we do see that on actual traditional principles like compactness. And, actually, I think probably a majority of states have either a constitutional or a statutory provision that requires the districts be compact, some very explicitly so, in Iowa, for example, with very precise formulas.

So these are things that we see, traditional districting principles enshrined in state constitutions and statutory provisions regarding districting. That's how I know they are traditional districting principles. They're not just practiced; they're enshrined in the law, they're required by these various constitutional and statutory provisions.

Now, that's -- that's clearly not the case with, Number 1, incumbency protection. There is -- to my knowledge, there is no state that explicitly requires -- not just allows, but requires -- the protection of incumbents, in the way that you laid out, by avoiding -- avoiding the double

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pairing -- avoiding the pairing or the double bunking of incumbents.

The same thing for cores. What I understand the term to mean is the following: I think the term -- the term that you put forth to me was "protecting the cores of districts," and I understand that term to mean that you would keep -- you would take your old district from the previous decade, and regardless of how that districting plan was drawn, you'd keep it together and try to draw as similar as possible a district to the district that you had for each legislator in the previous decade. And, obviously, there's not -- that's not something that constitutions and state statutes require of districting plans.

So that is the basis for my answer, and I just wanted to answer your question and give you as complete of an explanation of why I formed my -- my opinions on -- on that issue.

Q. So is it fair to say that your simulation model -- well, both sets of simulations -- you ran two, right, two sets of 500?

A. Yes, sir. 500, two sets of 500.

Q. Two sets of 500. Got it.

Fair to say, then, that your model did

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not attempt to preserve -- either simulation set did not attempt to preserve the cores of existing districts?

A. As I said, sir, that's not a traditional districting principle. And, in fact, if I had set out to preserve the cores of the old districts, then I would have probably ended up handing you a thousand maps that all look exactly like the previous decade's plan, which would have defeated the whole purpose of conducting simulations to follow traditional districting principles.

So, no, sir, I did not do that because it's not a traditional districting principle.

Q. Did your -- are you familiar with the term "communities of interest" in the redistricting context?

A. It's a pretty vague term. I mean, if you want to ask me a question about it, I just have to ask you to define exactly what you mean by it.

Q. I'm asking you. You said it's a vague term. What do you understand the term to refer to?

A. Okay. I understand the term to mean, in the context of traditional districting principles, preserving political subdivisions like counties and municipalities.

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Q. So you don't understand that term as going beyond that, for example, maybe to specific neighborhoods or portions of communities that may have commonality between them, either business or social, faith?

A. I mean, I certainly recognize that some people may use the term that way.

Q. Okay.

Okay. And is it fair to say that your simulation models did not attempt to preserve communities of interest, except to the extent that you're defining it to mean municipal boundaries?

A. Well, just to clarify, the simulation algorithm considers counties and municipal boundaries. I don't know whether you consider those to be communities of interest, but I certainly do. And so -- those are what I built into or programmed into the algorithm.

Q. Okay. How do your models account for a state that gains or loses a seat between -- so, for example, Pennsylvania, you start with 19; you have 18 -- how does your model account for, you know, population shifts that may -- that may occur that results in that seat loss?

A. Yeah, that's a good question and very

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important question. And the answer is, by making districts equally populated. That's the requirement. It doesn't matter whether this area had -- whether this county or that county had more districts in the past, fewer districts in the past. You've got to make sure that every single district in the current plan has exactly 705,687 or -88 in population. No more; no less. Can't deviate from that number. That's it. That's the simple population requirement. And, obviously, I used 2010 Census numbers.

So there is no other consideration of how many districts one area of a state lost or gained. That's just not relevant to the population equality requirement.

Q. So you would agree with me that a simulation that did not preserve population equality would not be a valid districting map, correct?

If you had a map or half -- you know, where you had population deviation from one district to the next, that would not satisfy your -- you would not consider that to be a valid districting map for a simulation, correct?

A. Well, what I'm telling you is my report and my simulation algorithm -- my simulation algorithm requires equal population, and so I'm just

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telling you how I conducted my analysis and drew my conclusions.

Q. Okay. Sir, when accounting for states that lose districts, like Pennsylvania did, does your simulation model consider at all where the population was gained or lost in the state?

A. I thought you just asked me that a minute ago, and the answer is, The simulation algorithm requires districts to be equally populated using the current decade's population, 2010 Census population. It doesn't care; it pays no attention to whether or not this region of the state or that region of the state used to be more equal -- more populated or less populated and whether they gained or lost representation because of that shift in population. The only thing the algorithm is concerned about is the current decade's 2010 Census population.

Maybe I'm misunderstanding. I thought that was the same question that you had just asked me a minute ago.

Q. Okay. No, I think -- I think I understand your answer.

I thank you.

So in your past -- you know, you -- you

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mentioned the number of simulation sets that you run.

In your past work, haven't you normally run or don't you often run three sets of a thousand simulations?

A. I wouldn't say I normally do that. Every report is a little bit different because every report brings a different set of questions that are asked to me by counsel --

Q. Sure.

A. -- so there have been a wide range on that number. I think I've produced reports with as few as 200 simulations and, I think, two different sets. I'm not sure I've ever done a report with one set of simulations -- actually, I think I can think of one that -- where I did.

But it's a wide range. Certainly, if you look at my many past expert reports, you will see a range.

Q. Sure.

How did you select the sample size -- I know why you did two sets, but how did you select 500 as the number of simulations to run in this instance?

A. Sure. I'd be happy to explain that, and I'm just going to preface that answer by saying that I -- I think I -- I answered essentially the

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same question from -- from Mr. Jacobson yesterday and explained -- laid this out in my report.

So when I am doing simulation analysis, analyzing a number of independent districting simulations, I know from past experience and I know from basic statistical knowledge that you need to be able to have 25 or more simulated plans, independent plans to be able to draw strong statistical conclusions.

Now, what I also know from my past experience in doing this type of analysis is that very often, I'll want to go back and be able to analyze just a subset of those simulated plans, say, a subset of the simulated plans that contain, say, a certain racial threshold, just as one example. And in order to be able to do that, I need to make sure that any ensuing analysis that I'm able to draw from such analysis -- from -- from such plans is still able to rely on, say, 25 or more plans in order to be able to draw strong statistical conclusions.

So if I started out a set just by drawing 25 and I wanted to look at a subset, say, just a subset that contained a certain racial threshold, it might end up in that subset with fewer than 25. So instead, what I do is to go way

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overboard. And so 500 is essentially just a nice round number. There's no particular reason for it, other than I know from past experience that if I go up to something in the level of, say, 200, 500, maybe even 1,000, as I've sometimes done in the past, that I'll have enough so that if I want to look at a reasonable subset, I'll still have 25 or more simulated plans to be able to focus on in that subset.

So I've learned from past experience that is a good thing to do, to go completely overboard, to go completely overkill, way over 25. So that's all that number represents.

Q. Okay. Do you know the total number of potential combinations of legal districting maps that could feasibly be drawn in Pennsylvania?

A. I'm going to ask you to explain to me, sir, what you mean by "legal districting" plans.

Q. Well, let's -- let's use your example, the number -- what are the total number of different simulated plans -- let me walk that back.

How many different ways could a simulation algorithm like yours -- how many different maps for Pennsylvania could it draw?

A. Well, I can only attest to the number

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as being 1,000 because that is what I see with my own eyes. So I can tell you that there are at least 1,000 different ways.

Q. At least 1,000.

A. That's the extent of, Number 1, what I can tell you I have empirically seen; and, Number 2, that is the extent of it being relevant for my analysis. So it is relevant to my analysis that an algorithm is able to produce a large number of different plans, and that is what I -- what I observed in my analysis.

Q. Would you agree with me, though, that -- that the number of total possible districting plans is pretty astronomically large?

A. 1,000 seems like a pretty big number, to me. And I turned over all 1,000 plans, and so that's what I'm able to tell you about because that's the analysis that I did. And I'm affirming for you that, yeah, 1,000 is a pretty big number, but I mean, look, I turned over all 1,000 of the simulated plans because I want the world to be able to look at all 1,000 of these different simulated plans. So that's why I turned over the electronic maps of every single one of the simulated maps in my report.

Q. Okay. You don't report the

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calculations of statistical significance in your expert report, do you, Dr. Chen?

A. I'm going to ask you to explain exactly what you mean by "calculations of statistical significance," because I do actually speak directly to statistical significance at several points throughout my report. And I'm happy -- just in case you didn't catch them, I'm happy to go page by page and point each one out to you.

Q. Well, you say extremes -- "extremely statistically significant."

What does -- what does that mean in a statistician's language?

A. Okay.

Sure, I'm happy to -- do you want to point me to a specific portion of my report where I use that phrase, and I'll be happy to kind of translate that for you in nonstatistical terms?

I'm happy to also volunteer a section for you to help you out.

Q. You can feel free to volunteer anything you want.

A. All right. I'm -- I'll help you out by just pointing you to Page 17.

Q. Right.

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A. And you might want to point me to the fourth line from the bottom.

Q. Okay.

A. I'll go ahead and let you ask whatever question you want about that.

Q. No, I appreciate that.

Okay. So you have 99.9 percent statistical certainty.

How did you arrive at that calculation?

A. Okay. Sure. So I'll start by explaining that this is an expert report. I intend this to be read by a court. I do not intend this to be read by statisticians, by academics, by those who are interested in the technical details of a statistical analysis.

Now, having explained that, I will explain my own statistical analysis that went into that statement --

Q. Okay.

A. -- with 99.9 percent statistical certainty.

So here's what we conduct in statistics, and this is basically Intro to Stats 101 here that I'm about to give you in my answer.

When we have a set of independent

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simulated plans, that's what we call a "sample." It is a sample of 500 plans. I can tell you that there were 500 independently produced plans. So that is one population, a population of 500 independently drawn plans. That's the population of one set that we're going to consider here.

Now, what are we going to compare it to? In statistical terms, we're going to compare it to a baseline. Now, in layman's terms, that baseline is the enacted map. I'm going to compare the simulated plans here on Page 17, which was described in Figure 2 -- I'm going to compare those 500 simulated plans to an enacted map.

And I'm going to go through the statistical jargon here -- and I'm happy to let you cut me off if -- if you feel that this is not responsive to your question, but I'm going to give you the statistical details because I think that's what you were asking for.

So when we have this population of 500 sample maps and we're going to compare it to one enacted map, we have two populations. That second population, the enacted map, was a sample of just one, but it's a population. It's a population of one.

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Now here's sort of statistical test comes in. We conduct what is called a two-sample t-test, with unequal sample sizes -- a two-sample t-test with unequal sample sizes.

Okay. So this is a very simple statistical test. It's something that's taught in introductory statistics classes.

To conduct this test, you look at the two different populations, and this is a test that's conducted on any sort of simple statistical software. You could even do it in Microsoft Excel. But the basic point of this -- of this test is to be able to say the following: We have a sample of 500 -- of 500 independent maps here, 500 independent maps that were produced by the nonpartisan computer algorithm, and we want to determine whether or not the enacted plan, the Act 131 Plan, that second population, produced a partisan outcome that could have plausibly been produced by this nonpartisan algorithm, this nonpartisan districting process.

So we compare the two populations, and in statistical terms, you conduct what's called a "t-test" and you conduct -- you estimate things like an estimated standard error. Now, we have software that, again, does this for you in milliseconds. But

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you basically conduct a t-test; you calculate a p-value by looking at a t-distribution. A t-distribution is a very standard statistical distribution based on the degrees of freedom and the estimated standard error.

All of that is a very fancy way of saying the following in layman's terms: How likely is it that the enacted plan's creation of a 13-5 Republican outcome is an outcome that could have emerged from the same districting process, that the vast majority of the time, these nonpartisan traditional districting criteria created either eight or nine Republican seats?

Now, you can just look at Figure 2 and be able to see that the answer is very, very, very close to 0 percent, or I can conduct a fancy t-test for you and be able to verify for you that we're able to make this same conclusion, with over 99.99 percent statistical certainty, using the t-test, calculating the t- -- calculating the t-test and translating that into a p-value that allows us to conclude with over 99.9 percent statistical certainty.

So that was -- I apologize if that was long, but I think that's what you were asking me for. The answer -- to summarize it, the answer was, a

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two-sample t-test.

Q. Very good.

All right. So if I understand the statistical analysis you went through with us, what you're really saying is -- you're saying -- your test is telling us that the map that was drawn by Pennsylvania, Act 131 -- that map is very different from the population of the map -- or the distribution of the population of maps that were drawn by your simulation, right? It's an outlier with respect to your distribution?

A. That's almost right --

Q. Almost right?

A. -- what we're able to conclude --

Q. We're getting there?

A. We're almost there.

What we're able to conclude, again, with extremely strong statistical certainty, is that it is extremely unlikely or extremely implausible -- statistically implausible that the partisanship of the enacted plan is one that could have arisen from the same process that produced these 500 simulated plans, that nonpartisan process following traditional districting criteria.

Q. And if Act 31 -- Act 131, pardon me,

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considered districting criteria other than the four or five, depending on how you want to count, that you considered in your traditional districting criteria that was not partisan biased, might that have affected your results?

A. I'm just going to have to ask you to explain exactly what you mean by those other possible hypothetical considerations that are not partisan biased. I just want to understand exactly what you're asking.

Q. Right. Let's -- let's use -- let's use one example.

What if the legislature had determined that it wanted to pair incumbents in -- for example, in the southwest part of the map? And assume that they did not do so for partisan intent. Just assume they just thought that was the right thing to do, and they drew their map using that criteria.

Might that have affected your results?

MR. JACOBSON: Your Honor, if I can just raise an objection.

THE COURT: You can.

MR. JACOBSON: This is now getting into the territory of information that wasn't produced on the basis of legislative

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privilege, whether that was an actual motivation that they had.

THE COURT: I'm going to overrule that, because he's offering hypotheticals. And the Court will accept them as hypotheticals, as they are being offered.

So I'm going to overrule your objection.

THE WITNESS: Okay. I'm going to try and answer your question. I'm going to explain it in the context -- I'm going to tell you the basis of my answer, and then I'm going to answer your question.

So here's the basis for my answer: What I set out to do in my report, as I often do in -- when I write expert reports, is, first, I ask Counsel, please tell me every single nonpartisan criteria that was used by the legislature in drawing the map.

I asked that to Petitioners' counsel. Petitioners' counsel told me we can't give you that information because the General Assembly is refusing to give us -- give us an answer to that.

So that's where I started from.

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So having said that, the basis of my answer is that I, instead, had to say, all right, I'm going to look at traditional districting criteria as applied in Pennsylvania and as informed by my reading of the Pennsylvania Constitution, but also based on my general expertise on traditional districting criteria in Congressional Plans.

Now, what -- I think the question that you're asking me is to suspend that reality and to answer this very hypothetical question of what if a particular region of the State was the only target for this consideration of incumbency protection.

Am I getting the question right?

BY MR. LEWIS:

Q. That's just -- that's just --

THE COURT: Yeah. Let me help, because I want to try and move this along as much as I can.

MR. LEWIS: Okay.

THE COURT: Dr. Chen, for purposes of answering my question, I want you to assume the following: That there are additional nonpartisan factors that could go

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into drawing a map that you did not consider. I want you to assume that for me.

How would that impact your conclusion and your opinion?

THE WITNESS: Okay. I -- Thank you, Your Honor. That is very clear. That -- that question makes sense --

THE COURT: Okay.

THE WITNESS: -- and I'm going to answer that as clearly as I can here.

My opinion is based on an analysis of answering two questions, and no more than these two questions. I am able to answer what kinds of plans would have emerged if we had just followed traditional district principles, as I've laid out many times. And I'm able to answer what kinds of plans would have emerged if we had followed traditional districting principles plus protected 17 incumbents in a nonpartisan manner.

My answers are purely based on those premises, and that's it; no more and no less. Anything beyond that, I have not had the opportunity to conduct that analysis.

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So I appreciate, Your Honor, the way that you framed that question, because that was a very clear question, and I'm able to answer that.

THE COURT: I do this for a living.

MR. LEWIS: Very good.

BY MR. LEWIS:

Q. Dr. Chen, I wanted to --

THE COURT: Counsel, I didn't mean to -- by the way, if that wasn't the question you were trying to ask, I didn't want to preempt you. You should continue with your -- with your planned cross.

MR. LEWIS: I -- I appreciate that.

BY MR. LEWIS:

Q. Dr. Chen, I just wanted to go back to the questions we were asking about how many maps, you know, could -- you know, you testified that your algorithm generated a thousand maps.

Do you know how many it could have generated?

A. Well, certainly, I could have left the computer running, but that's -- again, to go back to what Mr. Jacobson and I discussed at the beginning of the day -- the beginning of this morning, after

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you've seen 50 maps, you're not learning anything new by seeing a 51st map.

After you've seen 1,001 flips of the coin, what are you learning new by flipping the coin a 1,001st time?

But, obviously, yeah, I could have left the computer running.

Q. Okay. I wanted to just clarify one question around how your model identifies a particular district as being Republican or Democrat.

As I understand it, if a district -- based on the statewide election vote totals from the six statewide elections in 2008 and 2010, the total number of Republican votes, you know, was one more than the total number of Democratic votes, that you would score that district as a Republican district; is that accurate?

A. I don't think that's a very common outcome, but your math is correct, sir --

Q. Okay.

A. -- it is purely a -- a comparison of how many Republican and how many Democratic votes were cast in those statewide elections.

Q. Okay. Doesn't -- doesn't Pennsylvania have a history of split-ticket voting?

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A. I couldn't tell you because I didn't -- I didn't analyze that question. That wasn't a question that was put forth to me.

Q. Sure, sure.

If Pennsylvania did have a history or practice of split-ticket voting, defined as voting for maybe one party for the president and maybe a different party for some other office, might that affect the predictive value -- or how you're scoring a district as Republican or Democrat in your model?

A. That's a very good question, and I'm going to tell you how I thought about that -- that possibility. And, again, I'm going to start by saying that it was not my interest or my task to look at this phenomenon that you're calling "split-ticket voting." And so I don't have any actual empirical premise on which to start.

But that is -- that hypothetical possibility is always a consideration when we're looking at election results and looking at Congressional election results relative to statewide election results.

So here's what we do as political scientists -- and this point is so important because it gets to the core of the use of statewide elections

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and measuring the partisanship of districts -- what we do is we look at how well statewide elections are -- how well statewide elections do in predicting the partisan outcomes of those Congressional elections. In other words, we want to look at what is the best predictor.

What sort of data should best be used to predict the partisan outcomes of those Congressional elections whether or not there is that hypothetical possibility of split-ticket voting, whether or not there are other quirky factors that go into district-by-district election results, all of those things? We want to analyze how well do statewide elections do at predicting the actual final partisan outcomes of Congressional elections.

And I did such an analysis, as I explained in my report and as I've testified about yesterday. And what I found is that when you use these statewide elections -- when you use the 2008 to 2010 statewide elections, you are able to accurately predict the partisan outcomes of Pennsylvania's Congressional elections in 54 out of 54 Congressional election races all over the last three years, all -- all 54 races that were held using the current enacted plan. So that's 18 in each year, in 2012, 2004

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[sic], 2016.

That's really good statistical accuracy, and that tells us that this data and this model is accurately accounting for all of those dynamics, including things like split-ticket voting.

So that really gets to the core of exactly why we do this kind of analysis. And I just wanted to explain that.

Q. All right. Dr. Chen, I want to turn to a few of the exhibits that are in your report. I'll start with the first one here, which is Petitioners' Exhibit 4, which is your Figure 3 from your report.

So you would agree with me here that this is from your Set 1, which does not include simulation map -- or, excuse me -- does not include incumbency protection.

So, here, you would agree with me that most of your simulation maps are splitting between 48 and 56 municipalities, correct?

A. The entire range goes from 40 to 58 --

Q. Okay.

A. -- but I think your math is generally right.

Obviously, I don't have the exact count offhand, but, you know, eyeballing it, it looks

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pretty right.

Q. A range, okay.

We'll fast-forward here to Petitioners' Exhibit 8, which is your Figure 6 from your report.

I got it here in this group -- on the screen.

And this is from Simulation Set 2, Dr. Chen, where you factor in incumbency protection.

Would you also agree with me here that most of your simulations split somewhere between 56 and 66 municipalities?

A. That's approximately right. I would note the entire range is from 50 to 66.

Q. Okay. And you have the enacted plan, Act 131, splitting 68, correct?

A. Yes, sir, that was my counting of the number of municipalities.

Q. Okay. Do you know how many municipalities Pennsylvania has?

A. I couldn't give you the exact number, but I can give you a ballpark number. It's somewhere in the 2000s, I believe 2,300 or -600.

Q. If I told you it was 2,562, would you accept that?

A. I accept that.

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Q. You'll accept that? Okay.

In the grand scheme of things, it is terribly significant that Act 131 splits less than 10 more communities than -- or out of the 2,562 than your simulations, right?

A. By "communities," you're asking me right now about municipalities --

Q. Municipalities --

A. -- not about counties.

Q. -- we'll stick with the terms "municipalities," sure.

A. Okay. Sure.

So in terms of municipalities, yeah, it could actually be a significant difference. And let me explain to you why, and let me explain to you -- and if I could just ask you to repeat the number of split municipalities that you have in your count, sir.

You said 2,500?

Q. 2,562.

A. 2,562. Okay. I accept you -- I trust that number. It sounds about right.

So let me explain to you why splitting 68 municipalities is actually a significant number.

You don't look at the number of split

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municipalities in the context of the entire sea of all the tiny townships and boroughs that are in Pennsylvania, because when you really go out into rural parts of Pennsylvania, there are lots of boroughs, townships that have very small populations and, in some cases, very small geographic sizes.

No possible Congressional Plan could ever split many of those municipalities. In other words, you're never going to come up with a plan that splits, say, 1,500 municipalities; otherwise, you just end up with a bunch of serpentine-shaped districts, a bunch of long, narrow-shaped districts, intentionally traversing through rural Pennsylvania just to get a tiny fragment of every little township and borough across the State. That would obviously be pretty ridiculous.

Nobody draws plans like that -- or nobody sets out to draw plans like that following traditional districting principles.

What really matters are the townships or the cities with large populations or with large geographic areas. Those are the only ones that can plausibly be split apart to begin with. You're never going to split a lot of the very tiny municipalities across Pennsylvania with populations of less than 500

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people. It's just not really a reasonable way to draw a map by splitting a whole lot of those.

So that's why it's -- it's not really the right way to think about, to say, well, the Act 131 plan isn't so bad. It only splits 68 out of a grand total of 2,500 municipalities.

So I just wanted to put that answer in that kind of context; it's not really the right way to think about municipal splits.

Q. But, clearly, you thought it was significant that Act 131 split 68 municipalities, whereas yours, depending on which one you split, either -- somewhat less than 60 or up to 66 in your simulations, right?

A. Well, let me just help to clarify, because I think you're reading a little bit too much into -- into my report, and I think you're reading things that are really not really that significant or not that strong.

So let me just be clear about this. I think the Act 131 plan split significantly more counties than was really necessary, as pretty clearly demonstrated along the horizontal axis of this figure. It's splitting 28 counties, whereas simulated plans can very easily split anywhere from

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about 12 to 18 or 19 counties. That's a huge difference.

Now, in terms of municipal splits, I don't really draw anything that strong from this conclusion other than that, sure, it was possible, 1,000 out of 1,000 times, to split fewer municipalities. But I don't really draw the very strong conclusion that the Act 131 plan clearly subordinated municipals -- municipals -- the avoidance of municipal splits to a very strong extent simply because I don't think this number -- this gap that we see here in Figure 6 is necessarily all that striking, other than being able to show that, clearly, it is possible, it's very reasonable to produce fewer municipal splits.

But, really, where the action is, where the important finding is here is with respect to the significant gap on county splits. And so I just wanted to clarify that to you, because I think you were actually making the case a little bit more strongly than I actually am.

Q. Professor, you've -- you've contended that your simulations produce a total of a 1,000 maps that you believe are valid districting in Pennsylvania, correct?

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A. I guess I'm either going to ask you to explain what you mean by "valid" or I'm going to tell you what I mean by that. And I'm just going to say, again, what I mean by "districting plans" is they're following the traditional districting principles that I have laid out multiple times here in the last two days.

And, obviously, Set Number 2 is a slightly different variation of that --

Q. Understood.

A. -- and -- and I turned over all of these plans.

Q. Understood.

And you've turned -- and you've turned over all the maps that your simulations produced, correct?

A. Yes, sir, I did.

Q. Great.

How many of those maps did you review in preparation of your report?

A. I probably looked at a couple of them. I wrote the report in a fairly short, fairly expedited time frame.

So, I mean, I can tell you I didn't look at all 1,000. I looked at some of them.

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Q. Okay, some.

A couple, you think?

A. Oh, probably. Less than 10.

Q. Less than 10.

Okay. I draw your attention to Petitioners' Exhibit 7, which is Figure 1A from your report. This is the example of a simulated districting plan from Set 2.

How did you select this particular map?

A. Okay. Let me just orient myself to where this figure is.

Q. It's Figure 1A in your report, which is unnumbered Page 11. It is on the side --

A. I got you.

Okay. So you are talking about the example of a simulated districting plan from Simulation Set Number 2 --

Q. Correct.

A. -- and I believe your question, sir, was how I selected this particular figure, right?

Q. Right.

A. Okay. There was no special meaning to it at all. I just wanted -- as I always do in my expert reports, I wanted an illustration. And so I just found a plan that seemed to represent the

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general process.

And I mostly just wanted to show this as an illustration of the various features of how I analyze simulated districting plans. So it was just an illustration of how I analyze it with respect to things like the number of Republican seats, the number of counties split and the number of incumbents paired.

It's just an illustration. There's no special meaning.

Q. Do you know how many other maps from Simulation Set 2 you -- you looked at before you chose this one for your report?

A. Again, as I said, I certainly would have looked at maps just to verify that, certainly, the computer was correctly producing contiguous districts. I would check the populations just to make sure that wasn't some kind of mistake, that it hadn't produced unequal populations or hadn't produced plans that did not actually protect 17 incumbents. I would have checked for those basic things on a couple of maps.

I don't recall looking carefully at any more than a handful, certainly probably less than 10 that I looked carefully at. It was not -- not -- not

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a significant number.

And, again, I'm not representing this is somehow be -- this to somehow be the very best map or carefully chosen in any particular way; it's just a representative map.

Q. Okay. Dr. Chen, don't you actually need to look at your maps to determine if they really are fair comparisons to Act 131?

A. Well, this is why I turned over all 1,000 of the maps. What we do when we conduct simulation analysis is that I have a computer algorithm, and I program the computer algorithm to follow certain principles, certain criteria. And once I've got that algorithm set up and it's produced a bunch of plans, I want to make sure the algorithm actually worked correctly, it actually followed the instructions.

So I look at a couple of maps -- that's my normal research process -- I look at a couple maps to make sure that there wasn't some kind of horrendous mistake that was made along the way, there wasn't some kind of fatal flaw in the code that somehow spit out maps of West Virginia instead of Pennsylvania, things like that.

So that's why I need to make sure.

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Now, here's the bottom line: I turned over all the maps so the rest of the world could scrutinize them just as -- just as my computer has. And, obviously, I have counted them up and analyzed them in terms of various features that we've been talking about for the past two days.

Q. So is your answer to my question yes or no? Do you or do you not need to actually see your maps -- look at the thousand maps -- to determine if they're fair comparisons to Act 131?

A. I thought my answer was pretty clear. I described my research process and explained why no --

Q. No? So your answer is no?

A. -- that's not in my normal research process. I don't need to sit there and flip through 1,000 different pages in order to understand that these were maps produced using my simulation code, which I turned over, and the same maps, these 1,000 maps.

Q. Okay. And you've already given us this answer, but, I mean, you -- you -- never mind.

So we did look at your maps, Dr. Chen, and we'd like to go through a few of them with you.

MR. LEWIS: Just so everyone has

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them, I have paper copies.
THE COURT: Are these premarked?
MR. LEWIS: Well, these are just for cross-examination, so they're not necessarily exhibits. But . . .
THE COURT: Okay.
MR. LEWIS: That was our agreement.
MR. GERSCH: That was our agreement, that for cross-examination --
MR. LEWIS: That was our agreement. They don't need to be premarked.
THE COURT: That's fine.
MR. LEWIS: Your Honor, I just wanted to clarify. I'm sorry.
THE COURT: I understand that.
By them not being premarked, I'm assuming you're not offering them as evidence?
MR. LEWIS: We're going to use them in cross-examination. If they're -- if they're going to be admitted, we'll admit them through -- through other testimony --
THE COURT: Let me try this again.
Is there a potential that these exhibits could be admitted as evidence?

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MR. LEWIS: We may seek to do so.
THE COURT: Okay. So then before you go to give it to the witness, so the record is clear, let's mark it.
MR. LEWIS: Okay.
THE COURT: I'm sorry.
MR. GERSCH: Just to clarify the record, that part was not part of our agreement.
MR. JACOBSON: Our agreement was for -- to not have to turn over exhibits that would be used to --
THE COURT: I can't hear you, sir. I'm so sorry.
MR. JACOBSON: I'm sorry. It's a bad tendency of mine.
Our agreement was to not turn over exhibits that would be used for impeachment purposes only, not for things that would be admitted into evidence as exhibits.
THE COURT: Well, it's not uncommon for documents that are used for impeachment to ultimately be admitted into the record.
So if you agreed to allow documents for impeachment purposes, you tacitly agreed

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to the possibility that it would be offered as an admitted exhibit.
MR. JACOBSON: Your Honor, that was certainly not our understanding when we agreed to it. It was -- the agreement was very clearly about impeachment exhibits.
THE COURT: Well -- okay. Let's see if they admit them, and then we'll figure it out. But I definitely do not want a witness looking at something that isn't marked. Let's at least mark it.
MR. JACOBSON: Okay.
THE COURT: I think you would be up to 32.
MR. TUCKER: Yes, that's correct, Your Honor. We were just confirming.
- - -
(Legislative Respondents' Exhibit Number 32, marked for identification, as of this date.)
- - -
THE COURT: Okay. Let me confirm.
My clerk and I have a disagreement on how many premarked exhibits related to Respondents.

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Okay. What do you want?
THE CLERK: You're fine.
THE COURT: She tells me I'm right. It doesn't happen that often.
Okay. So we're going to start with Legislative Respondents' 2.
MR. LEWIS: Yes. What I've done, just to make it simpler, is we've just marked just a compendium exhibit with the 12 maps, if that's acceptable to the Court.
We're not going to go through -- actually, we're not going to go through 12 of them, but we have them just in a bound set.
If the Court would prefer I mark each one individually, we can do that.
THE COURT: How you mark them is going to impact how the Court deals with their admission. So you mark them giving yourself whatever flexibility you want to get admitted.
I've certainly been through situations where parties have marked a compendium exhibit, the witness testifies about two pages, and then you move the whole

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thing. The other side objects, and then staples are flying all over the place.

So --

MR. TUCKER: I'm going to grab them and take the staples out, Your Honor.

THE COURT: I'll tell you what. Why don't we take a break? We'll take a 10-minute recess.

THE CLERK: The Court is now in recess.

- - -

(Whereupon, a recess was taken from 11:24 a.m. to 11:36 a.m.)

- - -

THE CLERK: Ladies and gentlemen, the Court is now in session.

THE COURT: Please be seated, everyone.

Counsel can continue with your cross-examination of Dr. Chen, please.

MR. JACOBSON: Your Honor, if I may, can I just clarify the objection I had a moment ago in terms of admitting them into evidence, the exhibits?

THE COURT: I thought I clarified

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I'm going to wait until they try to admit them into evidence.

Right?

MR. JACOBSON: Okay. Understood, Your Honor.

THE COURT: Okay. If there's a motion to admit any exhibit, I will give you an opportunity to raise any objection to the admission of the exhibit.

Fair?

MR. JACOBSON: Fair.

THE COURT: Okay.

BY MR. LEWIS:

Q. Okay.

MR. JACOBSON: Your Honor, can I just ask -- we don't have a copy of the maps that they're showing Dr. Chen.

Can we --

MR. LEWIS: We'll distribute them before I ask any questions on them.

THE COURT: Then take it down.

MR. LEWIS: Yes, sir.

BY MR. LEWIS:

Q. Okay. Dr. Chen, you produced all thousand of your -- of your maps to the

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Legislative Respondents, correct?

A. Yes, sir.

Q. And I'd like to show you a series of maps that were produced from -- and, specifically -- let me take a step back.

You specifically produced a series of what are called "shapefiles," correct?

A. I produced electronic shapefiles. These are just GIS shapefiles.

Q. Okay.

All right. And those shapefiles can be readily transformed into maps using any number of GIS software programs, correct?

A. Well, it is a map itself. It's -- a shapefile is a map.

Q. So we're displaying the map, essentially, when you put a map up on the screen.

Okay. I'm going to go through a series of maps -- and we'll do it one by one -- that came out of your Set 2 simulations. And each one that I'm going to show you has a number, and that number correlates to the simulation number that appeared in your data files.

I'll represent that to you.

The first is Legislative

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Respondents' -- what we've marked for identification purposes as Legislative Respondents' Exhibit Number 32.

MR. LEWIS: And I will pass these out to counsel.

MR. JACOBSON: Thank you.

THE CLERK: Counsel, I'll take it to the Judge. Thank you.

THE COURT: Probably one for the witness, too.

THE CLERK: You can hand it to the witness.

MR. LEWIS: I'll hand the witness. Okay.

BY MR. LEWIS:

Q. It's on the screen as well.

All right. Dr. Chen, do you recognize this as one of your simulation maps from Set 2?

A. I really couldn't recognize it because, as I said, a thousand maps is what I produced, and no reasonable human can remember what 1,000 different maps look like even if I had actually scrolled through every one.

So I'm just not going to be able to represent anything -- anything like that for you

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today.

Q. Okay. You're aware that it is one of your -- one of your comparison maps, though, right? I mean --

MR. JACOBSON: Objection, Your Honor. There's no foundation established for who produced this map, how it was produced. I don't understand how the witness could agree with that representation.

THE COURT: Well, then, we're at a problem, because you've offered an expert witness that testified that he produced a thousand maps that -- that he's handed over in the course of discovery. He's trying to lay the foundation with the person who apparently created the maps, and the person who created the maps can't identify the maps.

So in terms of your foundational objection, I think we can resolve that if counsel can get together and agree that this was one of the maps that you disclosed to the other side as part of Dr. Chen's research.

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MR. JACOBSON: If I may, Your Honor -- and I can consult -- or we can ask Dr. Chen -- my understanding -- and I could be wrong about this -- is that the shapefiles we turned over would not necessarily look like this exactly as they appeared in terms of, you know, the -- the little box in the bottom right, the stars on the map.

I could be corrected if I'm wrong, but I don't believe the shapefiles we turned over would produce this exact image.

And so what I'm saying is we have no idea who produced this exact image and how they did it.

THE COURT: Okay. That question -- I'll sustain that foundational question.

Counsel, reexamine the witness.

MR. LEWIS: So here's -- okay.

Well, what we'll have to do -- if we can't get this in through him -- what we can do is -- this particular map was generated by Dr. Gimpel based on the shapefile produced from Dr. Chen. So if we need to print the map -- to identify how the map was

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printed, we can have Dr. Gimpel walk through that step.

It is not very complicated. This is a shapefile that is commonly used in GIS software, as Dr. Chen has indicated.

THE COURT: Well -- okay --

MR. LEWIS: It is -- it is what it is. I can get into how the incumbents were marked on the map. I will go through that with the witness.

THE COURT: You can -- you can certainly ask Dr. Chen to make certain assumptions in looking at this map if you want to --

MR. LEWIS: Yes, which I intend to.

THE COURT: -- what I don't think you can do is represent to Dr. Chen that this is one of his maps, because I think you have just conceded that it was not one of his maps; it was created by your expert.

MR. LEWIS: Well, it was displayed -- it was transformed into -- into a -- a printout map with the boundaries drawn on it. But the underlying map and the data was -- came directly from Dr. Chen's

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shapefile.

THE COURT: That's not what you asked Dr. Chen. You asked him if he'd seen this map before --

MR. LEWIS: Okay.

THE COURT: -- and I -- I -- my comments to the objection were I thought this was -- based on your questioning, this was indeed an actual map that was produced by Dr. Chen.

Now, you're kind of backing off of that and saying it was a map produced from data that Dr. Chen shared as part of his research and his opinion.

So why don't we do this? Why don't we try -- I'm going to sustain the foundational objection, but I'm going to give you another opportunity, if you want to examine the witness on this document at this time --

MR. LEWIS: Okay.

THE COURT: -- to ask him other questions.

Hold on for a second.

Counsel.

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MR. JACOBSON: Your Honor, if I just -- in case it's relevant to the current discussion, we exchanged our respective experts' data, and this was not something -- data from Dr. Gimpel -- that was included in the exchange of experts' data.

So to hear this is something that their expert did, it should have been included in the exchange of experts' data and information.

MR. TORCHINSKY: Your Honor, I think the Court can take judicial notice of where the counties are located in Pennsylvania. And all this did was put the location of the counties on the map.

And I think the Court can also take as judicial notice the addresses of the incumbents at the time because that, too, was a matter of public record.

That's the only two pieces of data that were overlaid on this map, and they are matters of public record. There's nothing -- there's nothing analytical about it. It is literally just an overlay of otherwise public data on top of the

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shapefile.

If it would help the Court, I could go get my laptop with the GIS files, and we can show the Court through the process of overlaying -- opening up the set of the 500 maps that Dr. Chen said -- we can actually do it for the -- we can actually show the process in front of the Court if that would help lay the foundation for this document.

This is literally his map, which are the lines that's the shapefile.

THE COURT: Counsel, you're using the word "map," okay --

MR. TORCHINSKY: Okay.

THE COURT: -- you're using the word "map." That's the first unclear thing to the Court. Then you're using a term called "shapefile," which is also an unclear term to the Court.

And -- and, certainly, I know what the Commonwealth of Pennsylvania looks like from a map perspective. I can also -- I agree with you, to a certain extent, take judicial notice of where Congresspeople live

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or lived -- I don't actually know if I can take judicial notice, but that's questionable.

But what I think you're saying is that all someone did, apparently Dr. Gimpel, was take something from Dr. Chen and put it on top of a map of Pennsylvania.

MR. TORCHINSKY: Your Honor, maybe I can step back and explain a little more clearly.

A shapefile is a set of lines. When you open the Map 12 shapefile into a GIS software, what you see is what you see on the screen here without the addresses of the incumbents marked and without the county names.

So the shapefile itself gives you the outline of the State of Pennsylvania, and the shapefile also draws all the little lines in between to create the district. That is the shapefile.

There's no overlay of any other map. When you open the shapefile alone in the GIS software, that is what is actually produced.

Then what Dr. --

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THE COURT: Okay. Okay. I think I understand.

MR. TORCHINSKY: Okay.

THE COURT: I'll accept that proffer at least for purposes of moving this forward.

MR. TORCHINSKY: Okay.

THE COURT: Based on that proffer, I want you to begin your examination of Dr. Chen anew and see if you can establish some familiarity with this document based on work that Dr. Chen has done.

MR. LEWIS: Okay.

BY MR. LEWIS:

Q. Dr. Chen, the shapefile that you produced that corresponds to Set 12 -- or Simulation Number 12 from your second set, or any simulation, do you understand the shapefiles contain the lines -- the district boundary lines for your -- for your simulation?

A. Sir, just to be clear, what the shapefile describes are a series of latitude and longitude coordinates. That's what a shapefile is.

Q. Okay. And that would be the output from your simulation, correct?

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A. Yes, sir. I turned over shapefiles describing the latitude and longitude coordinates of borders.

Q. Right.

Okay. And you would agree with me that the shapefile can be used to display a map similar to -- I'm not asking you to say this was your -- your -- your Set 12.

I'm just saying, in general, that shapefile can be used to draw a map with the red lines that you see on that -- on that screen, correct?

A. Well, just -- just to be clear, sir, a shapefile is just a series of latitude/longitude coordinates describing boundaries.

Now, certainly -- I -- I understand that you've -- you've represented to me that one of your experts took those files -- or took this particular file and made an artistic creation of his own, adding in various features. And I understand you've represented that to me, and I can verify that that is possible.

But I just wanted to be very technically clear that a shapefile is nothing but latitude/longitude coordinates describing the

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boundaries of various polygons.

Q. And in this particular case, the shapefiles that you produced describe the latitude and longitude points of polygons that consisted of the districtings that your simulation outputted, correct?

A. Sure. They're representing district boundaries. That is what a district shapefile is.

Q. Okay. So I will ask you to assume, for purposes of our questions --

MR. LEWIS: And, Your Honor, if we need to, we can use Dr. Gimpel to lay any necessary foundation --

THE COURT: Your examination is good so far.

MR. LEWIS: Okay.

BY MR. LEWIS:

Q. I'll ask you to assume for purposes of our discussion this morning that what is up on the screen, Legislative Respondents' Exhibit 32, is map -- is the shapefile -- or the output of the shapefile corresponding to simulation Number 12 from Set 2.

THE COURT: Dr. Chen, do you understand what he's asking you to assume?

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THE WITNESS: I do understand that, and I just want to make clear, Your Honor, that I just explained that that is not possible. So the output of the simulations is not what's on this --

THE COURT: No, I think what he's asking you to assume is that -- I forget what terminology you used, because it was much more eloquent than what I'm about to use, but that this is a graphic illustration of the shapefile latitude and longitude outputs for this particular set of -- or simulation in Set 2, which I think in your direct testimony, you also used geographic -- or pictorial illustrations of the shapefile data as well.

THE WITNESS: Yes, Your Honor. Thank you, Your Honor. That is -- that is correct. And I just wanted to make clear what this is and is not, because I don't think what you just said was consistent with what counsel just said.

THE COURT: Well, that's three times that's happened today, and I'm not trying to hijack the examination. I'm

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really just trying to -- was that what you were asking him --

MR. LEWIS: Yes, I was asking him to assume that that is the map that your shapefile would draw if one drew a map based on your shapefile.

THE WITNESS: And I just put that in my own words by saying that here's what this map is in front of me. It is an artistic creation --

THE COURT: "Artistic creation," that's what you said.

THE WITNESS: -- and certainly, counsel's representing to me that his expert derived it from my original shapefile and added on various artistic features onto this map, and I accept that. I accept counsel's representation that that is what his expert did.

So thank you for clarifying that, Your Honor.

THE COURT: Thank you.

MR. LEWIS: Thank you.

BY MR. LEWIS:

Q. And, Dr. Chen, I will also represent to

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you -- and you can see a series much like Figure 1A from your own report, which I'll flip back to -- for a moment. I see on Figure 1A that you've marked the location of what I understand to be the then-incumbents of the different seats in December of 2011.

Is that what you did in your Figure 1A, Petitioners' Exhibit 7?

A. It is, in fact, what I did in Figure 1A of my report. And I just want to, again, clarify that I did not do so in the map that you just handed to me, and those appear to be or, at least, counsel's represented to me, that those were an artistic creation of counsel's expert.

Q. Okay. And, again, I will represent to you that a similar overlay was performed on Map 12, not by you, but it was performed --

THE COURT: He's accepted that representation.

MR. LEWIS: He's accepted that. Okay.

MR. JACOBSON: Your Honor, could I just ask for a clarification?

Which simulation set is this from?

MR. LEWIS: Simulation Set 2.

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THE COURT: Which actual simulation, though?

MR. LEWIS: Simulation Number 12. When you see the map with the 12, that refers to, right -- that's -- that's the simulation number from Set 2.

And just for purposes of clarity, all the maps that we're going to be showing are out of Set 2. There are none from Set 1.

BY MR. LEWIS:

Q. Now, Dr. Chen, do you -- you testified earlier today that you thought that given different constraints on a map that you could produce maps that were -- I think the term you used was "ridiculous."

Do you recall that testimony?

A. I don't remember the precise word, but I accept that you got that right --

Q. Okay.

A. -- I think -- maybe I'll help you jog your memory. I think that came up in the context of you asking me about municipal splits, and I think I answered that, sure, if you want to split up 1,500 of Pennsylvania's municipalities, you could create a totally ridiculous-looking map.

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And I think that's where I used that word.

Q. I just want to bring up incumbent pairing for you. So this -- this particular map is an example of a map that would pair Congressman Fattah and Congressman Brady.

Sir, do you think that's a reasonable pairing of incumbents?

A. Well, I'm just going to, again, start by saying that I think what you just represented to me was that this map -- you represented to me the information that this map pairs Fattah and Brady. And I have not -- I can't vouch for the accuracy of where these stars are on the map because, again, you represented to me that that was an artistic creation of your expert. So I'm just going to start by pointing that out, and then I'll proceed to answer your question.

I think your question to me was whether it was reasonable to pair Representative Fattah and Brady.

That was your question, right?

Q. Yes.

A. Okay. And my answer to that question is that that was most certainly not a question that I

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analyzed. I can really -- I really can't give you an expert opinion on that matter.

I mean, to put it more precisely, there's nothing in my application of traditional districting principles in my report that would have led me to even attempt to analyze that question.

Q. Now, sir, we have some -- you were commenting on unusual-shaped, you know, districts. I'd like to call your attention to -- is the laser pointer up at the -- up at the dais?

A. Oh. Yes, sir.

Would you like it?

Q. Yes. I appreciate that.

Thank you, sir.

Does this district here -- let me see if I can zoom in a little bit more.

This district you have drawn here with -- and I'll represent to you, again, you have Representative Shuster drawn into this map.

Does that look like a regularly shaped district, to you, Dr. Chen?

A. You're talking about the district that encompasses Huntingdon and Fulton and Franklin; is that correct?

Q. That's correct. I'm going down the

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list.

A. If I could just ask you to repeat your question.

Q. Sure.

Does that look like a regularly shaped district, to you, Dr. Chen?

A. I'm going to answer the question as precisely as I can in the context of my expertise and my analysis.

Q. Okay.

A. I analyzed the compactness -- the geographic compactness of districting plans, and I analyzed that, as we discussed at great length over the past two days, in terms of standard measures of geographic compactness using Reock and Popper-Polsby scores. And I found that every single one, all 1,000 of districting plans that my algorithm produced, were significantly more compact than the enacted plan.

So I certainly had calculations on the compactness of each one of these districts, and I could quantify those for you, you know, in terms of the actual numerical scores, but I actually reported those numbers in the report. That is the extent of my expertise.

So I just wanted to make clear where my

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expertise ends.

Q. Okay. We can return to this, but -- when you calculate your compactness scores and -- for your report, you actually reported an average for the entire map; is that correct?

A. Yes, sir. That is normally how redistricting scholars evaluate the geographic compactness of plans. We calculate the scores up for individual districts, and then you take the average across the entire plan.

Q. All right. All right.

So we started with the Shuster district here -- it looks like a bit of a sorcerer, to me, but if we look up at this top left district, do you know why your simulation would have drawn a sort of interesting boundary here to encapsulate Representative Kelly into what I understand would have been the Fifth Congressional District?

A. Sure, look, I'm happy to answer that question specifically here, but I'll -- I'll answer it generally as well. Obviously, you're going to go through and find -- and point out the most noncompact districts that you can find in -- across these 500 simulated plans and then ask me about each one of them. And I'll just give a general answer, and I'll

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try and answer specifically here. And this is a very important point, because it is a key characteristic of the Simulation Set Number 2, as I have explained to -- to Mr. Jacobson at some length yesterday -- I think yesterday.

So what Simulation Set Number 2 is doing is -- it is not just following traditional districting plans, in other words, not just trying to maximize geographic compactness while otherwise following traditional districting principles. Instead, what Simulation Set 2 does is it intentionally protects 17 incumbents.

And if you look at the locations of the 19 incumbents in place as of the end of the previous decade's plan, in other words, the incumbents in place as of November 2012, some of them are geographically concentrated in certain urban areas, but, in general, when you make such an extreme effort in drawing a districting plan to protect as many incumbents as possible, you are necessarily going to only be able to achieve that at the sacrifice -- some sacrifice of principles like geographic compactness and minimizing county splits.

And, indeed, as I testified -- as I explained to Mr. Jacobson yesterday, that is exactly

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what we saw when we walked through carefully all of the results in Table 1 comparing Simulation Set 2 to 1, that when you follow this principle of trying to protect 17 out of 19 incumbents, you're obviously going to end up with more noncompact districts.

And the map that you are representing -- you, sir, are representing to me here, if, in fact, you are correct about its providence, that is a really good illustration of this, is that we see this district in the upper left corner --

So now I'm going to answer your question specifically.

Q. Okay.

A. -- it clearly has this kind of lower portion that is there because of a consideration about protecting a particular incumbent, about the incumbent Kelly. So that is what the sort of principle does to maps. When you intentionally try and protect incumbents, you end up with somewhat less compact districting maps, which obviously involve less compact districts.

Now, here's the more important point, and here's the bigger picture of all of this: The really important point to understand about what

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Simulation Set 2 found about geographically noncompact districts like this is that even in spite of the moderate sacrifice to compactness that was necessitated or caused by the effort to protect incumbents --

Q. Dr. Chen, I think you've answered the question.

MR. JACOBSON: If you could allow the witness to finish his answer.

THE COURT: Don't interrupt the witness's answer.

Dr. Chen, you can continue.

THE WITNESS: It was really brief. I was just going to explain that the really big-picture thing to be getting from your highlighting of that district in the upper left corner -- and I thank you for highlighting, because it illustrates this point really well -- is that in spite of the moderate sacrifice, the geographic compactness that is caused by an intentional effort to protect incumbents in a nonpartisan manner, in spite of that, we see across the entire set of 500 simulated plans in Simulation Set Number 2 that every single

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one of them is still significantly more geographically compact, whether you use the Popper-Polsby or the Reock score, significantly more geographically compact than the corresponding scores -- corresponding compactness scores for the enacted plan.

So I just wanted to explain what I see from those two districts that you just highlighted, because I think that illustrates that point really well.

Q. All right. We're going to move on to what we're going to mark for identification purposes as Legislative Respondents' 33.

\- - -

(Legislative Respondents' Exhibit Number 33, marked for identification, as of this date.)

\- - -

BY MR. LEWIS:

Q. Okay. Okay. I got the right map.

Okay. Dr. Chen, the same exercise as -- as before. The same exercise as before, Dr. Chen. I will represent to you that this -- and I will ask you to assume for purposes of our discussion

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regarding Legislative Respondents' Number 33 that this map is the output of the shapefile that you produced from Simulation Set 2, Simulation Number 20. And I will further ask you to assume that the overlay of the congressmen's residence from 2011 has been accurately added to this Map 20.

Specifically, I'd like to ask you regarding this map, Dr. Chen, this map once again -- actually, this map actually pairs Representative Brady and Representative Meehan.

Do you see that, Dr. Chen, in the line lower right-hand corner --

A. It looks, to me, sir, like your expert really overlaid a bunch of words in that -- in that corner of the map, so I can't really clearly make out the creation of your expert here in this area, but I'm going to accept your verbal representation about what it's doing.

Q. Okay.

A. I just can't really see clearly on the map for myself. It looks like a bunch of jumbled words, to me.

Q. Sure, sure.

And, Dr. Chen, you see much like before -- you would agree with me that you have a lot

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of noncompact and irregularly shaped districts on this map, yes?

A. As I just said a minute ago or a couple of minutes ago and as I explained to Mr. Jacobson yesterday, it's very clear that in Simulation Set Number 2, there are some modest or moderate sacrifice to geographic compactness --

THE COURT: Dr. Chen, now I'm going to interrupt, because the question was actually a pretty straightforward question: Do you see irregularly shaped districts?

THE WITNESS: Yes, sir.

THE COURT: Okay.

THE WITNESS: Okay. Thank you, Your Honor. I appreciate that. And the answer is, yes, as I explained -- as I elaborated before.

BY MR. LEWIS:

Q. Okay. Dr. Chen, we're now going to hand you what we're going to mark for identification purposes as Legislative Respondents' Number 34.

MR. LEVINE: Your Honor -- Your Honor, Cliff Levine on behalf of the Lieutenant Governor.

Could I just note an objection to

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these exhibits, because -- or a clarification, because in 2010, Kathy Dahlkemper was the Congresswoman from Erie, not Congressman Kelly, and so these maps do not -- I don't know if they're trying to reflect the 2010 situation in the creation of the map or not.

THE COURT: I don't either. All I know is counsel represented and asked the expert to make an assumption and the expert accepted the assumption.

MR. LEVINE: Okay. I withdraw.

THE COURT: Okay.

BY MR. LEWIS:

Q. All right.

Dr. Chen, the same exercise as before, we're going to ask you to assume that the map that's displayed on the screen, Legislative Respondents' Number -- marked for identification purposes as Legislative Respondents 34, is a map produced based on the shapefile that you produced for Simulation Set 2, Simulation Number 145.

And, Dr. Chen, just to keep this moving, I'll further note that this particular map also pairs Congressman Brady and Congressman Fattah,

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if you can see that in the lower right-hand corner of the map.

Specifically, Dr. Chen, are you aware that Professor Kennedy criticizes what's called "point contiguity" in the drawing of district maps?

A. I didn't read Professor Kennedy's report.

Q. Okay. Are you aware of what the term "point contiguity" means in districting?

A. Yeah, I understand what the term means.

Q. Okay. And can you define it?

A. Well, point contiguity refers to what's -- what's considered two different fragments of a district that touch only at a small point, rather than a nonzero length of shared area. So it essentially is, say, two squares that touch only at each of their respective corners. That's an example of point contiguity.

So, I mean, that is obviously, you know, a -- a principle of contiguity, that you can't have point contiguity -- or, at least, it is in most -- in many states. And certainly that is something that, you know, when -- when you look at the sort of districting plans that my algorithm produced, it checks for point contiguity and it makes

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sure that districts may touch at a very small shared area, but it cannot just touch at one point.

That is an essential part of the testing of my algorithm. And, again, I'm just going to say what I've said before. I laid out the computer code to be able to show the world exactly how those kinds of features were implemented into the algorithm.

Q. Dr. Chen, if the feature of eliminating or minimizing point contiguity was part of your algorithm, why was it not disclosed in your report as a traditional districting criteria?

A. It is. I said "contiguity." I mean "contiguity" means that.

Q. "Contiguity" means "point contiguity," that's what you're testifying to?

A. Generally, when -- when we talk about contiguity, we mean that districts are supposed to be contiguous in that any different portions of a district have to be touching at more -- more than one point. So, yeah, I mean, I apologize that I didn't clarify that for you when we went through the algorithm earlier today, but I'll be clear now.

The algorithm -- the computer algorithm guarantees point contiguity. That means, if you zoom

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in -- far in on any district and you zoom in far enough, you check every little border, you will see that the borders -- that the districts are all contiguous without using point contiguity, just to be clear.

Q. What was your threshold for point contiguity?

A. Generally, there's not a threshold, other than saying that it can't touch at a point that has a length of zero, so anything more than that is not point contiguity. It is not a violation of that principle. So that's just another way of saying that if you have, say, a north and a south portion of a district, as you see in, say, this district right in front of us that you've put up on the screen --

Q. I'm zooming in as best as I can here.

A. That's okay. I'll just use a generic example.

Q. There you go.

A. Okay. Sure, I'm happy to talk about that.

Q. Sure.

A. Basically, if you took the GIS shapefile and you zoom far in on it and you zoom very far in, you would see that every single district does

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not -- is contiguous and does not use point contiguity. That is the point of me turning over the maps in electronic format.

So I don't turn them over as, say, a PDF, where we might have low resolution. You have an electronic format so you have an actual depiction of the latitude/longitude coordinates of every little border, so that, you know, interested observers or interested people who want to scrutinize my maps are able to zoom very far in, in a way that you would not be able to on, say, a normal PDF document.

Q. You would agree with me this little point in here -- we can use a different example -- this is probably the best one on this map.

This little, small section here of the combined Brady-Fattah district, that's a very narrow, little ridge connecting that top portion to this lower portion, wouldn't you agree?

A. Oh, yeah, I totally agree with you that there's clearly a sacrifice to compactness here, and it appears to be driven by Simulation Set 2's very specific determining factor of intentionally trying to protect incumbents. Look at the location of the incumbents there, and you can see that is very clearly -- as I explained earlier today, and I'm

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just -- I -- very clearly the product of that feature of that simulation algorithm, trying to protect 17 incumbents.

Q. Sure.

All right. Dr. Chen, we're going to show you now what we've marked for identification purposes as Legislative Respondents 35.

\- - -

(Legislative Respondents' Exhibit Number 35, marked for identification, as of this date.)

\- - -

BY MR. LEWIS:

Q. I'll get it up on the screen here. We're all in agreement. All right.

Dr. Chen, again, I will ask you to assume for purposes of our discussion, one, that this is the output of the shapefile that you produced that corresponds to Simulation Set 2, Map Number 1 -- or Simulation Number 187.

Again, we'll further ask you to assume that the locations of the incumbent congressmen you know, have been placed on the map.

And, here again, Dr. Chen, would you agree with me that this particular district that runs

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from the northern part of the state all the way to the southern part of the state is -- would be a fairly noncontiguous district?

A. Noncontiguous?

Q. Excuse me. Excuse me --

A. You're asking the noncompact --

Q. -- I misspoke.

Right, noncompact.

I apologize.

A. The same answer as before. I think you've essentially been asking me the same question about several of these maps on Simulation Set Number 2. And I mean, if it helps you out, I'm happy to just tell you I'm going to respond the same way. I'll spare the Court the long answer.

THE COURT: Give me the short answer.

THE WITNESS: Well, the short answer is, Yes, I agree that clearly there is some sacrifice to compactness.

THE COURT: He wants to hear you say it. So what he says, Would you agree with me that this is noncompact?

THE WITNESS: Thank you, Your Honor.

THE COURT: Okay. And you would

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agree with him?

THE WITNESS: Yes, Your Honor.

THE COURT: Okay.

THE WITNESS: I mean, let me just clarify, because I need to describe it in a way that I know how.

So I'm measuring compactness as -- it's the same answer as before. I measure compactness quantitatively, and there's no doubt that these sort of districts here in Simulation Set Number 2, such as the one you've pointed out, are going to have lower quantitative compactness scores along Reock and Popper-Polsby because of the Simulation Set Number 2's requirement of protecting 17 incumbents.

BY MR. LEWIS:

Q. All right. I'm going to now hand you, Dr. Chen, what we've marked for identification purposes as Legislative Respondents Exhibit 36.

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(Legislative Respondents' Exhibit Number 36, marked for identification, as of this date.)

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BY MR. LEWIS:

Q. And, Dr. Chen, I just had one more question on 187 before we moved off it while I still have it up here on the screen.

What I've done is I've narrowed -- I've zoomed in -- I'll zoom out, and then I'll zoom in.

We have an example here of a district that runs in the center of the state around Clearfield, then heads into the southern part of the state, like this (indicating).

All right.

Dr. Chen, is this little point of intersection here -- is this an example of what we would call "near point contiguity"?

A. "Near point contiguity"?

Q. Yes.

A. I'm going to have to ask you what you mean by that term.

Q. Let me rephrase, then.

That's a pretty narrow point of connection between that Clearfield portion and that southern portion of that district, wouldn't you agree?

A. Oh. You're asking about the fact that the northeast portion is connected to the south --

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sorry -- the northwest portion is connected to the southeast portion by only a narrow strip of land?

Q. Correct.

A. And I couldn't tell you the precise amount of that land, but I generally accept that representation, that it's, you know, obviously contiguous.

It's not using point contiguity, which is the only thing that matters for my algorithm, for my simulation algorithm --

Q. Okay.

A. -- and whether or not that is a very narrow connection is not something that I -- that I analyzed.

Q. Okay. Turning now to Legislative Respondents 36, I will again, for purposes of our -- of our questions here today, ask you to assume that this is Simulation Number 228 from Simulation Set Number 2, that this map was produced from the shapefile that corresponds to that simulation. And I will further ask you to assume that -- that the incumbent congressmen have been identified with asterisks and blue text on the map.

THE COURT: Counsel, are you going to ask questions about the pairing again?

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MR. LEWIS: Yes.

THE COURT: Okay. Well, Mr. Levine's point of clarification is probably a good point of clarification that you might want to do now because I -- I can imagine --

MR. LEVINE: Your Honor, it was my error, and I would like to withdraw that. I got confused. It was -- Dahlkemper lost in 2010, and so the map would have been created with Kelly.

THE COURT: I think the clarification on the record, though, is important.

Incumbents as of when, is really the question, that when you're referring to incumbents, incumbents as of when?

MR. LEWIS: It would have been 2011, Your Honor.

MR. TORCHINSKY: Your Honor, it would have been as of the time the maps were drawn. In other words, the maps were drawn -- this map was adopted in December of 2011. It would have been the incumbent congressman at that time.

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THE COURT: Okay. I think that clarification is -- is valuable for everybody.

Thank you.

MR. LEWIS: No, thank you for pointing that out, Your Honor.

BY MR. LEWIS:

Q. Dr. Chen, once again, I'm flipping to another map now.

Once again, Dr. Chen, your simulation has Congressman Brady and Congressman Fattah paired in a district, correct?

A. I'll accept your oral representation of that, but I'm just going to qualify, once again, that I can't really see the muddled words on -- on your expert's-produced map.

Q. Okay. The same as before, Dr. Chen, you would agree with me that you have several noncompact districts, like, for example, this top district here or this district that -- it has almost a little sorcerer shape down here in the center that we saw earlier today.

You would agree that those are examples of noncompact districts, right?

A. Again, I'm going to give you the same

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answer as before. It is very apparent, to me, that those districts that you pointed to are clearly going to have less geographically compacted districts -- less geographically compact districts than the sort of compactness scores that we were seeing in Simulation Set Number 1, specifically because of the intentional effort to maximize the protection of incumbents.

Q. I'm going to hand you what's been marked for identification purposes as Legislative Respondents' Number 37.

- - -

(Legislative Respondents' Exhibit Number 37, marked for identification, as of this date.)

- - -

BY MR. LEWIS:

Q. All right. Dr. Chen, as with other -- as with the other maps we've gone through, I will ask you to assume that this map reflects the output of the display of the shapefile that you produced in connection with your report for Simulation Number 373 from Simulation Set Number 2.

Again, the same as before, I will further ask you to assume the location of the

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congressmen that held office as of 2011, when this map was adopted, that they are indicated with the asterisk and their names on -- on the map.

Dr. Chen, can you just explain -- really, the only question I had on this map, can you explain some of these unusual shapes?

And I'll zoom in. But, like, this here (indicating). I see another one up here (indicating) in the -- up in the corner.

Can you explain why your algorithm would have produced a shape such as that?

Let's just focus on this one here (indicating), above Bedford.

A. Sure. So I get that you're basically asking me why they're -- within each district, there's an area that apparently has jagged edges. I'm happy to explain that.

Q. Sure.

A. You're basically pointing out the jagged edges at various points at each district. I'm happy to explain why that is something that just naturally happens.

So, basically, what happens at the end of each district is that there is necessarily a place where you have to split a county, and generally you

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have to split at least one additional municipality. And you have to split it down the census blocks, meaning you have to assign some of the census blocks within one municipality to one district and some of those blocks into another district in order to achieve precisely equal populations.

So this is a very common feature of Congressional districting plans everywhere, given that these days, Congressional districting plans across most states try to achieve perfectly equal populations, and a districting algorithm that tries to produce perfectly equal populations with zero population deviations is no different.

There's going to be one place in every district where you've got to go down to the census-block level and split it between municipality, sometimes in somewhat jagged ways, in order to produce precisely -- precisely the right population, in other words, 705,000, with no deviations.

So that's what happens in the drawing of each district. And you will see that in the enacted plan, you will see those kind of jagged edges where a municipality is split up and you go down the census-block level. And you see that in the simulated plans.

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Here's the bigger picture, though: We want to account for all of that and evaluate all that in terms of actual objective measures of geographic compactness. And that's exactly what I did, and that is why in my report, I compare the compactness scores of all 1,000 of these simulated plans against the compactness scores of the -- of the enacted plan.

And so that's the bigger picture here, is that you look at the actual compactness of the entire plan as a whole as -- as -- as -- as calculated from its individual districts.

- - -

(Legislative Respondents' Exhibit Number 38, marked for identification, as of this date.)

- - -

BY MR. LEWIS:

Q. Okay. All right. Dr. Chen, we're going to go through this same process again with what we've marked for identification purposes as Legislative Respondents' Number 38.

THE COURT: We're going to go off the record for a second.

(Pause.)

THE COURT: Okay. Proceed.

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MR. LEWIS: Thank you, Your Honor.
BY MR. LEWIS:
Q. Dr. Chen, I've handed you what's been marked for identification purposes as Legislative Respondents' Number 38. As before, I'll ask you to assume that this map was generated as the output of the shapefile that you produced corresponding to Set 2, Map 415.
Dr. Chen, as with before, this Map 2 -- would you agree with me that this Map 2 features elements of narrow contiguity and any number of -- of noncompact districts? As an example of a noncompact district, I'd offer you this one here at the very top.
A. I'm just going to answer the same way: I evaluated the quantitative compactness of every one of these districting plans, and clearly, that is a district that has made some moderate sacrifices in terms of quantitative compactness in order to comply with Simulation Set 2's requirement of protecting -- intentionally protecting as many incumbents as possible.
MR. LEWIS: I have nothing further on this map, Your Honor.
If the Court would like to recess

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for lunch, this would probably be as good a time as any.
THE COURT: The Court will be in recess until 1:15.
THE CLERK: The Court is now in recess.
(Whereupon, at 12:35 p.m., a luncheon recess was taken.)

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AFTERNOON SESSION
(1:17 p.m.)
- - -
JOWEI CHEN, PH.D.,
was called for continued examination and, after having been previously duly sworn, was examined and testified further as follows:
- - -
THE CLERK: Ladies and gentlemen, Court is now in session.
THE COURT: Please be seated, everyone.
Before we continue with the cross-examination of Dr. Chen, I just want to point out to the parties that we have reserved until Friday to complete the trial in this matter. So the trial is not going to go past Friday.
That means unless the pace increases remarkably, we're looking at some late hours coming up. Particularly, I anticipate tomorrow may be a very late night.
But I just wanted to remind everybody that we're -- we're planning on concluding the trial on Friday.

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With that, you can proceed with your cross-examination of Dr. Chen.
MR. LEWIS: Thank you, Your Honor.
- - -
CROSS-EXAMINATION (RESUMED)
- - -
BY MR. LEWIS:
Q. Dr. Chen, does your -- is your simulation model indifferent to individual district compactness?
A. Indifferent to individual district compactness?
Q. Yes.
A. Okay. So you're asking me whether or not a district having a certain compactness score is something that my algorithm pays attention to or doesn't pay attention to?
Q. Correct.
A. Okay. And -- I mean, the answer is that it is accounting for the compactness of all districts. It tries to draw all districts in a compact manner after -- after fulfilling the other four criteria that came before it, and in Simulation Set 2, in fact, the other four plus incumbency protection.

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So the answer is -- is, no, it's not indifferent to district compactness. I mean, I -- I think I've explained that pretty clearly, that it's not indifferent to district-level compactness.

Q. Is your algorithm achieving compactness by, you know, drawing very compact districts in the urban areas such that when it has to draw less compact districts in, for example, the western portion of the State or -- or other otherwise, rural suburban areas, it can draw less compact districts in those and still maintain an overall compactness score that you would deem favorable?

A. No, sir. The district -- the districting simulation algorithm does not make that sort of distinction at all, and there is no input that would tell the algorithm to only care about compactness in certain areas of Pennsylvania and not others. It tries to draw compact districts everywhere in Pennsylvania subject to those other constraints.

Now, there are certainly going to be cases where those constraints are heavier in some parts of the State rather than others. This is especially true with Simulation Set Number 2, where compactness necessarily is going to be somewhat

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sacrificed in order to protect 17 out of 19 incumbents.

If there's a particular place on the map where there's a heavier concentration of incumbents or a very sparse set of incumbents and, yet, districts have to be drawn to include exactly one incumbent, then, certainly, there can be more significant sacrifices to districts in those areas affected by that particular configuration of incumbents.

So that is the way in which the measurement of compactness or the -- the perceived compactness may be a bit uneven across the State. It emanates from the specific features of where the incumbents lie, as well as, of course, the other -- the other criteria in the algorithm. But I would just highlight the incumbent-protection feature of Simulation Set 2.

Q. Dr. Chen, I'd like to now then refer to your Table 3 from your expert report, which has been marked Petitioners' Exhibit 11.

Dr. Chen, isn't it true that in your Simulation Set 2, that you paired incumbents in the southeastern part of the State nearly 97 percent of the time?

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A. Well, I didn't pair anybody. The computer drew simulation maps --

Q. Your simulation paired --

A. -- and I calculated which incumbent would lie within which district in each simulated map. And, you know, certainly, the exhibit you've brought up here appears to be the results of my analysis along those lines.

So I think the correct characterization is that the computer drew plans that resulted in the results we see here in this table.

Q. Okay. Would you agree with me that it's about -- roughly 96 percent of the simulated pairings pair incumbents that were in the southeastern part of the State?

A. I did not do such an analysis, so -- I paid no attention to that because my algorithm simply says protect as many incumbents as you can.

Q. All right. Let's -- we'll just look at the first.

You understand that Congressman Meehan represents the Seventh Congressional District, correct?

A. I couldn't give you that -- that fact off the top of my head, but if you'd like me to

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accept your representation, I'm happy to do so.

Q. Okay. Seventh District is in Suburban Philadelphia, correct?

A. Again, it's not something that I analyzed for my report, but I'm happy to accept your representation on that one.

Q. Okay. So the pairings involving just Congressman Meehan alone, 40.2 percent, 34.4 percent -- what's my next pairing here? -- another 4.8.

So you've got, right there, roughly -- you know, give or take, you've got 80 percent right there just with Congressman Meehan, fair?

A. I'm just not sure which columns you're -- or which rows you're asking me to add up.

Q. Sure.

Pat Meehan and Jim Gerlach, 40.2 percent; Bob Brady and Pat Meehan, 34.4 percent.

So let's do that, 74.6.

Then we go down and we have --

THE COURT: Meehan and Pitts.

BY MR. LEWIS:

Q. -- Meehan and Pitts, another 4.8.

So we're getting -- we're about 80 percent right there.

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A. You're just asking me on the math there?

Q. Yes, correct.

A. You added up those rows, and I affirm your math calculations. It's roughly 79 or 80 percent.

Q. All right. Perfect.

You understand that Representative Brady represents, I believe, the First District in Philadelphia, right?

A. I think I'm aware of that. Again, this is not any part of my expert analysis --

Q. Sure, sure.

A. -- but I accept your representation there.

Q. Okay. And former Representative Fattah represented the Second Congressional District also in Philadelphia, correct?

A. I'm happy to take your word for it.

Q. Okay. That's another 18 percent, isn't it?

A. You're asking me to add Rows 1, 2, 5 and -- and 3?

Q. One, 2, 3 -- 1, 2, 3 and 5.

A. Okay. I'm happy to be the math guy

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here for you. You add all that up, you're getting over 95 percent.

I don't have a calculator in front of me --

Q. Okay. That's fine.

A. -- but you don't need a Ph.D. to do that.

Q. Lawyers don't do math. So thank you.

Okay. Why didn't your simulations pair incumbents in the western portion of the State more frequently?

A. Okay. I'm happy to answer that answer in a general way as best as I can from my expertise.

So as I had explained in response to one of Mr. Jacobson's questions yesterday, when you apply traditional districting principles, which obviously include geographic compactness, minimizing county splits and so on, to a districting process that intentionally tries to protect incumbents, there are going to be certain pairs of incumbents that are more likely to be paired together.

Some pairs are going to occur more likely than others. If, for example, you have one incumbent over in Pittsburgh and another incumbent way over in Downtown Philadelphia, are they likely to

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be paired? No, because they're geographically very far apart.

So that's one key insight here from just thinking about how districting principles apply when you're trying to pair incumbents.

So what does that mean for -- specifically for the application of traditional districting principles here in Pennsylvania as applied to a districting process that intentionally tries to protect as many incumbents as possible?

It means that incumbents are more likely to be paired together in the same district under certain conditions. If they are geographically close to one another, they're more likely to be paired; if they reside within the same county, they're even more likely to be pair; if they reside within the same municipality, they're more likely to be paired.

Those are the sorts of factors that would -- that would make any two incumbents, all else being equal, more likely to -- to be paired.

So that's a very general answer.

Now, as to your specific question about one region of Pennsylvania versus another, I did not analyze that because it wasn't necessary to analyze

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that sort of -- of regional variation for the purposes of my expert report.

What I simply did in Simulation Set Number 2 was to have the computer intentionally protect as many incumbents as possible while paying no attention at all to the identities of the incumbents or to the parties of the incumbents. I really couldn't tell you the parties of most of these incumbent members.

Q. Dr. Chen, is it realistic to believe that the Pennsylvania Legislature, no matter who controlled it, would have ever paired Representative Brady with another incumbent?

MR. JACOBSON: Objection, Your Honor: no basis. He hasn't established any basis for this witness to be able to answer that question about what's realistic to believe.

MR. LEWIS: The witness is an expert --

MR. JACOBSON: Sorry. One more basis.

In terms of talking about the State Legislature's intent, we're now getting into information that, of course, they have but

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haven't disclosed on the basis of privilege. I believe that was the framing of the question, the Legislature's intent.

THE COURT: I don't think that's -- I -- on the phrasing of the question, I don't think -- I think, again, he posed a hypothetical. So I don't think it was an actual question or actual asking Dr. Chen about the intent of the General Assembly.

I think he was asking Dr. Chen, if I understand the question, Would it be reasonable, in his opinion, for the Legislature to have drawn a map that paired two particular incumbents together.

Was that your question?

MR. LEWIS: If it was realistic to believe that the Pennsylvania -- hypothetically, is it reasonable for the Pennsylvania Legislature to have paired Congressman Brady with another incumbent.

THE COURT: Would it have been reasonable?

MR. LEWIS: Yes.

THE COURT: okay.

Your objection is overruled. We'll

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see if he can answer the question.

MR. JACOBSON: If I may, Your Honor, I think part of my concern is the word "realistic." When you're talking about realistic --

THE COURT: I think he just said reasonable.

MR. LEWIS: I changed the word to reasonable.

THE COURT: He just said reasonable.

MR. JACOBSON: Okay. Under that new phrasing.

THE COURT: Go ahead, answer -- the objection is overruled.

Go ahead and answer the question.

THE WITNESS: Thank you, Your Honor.

My answer is that it is beyond my expertise as an empirical political scientist to tell you what the General Assembly should or should not do.

BY MR. LEWIS:

Q. And I'll ask you the same question with respect to former Representative Fattah.

Is it reasonable --

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THE COURT: Counsel, do you have to ask him that question? He just said it's beyond his expertise to answer those kinds of questions.

MR. LEWIS: Fair enough. Fair enough. I'll withdraw the question.

THE COURT: Let's move it along.

BY MR. LEWIS:

Q. Professor, your report discusses race as a possible constraint on how Act 131 was developed.

Do I understand correctly that for purposes of your report, you attempted to assess the possible role of racial factors solely by looking at how many of your simulated maps contained one Philadelphia-area district with a 56.8 percent or higher African-American voting-age population?

A. I'm going to answer your question, but the first thing I need to do is clarify that the premise of your question was -- was not correct. So I did not attempt to assess the possible consideration of -- of race by the General Assembly. What I did instead was I asked a very specific question at the end of my report. I asked, Suppose there was a hypothetical racial goal by the

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General Assembly, and then how would that affect the sort of plans that emerged assuming that hypothetical -- very hypothetical racial goal.

And, again, I'm taking no position on whether the General Assembly did or did not have such a goal. And, obviously, as you know, I'm taking no position on the legality of pursuing such a goal.

So having established that first and just to clarify the premise of your question, I'm going to answer the question now.

And just to be really clear, what I did is I isolated the set of simulated plans -- along those 1,000 plans, the set of simulated plans that created one district with at least a 56.8 percent African-American voting-age population.

Q. Did you analyze whether any of the majority/minority districts created in any of your simulations complied with the Gingles factors by which plans are assessed under the Voting Rights Act?

MR. JACOBSON: Your Honor, objection. Dr. Chen is not a lawyer.

THE COURT: Dr. Chen is a redistricting expert. I'm assuming Dr. Chen is familiar with the myriad of case law out there dealing with redistricting.

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If he doesn't understand the question, Dr. Chen can ask for clarification, which he's been very adept at doing during the cross-examination.

Dr. Chen, you can answer the question.

THE WITNESS: Thank you, Your Honor.

The answer to your question is that it is beyond my expertise as a political scientist to tell you whether or not a particular plan does or does not comply legally with the Voting Rights Act or with a particular Supreme Court case.

I mean, just to put that more concretely --

THE COURT: That was pretty concrete, Dr. Chen.

THE WITNESS: All right.

BY MR. LEWIS:

Q. Okay. Professor Chen, you wrote an article in 2016 with your coauthor David Cottrell entitled Evaluating Partisan Gains from Congressional Gerrymandering: Using Computer Simulations to Affect -- Estimate, excuse me -- Estimate the Effect of Gerrymandering in the U.S. House.

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And you published that in Volume 44 of Electoral Studies, Pages 329 to 340; is that correct?

A. Yes, sir, I did.

Q. Okay.

Okay. Professor Chen, I've put on the screen what is -- what is Figure 6 -- Figure 6 from that -- from that article.

Do you recognize this figure, sir?

A. I recognize it generally. It was in that article.

Q. Okay. Do you need a copy of the article to refresh your recollection?

A. I'd be happy to have that, sir.

THE COURT: Do you have enough copies to mark?

MR. LEWIS: Yes, Your Honor.

I believe we're on Legislative Respondents' 39.

Is that correct?

THE COURT: That's what I have.

MR. LEWIS: Okay.

- - -

(Legislative Respondents' Deposition Exhibit Number 39, marked for identification, as of this date.)

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BY MR. LEWIS:

Q. Figure 6, Professor Chen, is on Page 338.

THE COURT: My copy does not have a Page 338.

Dr. Chen, does your copy have a 338?

THE WITNESS: No, Your Honor, it does not.

THE COURT: Okay.

MR. TORCHINSKY: Your Honor, I think we have a printing error. The printer didn't copy the double-sided pages of the article. So we'll correct that later today, Your Honor.

MR. LEWIS: I can show you mine to authenticate.

THE COURT: I think the Petitioners' counsel will be fairly reasonable in how they react to this.

So do you have any objection to them providing a complete copy later? He can show you the complete version to see if you have an objection.

More importantly, you can show

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Dr. Chen so Dr. Chen can verify that it's his -- his work.

MR. JACOBSON: We fairly reasonably have no objection, Your Honor.

THE COURT: All right. Thank you.

BY MR. LEWIS:

Q. So, Dr. Chen, I'm going to give you mine --

THE COURT: You just want him to verify that the chart you have up is the chart that's in his article?

MR. LEWIS: Yes.

THE COURT: Okay.

THE WITNESS: Yes, sir, it looks like it.

BY MR. LEWIS:

Q. All right. Perfect.

THE COURT: Do you want to take that away from him now?

MR. LEWIS: Yeah, I probably should.

THE COURT: Okay.

BY MR. LEWIS:

Q. If you need it, let me know, and I'll give it to you.

So, Professor Chen, recognizing the

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copying error, the document that I just handed you, is that a true and complete copy of the article that you -- the one I actually handed you that has all the pages, is that a true and complete copy of -- of your 2016 article in Electoral Studies?

A. I accepted that was your intention, sir.

Q. Thank you.

All right.

THE COURT: So, Dr. Chen, you'll also agree that this document that is up on the screen in front of you is part of that article, correct?

THE WITNESS: Yes, Your Honor, it does appear to be.

MR. LEWIS: Yes. Thank you very much.

THE COURT: All right.

BY MR. LEWIS:

Q. Dr. Chen, does this figure not conclude, in your research, that the difference in expected Republican seats under the enacted directing plan versus a median simulated plan is less than one seat?

A. No, sir, it does not. And to explain

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why, I've got to explain what this article does -- the background of why this article does something completely different than what I did in my expert report here and to explain to you what -- what data -- what election data this article actually did use.

And so I'm happy to explain all of that in detail, but I'm also going to explain the following, which I've explained about my work earlier today.

This is one of these articles where I produced a very large number of simulated plans across many states, the complete code. And so you can see all of my calculations of every figure, including this figure in front of you, and you can see every little detail of exactly what went into and which elections went into this.

And so I just wanted to make that clear at the outset.

And I'd be happy to answer your question in more detail, but I'll let you -- or tell me if you'd like me to do that.

Q. But the point is that your conclusion from -- from Figure 6, based on your academic work, was that the difference in expected Republican seats

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under the enacted districting plan versus the median in your simulation in your academic study was less than one seat, correct?

A. That -- again, I would have to explain how that differs from the conclusions that I arrived at in my expert report --

THE COURT: Dr. Chen, Dr. Chen, just answer the question he asked you, and then if you want to explain your answer, you can do that.

But I think the question was, Does this chart show, based on the report you completed, that this chart is part of, what it shows, I think, is what he's asking you. And then you can explain if you think that that has any difference to what you did here.

Do you understand the question?

THE WITNESS: Yes, sir. Thank you. Thank you, Your Honor.

THE COURT: So, Counsel, why don't you rephrase the question -- or restate the question, whichever you choose? I think it was a fairly straightforward question.

MR. LEWIS: All right.

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BY MR. LEWIS:

Q. Counsel, does -- counsel -- Professor Chen, does Figure 6 not conclude, based on your academic work in this article, that the expect -- that the difference in expected Republican seats under the enacted districting plan and the median simulated plan is less than one seat?

A. No. It is less than a sum of probabilities of under 1.0. That is exactly what this figure that you have in this exhibit in front of you shows, and that's how it's described in the article.

Q. Okay. And, Dr. Chen, did you not describe in your work at the bottom of Page 338 -- and, again, I will hand you mine -- actually, we can do it this way.

I'll put it up on the Elmo.

All right. So, Dr. Chen, do you see -- where you describe Figure 6 -- where you describe Figure 6 in your report as disaggregating the effect of gerrymandering by -- by state, where you further state that it displays the magnitude of the expected partisan seat gain that is due to gerrymandering in each state?

Do you see that, Dr. Chen?

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A. Yes, sir, I see those words.
Q. Okay. So are you not, then, concluding that -- that the seat gain that you attribute to gerrymandering in Pennsylvania is less than one seat?
A. No, I'm not. That is not the correct interpretation of that article.
As I explained in that article -- and a lot of the technical detail of that explanation comes on Page 30 -- 333 -- what that article is doing and what that particular figure that you just pointed us to is doing is it is summing up a bunch of probabilities, a bunch of probabilities about the partisan -- about the partisanship of each district.
That is a very technical sort of calculation that I'm doing there, and I just wanted to make sure you understand that.
MR. LEWIS: Your Honor, at this point, we would move for the admission of Legislative Respondents' Exhibit 39.
THE COURT: Any objection?
MR. JACOBSON: Yes, we object, Your Honor. It was not on their exhibit list that was turned over on Friday or on their pretrial memorandum.
MR. LEWIS: Cross-examination,

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Your Honor. It wasn't excluded from the scope of their -- of our agreement on the exchange of exhibit list.
MR. TORCHINSKY: Your Honor, may I also point out, earlier, when Dr. Chen --
THE COURT: Hold on for -- hold on for a second.
You've come up multiple times and -- and -- standing up and -- and -- and interjecting. If you'd like to argue this objection, please come up to the podium and relieve your -- your co-counsel.
MR. TORCHINSKY: I'll take this one point, Your Honor.
THE COURT: Okay.
MR. TORCHINSKY: This article -- there was -- one of the exhibits admitted during this article was, in fact, a link that was on -- it was a page from Dr. Chen's own personal Web site that included links to all the data files in this article.
Now, we're just seeking to introduce the article that explained the list of data files that were included in the article -- included in the Plaintiffs' exhibit [sic]

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that was admitted earlier. This is just the article that accompanies it.
THE COURT: Okay. Are you done?
MR. TORCHINSKY: Yes, Your Honor.
THE COURT: Okay. If I remember Dr. Chen's expert report correctly, which we've admitted into the record, this article is identified in his expert report, correct?
MR. JACOBSON: I would have to check, but I'm not sure if it's mentioned by name, Your Honor.
THE COURT: He doesn't list his -- he doesn't list his -- you went over a whole -- when you examined him directly, you went over a whole list of publications of which this one was.
MR. JACOBSON: Yes, you're correct. That was his CV, but -- yes, that was admitted as an exhibit, Your Honor.
THE COURT: But you, on direct examination, brought up this article, correct?
MR. JACOBSON: Correct.
THE COURT: Objection overruled. We will admit it into the record

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when we have a complete copy, which counsel is free to verify before it goes to the court reporter.
MR. LEWIS: Yes. And we'll make sure that's handled right away.
Your Honor, I have nothing further for this witness. Thank you.
THE COURT: Anybody else have any cross-examination of this witness?
MR. LEVINE: I do, Your Honor.
MS. HANGLEY: Nothing, Your Honor.
- - -
(Whereupon, Legislative Respondents' Exhibit Number 39 was admitted into evidence.)
- - -
- - -
CROSS-EXAMINATION
- - -
BY MR. LEVINE:
Q. Good afternoon, Dr. Chen. My name is Clifford Levine. I represent the Lieutenant Governor of Pennsylvania.
A. Good afternoon, sir.
Q. I had a couple of follow-up questions

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to your testimony today. One concerns the methodology.

You had talked about the Monte Carlo/Markov example, and then you compared that to what you had done here with the 500 simulations --

A. Yes, sir.

Q. -- or 1,000 simulations?

A. Yes, sir.

Q. And the Judge asked a question. I just want to follow up on that.

When we were talking about the Etch A Sketch, as I understand it, the -- the Monte Carlo starts with a particular map or a particular point, and then there's an iteration; there's a change made to that, and then that's the second map; and then there's one change made to the second map, and then there's a third map created.

A. I think you're talking, sir, about my characterization of the Monte Carlo/Markov chain algorithm. And the way that came up this morning was I was explaining how the -- how I had read or understood the Fifield algorithm, the Princeton grad student's paper. And we were talking about that quite a bit this morning, and that was my

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description.

But I think you basically got it right. That was how I was describing that Princeton grad student's algorithm.

Q. Now, what you did, though -- you didn't build off of one map that built off the second map that built off the third map, necessarily?

A. That is correct, sir.

Q. So to use the Etch A Sketch example, you shook the Etch A Sketch and started all over again each of a thousand times?

A. That is an excellent analogy. I wish I could take credit for that myself, but that is exactly what you do.

THE COURT: Feel free to use it whenever you want.

THE WITNESS: Thank you, Your Honor.

BY MR. LEVINE:

Q. Now, in terms of the Monte Carlo/Markov -- and I'm missing one other --

A. Monte Carlo/Markov chain --

Q. Chain?

A. -- it's a mouthful.

Q. -- Monte Carlo/Markov chain, which is the first map, make an adjustment off the second map,

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make an adjustment off the third map, almost like a genetic link from Adam and Eve to the current time, generation to generation to generation.

In that case, does it matter where you start? In other words, would that be inherently biased if you started with a map that was very biased?

A. The answer is that I don't personally use that particular methodology, and so I'm not sure I can give you a very good answer to that. It's a little bit beyond my expertise simply because I don't use that particular methodology.

Q. Okay. I have another question for you concerning Petitioners' Exhibit 16. This was in your report. This was Figure 5 of your report.

Do you see that?

A. Yes, sir.

Q. And you basically are showing -- on the left side, you're showing a compactness measurement?

A. Yes, sir.

Q. And so you have a cluster, and the cluster is generally between -- you know, generally between 1 and 3 percent, if you look at the lower axis; is that right?

A. Yes, sir.

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Q. And -- and you make a comparison between the enacted plan, which you show on the lower axis at 6 percent?

A. Yes, sir.

Q. And this relates to the median/mean analysis that you were discussing?

A. Yes, sir, that's correct, the mean/median difference.

Q. Okay. So help me. I'm not a mathematician.

As I understand it, if you took a sample of many statewide elections and the averages all came out to 50/50 -- you know, you took two- or four- or whatever-year cycle, and it came out 50/50, Democrat/Republican, as an average of your sample, okay, would that -- and then you would start there.

If you had an election that was a 50/50 election, and you had, in our example, nine Congressional Democrats going to the Republicans and nine going to the Democrat, then that -- that would indicate from the mean -- median, that would be at a 0 percent point on your curve?

A. Okay. You're asking me if there was an election where the Democrats and Republicans both win 50 percent, and then we have a Congressional

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districting map that has a 0 percent efficiency gap, then I think what -- the answer you're asking me for is that, sure, the -- there would be a median district right at 50 percent.

I'm not sure if I quite got the question right.

Q. Let me ask it again.

I read this exhibit that's in front of us, Exhibit 16, and I see that you do natural -- you -- you have a cluster here between this 1 percent and 3 percent.

A. Yes, sir.

Q. Okay. And you describe the variables, you put in population contiguity -- not splitting municipalities, not splitting counties -- and generally have a compactness.

So you do this analysis in somewhat of, I'll say, a nonpolitical way, right --

A. Yes, sir.

Q. -- you're just graphing this out.

And everything seems to land in that 1 percent to 3 percent range, right?

A. Yes, sir.

Q. Now, would that -- is it fair to say that that reflects the geographic bias against

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Democrats in the map, because, as I understand it, if I see -- what -- when I look at one of the points on the cluster at 2 percent -- tell me if I'm right -- it strikes me that what you're saying here is that for the Democrats to achieve a 9 to 9 vote, they may need to have a statewide election total of 52 percent of 48 percent.

A. I think you got it basically right there, except for that last sentence, but I think you basically got it right.

So to go back to your earlier statement -- or your earlier question about your statement, this is, in fact, what this figure shows; it shows us that even when you just follow traditional district principles in a nonpartisan way, you still end up with maps that are slightly, slightly skewed against the Democrats, meaning that Democrats are more packed into a minority of the districts. And that is reflected here in this mean/median gap, where all 500 of the simulated plans are at least slightly above 0 percent in terms of a mean/median gap, so that does, in fact, reflect natural geography.

So I just wanted to answer that first part of your question and affirm that you're right,

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if you can go back to the last statement.

Q. That's what I'm trying to understand.

So the consequences of that, let's assume there is a slight geographic bias against Democrats, and in our state, there's a huge concentration of Democrats in Philadelphia, so that may help to explain that, but if there was a slight geographic bias against Democrats, right, would that mean that in a 50 -- in a situation where we ended up with nine Democratic congressmen and nine Republican congressmen, that generally speaking, the Democrats would have to outperform a 50/50 systemwide vote level?

A. And my answer to that is that I didn't answer that specific -- I didn't analyze that specific question. I get the question you're asking. And if I wanted to analyze that, I would have to go out and pick out the hypothetical election that, in fact, had a 50/50 vote share --

Q. Okay.

A. -- but -- I really couldn't -- I don't have any basis in my expert report to tell you.

Q. But it is fair to say that the cluster, in your view, would reflect the natural geographic bias, generally speaking?

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A. Yes, sir.

Q. And that if we are out at a 6 percent range, that would, in your view, indicate some kind of manipulation well beyond the natural geographic bias?

A. Well, at the very minimum, it reflects a map that was created with a different districting process that did not prioritize traditional districting principles.

Q. You also had a discussion concerning Dr. McCarty's report.

A. Yes, sir.

Q. And you pointed out that he had used a data set of the 2004 election and the 2008 election, right?

A. Yes, sir.

Q. And I believe you had indicated -- you had used 2008 and 2010.

A. In my report, I used every statewide election from 2008 and 2010, sir.

Q. And you indicated that it's generally preferable to use the more recent election data that was available?

A. Yes, sir, that's what we know as political scientists.

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Q. Isn't there something also pretty profoundly different between that data in that the 2004 and 2008 would contain two presidential cycles and the 2008 and 2010 would contain one presidential cycle and one nonpresidential cycle?

A. Yes, sir, that is certainly a significant difference. The point is that Dr. McCarty used a number of different sets of elections.

Q. And -- and -- and, again, I'm just going to generally ask this. It seems like common knowledge. You hear it all the time, but that Democrats outperform in presidential elections because there are certain types of voters, minority voters often are described, young voters and different voters that tend to show up more on presidential years than they do in nonpresidential years.

A. I mean, I can affirm that generally across the U.S., that has sometimes been put forth as a distinction. I can't say that I've analyzed that question with respect to Pennsylvania, and so I can't give you my expert opinion on that, except to say that I certainly heard that argument before.

Q. Well, the voter turnouts are quite

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substantially different in Pennsylvania in presidential years versus nonpresidential years.

Would be that fair to say?

A. Yes, sir. I mean, that's generally true. We know that across many states, and I'm sure Pennsylvania is -- is the same.

Q. So for instance -- and I'll represent this to you, that in 2008, Obama received 3.2-plus million votes, McCain received 2.6-plus million votes; in 2010, Corbett received -- the winner received 2.1 million votes, and Onorato received 1.8 million.

So it's quite a significant difference. I think that you would see that the voter turnout is greater in presidential years than in nonpresidential years.

Is that a fair assumption, in this world?

A. Yes, sir, I think that was probably a good illustration of different turnout levels in presidential versus nonpresidential years.

Q. So if -- if someone in this field were to exclusively use presidential years and not use nonpresidential years for -- for calculating results for Congressional districts, that data would be

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somewhat skewed?

A. You certainly would not be looking at the sort of elections that have the same turnout as nonpresidential Congressional election years if you were not looking at election results from, say, 2010.

Q. And assuming Democrats generally perform better in presidential years, then the use of only presidential-year data would make a district appear more inclined to vote Democratic?

A. Accepting the premise of your question, that sounds like a reasonable conclusion. Again, I've got to qualify by saying that I did not analyze that myself in my expert report.

Q. There was a reference made, I believe by counsel, about the notion that Pennsylvania voters often like to split their votes; they sometimes like to vote for presidential and sometimes for congressional.

Do you recall that discussion?

A. Yes, sir, I recall that question.

Q. I'd like to direct your attention to Stipulation 102, which is a joint stipulation.

Do you see that?

A. Yes, sir.

Q. Now, what that stipulation shows is

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that in 108 -- certainly in 2014 and 2016, the total Democratic vote for all 18 Congressional districts was less than the Republican vote.

Do you see that?

A. Yes, sir.

Q. But in respect to 2012, what that shows -- and, again, this is when Obama was running against Romney, 2012 -- what this shows is that the total congressional vote throughout the state was 50.8 percent Democrat and 49.2 Republican.

Do you see that?

A. Yes, sir.

Q. And so the results of that were, of course, that in 2012, the -- President Obama was elected in that year, there were row offices elected -- Democratic row officers elected, but we ended up with 13 Republican congressmen and five Democratic congressmen; is that right?

A. Yes, sir.

Q. And so what may be perceived -- what may be perceived as an inclination of voters to split the ticket between the president and the congressmen could also reflect a severe case of gerrymandering in which the votes ended up totaling more Democratic votes but resulting in 13 out of 18 Republican

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congressmen?

MR. TUCKER: Objection, Your Honor. He's asking the witness to speculate on something I don't think he's -- that I don't think he's opined that he's qualified to testify on.

MR. LEVINE: Your Honor, there's no speculation. It's just basic arithmetic that you would have 50 -- a majority of voters voted for Democrats. So it was -- it correlated to the Obama numbers and, therefore, you can't just assume that people split their votes in that context.

MR. TUCKER: Your Honor, I believe the question asked Dr. Chen to confirm that this plan was a gerrymander based upon vote percentages and the number of seats that each party held, and that's not something that Dr. Chen has indicated that he's qualified to testify on.

THE COURT: I don't think Dr. Chen has offered any opinions on what is or is not a gerrymander. Dr. Chen has offered opinions on comparisons of maps based on different data and things like that. But I

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don't think he's ever broached the subject of whether this plan is or is not, one, a gerrymander, by however one would define it otherwise.

So I'm going to sustain the objection.

BY MR. LEVINE:

Q. Well, let me ask you this: The reality of 2012 was that more Democrats voted -- or -- I'm sorry. Strike that.

The reality of 2012 was that more people voted for Democratic congressional candidates in Pennsylvania than Republican congessional candidates, correct, based on our stipulation?

A. You're asking about 2012, and I can see from the data table in front of us here that -- that that's what this table reflects, yes, sir.

Q. And despite that fact, the outcome in terms of the number of Republican congressmen and Democratic congressmen was that Pennsylvania ended up with 13 Republican congressmen and five Democratic congressmen?

A. It is certainly correct, sir, that in 2012, the outcome of the -- the 2012 congressional elections was a 13-5 outcome in Pennsylvania in favor

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of the Republicans.

Q. We saw a whole series of maps. I don't know that we have to put them back up. These were the legislative maps, Exhibits 32 to 38, I believe that were showing the various incumbencies.

Do you recall those?

A. Yes, sir.

Q. And those maps all showed -- they were showing the situation as of 2011 before the new map was enacted, right?

A. I believe counsel represented that they had their experts artistically create those stars on those maps in order to represent what their expert considered to be the locations of the incumbents.

Q. And I had indicated -- indicated that the prior congressperson was Kathy Dahlkemper. I had my year wrong --

MR. LEVINE: Which I apologize, Your Honor.

BY MR. LEVINE:

Q. -- but Kathy Dahlkemper was the Democratic congressman from Erie County --

THE COURT: Congresswoman.

BY MR. LEVINE:

Q. -- congresswoman --

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MR. LEVINE: Thank you.

BY MR. LEVINE:

Q. -- elected in the years 2006 and 2008 -- I'll represent that to you -- and Republican Mike Kelly defeated her in 2010.

A. Yes, sir. Thank you. I -- I accept that.

Q. Now, the maps that you -- that you saw showed an intact Erie County. Those were the maps before the change, but if we look at the current map --

MR. LEVINE: Do I have it in the book? There's too many books here.

What's the exhibit for the current map that was Petitioner?

MR. JACOBSON: Sixty-eight.

MR. LEVINE: What is it?

MS. MCKENZIE: Joint Exhibit 5.

MR. LEVINE: Joint Exhibit 5, and I also had Exhibit 1.

BY MR. LEVINE:

Q. This is the current map.

Do you see that?

A. Yes, sir.

Q. One of the ways that -- one way to

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affect outcomes of an election, if you were designing a map, would be to split the county -- split Erie County, for instance, and split the City of Erie, to the extent that they were a Democratic voting base.

Have you seen that or have you examined that sort of response?

A. I have not --

MR. LEWIS: Objection --

THE COURT: Hold on, Dr. Chen, please.

MR. LEWIS: -- objection: Your Honor, there's been no foundation that this witness has studied the map in question to be able to answer the question that's been asked.

MR. LEVINE: Let me rephrase the question, then.

BY MR. LEVINE:

Q. Are you aware of the demographic basis of Erie County versus other counties offhand?

A. What do you mean by "demographic basis"?

Q. The Democratic voting preference for that kind of --

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A. I couldn't tell you the number offhand, but, obviously, I've analyzed that data and worked with that data.

Q. And assuming that that was a county that had a voting preference by statistical result for Democratic votes, assuming that that was the case, one method -- one method of enhancing an incumbent from Butler County may be to split that county in half; that would be one possible outcome that could affect how future elections were conducted?

MR. LEWIS: Objection: it goes beyond the witness -- the scope of the witness's report and the opinions that he's offered in the case.

MR. LEVINE: I'm just inquiring, if you split a Democratic county, that could influence -- there was a whole discussion about incumbent protection and whether that was appropriate or not, and I'm showing the example that you could actually further increase incumbent protection by splitting the county of the former congresswoman, that's all.

THE COURT: Mr. Levine, you're on

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cross-examination. And I don't remember this line of questioning coming up.

Again, I think Dr. Chen was being offered to provide an analysis of multiple different computer-generated maps and how they relate to the current map in terms of certain characteristics. He did not offer any opinion that I know of or analysis that I know of where he looked at how one would gain a potential advantage by doing X, Y and Z politically.

Is that correct, Dr. Chen?

THE WITNESS: You're correct, Your Honor. I was going to answer and say essentially the same thing.

THE COURT: Okay.

MR. LEVINE: Okay. I'll move on, Your Honor.

BY MR. LEVINE:

Q. I'm going to show you what has been marked as Petitioner Exhibit 3. This was also premarked as Stack Exhibit 2. And this is your Figure 1.

Do you see that?

A. Yes, sir.

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Q. And that was one of your 500 simulations where you did not look to the preservation of incumbency, correct?

A. Yes, sir.

Q. Okay. This was also, I believe, Map 308. We had inquired just in terms of the number, and I think that was confirmed, that it was 308 --

MR. LEVINE: -- or if counsel could confirm that.

THE WITNESS: I don't have that data offhand, but I accept your representation of that. It sounds reasonable, to me.

BY MR. LEVINE:

Q. This was -- I'll represent to you that we had inquired what the number of map was just so we could look at the data and it was Map 308.

THE COURT: I -- I recognize -- is this the same exhibit -- Petitioners' exhibit that was moved and admitted?

MR. JACOBSON: Yes, Your Honor.

THE COURT: Which exhibit is it?

MR. JACOBSON: I believe 3, but give me one second. Yeah, Figure -- I'm sorry. Exhibit 3, which is Figure 1 from the

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report.
THE COURT: Okay.
BY MR. LEVINE:
Q. So in terms of the material that you provided to the various counsel, you also provided backup data as to your various simulations; is that correct?
A. Are you referring to replication code and data?
Q. Right.
For instance, Stack Exhibit 3 is the Simulation 308 that's that particular map, Set 1, district number, and it shows Republican partisan performance based on the 2008, 2010 criteria, election criteria, that you had earlier described?
A. I just got to be honest. I don't recognize this document. I'm not sure where it came from.
Q. Well, again, this was your -- your material did include the simulations of the data -- the backup data, did it not, for each of the maps in terms of you looked at the 2008 and 2010 elections; is that correct?
A. If I could just ask you to clarify. What is the backup data?

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MR. LEVINE: What was the file called? I'll ask Alex.
BY MR. LEVINE:
Q. Just at the bottom of the page, do you see that reference, Column KW, Simulation 308, Chen said one data file rounded to the nearest tenth percentage?
Did your material include that type of information?
A. I'm not exactly sure what "Column KW" means, but maybe this will help you out. I'll accept that certainly I calculated the Republican partisanship or the Republican vote share of all of the simulated districts, turned that data over, and maybe it was one of those files that you had opened up and called "Column KW."
Q. I'll represent to you that we just took 308 -- we just asked counsel -- 308 was that particular Figure 1, and we took this data --
THE COURT: Who is "me," Mr. Levine -- who is "we"?
Do you have a witness?
MR. LEVINE: No, I asked -- Your Honor, I asked both Mr. Jacobson and Mr. Gersch just to confirm that Figure 1 was

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Map 308, that's all.
THE COURT: I'm asking about this exhibit.
Who prepared this exhibit?
MR. LEVINE: We did that in our office just simply copying the information or taking the information from the material, the material that was provided to all counsel, along with Dr. Chen's material. We didn't alter any numbers. We just took the data that was made available by Dr. Chen.
THE COURT: Okay.
BY MR. LEVINE:
Q. You did this --
THE COURT: Do you have a question for Dr. Chen? He's already said he doesn't recognize this exhibit. So -- so --
BY MR. LEVINE:
Q. You did this for each and every -- you -- you calculated for the 20- -- 2008 and -- I'm sorry.
You looked at all of your simulations, correct, all your simulated maps, and looked at data from elections from 2008 and 2010; is that correct?

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A. Yes, sir, I did do those calculations, and I accept your representation that you were just directly taking from that file and just copying and pasting some numbers.
Q. For each district, you looked at what the District 1 would look like in terms of the performance based on the 2008 and 2010 elections, right?
A. Yes, sir, I accept your representation about where this file came from.
Q. Thank you.
And you also then -- you indicated in your testimony earlier that you did a confirmation of that data of the various districts in Simulation 308 -- that's Figure 1 -- based on the 2012, 2014 and 2016 elections, you just looked at the average data and came up with similar data, right?
A. Yes, sir, I did do those calculations, and I accepted that as what you copied onto this document.
Q. Okay. All right. And, in fact, without going through line by line, I'll represent to the Court that they were fairly close in terms of the percentages as you looked through this data.
Is that a fair statement?

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A. I didn't glance, but if you want to put that figure back up -- or I accept your representation about that, I guess.

Q. All right.

All right. There was nothing magical about the numbers that you indicate -- that you had used, right?

If I recall, you said that they were random numbers, so when we looked at the figure -- when we looked at your figure, you have -- for instance, Stack Exhibit 2, you have 12 -- Congressional District 12, Congressional District 14.

Those were just randomly created numbers, right?

A. Those numbers mean absolutely nothing substantively meaningful. I think at one point I had tried to see if I could somehow assign the numbers in a way that would actually line up with the districts of the enacted map, putting District 1 in Philadelphia, for example, but I soon found that the enacted map differed in so many ways from most of these stimulated maps, that that was a fruitless effort.

Q. Let me make an effort for looking at what we marked as Stack Exhibit 4.

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Do you see that?

And I will represent to you -- and we can go through this -- that what I tried to do is take a district that had at least one county -- in other words, looking at the existing map, Congressional District 3 had at least one county that was contained in your District 12. So I numbered them just to try to get some geometric symmetry.

A. I accept that, sir. That sounds reasonable. I accept that you did that.

Q. All right. So you would take -- again, looking at at least one county being base, you can look at -- what you had called Congressional District 12, you can call that District 3, for instance, right?

Do you see that?

A. Yes, sir, I see that's what you see here.

THE COURT: Mr. Levine, this case is confusing enough. If we're going -- Dr. Chen's testimony, clearly he indicated that he numbered these at a random number for the maps that he generated, and we all know that they don't correlate to the districts.

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Do you really need him to confirm that you can overlay the districts where you want to overlay them?

MR. LEVINE: I was just getting the exhibit in, but I can represent to you --

THE COURT: Just so we're clear, Mr. Levine, you're not necessarily getting any exhibits admitted into evidence --

MR. LEVINE: No. Okay.

THE COURT: -- you're -- you're -- you're presenting him with things that you did or your office did, and he's assuming things that you're offering him. So I'm not sure you're accomplishing what you want to ask.

I'll let you make your motions, but you seem to be trying to confirm with him a lot of representations that you're making.

MR. LEVINE: Well, Your Honor, for that, I simple took the number -- he indicated that I could -- that the numbers were random and I simply changed the numbers.

THE COURT: Do you need a witness to do that, or can you make that argument in

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your briefs?

MR. LEVINE: Well, I was just going to show one exhibit. I'm just trying to show that you could use the same data and make a comparison ultimately to the existing congressional maps.

That's all, Your Honor.

I can move ahead.

THE COURT: Okay. Just keep in mind, this is an expert witness --

MR. LEVINE: I understand that.

THE COURT: -- on cross-examination.

MR. LEVINE: I understand that.

BY MR. LEVINE:

Q. Looking -- Dr. Chen, looking at Figure 1, your analysis of -- let me get it -- I don't have the -- Stack Exhibit 2, your Figure 1.

Do you see that?

A. Yes, sir.

Q. And we could do -- much as we just saw the Legislative counsel do, you could plug in by looking at the addresses of existing incumbents and plug in where they might be located?

A. Yes, sir, you could do that. I certainly did not do so. This is Simulation Set

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Number 1.
MR. LEVINE: I would note, Your Honor, that we have a stipulation -- we have a stipulation, Stipulation Number 155, that contains the addresses of all of the current congressmen.
THE COURT: Okay.
BY MR. LEVINE:
Q. And I would just again indicate, based on my representation, that I took Map 2 -- it's very easy to take Map 2 and plug in the address and show where that would exist on the map; is that right, sir?
A. I accept that's what you do, and obviously I affirm that that's technically possible.
Q. All right. And so you can show where the various congressmen reside by looking at this map, your Simulated Map 308, right?
THE COURT: This is a new -- this is a new exhibit you're identifying?
MR. LEVINE: This is Exhibit 9.
THE COURT: So you're identifying Lieutenant Governor Stack 9.
THE WITNESS: Sir, I affirm that, and I accept that that's what you did here.

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BY MR. LEVINE:
Q. All right.
MR. LEVINE: Again, Your Honor --
BY MR. LEVINE:
Q. You can simply renumber those per Stack Exhibit 5 and then obviously, the -- the districts would be the same and the residences would be the same, you would just have a different number.
A. Yes, sir, same answer as before, it would be very easy for you or anybody else to go renumber those districts.
MR. TUCKER: Your Honor, I might just object really quickly on that point. We're talking about renumbering districts. They're different districts. They're different maps.
THE COURT: I think I've already expressed my -- my concern about overlaying different numbers on maps, and I've already expressed to Mr. Levine my concern that he may not be efficiently using this witness for purposes of what I think he's trying to accomplish.
MR. LEVINE: Thank you, Your Honor. And, again, just so you understand,

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Your Honor, I am simply showing one of the simulated plans, the one that he selected in his expert report, and I'm just showing how that map could be used as a potential map and a potential remedy in this case. And it can show where the existing congressmen reside --
THE COURT: You didn't ask him that. You didn't -- you didn't -- that's not what you asked him. You didn't ask him if a particular map that he included in his report would be an appropriate remedy in this case if the Court ultimately would throw out the existing map. That's not what you asked.
Would you like to ask that question?
MR. LEVINE: Yes, Your Honor.
THE COURT: Okay.
BY MR. LEVINE:
Q. All right. Do you see what I have before you, Stack Exhibit 2?
And that's also our Petitioners' Exhibit 3, I believe; is that right, Petitioners' Exhibit 3?
Do you see that in front of you?

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A. Yes, sir.
Q. I have a couple of questions about this map.
The bottom of the map, you indicate that this has expected Republican seat split, Democratic seat split of 9 to 9?
A. Yes, sir, 9 Republican seats, 9 Democratic seats.
Q. Right.
And you also show it has county split of 14 versus 28?
A. Yes, sir, 14 county split in this map in front of us.
Q. All right.
And it also shows your compactness scores?
A. Yes, sir, it does.
Q. And these are all scores that are within -- I'm not going to go through all the exhibits but, if we go through your expert report, the compactness scores, the expected Republican seats, the county split are all within the norm, all within the range and clusters of your various analyses?
A. Certainly we saw normal distribution,

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and this was part of that distribution. We did see this within the normal range in terms of compactness scores as well as county split, yes, sir.

Q. Now, when we talk about county splits, you indicate that the current map has 28 county splits, right?

A. That was what I counted on the enacted map, yes, sir.

Q. Which would be 28 counties were actually split and have a line going through them, right?

A. Yes, sir, 28 of the 67 counties were divided into multiple districts.

Q. Right.

Many of the counties have multiple splits, though; isn't that right?

A. I'm not sure I specifically analyzed that question. I may have noticed that with a few counties, but I didn't calculate the precise number, but I accept your representation on that.

MR. LEVINE: Let me direct the Court's attention --

BY MR. LEVINE:

Q. -- and your attention to Stipulation Number 90, in which we identify and agree that the

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various counties and the various number of districts fall within a particular county.

Do you see that, Stipulation 90?

A. Yes, sir, I see it.

Q. So, for instance, Montgomery County has five -- five districts that actually run through Montgomery County.

A. And, sir, I accept your representation; I accept your calculations; and I accept that -- the conclusion that there are some counties that got multiple districts run through them.

Q. And so when I -- when I note the comparison of 14 counties split by your Figure 1 versus 28 county split -- actually, in terms of total splits, it's actually significantly less; is that right?

A. Again, I didn't actually do the calculation of how many districts within each county there were.

Q. I appreciate that. I appreciate that.

A. I accept your representation on that, but I've just got to be very clear to the Court here that I did not do that calculation.

Q. All right. So looking at this map, is this -- would this map serve as an adequate starting

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point if the Court wanted to -- the Supreme Court or the Commonwealth Court wanted to adopt a map as a remedy, would -- in your view, would Figure 1 be an appropriate map that could serve as a remedy in the event this Court concluded that this current map was unconstitutional?

MR. LEWIS: Objection, Your Honor: It goes beyond the scope of the witness's direct examination. It also goes beyond the scope of the witness's report and the witness's expertise, as he's testified today.

MR. LEVINE: Well, I think I'm actually following Your Honor's lead; this map also is showing -- it meets all of the criteria that a -- that -- that should be considered for an appropriate map.

BY MR. LEVINE:

Q. Is that correct?

MR. LEWIS: Objection.

THE WITNESS: Well --

THE COURT: Mr. Levine, I'm going to ask if you can rephrase the question, because there was a word in there that you had that -- that I believe would be clearly

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beyond the scope of Dr. Chen's testimony, but I'm going to ask if you want to rephrase it.

BY MR. LEVINE:

Q. Dr. Chen, you identified five primary criteria for your review of a map, right?

A. Yes, sir.

Q. Population contiguity --

A. Yes, sir.

Q. -- municipal county splits.

Does Figure 1 meet those criteria, in your view?

A. It followed those criteria. It was produced by a districting process that followed, adhered to those traditional districting principles.

Q. And looking at the results that you see when you note nine Democratic seats, 14 county split and the various compactness tests, it satisfies the range, based on your analysis, in terms of providing a map that meets the various criteria that you would look for in redistricting; is that correct?

A. Well, it is a map that was produced following those criteria. It -- obviously -- I think what you're trying to ask is, it clearly is a map that does better than the enacted plan on those

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criteria that we saw down there.
It followed the criteria.
Q. Thank you.
And let me just show what we marked as Stack Exhibit 10.
MR. LEVINE: And, again, Your Honor, this is simply the renumbering of Stack Exhibit 9 to show that there's no change in the analysis. So I'll represent that, and at this point, I would move for the admissions of Stack 1 through 10.
MR. LEWIS: We're going to object to several of those. We've got so many of them.
THE COURT: Well, I've only got 1 through 4 marked and 9 and 10 actually marked.
What happened to 5, 6, 7 and 8?
MR. LEVINE: Excuse me.
MR. LEWIS: Can we perhaps go through them one at a time?
THE COURT: Well, I want to make sure I know what is marked.
MR. LEWIS: Absolutely, of course.
MR. LEVINE: Let me go through.

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Exhibit 1 -- Exhibit 1 is already in evidence. That is the existing map.
THE COURT: So you don't want to move Exhibit 1?
MR. LEVINE: I don't need that.
Exhibit 2.
THE COURT: Are you done with Dr. Chen, by the way?
MR. LEVINE: Yes, I am.
THE COURT: You're not done. Before we move on to the machinations of what exhibits we're going to introduce on behalf of the Lieutenant Governor, I just wanted to allow you to take a break.
THE WITNESS: Thank you, Your Honor.
May I step down?
THE COURT: No. You can have a drink of water, something like that effect, but anyway --
THE WITNESS: Thank you, Your Honor.
THE COURT: Okay.
So you are not moving 1.
Are you moving 2?
MR. LEVINE: That's the same as Petitioners' 3, so I don't have to do that.

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THE COURT: Are you moving Stack Exhibit 3?
MR. LEVINE: Yes, I am. That was the simulation data that he -- all it was, was verifying the 2008, 2010 statewide elections and the 2012 to 2016 that he testified that he did for each and every map. And, again, this was made available by counsel to all of the counsel.
THE COURT: Any objection?
MR. LEWIS: I mean, we would object on the basis of foundation. The witness didn't recognize it.
MR. LEVINE: They took the same data, they took the same map.
THE COURT: Who's "they," Mr. Levine?
MR. LEVINE: The Legislative counsel just showed a map and --
THE COURT: They didn't move their admission.
MR. LEVINE: I believe they did.
MR. LEWIS: No, we didn't. We're --
MR. LEVINE: All right.
THE COURT: They didn't move their

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admission.
I'm going to sustain the objection, but I'll tell you this, Mr. Levine, I have written many a brief in my legal career, and I have had many of an opportunity to take statistical data and create a chart within a brief without the chart having to have been admitted as evidence. So I think --
MR. LEVINE: I don't want to go -- I could go -- well --
THE COURT: So Exhibit 3 is -- we're not obligating it; we're sustaining the objection.
How about Exhibit 4?
Are you moving Exhibit 4?
MR. LEVINE: Yes, I am.
THE COURT: Any objection?
MR. TUCKER: Yeah, Your Honor, we object. That's the renumbered districts. As Your Honor already alluded to, I think it's just going to cause more confusion in the case. And the districts aren't the same. They're different maps.
MR. LEVINE: But, Your Honor, causing more confusion, that's not an

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objection. We -- we're taking this map to show comparatively what districts and where the current incumbents reside. It just makes it easier to assess this in the current context.

THE COURT: So the information that -- the information --

MR. LEVINE: Excuse me. I'm just getting some water. May I have some water?

THE COURT: So, Mr. Levine, as I understand it, the information that you want to show in this exhibit simply where the incumbents -- what Congressional districts the incumbents were in prior to the 2011 Plan?

MR. LEVINE: No, no.

What I am proposing -- what I am trying to get this in for, there is a map, 308, Figure 1, that is his map, and that meets certain criteria that he just indicated that would be appropriate to serve as a map for the entire state.

I mean, I'm just saying that's -- we are presenting this as an example of a map that would meet the various criteria that

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he's been describing. Okay?

MR. TUCKER: Your Honor.

MR. LEVINE: Wait. Excuse me.

So this is simply to show a correlation between the existing geographic Congressional districts and this simulated plan. We're doing that for two reasons: Your Honor, one is to simply show, for instance, that Congressman Thompson, who represents the Third District in the current-numbered district in Erie, would be able to keep his seat with the current map -- with the 308 Map, with the Figure 1 map.

So, for instance, it's simply --

THE COURT: I understand. But, Mr. Levine, it seems, to me, what you're doing is you're making argument. You're not -- you're not -- you're not providing -- what this document is is apparently illustrative of probably facts that are already stipulated to.

Is that fair?

MR. LEVINE: Well, not completely, which is why I'm just trying to close the

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loop. I'm just trying to show, for instance, if we were to discuss this before the Supreme Court and we were to reference, in this simulated map, District 2, to me, it would be less confusing if I could call it District 14 because that correlates to Mike Doyle's District 14 that currently exists in Pittsburgh.

MR. TUCKER: Your Honor, if I may, our objection to that is there isn't a correlation. We're talking about entirely different maps. We're talking about one map that was simulated by Dr. Chen, and the enacted map.

THE COURT: I understand -- Mr. Levine, I understand what -- what -- I think I understand what you're trying to do. I don't think -- I don't think moving the admission of this exhibit with particularly this expert is the right way to put this in, nor do I think you need to put this in.

I think you can probably make the contention you want to make to the Supreme Court without necessarily having this document as an admitted exhibit.

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So for that reason and others, I'm going to sustain the objection, and we're not admitting Stack Exhibit 4.

Was Number 5 marked?

MR. LEVINE: Well, 5 was simply -- again, it's the same map showing the numbers, because -- Your Honor, again, I would ask you, not only -- I'm showing, for instance, where the 14th District is for incumbency, but I would also like to compare that this Figure 1 map will actually show considerable improvement in terms of future witnesses that will be testifying at this trial.

THE COURT: Well, you can try to use those with future witnesses. But, again, this particular witness -- as I understood Dr. Chen's testimony, he did not opine on what would be or would not be a lawful map. He opined on a comparison of maps in terms of certain characteristics.

I think you are trying to take the position that his maps are lawful and the current plan is not. I'm not sure that works. And I also don't think you marked it

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during your examination of him.
So I'm not admitting 5.
What about 6? I don't have 6 being marked.
Did you mark it?
MR. LEVINE: No, 6 -- I am not offering that at this point --
THE COURT: Okay.
MR. LEVINE: -- 7, I'm not offering; 8, I'm not offering at this point.
Nine.
THE COURT: Okay. Exhibit 9.
Any objection to Stack Exhibit 9?
MR. TUCKER: I mean, I think this is the same as the prior -- I think -- sorry. I'm losing track, Your Honor, but I think Stack Exhibit 5, it's just another --
THE COURT: No, 9.
MR. LEVINE: Nine is using the Figure 1 Congressional numbers.
MR. TUCKER: Okay. I'm just showing -- taking the --
THE WITNESS: For instance, the Figure 1 has the northwestern Congressional district just arbitrarily numbered as 12. I

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kept that for this. And I'm just simply -- the only difference is I'm showing that the residence of Thompson -- the residence of the Congressman simply based on the stipulation of the parties.
MR. TUCKER: Your Honor, at this point, there hasn't been any witness that's been able to authenticate these maps.
MR. LEVINE: No. This map is identical -- this map is identical to Figure 1, Simulation 308, which is already in evidence.
But this is Petitioner Map 3, and then I simply took the stipulation of all of the parties here that said the various Congressmen reside at these residences, and I put the residences in.
And I could go through and show how Congressman Kelly lives in Butler County. In fact, these -- many of these are the identical points that they were showing in their maps.
MR. TORCHINSKY: Excuse me, Your Honor. The maps that we displayed on the screen showed the incumbents as of

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December 2011. I believe this map is displaying the home addresses of the current 2017 Congressional incumbents. It's a very different data set.
MR. LEVINE: And, Your Honor, I'm entitled as part of this case to show a potential remedy. I mean, they can show -- they want to show where residences are in terms of trying to justify the legislative action in 2011. That's fine. But I can -- I also have the right to go in front of the Supreme Court and say, This is a map that meets the criteria and, by the way, this is where the incumbents currently reside under this potential map.
I don't think we need Dr. Chen to offer that as a potential remedy --
THE COURT: Then why are you offering it while Dr. Chen is on the stand?
MR. LEVINE: I'm simply trying to -- it was his map. I'm simply showing the points where the -- where the residence is, right, just as counsel here was asking him this identical question about where the Congressmen's residences are vis-a-vis the

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maps. It's just for that limited purpose we're trying to make that comparison.
THE COURT: Is there any -- is there any concern by -- I'll put Petitioners in here, too. Why not? -- by any of the parties that this map, at least as it is depicted, does not accurately represent the district breakdowns as reflected in Dr. Chen's 308 simulation?
MR. TORCHINSKY: Your Honor, Dr. Chen's 308 simulation as presented in his report contained his Simulated Map 308 and his Simulated Map 308 with the 2010 incumbents' home addresses plotted on the map --
THE COURT: That wasn't my question.
My question is, Is this consistent with the districts reflected in his Map 308?
MR. TORCHINSKY: Yes, Your Honor, I believe the districts there are -- do reflect Dr. Chen's Map 308, but he never, in his report anywhere, plotted the addresses of current incumbents.
THE COURT: Okay. So what I'm

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going to do to try and move this along, Mr. Levine, is I'm going to allow you to admit Stack Exhibit 9 but not as substantive evidence, but as illustrative evidence. And you can use it -- again, I don't think I have to do this because I think you could do it anyway in your briefs, but I will let this in as illustrative evidence.

And you can tie it up in terms -- in your briefs in terms of the stipulation, but I'll at least let this into the record for illustrative purposes only.

So it is admitted only for that purpose, Stack 9.

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(Whereupon, Stack Exhibit Number 9 was admitted into evidence.)

- - -

MR. LEVINE: All right. And then Stack 10 was exactly -- the exact same exhibit as Stack 9. It simply showed the renumbering to correlate to the current geographic Congressional districts.

And I can put that to another witness if you'd like, but the same

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exercise. It's simply --

THE COURT: Nine I'm not going to admit -- or 10 I'm not going to admit.

MR. LEVINE: All right. Thank you, Your Honor.

Thank you, Dr. Chen.

THE WITNESS: Thank you, sir.

THE COURT: Any other cross-examination of Dr. Chen?

(Pause.)

MS. HANGLEY: No, Your Honor.

THE COURT: Redirect?

MR. JACOBSON: Thank you, Your Honor.

THE COURT: Can we go off the record for a minute, please?

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(Whereupon, a discussion was held off the record.)

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MR. LEWIS: Your Honor, we'll make sure this gets included in the official binders.

THE COURT: Thank you.

Do you want to do that now and just

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slide it in?

MR. TUCKER: We can slide it in, but we can also get a three-hole punch to make sure it goes in easily.

THE COURT: Why don't you just slide it in for now? We can say it's done.

MR. TUCKER: It works for us.

MR. LEWIS: It works for us.

(Pause.)

- - -

REDIRECT EXAMINATION

- - -

BY MR. JACOBSON:

Q. Good afternoon.

A. Good afternoon, sir.

Q. Dr. Chen, how many Congressional districts are in Pennsylvania?

A. There are currently 18.

Q. And how many simulated maps did you create in total?

A. I created -- my computer created a total of 1,000 simulated maps.

Q. Now I think this is even math that we can all do here.

So how many total simulated districts

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did you create, not maps, but districts?

A. The computer created a total of 18,000 simulated districts.

Q. Now, Counsel, I believe -- I'm sorry -- Dr. Chen, Legislative Respondents' counsel showed you a series of maps that were -- they represented were drawn from your thousand maps, correct?

A. Yes, sir.

Q. And would it be fair to say that, in total, they showed you about, let's say, 10 districts -- again, not maps, but districts that they pointed to what they called "irregularities" in?

A. Yes, sir, it sounds about right, about 10 or so.

Q. Again, this is -- well, slightly harder math.

How -- 10 divided by 18,000 is around -- roughly how many? What percentage?

THE COURT: Counsel, are you really asking him to do math? Isn't this something you could argue?

BY MR. JACOBSON:

Q. Dr. Chen, would you consider 10 a representative sample of 18,000 districts?

A. No, sir, not at all.

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MR. JACOBSON: If we could pull up --

BY MR. JACOBSON:

Q. And, in fact, if we took your 18,000 districts, and if I wanted to go through and pick 10 that I would consider, you know, the most irregular looking, would that be very difficult to do?

A. No; that would be pretty easy to do.

MR. JACOBSON: Now if we could pull up Legislative Respondents -- the one they marked for identification as 36, please. That was map 228, I believe.

BY MR. JACOBSON:

Q. And, Dr. Chen, do you have that in front of you?

A. Yes, sir.

Q. Now, this was one of the maps they showed you -- is that correct -- Legislative Respondents' counsel?

A. Yes, sir.

Q. And looking at this map, they -- they represented that Dr. Gimpel created it, correct?

A. Yes, sir.

Q. Did Dr. Gimpel put the county lines on this map?

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A. No, sir, he did not.

Q. Could Dr. Gimpel have put the county lines on your map in your experience as someone who's worked with GIS software?

A. Yes, sir. That would have been very easy to do.

Q. Now, Dr. Chen, could some of the irregular shapes -- and I'm just using their terminology, "irregular shapes" -- that they showed you in terms of districts -- could those be caused by the shapes of the actual counties?

A. Yes, sir. I mean, basically, when district lines follow counties, you do sometimes get irregular-shaped districts.

Q. Dr. Chen, in this particular example in front of you, I'd like to -- to point you to the western portion of the State. And if you can see it, it's between Clarion and Armstrong County. Do you see where I'm talking about?

A. Yes, sir.

Q. Do you see the sort of squiggly line that separates the two of them, which is also a district line in this example?

A. Yes, sir, I see that very squiggly, long line there between Clarion and Armstrong.

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THE COURT: It's actually Clarion.

THE WITNESS: Clarion. Thank you, Your Honor.

THE COURT: And it's not Lebanon; it's Lebanon.

(Laughter.)

BY MR. JACOBSON:

Q. Right around there? Is that right? We're pointing at it with my laser.

A. Yes, sir.

Q. Now, I believe -- and if I'm misrecalling, this might have been one of the examples they pointed out as an anomalous-looking district line because it was all squiggly; is that right?

A. I think so. I can't recall every single one they pointed out, but we were certainly around that area of the State.

MR. JACOBSON: If we can now pull up Petitioners' Exhibit 68.

BY MR. JACOBSON:

Q. And if we could -- Dr. Chen, I'm going to represent to you that this is a map of the actual enacted Congressional districts in Pennsylvania, but that also shows the county lines.

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Will you accept that representation?

A. Yes, sir.

MR. JACOBSON: If we could zoom in the portion that divides Clarion and -- I probably just said it wrong, didn't I? -- the -- Armstrong and the county that's north of Armstrong.

THE WITNESS: Yes, sir.

BY MR. JACOBSON:

Q. Now, does that -- do you recognize that squiggly line from something we talked about in the last 30 seconds or so?

A. Yes, sir, I recognize that same squiggly line where it appears Allegheny River creates a very squiggly border between Clarion and Armstrong Counties.

Q. So in your expert opinion, could the squiggly line that appeared on the district that Legislative Respondents pointed out to you have been caused because it was just a separation of the county?

A. Yes, sir. That squiggly line gets created when you have a districting process that attempts to minimize the splitting of counties; in other words, the follow county boundaries, a

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traditional districting principle. That squiggly line is what happens when you have district lines that attempt to follow the county boundaries right there.

THE COURT: Counsel, I'm confused. I thought you said the squiggly line was a river.

MR. JACOBSON: Well, the squiggly line -- the light lines that we see there are the county boundaries. Now, it might also be that it's a river that separates the counties there. I don't know that.

THE COURT: So you're proffering that that is -- that squiggly line is the county boundary between Armstrong and Clarion? Is that your proffer?

MR. JACOBSON: Yes, Your Honor. All of the sort of dotted line on Petitioners' 68 are the county boundaries.

If we could zoom out, it might be easier to see.

THE COURT: Okay.

Okay. Thank you.

BY MR. JACOBSON:

Q. If we can now -- Dr. Chen, if we could

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go back now, I want to look at Map 20, which was -- that Legislative Respondents showed you, which is -- I believe they marked for identification as Number 33.

A. Yes, sir.

Q. Now, Dr. Chen, you've already said that Dr. Gimpel did not put the county lines on his maps.

Did he put the municipality lines on his map?

A. No, sir, he did not.

Q. Would it have been difficult for him to put the municipality lines on his maps?

A. It would be very easy to do so, sir.

Q. I want to show you -- if you look just to the right on Bedford in the southern end of the State right here.

Do you see what I'm describing --

A. Yes, sir.

Q. -- between Bedford and Fulton, I believe?

I believe this was an example that opposing counsel and Legislative Respondents' counsel showed you as purported anomaly or irregularity in your -- in your maps; is that correct?

A. I do recall we were discussing this

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portion of this map.

Q. Counsel -- I'm sorry -- Dr. Chen, I'm going to represent to you that if we pulled up a -- a map that showed the borders of all the municipalities in Pennsylvania, we'd see a lot of little squiggly lines right there that had those similar sort of borders.

Will you accept that representation?

A. Yes, sir. I certainly looked at municipality boundary shapefiles in Pennsylvania, and I can affirm that you do see lots of squiggly lines.

Q. So given that, assuming my representation is accurate, would that explain the squiggly lines that we see here on your simulated map?

A. Yes, sir, assuming that you have a districting process that is trying to follow municipal boundaries. If you had a districting process that ignores those, then that wouldn't really be an issue. But assuming you were trying to follow this traditional districting principle of adhering to municipal boundaries, then, certainly, that can happen.

Q. And going back to counties for a second --

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MR. JACOBSON: Can we pull up Petitioners' Exhibit 68, please?

BY MR. JACOBSON:

Q. Again, this is the same map of the enacted map showing the county boundaries.

Now, I believe Legislative Respondents' counsel referred several times -- I think he used the word "sorcerer" to describe what some of your simulated districts look like.

MR. JACOBSON: If we can zoom in on the south where Perry and Cumberland Counties are on this map, which is I believe right here; is that right?

BY MR. JACOBSON:

Q. Dr. Chen, I don't know if you can see it from the screen in front of you, the county lines for Perry and North Cumberland?

A. Yes, sir.

Q. And is it fair to characterize them as sort of angled up and to the right and sort of long slivers? I don't know if that's the best terminology, but would you -- is that a fair characterization of the shapes of those counties?

A. It does look sorcerer-like, yes, sir.

Q. Now, could those county shapes that we

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just saw -- could that explain the sorcerer-like images that we saw on the simulated maps that opposing counsel walked you through?

A. Assuming that it was a districting process that followed county boundaries and attempted to avoid splitting up counties, then yes. And, obviously, that is what my simulated algorithm attempted to do in both sets.

So yes, sir.

Q. Now, Dr. Chen, I know you made this point several times, so I'll be very brief on it.

All of these maps were from what simulation -- when I say "these maps," the maps that Legislative Respondents' counsel showed you.

What simulation set were they from?

A. Well, they were entirely showing me maps from Simulation Set 2, the set of simulations that intentionally attempts to protect as many incumbents as possible.

Q. And if they had showed you -- or if you just looked at maps in Simulation Set 1, would we see -- what would you expect we would see in terms of the number of sort of irregularly shaped districts, again, to use their words?

A. I quantitatively analyzed that in terms

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of compactness, and I found that the simulated plans in Simulation Set Number 1 were more geographically compact than in Set 2.

And we discussed that at great length yesterday, but, obviously, it's because you are intentionally trying to reach out and protect 17 incumbents in Simulation Set Number 2.

So, certainly, the plans in Set 1 are quite a bit more geographically compact.

MR. JACOBSON: And if we could pull up Petitioners' -- I don't know the exhibit -- it's Figure 10 -- sorry -- Figure 7 from the Chen report. I'll pull up the exact exhibit number in a moment.

BY MR. JACOBSON:

Q. We don't even need the exhibit for this.

Dr. Chen, even given that sort of sacrifice of compactness moving from Set 1 to Set 2 that you just described, what did you find in looking at the compactness of your plans and Simulation Set Number 2 versus the enacted -- the compactness of the enacted Act 31 plan?

A. I found that even in Simulation Set 2, the set of simulations that intentionally protects 17

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incumbents, all 500 of the simulated plans in this Set 2 were very significantly more geographically compact than the enacted plan, and they were more geographically compact whichever measure of compactness you used.

Just as an example, the Reock score of the simulated plans ranges from about .33 all the way up to .43. The enacted plan has a Reock score of all the way down to .28. Whichever measure of compactness you use, it was very clear that the enacted plan was not only outside of the entire range but was very significantly lower in terms of overall geographic compactness than every single one of the 500 simulated plans.

MR. JACOBSON: My apologies.

I'd like to pull up Table 3 from Dr. Chen's report. And I can find that exact number in a second, the exhibit.

I apologize, Your Honor.

THE COURT: While we're doing that, Legislative Respondents' counsel, can I have a full copy of Legislative Respondents' 30 -- what was that, 31?

MR. LEWIS: Thirty-nine.

THE COURT: Yes, the article. I

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think it's 39, maybe.

MR. TUCKER: Yes, I believe it's 39, Your Honor.

THE COURT: Okay.

MR. JACOBSON: Apologies. It's Petitioners' Exhibit 11.

THE COURT: Thank you.

You can file that.

BY MR. JACOBSON:

Q. Dr. Chen, I believe Legislative Respondents' counsel showed you this chart; is that correct?

A. Yes, sir.

Q. And I also believe on all of the simulated maps that they showed you, that they walked you through, that Dr. Gimpel created -- and I could be mistaken, but I believe on all of those -- one of the two incumbents that was compared -- that was paired in all of those was Representative Brady.

Does that sound right?

A. Yes, sir.

Q. Dr. Chen, in your simulations, what was the most common pairing of two incumbents?

A. In the simulated plans in Simulation Set Number 2, the most common pairing was the pairing

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of Jim Gerlach and Pat Meehan that occurred 40.2 percent of the time.

Q. Thank you, Dr. Chen.

Now, Legislative Respondents' counsel also asked you how many maps you had looked at, and I believe you said a handful of them. I think you might have said up to 10, if I'm remembering right.

When you said "looked at," were you referring to just visually looking at?

A. Yes, sir. I thought that's what the question was -- was asking. Obviously, I -- when I was talking about maps, that I had actually taken the shapefile, printed out on something like a PDF document and actually looked at. That's what I thought the question was asking me.

Q. And did you analyze the data of all thousand of your maps?

A. Oh, of course, I did. That's what I normally do in my research process. I analyze -- meaning by computer, I analyze every single simulated plan that my computer produces. That's how I always do my research.

Q. Now, on Simulation Set Number 2 --

MR. JACOBSON: And keeping this same exhibit up if we could. Sorry about that.

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BY MR. JACOBSON:

Q. I believe you received several questions about why you -- the -- the most common incumbents were paired in the eastern part of the State.

Does that sound right?

A. Yes, sir. I recall that question.

Q. And you -- I believe you also received questions earlier in cross-examination about whether you studied potential efforts not to pair -- or to specifically pair two incumbents in Western Pennsylvania.

Does that sound right?

A. Yes, sir. I recall that question.

Q. Dr. Chen, if you had been told -- if you had been provided, by Legislative Respondents, an official document of some sort that said that a nonpartisan criterion that they used or considered was they specifically wanted to only pair two incumbents in Western Pennsylvania but in a nonpartisan fashion, is that something you could have incorporated into your algorithm?

A. Very easily, sir. I absolutely could have incorporated any -- any such nonpartisan districting criteria that was set forth to me if someone could have represented that that was the General Assembly's goal or attempt.

And, in fact, that's why I specifically asked that question -- Petitioners' counsel -- I asked Petitioners' counsel to tell me every nonpartisan criteria considered by the General Assembly. Petitioners' counsel told me that the General Assembly refused to turn that information over.

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Q. And could you have created a thousand simulations incorporating that particular nonpartisan criterion?

A. Absolutely, sir.

Q. And if I had -- if -- if Petitioners' counsel had given you different nonpartisan criterion, for instance, a particular county that, no matter what, shouldn't be split, could you have incorporated that into your simulations?

A. Absolutely, sir. I would very gladly have done so.

Q. Dr. Chen, I only have two more questions.

I believe you were asked about a concept called "CORE retention"; is that correct?

A. Yes, sir.

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Q. If -- if -- I want you to accept as a hypothetical that the prior districting plan, prior to the Act 31, was gerrymandered to favor Republicans.

Will you accept that as a hypothetical?

A. I accept that hypothetical.

Q. If that were the case and the -- and we -- and a criteria to be used was to maintain a large percentage of the existing districts, what -- what bias would that introduce into the analysis?

A. Well, obviously, if you start with an already gerrymandered map and you say that our districting consideration is to keep together those same districts as much as possible in the new map, then you are going to end up with a new map that is just as gerrymandered or very close to as gerrymandered as that previous map that you previously started with.

Q. The final question, Dr. Chen: In your expert report and your testimony that you've opined on today -- or yesterday as well -- what did you find was the partisan intent in drawing Act 131?

A. I found that there was a partisan intent to favor Republicans.

Q. I'm sorry. I misstated my question.

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What criteria did you find predominated in drawing this Act 131 plan?

A. I found --

MR. TUCKER: Objection, Your Honor. This exceeds the scope of direct examination.

MR. JACOBSON: It's literally his entire expert report, Your Honor.

THE COURT: I'm not sure.

As I understood his testimony on direct, he indicated -- his testimony is, essentially -- as I understand your expert opinion -- and I want you to correct me if I'm wrong -- his expert opinion is if you apply traditional -- what he refers to as traditional district -- redistricting principles -- what he has described as traditional redistrict principles, either separately or in cooperation with incumbent protection, it doesn't explain alone the deviations in compactness and all the other criteria, plus what he viewed as the political results of the election.

I think that was his --

MR. JACOBSON: Could I try to

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rephrase the question to be a little bit more precise, Your Honor?

THE COURT: I do, because I don't think he specifically offered an opinion as to what the General Assembly's intent was in crafting this plan --

MR. JACOBSON: Okay.

THE COURT: -- but you can ask him again.

MR. JACOBSON: Thank you, Your Honor . And I'll ask. And if we still have an issue --

THE COURT: I don't think that was part of his initial testimony.

BY MR. JACOBSON:

Q. Dr. Chen, did you find that predominant intent -- sorry -- that partisan intent predominated over the traditional districting criteria in the drawing of this map?

A. Yes, sir, I found that partisan intent predominated over traditional districting principles. I don't, in my report, attribute that intent to any particular body.

Q. And, Dr. Chen, did you find that partisan intent predominated over the traditional districting criteria even if you include a hypothetical goal of not pairing 17 of 19 incumbents?

A. Yes, sir, that's exactly what I found. I found that partisan intent predominated over traditional districting criteria even if one wants to account for this hypothetical goal of protecting as many incumbents as possible.

MR. JACOBSON: Thank you, Dr. Chen.

THE WITNESS: Thank you, sir.

MR. JACOBSON: We excuse the witness, Your Honor.

THE COURT: I think you're done, Dr. Chen.

THE WITNESS: Thank you, Your Honor.

PRESIDING OFFICER: You may step down.

(The witness is excused.)

MR. FREEDMAN: The Petitioners call John Kennedy. We're ready.

THE COURT: Let me adjust myself here for a second, unless the Court would like to take a break.

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JOHN KENNEDY, PH.D.,

after having been first duly sworn, was examined and testified as follows:

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MR. FREEDMAN: Your Honor, permission to approach the witness to hand the pointer?

THE COURT: Sure.

You may proceed.

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VOIR DIRE

- - -

BY MR. FREEDMAN:

Q. Sir, could you state your name for the record?

A. Yes. John Kennedy.

Q. And where are you presently employed?

A. At West Chester University.

THE COURT: Mr. Kennedy, could you pull that microphone closer to you, please? Or is it Dr. Kennedy? Do you have a Ph.D.?

THE WITNESS: I do have a Ph.D.

THE COURT: You've earned it. Dr. Kennedy it is.

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BY MR. FREEDMAN:

Q. Dr. Kennedy, in what capacity are you employed by West Chester University?

A. I'm a professor to the Department of Political Science.

Q. What is your educational background?

A. I have a Bachelor's and Master's degrees at Kutztown University and a Ph.D. from Temple University.

Q. How long have you been at West Chester University?

A. I've been at West Chester for 20 years.

Q. And have you taught anywhere else?

A. I have. Prior to that, I taught as an adjunct at a number of state and private colleges and universities, including Penn State branch campuses and Muhlenberg College, Moravian College, and a few others.

Q. What classes do you teach?

A. I teach a number of classes relating to American government, including Introductory Class American Government. I teach a class on the United States Congress, American political parties, state and local government. And I've also created two classes at West Chester, one entitled Campaigns and

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Elections, and the other entitled Pennsylvania Government and Politics.

Q. What, sir, do you consider to be your fields of academic expertise?

A. Pennsylvania government and politics. I've written three books on Pennsylvania politics: one entitled The Contemporary Legislature, which was published in 1999; one entitled Pennsylvania Elections, Statewide Contests Since 1950, which was later revised in 19- -- in 2014; and, also, most recently this fall, I was -- I was -- I published a book entitled Pennsylvania Government and Politics.

Q. Have you looked at all at questions of political geography in your book?

A. Yes, I have. I've looked at political geographic questions in context of my book on Pennsylvania elections in particular. I divided the State up into different regions and wrote narrative on over 100 statewide contests since 1950 through the lens of political geography.

In addition, from 2000 to 2008, I was a political analyst for the West Chester University Center for Social and Economic Research. During that period of time, we conducted a number of statewide polls in Pennsylvania.

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My primary responsibility was to draw up a -- a geographic model for the poll, which we used as far as sampling the State's population, which proved highly effective. We were correcting all of our analysis -- all of our predictions.

Q. Thank you.

A. I'm sorry. Myself and my codirector Dr. Lorraine Bernotsky.

THE COURT: Counsel, suspend for a moment.

(Pause.)

BY MR. FREEDMAN:

Q. Just to be clear, Dr. Kennedy, have you ever testified as an expert before?

A. No, I have not.

Q. Have you ever testified in court before?

A. No, I have not.

Q. Okay. Are you familiar with redistricting?

A. Yes, I am.

Q. How are you familiar with redistricting?

A. Well, I've studied -- I've studied it, I certainly taught about it, and I also contain a

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passage in my most recent book, Pennsylvania Government and Politics, which deals with the most recent map.

Q. Are you familiar with gerrymandering?

A. I am.

Q. How are you familiar with gerrymandering?

A. Again, I've looked at it; I've researched it and taught about it, particularly in my U.S. Congress class, Campaigns class and, most recently, my Pennsylvania Government and Politics class.

Q. Now, you just testified you haven't testified as an expert before.

Are there other areas where, professionally, you've been recognized as an expert?

A. I have -- from -- I've appeared in a number of -- I've -- early 2000s, I was an analyst for NBC 10 in Philadelphia, a political analyst. I also later served as an analyst for PBS 12 in Philadelphia.

I've been quoted in a number of media outlets, including both regional local, regional national newspapers, including the Washington Post, the L.A. Times, and the Associated Press. I have

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appeared on National Public Radio.

Q. Are you involved with any professional associations where they recognize your expertise?

A. Yes. I -- I was previously a member of the executive committee of the Pennsylvania Political Science Association. Currently, I serve on the editorial board of Commonwealth, which is the journal of the Pennsylvania Political Science Association. I've served as advisor to college Republicans and college Democrats at West Chester University.

In 2014 -- excuse me -- in 2015, I was selected to be the keynote speaker at the Undergraduate Research Conference held in the State Capitol. And in 2006, I was honored to have been selected by, then, the office of Speaker of the House, John Perzel, to be one of the guest presenters at the 100th anniversary of the State Capitol Building.

Q. Have you presided over any academic conferences that concern the questions of redistricting?

A. Yes, I have. In 2012, I was the chair and panelist for the Plenary Panel at the Pennsylvania Political Science Association with -- which dealt with redistricting. The guest speaker

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was one of the mapmakers in -- in Pennsylvania.

Q. Have you ever won any awards professionally?

A. I was -- I was awarded the Outstanding Teaching Award at West Chester in 2011.

Q. Okay. Why did you agree to take this assignment? Why are you here testifying today?

A. Well, I thought it was an interesting question to look at whether or not partisan considerations would override or can override historical criteria in redistricting. It was interesting, for me, to go in a very deep level and look at how the 2011 Map has evolved and changed from previous.

And it was also an interesting question whether or not communities of interest -- how they were dealt with in the current map.

Q. What's your understanding of what this lawsuit is about?

A. It's my understanding that the lawsuit was brought by 18 Democrats from across the Commonwealth who believe that the current 2011 Map has infringed upon their -- under their Pennsylvania Constitutional rights, that they have -- particularly as it relates to communities of interest, that they

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have been deprived of their ability to elect individuals of their choice due to the map.

Q. What questions have you been asked to address here today?

A. Yes, I was asked to address the question of whether or not this 2011 Map has negative -- has a negative impact on Pennsylvania's communities of interest and, if so, can we make any conclusions about the partisan overall effect of it.

Q. How did you go about answering those questions?

A. Well, first, I took a look at -- and a detailed look at the current map, the 2011 Map; and then, second, I went and looked at previous maps, beginning in 1966, which was the beginning of sort of the modern era of redistricting; third, I looked to see whether there are any differences between the current map and previous maps, whether there are anomalies present and, if so, I looked to see whether or not there might be some partisan impressions relating to those anomalies.

Q. How does your expertise in Pennsylvania elections, political history and geography help you to address these questions?

A. Well, based upon my experience in

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writing and teaching about Pennsylvania politics for a number of years, I have considerable familiarity with Pennsylvania's political history, particularly over the last 75 years; I have considerable familiarity with Pennsylvania communities; and I also have considerable familiarity with elections in Pennsylvania.

Q. What is the purpose of your testimony today?

A. The purpose of this testimony -- my testimony is to look and see how the particular -- this particular map impacts communities in -- in -- communities of interest in Pennsylvania, to look and see whether or not there are anomalies present and, if so, does it place non- -- does it place partisan considerations over nonpartisan considerations.

MR. FREEDMAN: Thank you.

At this time, we offer Dr. Kennedy as an expert in political science with the specialty in the political geography and political history of Pennsylvania.

THE COURT: Any objection?

MR. TUCKER: No, Your Honor.

MS. HANGLEY: No, Your Honor.

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MR. TABAS: No.
THE COURT: Okay. We will accept Dr. Kennedy as an expert witness offering testimonies in the area of political science, including political geography and political history, in Pennsylvania.
MR. FREEDMAN: Thank you, Your Honor.

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DIRECT EXAMINATION

- - -

BY MR. FREEDMAN:

Q. Dr. Kennedy, did you reach any conclusions in this matter?

A. Yes, I did.

Q. Could you tell us what conclusions you reached?

A. My conclusion overall was that the 2011 Map negatively impacts Pennsylvania's communities of interest to an unprecedented degree and contains more anomalies than ever before.
In addition, I've concluded that the 2011 Map places partisan considerations above those of communities of interest and disfavors Democrats overall -- or I should say favors Republican voters

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overall over Democrats --

Q. Over Democratic voters --

A. -- over Democratic voters.

Q. How did you reach those conclusions?

A. At first, I looked at the -- the 2011 Map to see how it treated communities of interest, whether there were anomalies present, whether there are strangely designed districts, whether there are things that just don't make sense, whether there are tentacles, whether there are isthmuses, whether there are other peculiarities relating to this campaign -- excuse me -- to this particular map.

Q. And did you -- with regard to your findings on partisanship, did you do anything when you found those anomalies?

A. Sure.
I looked at the election returns and see -- and -- in order to observe party -- how partisanship was related to these -- the election returns, and my conclusion was that this is a gerrymandered map and that it gives preference to one set of voters over another.

Q. Did you prepare a report in this matter?

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A. Yes, I did.

Q. It's --

MR. FREEDMAN: Can we see Exhibit -- Petitioners' 53?
THE COURT: Petitioners' Exhibit what?
MR. FREEDMAN: Fifty-three.
I've got it on my screen there.
There it goes.

BY MR. FREEDMAN:

Q. Professor Kennedy, do you recognize this?

A. Yes, I do.

Q. What is this?

A. This is my report on Pennsylvania's Congressional districts.
THE COURT: Actually, it's the first page of his report.

BY MR. FREEDMAN:

Q. It's the first page of your report.

MR. FREEDMAN: Fair enough, Your Honor.

BY MR. FREEDMAN:

Q. And you have a copy of your report with you, sir, on the stand?

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A. Yes, I do.

Q. Do you have a CV?

A. Yes, I do.

MR. FREEDMAN: Can we see Petitioners' 54?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you identify this?

A. Yes. That's my curriculum vitae.

MR. FREEDMAN: Petitioners move Exhibit 54 into evidence.
THE COURT: I think I marked the wrong one.
So you just put 53 and 54 up?
MR. FREEDMAN: No, I put 53, just for identification.
THE COURT: I'm trying to keep track here.
So 53 you put up, and now you have 54 and you're moving in 54?
MR. FREEDMAN: Fifty-four.
THE COURT: Any objection?
MR. TUCKER: No, Your Honor.
MS. HANGLEY: No, Your Honor.
MR. TABAS: No.

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THE COURT: Exhibit -- Petitioners' Exhibit 54 is admitted without objection.

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(Whereupon, Petitioners' Exhibit Number 54 was admitted into evidence.)

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BY MR. FREEDMAN:

Q. Professor Kennedy, let's -- I want to go through some of your conclusions in detail just so we're talking about the same thing.

Can you just restate your -- your conclusion in this matter?

A. Yes. I concluded that the 2011 Congressional district map for Pennsylvania negatively impacts Pennsylvania's communities of interest to an unprecedented level and -- and possesses more anomalies than ever before.

Q. Okay. That's enough to start with.

So can you explain what you mean by "community of interest"?

A. Sure. For Pennsylvania's -- for Pennsylvanians, community is very important. Noted Pennsylvania historian Philip Kline once remarked that if you ask a Texan where they're from, they'll undoubtedly say they are a Texan. If you ask

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a Pennsylvanian where they're from, they're much more likely to respond as their hometown. Pennsylvanians identify with their own hometown, with their community.

I often ask my students, particularly in my Pennsylvania class, Where do you -- where -- when you're traveling out of state, if you're on vacation, and someone asks you, Where are you from, almost always someone will say relating to their hometown; rarely will they say they're from Pennsylvania.

Pennsylvanians identify with their community, with their hometown, whether it's the Lehigh Valley; whether it's the Mon Valley; whether it's Easton, or Harrisburg, Erie, Reading; or they might be from Delco or Montco. And even individuals who come from our largest cities, Philadelphia, are probably more likely to respond that they're from the Great Northeast or South Philly or Manayunk or Roxsborough. Or people from Pittsburgh, more likely to respond they're from Shadyside; the Hill District; Lawrenceville.

So the point is, communities are important to our identity as Pennsylvanians. Residents of Delco have a different identity than

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residents of Amish Country. Those who reside in James -- in Johnstown have a different identity than those who live in Aliquippa. Those that live in Allentown have a different identity than those who live in Hershey.

Q. When you travel out of state, where do you say you're from?

A. Now I say I'm from western Montgomery County, but there's still a bit of Lehigh Valley in me as well.

Q. What familiarity do you have with communities of interest in Pennsylvania?

A. I -- I -- I have studied and looked at communities of interest in Pennsylvania extensively.

Q. Now, you said part of your conclusion was that -- you said that communities of interest in Pennsylvania have been negatively impacted.

What do you mean by "negatively impacted"?

A. They've been carved up, they've been separated from one another.

Q. Earlier, we were discussing the term "gerrymandering."

What does that term mean?

A. Gerrymandering is generally described

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as the political manipulation of legislative district lines to achieve some sort of political result.

Q. How does a gerrymander take place?

A. There's -- there are several different ways to achieve a gerrymander, most notably, by the methods cracking and packing.

Q. What is cracking?

A. Cracking is where you separate, or divide, the opposite party's loyalists in order so that -- in order that they cannot form a larger, cohesive political voice.

Q. And what is packing?

A. Packing is -- packing is the opposite; you're taking individual groups who reside in different communities and packing them together simply based upon their partisan performance, thereby lessening their impact over a broader area.

Q. People sometimes say that packing is a natural phenomena, that some sort of clustering of voters is going to be a feature of every map.

Do you have a response to that?

A. Well, that's not what we're looking at here. That -- we're not looking at clustering. We're looking at anomalies. We're looking at things that aren't natural.

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Q. And what do you mean by "anomalies"?
A. Anomalies, you know -- anomalies are -- are ways that effective -- effectuate cracking and packing, things that don't make sense, appendages, tentacle --
Q. What do you mean by an "appendage"?
A. Appendage is -- you know, an arm going up from one area to another which doesn't seem to make sense, an isthmus connecting one community to another which ordinarily wouldn't have anything in common.
Q. You also used the word "tentacle." What do you mean by "tentacle"?
A. Tentacle, you know, a narrow -- a narrow tract of land reaching up, again, and grabbing communities and bringing them into a certain district.
Q. So I want to walk through the basis for your conclusion about communities of interest being negatively impacted to an unprecedented degree.
MR. FREEDMAN: Can we take a look at Petitioners' 68 --
BY MR. FREEDMAN:
Q. -- which is Map 6 from your report. Professor Kennedy, do you recognize

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this?
A. This is a Congressional district map of Pennsylvania's 18 Congressional districts.
MR. FREEDMAN: Petitioners move Exhibit 68 into evidence.
THE COURT: Any objection?
MR. TUCKER: No, Your Honor.
THE COURT: Okay. Petitioners' -- Petitioners' Exhibit 68 is admitted without objection.
- - -
(Whereupon, Petitioners' Exhibit Number 68 was admitted into evidence.)
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MR. FREEDMAN: Thank you, Your Honor.
BY MR. FREEDMAN:
Q. Do you want to explain sort of how this map supports your conclusions?
A. Sure. If we can, can we look at certain individual districts first?
Q. Sure. Do you want to start with District 3?
A. How about District 3?
MR. FREEDMAN: Can we see

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Joint Exhibit 8?
BY MR. FREEDMAN:
Q. Professor Kennedy, can you tell us what this is?
THE COURT: Did you say Joint Exhibit 8?
MR. FREEDMAN: Yes, Joint Exhibit 8, not Petitioners' Exhibit 72.
THE COURT: This exhibit is, I assume, part of the stipulation that's already a matter of record?
MR. FREEDMAN: Yes, Your Honor.
THE COURT: Okay.
BY MR. FREEDMAN:
Q. Professor Kennedy, can you identify Joint Exhibit 8?
A. That's a district outline map of the Third Congressional District in Pennsylvania.
Q. Do you want to just -- can you walk us through the geography of this district?
A. Sure.
This district begins in the northwest corner of Pennsylvania in Erie County. It then -- you'll notice the county, itself, is split literally in half, with the westernmost portion of Erie County

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placed into the Third District and the easternmost portion of the county placed in the Fifth Congressional District. It then winds down to Crawford County and -- and Mercer County and then also -- and then heads west into Butler and Venango counties.
Q. Can you explain -- or describe for us what you see as the communities of interest in this district?
A. Sure. I think -- the Third District Map highlights what -- what we discussed a few moments ago, known as cracking.
Q. I'm sorry. Pardon. My question was about communities of interest here.
A. Yes. We're looking here at -- I'm sorry.
Would you repeat the question?
Q. Yes. Can you just walk us through the communities of interest that are -- that are in this district?
A. Sure. Well, you have a community of interest itself in -- of Erie County -- it's the most populace county in the Third Congressional District.

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And then there are further communities along the Ohio border, which -- along Mercer County, which essentially are suburbs of the Youngstown area, and then more rural counties as a -- further west into the -- as you go further west into Butler and Venango counties.

Q. Did you mean to say further east into those counties?

A. Further east. I'm sorry. Pardon me.

Q. Did you see any anomalies in the way this district was drawn?

A. Yes. I think most notably, there's no apparent nonpartisan explanation for why Erie County, which had never been split previously, as it borders the states of Ohio and New York and Lake Erie, itself -- there's no apparent nonpartisan reason why Erie County is split in half, other than to effectively create a cracking of the Democratic vote in Erie County and separating it from the community of interest, its suburbs, in the eastern side.

Q. Did you -- have you figured out or have you examined any partisan implications for that?

A. Sure. I think it demonstrates the partisan implications of this cracking.

MR. FREEDMAN: Can we see

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Petitioners' 73?

BY MR. FREEDMAN:

Q. Mr. Kennedy, can you tell us what this is?

A. Yes. This is the -- this is the map of the Third Congressional District. It is designed to show the Democratic and Republican vote share for the 2010 U.S. Senate race, which was a very competitive contest between Democrat Joe Sestak and Republican Patrick Toomey.

The deeper the blue shadings indicate a stronger vote for Sestak; deeper the red shadings indicate a stronger vote for Toomey.

MR. FREEDMAN: Petitioners move Exhibit 73 into evidence?

THE COURT: Any objection?

MS. HANGLEY: No objection.

MR. TUCKER: Yes, Your Honor. I don't know if there's been enough foundation laid for this exhibit as to how it was prepared and how these -- how the statistics and the coloring was arrived at.

MR. FREEDMAN: I can build a --

THE COURT: Build a foundation.

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BY MR. FREEDMAN:

Q. Professor Kennedy, are you familiar with the shape of the Third Congressional District?

A. Yes, I am.

Q. How are you familiar with it?

A. I've looked at it. I've studied it.

Q. Are you familiar with the -- the election results in the 2010 Senate race?

A. Yes, I am.

Q. How are you familiar with those Senate -- with those election results?

A. Oh. I've looked at it and studied it.

Q. Is this map a fair and accurate depiction of the Senate election results in the 2010 Senate race?

A. Yes, it is.

MR. FREEDMAN: Petitioners move Exhibit 73.

THE COURT: Does that address your foundational objection?

MR. TUCKER: Your Honor, it doesn't. We haven't laid a foundation for how his familiarity with those general numbers are used in some type of GIS software or something else that generated this

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particular map. I haven't heard how we actually got to this particular exhibit.

THE COURT: Counsel, where is this map from?

MR. FREEDMAN: This is a map in his report. It was created by another one of our experts. He's interviewed the expert about the process.

THE COURT: Okay. Can you ask him -- instead of -- it's his report. If it's in his report, ask him where he got it from, how he got it and -- and --

MR. FREEDMAN: His understanding of the process?

THE COURT: Yes.

BY MR. FREEDMAN:

Q. Professor Kennedy, can you explain where you got this map from?

A. Yes. It was prepared by Dr. Warshaw.

Q. Can you explain how he prepared it?

MR. TUCKER: Objection, Your Honor -- well, I guess we'll see if he has knowledge of that, but it seems to call for speculation.

THE COURT: No. Let's keep in mind

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this is an expert report. He's entitled to rely on facts not of evidence that an expert in his circumstance in his field would rely upon. So let's allow him to raise the foundation.

The fact that that doctor is not necessarily here does not mean that it cannot form a basis of his opinion, under the Pennsylvania Rules of Evidence.

So proceed with your foundation.

BY MR. FREEDMAN:

Q. Can you explain -- have you discussed this matter with -- the preparation of this map with Dr. Warshaw?

A. Yes, I have.

Q. What is your understanding of how he prepared this map?

A. Using GIS software, he was able to prepare this map.

Q. And can you explain what that -- what that means?

Can you explain, like, where he got the data from, where -- and how he applied it to the map?

A. Oh, sure. The data is available through the Pennsylvania Department of State

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Web site.

Q. And you've independently looked at that data, correct?

A. Yes, I have.

Q. And you checked the accuracy of the map, to the best of your ability?

A. Yes, I have.

Q. And the portrayal of the map regarding the blue regions and the red regions, does that correspond to your general understanding of the politics of the -- of these communities?

A. It has.

And I have written about this particular election in my book.

MR. FREEDMAN: Petitioners move Exhibit 73 into evidence.

THE COURT: Any objection?

MR. TUCKER: No, Your Honor.

THE COURT: Any other objections?

MS. HANGLEY: No, Your Honor.

THE COURT: Petitioners' Exhibit 73 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number

597

73 was admitted into evidence.)

- - -

BY MR. FREEDMAN:

Q. Could you explain what partisan implications there are associated with the anomaly we were talking about?

A. Sure. The partisan implications are --

THE WITNESS: If I may use this pointer, Your Honor.

The Erie County historically is -- is -- has been -- has been Democratic, the most Democratic area of the -- of the Third District over the years. It is also the most populace county in the Third District. It has been -- served as the base of the Third District historically.

This is the first time in the modern era of redistricting that Erie County is cracked. Erie is located right here (indicating). And you can see how it is separated from the rest of the county, which is pushed into a very rural and overwhelmingly Republican county.

The net effect is that Erie County -- the voice of voters in Erie

598

County, Democratic voters in particular, is diluted by pushing eastern parts of the county into the Fifth and thereby diluting the overall impact of what's left of Erie County voters into the Third.

BY MR. FREEDMAN:

Q. Thank you.

Are there other districts in the Pennsylvania map that support your conclusion?

A. Sure.

Q. Which one would you like to talk about?

A. If we look at the Seventh Congressional District.

Q. Sure.

MR. FREEDMAN: Can we take look at Joint Exhibit 12?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you identify this?

A. So that's -- that's a map of the Seventh Congressional District in Pennsylvania.

Q. Could you walk us through the geography of this district?

A. Sure.

The Seventh Congressional District has

599

become famous certainly systemwide, if not nationally, as one of the most gerrymandered districts in the country.

Historically, the Sixth Congressional District was based in Delaware County.

Q. Did you mean to say the Seventh?

A. Did I say -- I'm sorry.

Q. You said the Sixth.

A. I'm sorry.

The Seventh Congressional District was historically based in southern -- in Delaware County, and it does begin in the Delaware County today, and then it moves further north through parts of the Montgomery County, up to northern -- western Montgomery County. It's essentially two districts -- it's essentially two districts, an eastern and western district.

Again, it's been famously referred to as the "Goofy kicking Donald district," Goofy being the eastern portion of the district, Donald being the western portion of the district. The western part of the district, again, also takes in Chester County, parts of Berks County. And, also, it goes into Lancaster County.

600

Again, this is essentially two different -- two different counties. If you were to drive from this end (indicating) of the district to this end (indicating), it's about a 20-mile drive through the Sixth Congressional District to arrive there. It's combined, at this point, by a mere tract of land along Route 30. And I think we have a map that gives us an aerial view -- an aerial photo of that particular tract of land.

Q. Sure. This is from your report, Page 32.

MR. FREEDMAN: Can we see Petitioners' Exhibit 82?

BY MR. FREEDMAN:

Q. Can you tell us what this is?

A. Yes. That is an aerial photograph of the spot where essentially Goofy's toe is kicking Donald Duck right -- right about there, I believe.

Q. Do you have any sense of how wide that is?

A. How wide it is?

I think we have a map that can demonstrate that.

Q. Do you know -- yeah.

Do you see the scale at the bottom?

601

A. Oh. I can't read it from here. But I believe it's -- it's -- it's roughly the length of two football fields.

Q. I just want to check your report and make sure that I am pointing you to the right exhibit. I believe --

MR. FREEDMAN: Can we just do a blowup on the district -- no, on the -- on the -- where the connection is.

BY MR. FREEDMAN:

Q. This is the picture from your report, so there's nothing -- there's not a more detailed blowup than this.

A. Yeah. Again, that's -- that's essentially the section of the length of a football field. It's -- it's a medical facility.

Q. Did you observe other comparable points in the district?

A. Sure. If we can go back to the original map of the Seventh District.

MR. FREEDMAN: That would be Petitioners' Exhibit 86 -- I'm sorry, Joint Exhibit 12?

THE WITNESS: Yes.

In this particular area

602

(indicating), there's another narrow tract of land --

MR. FREEDMAN: I think you need to push the button on the clicker. There you go.

THE WITNESS: -- it's a narrow tract of land which I believe where Goofy's Adam's apple is located, and I think we -- I think we have an ariel photograph of that.

MR. FREEDMAN: We do.

Can we take a look at Petitioners' Exhibit 81?

Can you blow it up a little?

BY MR. FREEDMAN:

Q. Mr. Kennedy, what is this?

A. That's an aerial photograph of what is -- on the broader sense is a connection which is -- which is a -- a steakhouse -- Creed's Seafood & Steaks in King of Prussia. That's the size of the connection at that point.

MR. FREEDMAN: Petitioners move Exhibit 81 into evidence.

THE COURT: Any objection?

MR. TUCKER: The same objection, Your Honor, and given the previous testimony

603

that we learned, I don't know there's been a foundation of where these photographs were pulled from or who took them or any foundation for them, again.

THE COURT: Would you like to lay a foundation on the photograph, please?

MR. FREEDMAN: Certainly.

BY MR. FREEDMAN:

Q. Professor Kennedy, can you tell us where you got this photograph from?

THE COURT: It looks like Google.

THE WITNESS: Google. Okay. Thank you, Your Honor.

BY MR. FREEDMAN:

Q. Do you have any understanding of how the line was drawn on top of it?

A. Sure. I believe using GIS software.

Q. And do you know who put together this picture?

A. I believe it was Christopher Warshaw, Dr. Warshaw.

Q. Okay. Are you familiar with what is portrayed in this picture, this portion of the Seventh Congressional District?

A. Yes. That's an area which connects the

604

eastern side of the Seventh Congressional District at Creed's Seafood & Steaks in King of Prussia.

Q. And how are you familiar with what this picture depicts?

A. I mean, I've looked at it extensively.

Q. Is this picture a fair and accurate description -- depiction of this portion of the Seventh Congressional District?

A. Yes, it is.

MR. FREEDMAN: Petitioners move Exhibit 81 into evidence.

THE COURT: Any objection?

MR. TUCKER: No, Your Honor.

THE COURT: Petitioners' Exhibit 81 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 81 was admitted into evidence.)

- - -

THE COURT: I do appreciate your efforts to move it along, though.

MR. FREEDMAN: Yes, Your Honor. I neglected to move Petitioners' 82 into evidence. So can we go back to Exhibit --

605

THE COURT: Any objection to Petitioners' 82 being admitted into evidence?

(Pause.)

THE COURT: Petitioners' 82 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 82 was admitted into evidence.)

- - -

MR. FREEDMAN: Okay. Can we go back to the overall map of the Seventh Congressional District -- 83 -- Joint 12?

BY MR. FREEDMAN:

Q. Is there anything else about the Seventh Congressional District you wanted to talk about?

A. Yes. Adjacent to the Seventh Congressional District is the First Congressional District, which comes down in this area (indicating) of Philadelphia and then, also, as an example of packing Democratic voters, grabs the City of Chester -- parts of the City of Chester and then moves up and grabs a number of other

606

Democratic communities, including the -- the town of Swarthmore, right here (indicating), which is located, I suppose, in what's Goofy's armpit.

THE COURT: That's Donald.

THE WITNESS: I'm sorry. Donald. It's been a while.

BY MR. FREEDMAN:

Q. It's actually --

MR. FREEDMAN: No, Your Honor, it's --

THE COURT: Is Donald on the right?

MR. FREEDMAN: Donald is on the left. Donald is getting kicked, Your Honor.

THE COURT: That's strange, I actually thought that was Goofy on the left. I thought that was -- I've completely had this all messed up.

I still don't see Donald on the left, but I'll assume Donald is on the left.

MR. FREEDMAN: Goofy is a little bit clearer, Your Honor. I think you can take judicial notice of that.

THE COURT: That's fine.

BY MR. FREEDMAN:

Q. So did you draw any conclusions

607

regarding the partisan implications of what the -- Goofy's-armpit point you were just making?

A. Sure. I believe we have a map which indicates the -- the partisan nature of this particular area.

Q. Sure.

MR. FREEDMAN: Can we see Petitioners' Exhibit 70?

BY MR. FREEDMAN:

Q. Professor Kennedy, what is that?

A. This is a map of the First Congressional District in Pennsylvania.

Q. Can you just explain --

THE COURT: I don't think you have the right exhibit.

MR. FREEDMAN: No, he's looking at the regional --

BY MR. FREEDMAN:

Q. Can you explain sort of how this ties to the map we were just looking at?

THE COURT: Oh, okay. Okay.

THE WITNESS: Sure.

The First Congressional District is an overwhelmingly Democratic district, primarily based in Philadelphia, but then it

608

also takes in some appendages down here (indicating) in Delaware County.

You can tell again -- using the scale -- the blue scale highlighting the Sestak vote, the red scale highlighting the Toomey vote, you know, it's clear how Democratic some of these municipalities are in this particular area, Delaware County.

And then you can see there's a small, little tract of land here (indicating), an isthmus, which goes up and connects Swarthmore right there, very heavily Democratic, which historically had been placed in the Delaware County district, which was the Seventh District.

MR. FREEDMAN: Petitioners move Exhibit 70 into evidence.

THE COURT: Any objection?

MR. TUCKER: No objection, Your Honor.

Can we -- and to speed things along, can we just get a stipulation in the record that all of these maps and photographs were prepared by Christopher Warshaw, and I think we can have no objection to any of this

609

going forward and not to have them lay the foundation for each one?

THE COURT: Dr. Kennedy, is that correct?

THE WITNESS: Yes, I'm fine with that.

THE COURT: I feel like I'm talking to my 14-year-old. No offense. He's a very smart 14-year-old.

Do you agree that all of these maps that we're going to be looking at that were reproduced in your report were prepared by Dr. Warshaw?

THE WITNESS: Yes, Your Honor.

THE COURT: Okay. Thank you.

And that was 70?

Petitioners' Exhibit 70 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 70 was admitted into evidence.)

- - -

THE COURT: We're going to take a 10-minute break.

I would like to see counsel -- lead

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counsel, preferably, in -- just follow my clerk. Okay? We'll be recessed for -- let's say 15 minutes.

MR. FREEDMAN: Thank you, Your Honor.

THE CLERK: We're in recess.

- - -

(Whereupon, a recess was taken from 3:40 p.m. to 4:04 p.m.)

- - -

THE CLERK: Ladies and gentlemen, please be seated.

The Commonwealth Court is now in session.

THE COURT: Please be seated, everyone.

Dr. Kennedy, I remind you that you're still under oath.

THE WITNESS: Yes, Your Honor.

THE COURT: Okay. Please proceed.

MR. FREEDMAN: Your Honor, there's one administrative thing that I want to clean up, which is, right before we went off, we were discussing a stipulation concerning the maps and the photos. And

611

there's actually a distinction, and I need to build a foundation.

It's -- Dr. Warshaw created the red/blue maps. I need to build a separate foundation on the photos, which I think I can do quickly.

THE COURT: You mean the photos in the sense that they came from Google and have an outline on them?

MR. FREEDMAN: Yes.

THE COURT: Okay. Go ahead, if you want to clean that up in the record, feel free.

BY MR. FREEDMAN:

Q. Professor Kennedy, are you familiar with the Pennsylvania Legislative Reapportionment Commission?

A. Yes, I am.

Q. Are you familiar with their Web site?

A. Yes, I am.

THE COURT: Dr. Kennedy, can you please move that microphone? Tilt it towards you. It's sort of -- there you go.

THE WITNESS: Yes, I am.

612

BY MR. FREEDMAN:

Q. Did you check the photos in your report against the images on the Legislative Reapportionment Commission Web site to confirm their accuracy?

A. Yes. They match up with those on the -- which come underneath the Department of State Web site, yes, the Reapportionment Commission.

Q. And what is your understanding -- and what is your understanding of the source of those photos?

From that Web site?

A. From that Web site, yeah.

MR. FREEDMAN: So we agree -- that is the foundation --

BY MR. FREEDMAN:

Q. And they're true and accurate depictions of those portions of the Seventh Congressional District?

A. Yes, they are.

MR. FREEDMAN: Petitioners re-move Exhibit 81 and 82.

THE COURT: Well, they're already in --

MR. FREEDMAN: They're already in.

THE COURT: -- but I'm sure they

613

appreciate your clarification on the record.

MR. TUCKER: We do, Your Honor.

THE COURT: Okay.

MR. FREEDMAN: Can we see Petitioners' Exhibit 83?

BY MR. FREEDMAN:

Q. Professor Kennedy, what is this?

A. This is the -- this is a map of the Seventh Congressional District. This map indicates the vote share for Joe Sestak in blue and Patrick Toomey in red.

Q. You testified earlier that your view was this was essentially two different districts. Does this help you explain that conclusion?

A. Yes. You can see that we had -- in tracing the geography, we have lower Delaware County here, another community up here in Montgomery County out to Western Montgomery County, again -- and connected here by a tract of land which is a medical facility.

And then we have -- again, you can look at the shadings of blue over here. This is a more Democratic area. Connecting here to -- to Chester -- southern Chester County into parts of Berks County

614

and more rural areas into Lancaster County, where you see a much redder hue.

MR. FREEDMAN: Petitioners move Exhibit 83 into evidence.

THE COURT: Any objection?

Petitioners' 83 is admitted into the record without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 83 was admitted into evidence.)

- - -

BY MR. FREEDMAN:

Q. Professor Kennedy, you testified earlier that the historic routes of this county were in Delaware County -- this district were in Delaware County?

A. Historically. And I believe we have a -- a depiction demonstrating the evolution of the Seventh Congressional District.

Q. Sure.

MR. FREEDMAN: Can we see Joint Exhibit 24?

BY MR. FREEDMAN:

Q. Can you tell us what this is?

A. This is -- this is -- this particular

615

visual traces the evolution of Pennsylvania's Seventh Congressional District from the beginning the early parts of the modern era redistricting when it contained Delaware County. And it was relatively compact over -- through the years, even into the most recent map in -- prior to this one in the 2000s.

But then you can see it makes a considerable change as far as the most -- as far as the 2011 Map is concerned.

Q. Great.

Should we move on to another district?

A. Yes. I just add -- and we can come back to this later, but the Seventh Congressional District throughout this entire area contains 20 -- I believe, 26 split municipalities.

Q. Thank you.

Can we move on to District 6?

A. Sure.

MR. FREEDMAN: Can we see Joint Exhibit 11?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you tell us what this is?

A. Yes. This is a Congressional Map of Pennsylvania's Sixth District.

616

Q. Can you explain the geography for us?

A. Sure. The Sixth Congressional District begins down here, in Chester County, then -- then moves northward into more western areas of Montgomery County, then jettisons westward through parts of Berks County, and then before -- and finally settles in what is relatively -- I refer to, I guess, as central Lebanon County.

It's -- it's -- it's a long journey, and I think it's been likened by some as resembling the State of Florida with a more jagged and elongated panhandle.

One reason I think it's interesting to look at this particular map is as it makes its journey westward, you'll notice around this Berks County area, there's an area that's been carved out of the Sixth Congressional District.

Q. I'll show you that in a second.

Do you want to just walk the Court through the communities of interest that are here?

A. Sure.

So, here, we have southern Chester County, communities such as West Chester. And then we have other communities over here in western Montgomery County, moving further west through

617

Berks County and then all -- and ultimately resting down in more -- what you considered central Pennsylvania in Lebanon County.

Q. Does anything unite these communities other than this district?

THE COURT: I'm sorry. I didn't hear that.

BY MR. FREEDMAN:

Q. The question was, Is there anything that unites these different communities other than all being put in this one district?

A. To me, in my opinion, they -- they are separate communities of interest. Certainly, it's -- you know --

Q. And have these communities of interest been maintained whole in this district?

A. In my opinion, they have not been.

Q. You mentioned earlier the portion around Reading --

A. Sure.

Q. -- do you want to discuss that?

A. Yeah. I think we have a map of the -- of the 16th Congressional District, which can illustrate that.

MR. FREEDMAN: Can we see

618

Petitioners' Exhibit 97?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you tell us what this is?

A. Yes. This is a map of the 16th Congressional District in Pennsylvania.

Q. And this is your red/blue map, right?

A. It is. It depicts the vote share for Republican Patrick Toomey and Democrat Joe Sestak.

Q. What is the history of the 16th Congressional District?

A. Historically, the 16th Congressional District is one which is based in Amish country. It was -- it -- it has always been one of the more redder districts in Pennsylvania. And it continues to be relatively red outside of the City of Lancaster in the blue area.

But you'll notice the appendages that have been attached now to the 16th Congressional District. Down at this end, which looks a little bit like a boot, maybe, we have Democratic municipalities, such as Coatesville, which have been removed from Chester -- the Chester County Sixth District.

And, also, I think most notably is

619

the -- is the removal of Reading from traditionally -- its traditional home is the county seat in Berks County -- taken out of the Sixth Congressional District via a very narrow isthmus as it corrals Reading and pulls it into the Sixth Congressional District, which has the net political effect of diluting Democratic precincts and Democrat performance in Reading and, also, in this particular case, Coatesville.

Again, when we look at communities of interest, we're looking at, you know, whether it was the Sixth or this district. You know, Coatesville has commonalities with the Sixth Congressional District, the one we looked at previously, not Amish country.

Q. I think, in your report, you've actually got a picture of the connection to Reading. Would you like to take a look at that?

A. Yeah, I believe there is one.

MR. FREEDMAN: Can we take a look at Petitioners' Exhibit 99?

BY MR. FREEDMAN:

Q. Professor Kennedy, what is this?

A. This is the narrow isthmus which scoops up Reading and brings it into the 16th Congressional

620

District.

The length of this path is really the size of a malt store one side and a service center on the other. It's a very narrow tract of land which is used to bring Reading into the 16th and take it out of its traditional home located in Berks County.

MR. FREEDMAN: Petitioners move Exhibit 99 into evidence.

THE COURT: Any objection?

MS. HANGLEY: No objection.

THE COURT: Petitioners' Exhibit 99 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 99 was admitted into evidence.)

- - -

MR. FREEDMAN: And let's go back to 97 briefly.

Petitioners move 97 into evidence.

THE COURT: Any objection?

Petitioners' Exhibit 97 is admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number

621

97 was admitted into evidence.)

- - -

BY MR. FREEDMAN:

Q. I want to go back to the overall Sixth -- red/blue map.

MR. FREEDMAN: Can we see Petitioners' Exhibit 78?

BY MR. FREEDMAN:

Q. Professor Kennedy, what is this?

A. Yes. This is the -- this is the Congressional district map of the Sixth.

Q. And it's -- can you explain the red and the blue -- or the significance -- can you explain the partisan implications?

A. Sure. The partisan implications is -- this particular area of the -- of Chester County, you can see the more bluer shadings and, you know, the political implications of taking this part of Chester County, moving it northward and then especially westward into Lebanon County. Again, you're looking at different communities of interest which are combined into this political -- into this Congressional district.

You're looking at areas here in southern Chester County and as far as away as Lebanon

622

County, two distinct communities of interest.

Q. And can you just -- does this illustrate the impact of taking Reading out of the district?

A. It does. Reading, again, is located right here. If Reading had been located in the Sixth Congressional District, it would have changed the partisan makeup and the partisan performance in this district, I think, considerably. As you notice in the last map, Reading is a very Democratic city.

Q. In your view, what is the community of interest that concerns Reading? What -- is it part of -- is it part --

A. It's -- it's the county seat for Berks County.

Q. And do you have any understanding, historically, how Reading had been treated?

A. Historically, prior to the 2000 map, it had been -- remained part of Berks County and remained whole.

Q. Okay.

MR. FREEDMAN: Can we move to the 15th District, Joint Exhibit 20?

I'm sorry. Before we move on, let's move Exhibit 78 into evidence.

623

THE COURT: Any objection?
Petitioners' Exhibit 78 is admitted without objection.
- - -
(Whereupon, Petitioners' Exhibit Number 78 was admitted into evidence.)
- - -
MR. FREEDMAN: Joint Exhibit 20?
BY MR. FREEDMAN:
Q. Professor Kennedy, what is this?
A. This is a map of the 15th Congressional District in Pennsylvania.
Q. Can you walk us through the geography of this?
A. Yes. The 15th Congressional District in Pennsylvania, historically, was based -- it was considered a Lehigh Valley district based in Lehigh and Northampton Counties. At times, it included parcels over the last 50 years perhaps in Monroe County, a slight parcel in Montgomery County, but it was primarily a Lehigh Valley-based district, Lehigh County and Northampton County.
The 15th Congressional District now, however, has eliminated a segment of Northampton County and the eastern side. It now runs west

624

through -- through -- through parts of Berks County, ultimately landing in Dauphin County. It's -- it's a considerable stretch here from Allentown to Hershey, Pennsylvania.
Again, when you're looking at communities of interest, you're looking at two diverse communities of interest.
Q. And what are those communities?
A. Well, again, the Lehigh Valley -- as someone who was born in Lehigh Valley and lived in Northampton County for the first 32 years of my life, two doors down from the Lehigh County border, people from Lehigh Valley identify themselves as Valley residents, whether it's -- you know, there's a real community of interest involved, be it the, you know, Lehigh Valley Chamber of Commerce, which is located in the Easton; Lehigh Valley Transportation Authority; Lehigh Valley International Airport --
Q. Lehigh Valley has an international airport?
A. I believe it does.
Q. Go ahead.
A. So Lehigh Valley is also the third largest metro area in Pennsylvania, so it is a sizable community. And, again, by cracking -- and I

625

think we have a map that can show the impact of this -- but by cracking Easton, which is the county seat of Northampton County and is very Democratic, and parts of -- about a quarter of the City of Bethlehem, and cracking it out of the Lehigh Valley and running this Congressional district all the way down to Hershey, Pennsylvania essentially means that there no longer is, in my mind, a Lehigh Valley district.
Q. Why don't we take a look at Petitioners' Exhibit 95?
And can you tell us what this is?
A. Yes. Again, this is the blue/red continuum relative to Joe Sestak and Patrick Toomey's vote in the 2010 Senate election.
You can see the areas around Allentown, Pennsylvania, remain relatively blue. The more excerpts heading out west, however, give it a much redder shade. What was once a very competitive district going back to the mid-1950s, in the 32 election cycles till today, Democrats have won 16, and Republicans have won 16.
So this is a very competitive district. Northampton County itself is perhaps the best bellwether for elections in the State. Since 1980,

626

it's never deviated more than 2 percentage points from the statewide average and only once more than one percentage point.
Again, this is a community of interest here, the Lehigh Valley. And you can see what was essentially the Lehigh Valley district no longer exists.
Again, going back to the community of Lehigh Valley, it's the -- the minor legal baseball team is called the Lehigh Valley Iron Pigs. It's not the Allentown/Hershey Iron Pigs.
MR. FREEDMAN: Petitioners move Exhibit 95 into evidence.
THE COURT: Any objection?
Petitioners' Exhibit 95 is admitted without objection.
- - -
(Whereupon, Petitioners' Exhibit Number 95 was admitted into evidence.)
- - -
BY MR. FREEDMAN:
Q. Should we move to the 17th District to see where Easton and Bethlehem went?
A. Sure.
MR. FREEDMAN: Can we see

627

Joint Exhibit 22?
BY MR. FREEDMAN:
Q. Professor Kennedy, what is this?
A. This map depicts the 17th Congressional District in Pennsylvania.
Q. Can you just walk us through the geography and communities of interest?
A. Sure. In the -- in the furthest north point of this Congressional district, we have areas of Scranton and Wilkes-Barre, and it moves down into areas of Northampton County, over here up in the Poconos -- this is a very narrow path here up into the Poconos and Monroe County.
So this arm reaches down. Here's Bethlehem -- parts of Bethlehem, and here's Easton, again, the county seat of Northampton County. And then the county moves -- this -- sort of body here moves down to -- down towards -- including Schuylkill County at the end.
I think we have a map of the 2010 election that depicts this.
MR. FREEDMAN: Can we see Petitioners' Exhibit 102?
THE WITNESS: Earlier, we discussed the issue of packing. And this is a

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textbook example, I think, of what a packed Congressional district looks like.
And you might recognize it as a Transformer, if you have a child. It has sort of the head here, there's the left arm, there's maybe a right arm and some kind of, you know -- I don't know -- a weapon or something here that the Transformer has. Then you've got the body here.
You can see these are very blue areas. They've been -- you know, we're looking at two distinct communities of interest here: Easton/Bethlehem, Scranton/Wilkes-Barre. In my opinion, Easton and Bethlehem, they belong with Allentown. They don't belong with Scranton, and they don't belong with Wilkes-Barre.
MR. FREEDMAN: Petitioners move Exhibit 102 into evidence.
THE COURT: Any objection?
Petitioners' Exhibit 102 is admitted without objection.
- - -
(Whereupon, Petitioners' Exhibit Number

629

102 was admitted into evidence.)
- - -
BY MR. FREEDMAN:
Q. Were there any other anomalies that you wanted to discuss on this?
A. I believe if you were to take the drive from Bethlehem/Easton to the other end of the district right here, you're traveling approximately 50 miles across the old 15th -- or the current 15th District.
Q. Let's move to the 11th District.
MR. FREEDMAN: Can we see Joint Exhibit 16?
BY MR. FREEDMAN:
Q. Professor Kennedy, can you tell us what this is?
A. Yes. This is a map of the 11th Congressional District in Pennsylvania.
Q. Can you walk us through the geography and the communities of interest?
A. Sure. Historically, the 11th was a very Democratic district. From the mid-1950s until 2011, only the Democrats held the seat during that entire time, except for a two-year period from 1981 to 1982.

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I mean, this is a district which -- you know, there were coal areas in here. There was manufacturing. You had Irish immigrants, Eastern European immigrants, strong union.
Today, Scranton and Wilkes-Barre have now been removed from the 11th. Again, they were in what we just looked at, the packed 17th.
This is almost a straight vertical district from the northern end, Wyoming County, all the way down -- which is really Northeastern Pennsylvania, not quite the far northeast, but close to it -- all the way down to where it finally lands in Cumberland County, which I think most people consider to be South Central Pennsylvania.
Q. Do you know how long the district is from end to end?
A. I believe it's about 200 miles long. And, in fact, if you lived in Nicholson, which is -- I believe it's a borough up here in Wyoming County, you would need to travel 80 miles to Hazelton to get to the nearest district office in this particular Congressional district. That's 80 miles to get to the nearest district office.
Q. Do you want to comment at all about the southern tip, where we're sitting right now?

631

A. The southern tip -- again, we see something carved out of this. Previously, the City of Harrisburg had been included in this district. You can see right now that that area which I'm referencing right there is the capital of Pennsylvania. And we have another map, I think, which can illustrate where Harrisburg is today, at least a large part of it.

MR. FREEDMAN: Can we see Petitioners' Exhibit 75?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you tell us what this is?

A. Yes. This is a map of the Fourth Congressional District. Historically, this was a very Republican district and has become actually more Republican over the last several decades. There are a few Democratic areas in Gettysburg and the City of York, but you can see -- I mean, it is -- I mean, it appears relatively normal, especially compared to the districts we've looked at.

But, again, right up here, the northernmost tip, Harrisburg, which had previously been located in areas and communities of interest in Metro -- Central Pennsylvania and the Harrisburg

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Metro area, now is at the furthermost tip of what is the Fourth District.

The overall impact of Harrisburg, which is a predominantly Democratic city today, being moved into the Fourth District is to dilute the Democratic vote in Harrisburg. And it really just gets washed away in what is one of the more Republican districts in the State.

And I'm sorry. I should have mentioned the blue illustrates the Sestak vote in the 2010 race, and the red illustrates the Toomey vote.

Q. And just -- can you comment on Hershey -- what county is Harrisburg is?

A. Harrisburg is in Dauphin County.

Q. Do you want to comment on the historical issues around Dauphin County?

A. Yes. I believe this is the first time -- just like the first time Erie County was cracked, this is the first time that Dauphin County, which houses the capital of the State, has been splintered.

MR. FREEDMAN: Petitioners move Exhibit 75 into evidence.

THE COURT: Any objection?

Petitioners' Exhibit 75 is admitted

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without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 75 was admitted into evidence.)

- - -

MR. FREEDMAN: Okay. Can we take a look at the 12th District, Joint Exhibit 17?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you identify this for us?

A. Yes. This is a map of the 12th Congressional District in Pennsylvania.

Q. Can you walk us through the geography and communities of interest?

A. Sure. If we can begin at the westernmost edge on the Ohio border, it begins with the northern point here in southern Lawrence County. It does take in Beaver County and then heads sharply eastward along upper Allegheny and Westmoreland County, noticing that there's, what I would call, a tentacle piercing up through the middle of that journey.

Ultimately, it lands in the eastern section of Cambria County to the north and Somerset County to the south.

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Q. Do you observe any anomalies in this district?

A. Yeah, a few items. This is, again, quite a distance along the way. And as it makes this journey, there are four other Congressional districts that it's passing as it connects what was the old Fourth to what was the old 12th, which is now the 12th itself.

Earlier, we discussed methods of gerrymandering known as cracking and packing. This is another method of gerrymandering. This one is -- I refer to as "hijacking."

The impact of this particular district map was that in the previous 2000s map, the Fourth was represented by a Democrat, Jason Altmire, whose home was based here in Beaver County. And the 12th, over here, was held by a Democrat, Mark Critz, who was based over here in the Johnstown area.

This is, again, what I refer to as "hijacking" in that by combining these two disparate communities of interest, the net effect was that these two Democrats were forced to run off against one another in the 2012 Democratic primary race, automatically eliminating one of them.

As this district picks up more

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Republican-performing areas, particularly in Westmoreland County, it also combined to make this district overall more Republican. And the net effect was, in the general election of 2012, the Republican won a narrow victory over all in the new 12th.

Q. How long is this district from end to end? Do you know?

A. I believe it's 120 miles.

Q. And do you want to comment on -- you mentioned earlier the tentacle?

A. The tentacle -- I would like to comment on the tentacle. I think we have a map that can demonstrate it better.

Q. Sure.

MR. FREEDMAN: Can we see Petitioners' Exhibit 93?

BY MR. FREEDMAN:

Q. Professor Kennedy, what is this?

A. Yes. This is, again, the -- the blue highlighting the Sestak vote, the red highlighting the Toomey vote for the 2010 U.S. Senate race. And this is a map of the -- the Fourth Congressional District.

Q. Did you mean to say the 14th?

A. Fourteenth. I'm sorry. This is a map

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of the 14th Congressional district, based -- the 14th here -- is based here in the City of Pittsburgh, of course, overwhelmingly Democratic. And the end lines are Democratic as well.

And if you recall looking at the old 12th, as the 12th moves from west to east -- or it can go east to west, I suppose -- there was that tentacle that we observed in the previous map. That tentacle is this stretch of blue that rises up through the -- up north through the Allegheny River. Those are Democratic river precincts, as they are packed into what is already a very Democratic Congressional seat, diluting the Democratic vote in the new 12th.

MR. FREEDMAN: Petitioners move Exhibit 93 into evidence.

THE COURT: Any objection?

Without objection, Petitioners' Exhibit 93 is admitted.

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(Whereupon, Petitioners' Exhibit Number 93 was admitted into evidence.)

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BY MR. FREEDMAN:

Q. Professor Kennedy, we've looked at

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seven primary districts and a bunch of incidental districts next to them.

In addition to your district-by-district analysis, is there any other work that you did that supports your conclusions?

A. Yes, there is.

Q. Can you describe that?

A. Sure. I also looked at the number of county splits and municipal splits that have occurred historically in Pennsylvania.

Q. And do you discuss those in your report?

A. I do. I believe I have a table which illustrate the splits.

Q. Can we see Table B from your report?

MR. FREEDMAN: That is Petitioners' Exhibit 56.

BY MR. FREEDMAN:

Q. Professor Kennedy, can you tell us what this is?

A. Yes. This is a table which, again, lists the number of split counties and split municipalities through the decades.

Q. And what's the significance of this?

A. Yes. You can see that the number of

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split counties was relatively low in the early years of the modern era redistricting. And then in the 2000s, it jumped up a little. 2010 Map produced a few more split counties.

You can't even -- you can't ever see, as far as a municipality is concerned, how the 2000s map -- the number of split municipalities just skyrocketed from only 14 in the '90s map. And, again, the '90s map, we're not -- we're not looking here at ancient history as far as Pennsylvania is concerned. This is a period of one redistricting map from 1990s to 2000s.

Again, the 2000s map was a gerrymandered map as well. The 2010 has just, you know, increased it -- increased the numbers overall.

I do want to caution, though, that split counties and split municipalities are indicative of a gerrymander -- of a splitting of a community of interest. It doesn't tell the whole story, but it can be --

Q. What -- what do you mean, it doesn't -- a split doesn't tell the whole story about a community of interest?

MR. TUCKER: Your Honor, before we get to that question, can I object and move

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to strike the testimony about the 2002 plan being a gerrymandering map? I don't believe there's been any evidence or analysis of that map by Dr. Kennedy.

MR. FREEDMAN: Dr. Kennedy has not analyzed -- has not done an analysis comparable to what he's done for 2011 for the 2002 Map, and it's not discussed in his report. So we don't object to that portion being stricken.

THE COURT: We'll strike Professor Kennedy's opinion with regard to the 2000 map being gerrymandered.

Does that address your objection?

MR. TUCKER: It does, Your Honor. Thank you.

THE COURT: Thank you.

BY MR. FREEDMAN:

Q. So, Professor Kennedy, you were just explaining that -- I asked you to explain the significance of -- what you meant that the split doesn't tell the whole story.

A. Again, splits may be indicative of splitting of a community interest, but not necessarily.

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In the 2000s, the number of split municipalities was at 67. It increased to 68. I do want to mention that there was a revised map. Subsequently, the 2000s map was struck down by the courts.

The Court had asked that the legislature redraw the new maps in a period of three weeks. And I think, in 10 days, a new map was produced.

It does change the municipal lines a little bit -- the municipal splits, I should say. It increases them somewhat. However, what I'm looking at here is the overall plan -- initial plan in 2000 that the Legislature had passed through the normal redistricting process.

What I'm looking for here is what are anomalies. Where are split communities of interest?

When the revised map, for instance, was passed in -- which impacted the 2004 race, the Court had asked that some minor population adjustments be made among the districts. And so, for example, a division of -- of Upper Macungie Township was nicked out of Lehigh County and pushed into the Sixth Congressional District, likewise similar item happened to Tioga County.

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So, in other words, if you're looking at that particular instance, I don't consider, personally, one district out of Upper Macungie Township carving up the Lehigh Valley or splitting the community of interest known as Lehigh Valley.

Again, that's why it's -- splits might give you some information, but, again, that's not the same as taking out the county seat, Easton, taking out one fourth of the City of Bethlehem and a number of other Democratic municipalities, as the current plan does in the 15th.

MR. FREEDMAN: Petitioners move Exhibit 56 into evidence.

THE COURT: Any objection to Petitioners' Exhibit 56?

Admitted without objection.

- - -

(Whereupon, Petitioners' Exhibit Number 56 was admitted into evidence.)

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BY MR. FREEDMAN:

Q. Now, your report also talks about census-block splits?

A. Yes.

MR. FREEDMAN: Can we see

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Petitioners' Exhibit 57?

BY MR. FREEDMAN:

Q. Professor Kennedy, can you tell us what this is?

A. Yes. This table looks at the number of municipalities split at the census block level by decade.

Q. And what is a census block?

A. A census block is the smallest measurement utilized by the U.S. Department of Census to measure population. It ranges typically from 600 residents to 3,000 residents.

Q. And what's the significance of this trend?

A. The significance of this particular table is that you can see, in the early maps, there were zero census blocks split; in the '90s, there were only 3; in 2000s, it moved to 6; but in the most recent map, it jumped to 19.

Again, splitting at the census block level is a highly granular split. We're looking here at splits among neighborhoods, split between one Congressional district and another. I mean, this is -- it was quite a leap to get to 19, and apparently, that's what the mapmakers needed to do

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under this current plan.
MR. FREEDMAN: Petitioners move Exhibit 57 into evidence.
THE COURT: Any objection?
Without objection, Petitioners' Exhibit 57 is admitted.
- - -
(Whereupon, Petitioners' Exhibit Number 57 was admitted into evidence.)
- - -
BY MR. FREEDMAN:
Q. Professor Kennedy, did you also examine the number of -- for particular counties, the number of districts into which they had been split?
A. Yes, I did.
Q. Can you summarize your findings on that?
A. Sure. Quickly, it's also important to note that certain counties were split considerably more than others. In particular, Montgomery County, which is the third largest county in the State, is split into five different Congressional districts.
Of those five Congressional districts, none of the congressmen or -women who represent those districts actually live in Montgomery County.

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Westmoreland County and Berks County, which have relatively lower population, are also split considerably as well into four different legislative districts.
Q. Just to conclude, can you just summarize your conclusions for us again?
A. Sure. To summarize my conclusion, the 2011 Map carves up Pennsylvania's communities of interest at an unprecedented level and -- and contains more anomalies than ever before.
In addition, the 2011 Map gives precedence to political considerations over considerations of communities of interest and disadvantages Democratic voters, as compared to Republican voters. This is a gerrymandered map.
MR. FREEDMAN: Finally, can we pull back up Petitioners' Exhibit 53.
BY MR. FREEDMAN:
Q. Your report.
MR. FREEDMAN: Petitioners move Exhibit 53 into evidence.
THE COURT: Any objection?
MR. TUCKER: No objection.
MS. HANGLEY: No objection.
THE COURT: Petitioners' Exhibit 53

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is admitted without objection.
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(Whereupon, Petitioners' Exhibit Number 53 was admitted into evidence.)
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MR. FREEDMAN: I tender the witness.
THE COURT: Thank you.
Cross-examination.
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CROSS-EXAMINATION
- - -
BY MR. TUCKER:
Q. Good afternoon, Dr. Kennedy. My name is Rob Tucker. I represent the Legislative Respondent Speaker Turzai in this matter.
A. Good afternoon, sir.
Q. Have you ever drafted your own map?
A. No, I have not.
Q. Have you ever tried to do it?
A. No, I have not.
Q. Do you agree that we can't tell whether partisan considerations played either an intent or the predominant intent just by looking at the boundaries of a map?
A. I made no conclusion relative to

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intent. I made an observation of what 2000 Map actually achieved, but I did not make any comments relative to intent.
Q. Sure. But -- but just generally, if you're looking at just the shapes of a particular district, you can't draw any conclusions about why that district was -- was drawn based on shape alone, would you agree?
A. Would you repeat the question?
Q. In generally evaluating any -- either a Congressional district map or a legislative district map, you can't determine whether or not partisan considerations were either a factor -- a predominant factor just by looking at the shape of the district, can we?
A. Well, again, I didn't look at intent. I was asked to look at how this map impacts communities of interest.
Q. Did you attend any of the hearings on Senate Bill 1249, which ultimately resulted in the 2011 Congressional Plan?
A. No, I did not.
Q. And you haven't proposed any of your own maps or own plans in this case, have you?
A. No -- no. I'm not -- I'm not a

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mapmaker.
Q. You've not written any articles on redistricting?
A. No. I have chaired, again, the plenary panel on redistricting in 2012 with the Pennsylvania Conference. And in the process of chairing that particular panel, I did interview all four mapmakers, the two Republicans and the two Democrats.
Q. But you haven't written any peer-reviewed articles or anything like that specifically on redistricting, have you?
A. Not a peer-reviewed article, no. I do comment on it in my most recent book, however.
Q. Do you consider yourself an expert in redistricting?
A. I consider myself an expert in looking at Pennsylvania's communities of interest.
Q. I believe you were offered for being an expert in Pennsylvania's political geography, correct?
A. I believe I have specific knowledge of Pennsylvania's political geography.
Q. But you don't have specific expertise in redistricting, do you?
A. I have -- I have never -- I have never

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drawn a map, if that's your question; but I have studied it, I have taught about it and I have written about it.
Q. Let's talk about some of the factors and criteria that go into drawing a map.
I'm assuming we can agree that one of the first factors is equal population, correct?
A. That's mandated by the courts.
Q. And what's your understanding of what the equal population requirement is?
A. I don't know the exact measurement.
Q. Do you know how exact it has to be?
A. No, I don't.
Q. Are you aware of whether being 19 people off in a district would not comply with the equal population requirements?
A. No, I don't know the exact number.
Q. Do you have any knowledge about the Voting Rights Act?
A. I have some knowledge.
Q. And what is your knowledge about the Voting Rights Act?
A. In general, if minority population is sufficient, they're guaranteed representation.
Q. Now I'm talking about any type of

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partisan voting results since the enactment of the plan.
You haven't analyzed any partisan voting results for any particular district since enactment of the plan?
A. Would you repeat that question?
I'm sorry.
Q. Sure.
You haven't analyzed any partisan voting results for any particular district since enactment of the 2011 Plan?
A. In this particular report?
Q. Correct.
A. I'm trying to think whether I allude to any changes that have occurred. I can't say with certainty whether I've cited that or not.
Q. And, sitting here right now, you can't testify to anything that's in your report, correct, on that subject?
A. I mean, I'm sorry -- I'm just not aware of -- off the top of my head what -- what is in my report that looks -- I'm not saying I did or I didn't. But I didn't focus on as far as -- you know, partisan performance since that time. So I -- I -- you know, some districts have -- so I really can't

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say.
Q. Let me try to simplify.
We saw a bunch of maps. We had a color-coded -- the partisan makeup of the district based upon the 2010 Senate vote, correct?
A. Yes.
Q. You don't have any similar analysis for after enactment of the 2011 Plan, do you?
A. I don't believe I do.
Q. Okay. Thank you.
THE COURT: You can give him a hand. Go ahead.
(Counsel confer.)
MR. TUCKER: I can continue with questioning while we're working out the technical difficulties, Your Honor, to move things along.
THE COURT: Thank you.
BY MR. TUCKER:
Q. Dr. Kennedy, I'd like to talk a little bit about the splits in both the 2011 Plan and the prior plan that was enacted, for a little bit.
A. Yes.
Q. You and I can agree -- and I was trying to get your tables and stuff pulled up here, and

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hopefully we'll be able to do that in a minute -- that the current plan splits 28 counties, correct?

A. Yes, I believe so.

Q. And you believe that the current plan splits more counties than any other prior plan; is that accurate?

A. No, it does not contain more split counties than the revised map that was issued for the 2004 election.

Q. And what I was going to show you on the screen here -- but we can maybe just talk about it -- is . . .

THE COURT: There is paper.

MR. TUCKER: And that's what I was getting to, Your Honor.

THE COURT: He's got all those binders.

BY MR. TUCKER:

Q. If you you'll turn, Dr. Kennedy, to Petitioners' Exhibit 56 in the old-fashioned binder over there.

THE COURT: I think 56 will be Volume 2.

THE WITNESS: Yes.

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BY MR. TUCKER:

Q. And Petitioners' Exhibit 56 is Table B of your report, correct?

A. Correct.

Q. And that identifies the split counties and municipalities by decade for 1966 to '72 and then the '70s, '80s, '90s, 2000s and 2010s, correct?

A. That's correct.

Q. And this table reflects that there were 28 counties, as we just discussed, split in the 2010s, which would be the 2011 Plan, correct?

A. Yes.

Q. And then 25 counties split in the 2000s.

Do you see that?

A. Yes, that -- based upon the map that was originally issued for the 2000s.

Q. Right.

So the map that you're referring to when you're looking at the 2000s is a map that was found unconstitutional, correct?

A. Ultimately, yes.

Q. Do you know why that plan was found unconstitutional?

A. There were some slight imbalances among the several Congressional districts.

Q. When you mean "imbalances," you mean on population?

A. Population.

Q. And when you've got imbalances in population, inevitably you're going to have to move around, probably, some small either blocks of people or municipalities to get to equal population, correct?

A. Yes.

Q. And so in doing so, you will probably have to, maybe, split more counties or split some more municipalities in order to get to equal population.

Is that a fair statement?

A. You may have to, but I'd have to know more information to definitively say.

Q. So we can agree, then, that -- what I'm going to refer to, the original plan, is Act 1. I believe it was Act 1 of the General Assembly in 2000, is the original plan that was found unconstitutional.

Okay?

Can we agree on that?

A. Act 1 was the one that was originally found unconstitutional?

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Q. Yes.

And then in response to that, the General Assembly enacted Act 34?

A. Correct.

Q. Okay. Are you aware of how many counties are split in Act 34?

A. I -- I believe it's -- I believe it's 30 -- I believe it was 32, but I may be wrong.

Q. And --

A. I don't have -- I don't have that in front of me, and I don't know off the top of my head. I didn't look -- I didn't look -- spend much time looking at that map. I focused on the original map that the legislature produced through the normal legislative process.

Again, I -- I referenced this in -- in my earlier statement.

Q. Sure. But your report -- your report says that the current plan splits more counties than any other prior plan.

And I guess what I'm trying to get to here is that the plan that was actually in place immediately prior to adoption of the 2011 Plan split more counties, didn't it?

MR. FREEDMAN: Objection: misstates

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what his report says.
THE COURT: I'm sure he can -- I'm going to overrule. He's on cross-examination. If he doesn't like the premise, he can correct it on his answers.
THE WITNESS: Yes, would you repeat that question, please?
BY MR. TUCKER:
Q. Let's see if you and I can agree on this: Does the 2011 Plan split fewer counties than Act 34?
A. It splits fewer counties than the revised plan. But I do mention that in my footnotes, that it contains -- this map contains more splits county-wise and municipal-wise than any map, excepting this revised map that was rushed through.
I -- I just -- I'll just leave it there.
Q. The revised map, Act 34, was adopted by the General Assembly, correct?
A. It was.
Q. Enacted as statute?
A. Yes.
Q. And it applied to the 2004, 2006, 2008 and 2010 elections?

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A. Yes.
Q. And under that plan, Act 34, that plan split more counties than the current plan, correct?
A. Yes; however, once again, I did an apples-to-apples comparison contained -- looking at the 2000s map and the 2010 map, the original map that was produced and the map of 2010.
Subsequently, due to slight population variations, Pennsylvania legislature was given, I believe, three weeks to change the 2000 -- the original map. I believe it took them 10 days to make a few little nicks, a little nick out of Lehigh County, Tioga County, one district out of Upper Macungie Township. And that's why I mentioned earlier that splits tell you a bit of the story, but they don't tell you the whole story. They're indicative, but they don't tell you the whole story. And I'm focusing on communities of interest and how they were carved up.
Q. How about municipality splits under Act 34?
A. We have the same situation. They went up a little bit. I noted it.
I've written a number of books, and over the years and most recently, in my recent book,

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as my students used it this past semester, there were discrepancies in the book, there were typos in the book. It's very frustrating.
When I saw the report and I read the Gimpel report, Dr. Gimpel's report, I noticed that he was referencing numbers that I wasn't referencing, so I went back to look at differences, what were the differences. I didn't quite understand all the numbers that he had in his -- in his report, but I noted that he was looking at these things differently than I was. So I felt the need, for the record, to make sure that this correction was made. I wanted there to be no confusion.
My methodology when I approached this originally was looking at the 2000 map.
Q. Dr. Kennedy, a simple question: Does Act 34 split more municipalities than the current plan?
A. Yes, it does.
Q. Do you know how many municipalities that Act 34 splits?
A. I don't know exactly. I didn't --
Q. Do you have a range? Do you know, was it in the 80s?
A. I -- I really don't know exactly. I

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didn't focus on that particular map. I mean, I think I'm right with the counties because four, you know, it's a pretty -- I can remember that. I don't know the exact number of municipalities. I didn't look at that plan.
Q. So as I understand it, then -- and correct me if I'm wrong -- but any -- any of the statistics that are in your report that reference to the decade 2000s, you base that under Act 1, correct?
A. I believe that's -- that's what my footnote indicates.
Q. And Act 1 was repealed effective April 17th, 2002, correct?
A. It was.
Q. And you agree that avoiding county and municipality splits, that would be a valid redistricting goal, correct?
A. That -- yes, absolutely, that is a valid redistricting goal, avoiding splits.
Q. And the 2000 plan, we agree, split 68 municipalities, correct?
A. Yes.
Q. And that's out of 2,562 total municipalities in Pennsylvania; is that correct?
A. Well, I don't know the exact number,

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but I -- I'll -- I'll agree with that, surely.
Q. That sounds about right.
A. I -- I trust your numbers are accurate.
Q. That's only just a little over 2 percent of all the municipalities in Pennsylvania, correct?
A. Again, I'm a political scientist; I'm not a mathematician. But, again, I trust your numbers.
Q. Dr. Kennedy, you recognize that Pennsylvania lost a Congressional seat after the 2010 Census, correct?
A. Yes.
Q. Dropped from 19 to 18?
A. Yes.
Q. And losing a seat requires the district boundaries to change?
A. Any new Census -- any decade is going to require new boundaries.
Q. But particularly when you lose a seat, the population size of each district has to grow, correct?
A. Sure.
Q. So those boundaries, likewise, have to somewhat grow?

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A. Sure.
Q. Are you aware of where in Pennsylvania there was population loss between the 2000 and the 2010 Census?
A. I have some general knowledge of it, but it isn't anything that I looked at in detail.
Q. So you're not aware whether that population loss occurred more in the western part of the state versus the eastern part of the state?
A. Oh, I imagine compared to the southeast, the western part of the state lost population, comparatively speaking. I have knowledge of that.
Q. So would you agree that if the population loss mostly occurred in the west, that that's where the seat loss should occur?
A. No, I would need to have more information. I can't agree on that.
Q. I want to talk a little bit about some of the specific districts that you discussed during your direct examination, and I want to start with Erie County, which I believe your opinion is that Erie County was inappropriately split in the current plan; is that correct?
A. Certainly, I mentioned that Erie County

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is an example of a cracked municipality -- a cracked county, sure.
Q. Do you consider the City of Erie a community of interest?
A. I consider Erie -- Erie and the county itself and certainly its suburbs a community of interest.
Q. The City of Erie itself, though, is kept whole in the current plan, correct?
A. It is.
Q. And the prior plan split a number of different counties that the current plan doesn't in District 3; is that correct?
A. Yes.
Q. The prior plan split Armstrong, Butler, Mercer, Venango and Warren counties; is that right?
A. I believe so.
Q. But they're kept whole in this plan?
A. Yes, they are.
Q. And, again, one of the valid principles of redistricting is keeping counties whole, correct?
A. Sure, avoiding splits.
Q. And so the current plan keeps more counties whole in District 3 than the prior plan did?
A. I believe that's accurate.

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Q. You consider Reading a community of interest as well?
A. Reading and its environs. Certainly, Berks County is the county seat.
Q. But under the prior plan, the City of Reading was split, I think, a couple times; is that correct?
A. I believe it was, yes.
Q. And in this plan, it's kept whole --
A. It is.
Q. -- as a community of interest?
A. And it's moved into Amish Country.
Q. You talked a little bit about District 12.
A. Yes.
Q. And District 12, in the current plan, results from the combining of the Fourth and the 12th Districts under the former plan, correct?
A. Yes.
Q. And, inevitably, two incumbents had to be paired under the new plan?
A. No, not necessarily. Two incumbents did not necessarily -- I don't believe so, unless there were -- unless there was -- I'd have to go back and think if there was an open seat. I don't know --

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I'm not sure there were -- there were -- I'm not sure in the 2012 election we had every incumbent running for reelection.

Q. I'll represent to you that the time the plan was being drafted, each of the Congressional seats -- the 19 Congressional seats in Pennsylvania were -- were filled.

So based upon that representation, somebody was going to have to lose their seat, unless they decided not to run again, correct?

A. That's the case, yes.

Q. And under the plan, it paired the Fourth and the 12th, which were represented by Jason Altmire and Mark Critz.

Are you aware of that?

A. Yes.

Q. And are you aware of whether Representative Altmire supported this new 12th District?

A. I'm not aware.

Q. Is it important to you that districts be competitive?

A. No. I -- we went through earlier the criteria that is generally acknowledged. I don't believe competitiveness was one.

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Q. Let's talk a little bit about the 15th District. And -- and I apologize. I can't remember whether you testified to it today or it's in your report, but I do know that one of your claims is the City of Bethlehem is cracked into the 15th District.

Is that accurate?

A. I believe I mentioned that a part of the City of Bethlehem is cracked out of the 15th and moved into the 17th.

Q. And you're aware it's only four census blocks of Bethlehem that are cracked into the 115th District, correct?

A. I -- I believe you're incorrect. I believe it's four divisions plus four census blocks out of 17 divisions overall, so it's roughly one-quarter of the city which has been cracked out of the 15th and into the 17th.

Q. Dr. Kennedy, can geography play a role in the partisan makeup of districts?

A. I'm not sure quite what you mean.

Q. Let me try to phrase.

Can geography -- can political geography play a role in the partisan makeup of districts?

A. I'm sorry. I'm not trying to be

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avoiding. I'm just not quite sure I can wrap my mind around your question. I think maybe I just would need to know more about what you're trying to get at.

Q. Yeah, let me try to approach it from a different perspective.

Do you agree that generally, Democrats tend to go towards urban areas and Republicans are found more often in suburban and rural areas?

A. I wouldn't necessarily say suburban areas. That's a pretty broad brush.

In general, there is some natural clustering. I'm not here to argue that there isn't. What I'm looking -- what I looked at what -- were anomalies, things that didn't make sense.

Q. Actually, I like the way you put it, "natural clustering." That's a much better way of putting it.

So you agree that there's natural clustering of Democrats in Pittsburgh and Philadelphia, correct?

A. Oh, sure, those are heavily Democratic cities.

Q. And that has nothing to do with how the boundary lines are drawn, that's just natural political geography?

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You agree?

A. I -- that's -- that's -- that's natural -- yeah, sure, absolutely, that's -- that's the partisan makeup of Philadelphia; that's the partisan makeup of Pittsburgh. I don't believe I said anything otherwise.

MR. TUCKER: Your Honor -- thank you, Dr. Kennedy -- I don't have any further questions for the witness.

THE COURT: Any further cross-examination?

Any redirect?

MR. FREEDMAN: Can we have just one minute to confer?

THE COURT: Sure.

(Counsel confer.)

MR. FREEDMAN: Your Honor, no -- no redirect.

THE COURT: Okay. Dr. Kennedy, thank you for your testimony.

THE WITNESS: Thank you, Your Honor.

THE COURT: Call your next witness, please.

Lawyers coming out of the woodwork here. I thought they were just in the first

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and second rows.
MR. GEFFEN: The place is full of them.
THE COURT: Okay.
MR. GEFFEN: Good afternoon, Your Honor. I'm Ben Geffen from the Public Interest Law Center.
THE COURT: Mr. Geffen, good afternoon.
MR. GEFFEN: Petitioners call Tom Rentschler.

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THOMAS C. RENTSCHLER,
after having been first duly sworn, was examined and testified as follows:

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DIRECT EXAMINATION

- - -

BY MR. GEFFEN:

Q. Good afternoon.

A. Good afternoon.

Q. Would you please state and spell your name for the record?

A. Sure. Thomas Carl -- that's with a

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C -- Rentschler, R-E-N-T-S-C-H-L-E-R.

Q. You're a Petitioner in this matter?

A. Yes, I am.

Q. And where do you live, Mr. Rentschler?

A. I live in Exeter Township. My address is 4016 Crestline Drive, Reading, Pennsylvania 19606, but I do not live in the City of Reading.

Q. Okay. How long have you lived at that address?

A. For approximately 20 years.

Q. Okay. You mentioned you live in Exeter Township.

Can you tell us just a little bit about Exeter Township?

A. Sure. It's a Township outside of Reading, is about, I think, 15,000 people or so, pretty much ethnically white, Caucasian, a lot of middle class residents there. I believe we probably run the gamut of income, but I'd say a solidly middle class community.

Q. What is your profession, Mr. Rentschler?

A. I'm an attorney.

Q. What sort of law do you practice?

A. I'm a general practitioner. I do

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mostly domestic law, estate planning, estate administration.

Q. Okay. Do you have children?

A. Yes, I do. I have three children. I have a son who is 23 years old, a son who is 20 years old and another son, who is 17. I also have a stepson who is 22 years old and a stepdaughter who is 14.

Q. Are you a registered voter?

A. Yes, I am.

Q. What political party are you registered with?

A. I'm a registered Democrat.

Q. How long have you been registered with the Democratic Party?

A. Most of my adult life, at least consistently for the last 25 years.

Q. And how often do you vote?

A. I am a very regular voter, so I try to vote in all primaries and general elections.

Q. And why is it that you are such a regular voter?

A. I believe it's important, as my civic duty, to select people who represent me on a local level, state level and a national level and, in this

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case, a Congressional district level.

Q. Thank you.

I'd like to look at Joint Exhibit 5.

THE COURT: Are we working?

IT TECHNICIAN: Yes.

THE COURT: Good.

BY MR. GEFFEN:

Q. Are you familiar with -- with this map that's on the screen right now?

A. Yes, I am.

Q. And this is the 2011 Congressional Map, right?

A. Yes.

Q. Can you identify for us on this map -- first, can you tell us the number of your current Congressional district?

A. Sure. I live in the Sixth Congressional District.

Q. And I think there should be a laser pointer there.

Can you show us where that district is?

A. It is district starting down there in Chester County, going up into Montgomery, across sort of the midsection of Berks and then into eastern Lebanon County.

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Q. Who is your congressman?
A. Ryan Costello.
Q. And what political party is Representative Costello in?
A. Mr. Costello is a Republican.
Q. How long have you been a Sixth District resident, Mr. Rentschler?
A. I believe probably for -- since around 1994, I lived in Montgomery County for a very short period of time, which I think I moved out of the Sixth District, but I was born and raised in the Sixth Congressional District.
Q. And are you -- it sounds like you're generally familiar with the current makeup and boundaries of the Sixth District.
A. Yes, I am.
MR. GEFFEN: We'd like to see Joint Exhibit 11, please.
BY MR. GEFFEN:
Q. You're familiar with this map?
A. Yes, I am.
Q. And this is a map of the Sixth District, right?
A. Yes.
Q. Can you use the pointer, please, to

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show us on the map where your residence is?
A. Sure. And if I shake my hand at all, I'll go into two wrong districts, but I believe I would be -- and my hand shaking is little bit. I can't hold it steady. But I'm right there in that part of the Sixth Congressional District, probably about 2 miles from the Reading school district -- or from the Reading Congressional District and not very far away from the Seventh Congressional District.
Q. Okay. And just for the record, I think you were pointing with the laser approximately just below the A or the D in the word "Reading" on that map.
Is that about right?
A. That would be about right.
Q. Are you familiar with how the Sixth District was shaped under the previous Congressional Map?
A. Not in particularity as -- as I am with the shape of this map. I believe it was a little more centered to -- to the east -- east and south and the City of Reading was divided into two different Congressional districts, and I believe Exeter Township, the township that I live in, may have been divided slightly in that -- in that map.

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Q. Okay. You testified that you vote in every election or almost every election.
Does that include elections for the U.S. House?
A. Absolutely.
Q. And if you don't mind my asking, who did you vote for in 2016 in the general election for the U.S. House?
A. Mike Parrish. Mike Parrish.
Q. And what party was Mike Parrish in?
A. A Democrat.
Q. And how about in 2014 in the general?
A. Dr. Manny Trivedi.
Q. And what party does Dr. Trivedi belong to?
A. He was also a Democrat.
Q. And what about the 2012 general?
A. Dr. Manny Trivedi.
Q. Okay. Who won those three elections?
A. I believe the -- the last two elections have been won by Ryan Costello. The 2012 election was won by James Gerlach.
Q. And what party was James Gerlach in?
A. He was a Republican as well.
Q. Okay. Mr. Rentschler, how has the

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2011 Plan impacted your ability to participate in the political process?
A. Well, I believe that it has unfairly eliminated my chance of getting to vote and actually elect a Democratic candidate just by the shape and the design of the district. I think that what it has done is made it pretty impossible for a Democratic candidate to be elected based on the composition of the district.
Q. Okay. And are there any issues that are currently or recently before the U.S. House that are of particular significance to you?
A. Absolutely. One of the biggest issues for me is a healthcare issue. I've been a Type 1 diabetic for the last 33 years, and one of the concerns that I have with what I perceive is the Republican opposition to the Affordable Care Act is an attempt, in various ways, to remove the preexisting conditions for health insurance coverage, which, right now, I have that. I have that protection. And that's really important to me because when I was in my 20s, that didn't exist, and I had graduated from college, I needed insurance. I left a job. I needed insurance.
So there were at least three occasions

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of -- in my 20s where I had to wait a year to get insurance for the thing that I really needed insurance for. The Affordable Care Act has removed that fear for me, and I can't emphasize how much is -- now, unfortunately, I'm in my 50s -- health issues and a loss of health insurance, to me, would be catastrophic.

Q. Is there anything else about the Affordable Care Act you wanted to mention?

A. Absolutely. I currently have a 23-year-old son, recent college graduate, who's looking for his first real employment. And because of the Affordable Care Act, he is permitted to be on my family insurance until he reaches age 26. That's very important to him right now because he does not have a full-time job that provides him with healthcare coverage.

I also have a 22-year-old stepson who is on that plan as well, and he'll be able to stay on that until he reaches 26. So, to me, those are very important features of the Affordable Care Act.

Q. Congressman Costello, does he represent your views on healthcare?

A. Well, I think given the fact that he voted against -- or voted to repeal the Affordable

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Care Act, rather, in 2015, I'd say, no, because, to me, that is my issue with healthcare, and I don't believe that he will defend the Affordable Care Act.

Q. Is there any other recent vote in the U.S. House that -- where you feel that Ryan Costello's interests diverge from yours?

A. Absolutely. I think the vote on the tax act greatly diverges from my views. Although it's been sold as a middle class tax cut, I lived through some tax cuts before that were proposed to be middle class tax cuts or supply side tax cuts, and this has that same feeling, that over time, I believe the middle class and the lower class will see their taxes go up and not go down.

A second thing about that tax bill, as it's going to reconciliation, is it puts the Affordable Care Act in jeopardy. And I believe that Representative Costello, if push comes to shove, will sell out the Affordable Care Act.

Another issue that's very important to me, as many people in this room have gone to law school, they have law school debt, and so I have debt from law school. And that's a substantial part of my obligations that I believe would remove that ability to deduct student loan debt, and then that's not just

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for me, but also for my oldest son, who is, as I said before, a recent college graduate.

He's struggling right now greatly with student loan debt, and the availability of deducting that interest is -- is very critical to him.

I have a current son in college who is taking student loan debt as well, and so he'll be impacted with that in, hopefully, the next year and a half. Hopefully, he doesn't drag it out an extra year. But that will impact him. And then I have two other children who are waiting to go to college. My son is a high school junior, and my stepdaughter is a freshman in high school.

So that's an issue that is going to affect me and my family for a long time.

Q. Changing gears just a little bit, how far is your residence from the City of Reading?

A. Approximately 2 miles.

MR. GEFFEN: And if we could see Joint Exhibit 21, please.

BY MR. GEFFEN:

Q. This is a -- a map -- are you -- are you familiar with this map?

A. Yes, that appears to be a map of the 16th Congressional District, which also, strangely,

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extends into Reading.

Q. And can you indicate with a pointer where on the map the City of Reading is located?

A. Sure. It's right up there (indicating) at the top.

Q. And just for the record, your laser pointer is right over where the word "Reading" is written below the U.S. 222 sign?

A. That's correct.

Q. And can you indicate with the pointer where your residence is?

A. Sure. This is a little easier because I have -- I live right off of 422, so I would be in that little notch right there (indicating). And I can't hold it steady enough --

Q. But you're pointing right below --

A. -- it's right there in that notch.

Q. You're pointing right below the D in the word "Reading"?

A. Correct.

Q. Okay. How does the fact that the City of Reading is in a separate Congressional district from your residence impact you?

A. It impacts me in a couple of ways. First, Reading is the county seat of Berks County,

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and so it's an important part of the county. I live 2 miles away from there, and so the economic life of the city, the social life, the sports life, the Reading Phillies and so forth, are a part of my life. But Reading is also one of the poorest countries in the nation --

Q. I'm sorry. One of the poorest --

A. Poorest -- I'm sorry. Poorest cities, rather. I apologize.

-- poorest cities in the nation. It's right next to where I live and other communities, so the health of the City of Reading impacts the health of Berks County. And recently, in -- in Reading, there's been a push to sort of more regionalize the Read -- or Reading area with Berks County for business purposes, so various Chambers of Commerce have changed their name to the Greater Reading something, Chamber of Commerce.

Sort of like the testimony that Dr. Kennedy gave about the Lehigh Valley, Berks County is -- Reading is a big part of Berks County, and Berks County depends on Reading and Reading's success.

Q. Okay. And do you happen to know how many different Congressional districts Berks County

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falls within?

A. Yes. It falls within four Congressional districts.

Q. So you testified about the impacts of the Sixth Congressional District on you.

Is there any impact of the 2011 Plan on a statewide basis that you're concerned about?

A. Absolutely. I think one of the concerns that I have is the 13-5 distribution of representatives across the state of Pennsylvania, especially given the fact that when Republicans, I believe, slightly were less than the majority vote, they got 13 seats, and as that number went up to -- again, I'm estimating -- 54 to 56 percent in other elections, they maintained 13 out of the 18 seats.

To me, I believe that -- as I stated before, that democratic views, as they're expressed statewide, or Democrats across the state have more representation, I think our views would be more strongly advocated for in the United States Congress. And since the Congress is a coequal branch of government with the executive and judicial, in particular, Pennsylvania should be able to have a congress that represents its voters more accurately.

And I don't believe that the current

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map does that. I think the map currently overrepresents Republicans in Congress and severely underrepresents Democratic Members of Congress.

Q. Okay. Do you take the position that the -- that there's a legal requirement that the Sixth District be drawn in such a way that you're guaranteed to have a Democratic congressman representing you?

A. Absolutely not. I just take the position that I think the Congressional districts across the state of Pennsylvania should be drawn in a way that it's fair. And that map does not appear, to me, as fair. Just giving it the eyeball test, it does not seem to be a fair district or a fair Congressional districting of -- of the state.

I'm just asking for something that is fair and drawn for some reasons that make sense. It's hard for me, as an average citizen, to comprehend how the fifth biggest city in Pennsylvania, which is 2 miles from my house, is not in my Congressional district, when it's the center of the county, it's the county seat, but yet I'm in the same district as people that are in eastern Lebanon County that have no connection to -- to my location, where I live.

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There's no community of interest there. And the City of Reading, which I have a clear interest in, is in a district that's in Lancaster County.

Q. Okay. Is there anything else you'd like to say about your concerns about the 2011 Plan?

A. I just find that the -- the 2011 Plan has really diluted what I believe is my participation in the voting process and in selecting leaders. I believe that the -- the plan has been so structured so that politicians have picked their voters in so many places, and that's not the -- the way that it should work. We should be picking our elected representatives. And I believe that we've been picked by the politicians and we just fill in their slots for what they need.

MR. GEFFEN: Thank you very much. I have no further questions on direct and tender the witness.

THE COURT: Cross-examination.

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CROSS-EXAMINATION

- - -

BY MR. GIANCOLA:

Q. Good afternoon, sir.

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You -- you testified a moment ago you're a registered Democrat, correct?

A. Yes, that's right.

Q. And you've been a registered Democrat for the last 25 years or so?

A. Yeah, that would be a fair statement.

Q. You weren't always a registered Democrat?

A. No, I was not.

Q. You started out as a registered Republican?

A. That's correct.

Q. When you were a registered Republican, did you typically vote for Republicans?

A. No, I don't believe I did. And, honestly, thinking back -- it's been a long time, because that was my first registration -- I think I may have voted for Republicans one time. And that would have been in -- in or around 1986 or so.

Q. Since you registered as a Democrat, have you ever voted for a Republican?

A. Yes, I have.

Q. Okay. Did you have any problems changing -- nobody prevented you from changing your registration from Republican to Democrat, correct?

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A. No, they did not.

Q. And you testified just a moment ago, you regularly vote, correct?

A. That's correct.

Q. So you don't have -- you've never had any -- nobody's ever prevented you from voting in an election?

A. No.

Q. I understand you've donated to -- in the past to political candidates?

A. Very seldomly, and only one time. And that would be to Bernie Sanders recently.

Q. Okay. Nobody's prevented you, though, from making political contributions, correct?

A. No, I've never been prevented from doing that.

Q. You've never been prevented from campaigning or engaging in any kind of civic activity, correct?

A. No.

Q. You testified that you don't see eye to eye with Representative Costello on a few issues, right?

A. That would be correct.

Q. You don't like his views on healthcare?

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A. No.

Q. Or on the tax bill?

A. No.

Q. Or on abortion?

A. Absolutely not.

Q. I understand from your deposition, you believe he aligns himself with President Trump about 94 percent of the time, correct?

A. Yes. And after my deposition, I checked that again on -- on 5:38, and I think it was 91.04.

Q. Well, then, you were pretty close.

And do you see eye to eye with Trump on a lot of issues?

A. Absolutely not.

Q. Do you see eye to eye with Trump on any issues?

A. How much time do we have for me to think about that?

I might be able to find something, but off the top of my head, I'd have to say the answer would be no.

Q. No.

I appreciate your candor and your speed.

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You live, I think you said, about 2 miles from the City of Reading, correct?

A. That's correct.

Q. So you're fairly close to one of the borders in your Congressional district, correct?

A. Absolutely.

Q. You'd agree with me that no matter how a map is drawn, somebody is going to live close to a Congressional district border, correct?

A. Yes, that would be true, I would assume.

Q. And there's people -- there are people who live closer to a Congressional district border -- to your Congressional district, in the Sixth, there are people who live closer to the Congressional district border than you do, correct?

A. I would say that's a fair statement.

Q. There are people who live even closer to Reading than you do?

A. Um-hum, absolutely.

Q. I believe it's your testimony that there's no chance for a Democrat to win in the Sixth Congressional District the way it's currently drawn, correct?

A. As it's currently drawn, that's my

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belief.
Q. You feel it's become less competitive for Democrats?
A. Yes.
Q. Okay. So since the 2011 Plan was drawn, it's been less competitive, Democrats have a less chance -- have a lower chance of winning?
A. Yes, that -- that would be my impression from -- from the map and some voting results.
Q. Who did -- in 2010, did you vote in that Congressional election?
A. Yes, I did.
Q. Okay. And do you remember who the Republican candidate was?
A. I believe the Republican candidate was James Gerlach.
Q. And do you remember who the Democratic candidate was?
A. I believe it was Dr. Manny Trivedi.
Q. And how about in 2012, was Representative Gerlach, again, for the Republicans?
A. Yes, that's correct.
Q. And I think you just testified a moment ago that it was Dr. Trivedi for the Democrats?

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A. Yes, I did.
Q. So it was the same two candidates?
A. The same two candidates.
Q. Do you recall the margin of victory for -- let me finish the question first -- do you recall the margin of victory for Representative Gerlach in 2010?
A. I'm trying to think back, and I can't tell you off the top of my head. I believe he would have been maybe in 54 percent, but I don't know that -- that number.
Q. If I told you it was 57-43 in 2010, would you agree with that?
A. I'd have no doubt -- no reason to doubt your number.
Q. Do you know what the number -- what the margin of victory was in 2012?
A. No, I don't.
Q. Okay. If I told you it was 57-43 in 2012, would you agree with me?
A. I'd have no reason to doubt your number.
MR. GIANCOLA: That's all the questions I have. Thank you.
THE COURT: Any more

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cross-examination?
MS. HANGLEY: No, Your Honor.
THE COURT: Okay. Redirect.
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REDIRECT EXAMINATION
- - -
BY MR. GEFFEN:
Q. Very briefly on redirect, you were asked if you'd voted for a Republican since registering as a Democrat, and you said yes?
A. That's correct, I have.
Q. Do you mind sharing when and who that was?
A. Absolutely. I don't know that I'll get the years exactly correct, but, typically, I'll vote for Republicans in local elections who I, personally, know and have personal interaction with. So I voted for an Exeter Township supervisor in this past election who was my son's soccer coach, and I talked to him twice at the polls, both in the primary, when I couldn't vote for him because he was a Republican, but then during the general election, I had a chance to speak with him at my voting booth. And I've known him for many, many years.
I've also voted for a Republican for

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the Register of Wills. I was on a board of directors of Berks Connections/Pretrial Services with him. So I voted for him in the -- in the general election as well.
And I believe there's one more and it's -- it's slipping -- oh, I voted for a county commissioner for Berks County, who was a Republican also, and I had some interaction with him as a president of the board of -- of Berks Connections/Pretrial Services. And he's been very instrumental in various things in our organization.
Q. Okay. Thinking back in the last, let's say, 20 years, though, have you voted for a Republican for the U.S. House?
A. No.
Q. Have you voted for a Republican for president?
A. No.
Q. For governor?
A. No.
MR. GEFFEN: Okay. I have no further questions.
THE COURT: Thank you for your testimony, sir. You may step down.
THE WITNESS: Thank you.

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(The witness is excused.)
MR. GERSCH: Your Honor, in view of the hour, I think we should just start in the morning.
THE COURT: Who are we starting with tomorrow morning?
MR. GERSCH: Assuming -- and I think the discussions we've had with Legislative Respondents' counsel, I think we'll have -- we'll reach agreement with the rest of the fact witnesses, so assuming that's true, we will start with Dr. Pegden and then we'll finish with Dr. Warshaw.
THE COURT: Okay. Do you think you'll need all day for that?
MR. GERSCH: I think there's a good chance we will -- a lot depends on the cross, but I think there's a good chance we will not.
THE COURT: Okay. Well, then I'd like to have Legislative Respondents to at least have some witnesses available to testify tomorrow, if that's possible.
MR. TUCKER: I'll have to check on experts' travel schedule, because we're --

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our only witnesses are three experts. We're not putting on any other fact witnesses.
THE COURT: How many experts do you have?
MR. TUCKER: Three.
THE COURT: The question is, Are any of them available to testify tomorrow?
MR. TUCKER: I think one may be available to testify tomorrow.
THE COURT: Well, if they get done and we have time, I don't want to waste it, so I would like to have someone available to testify tomorrow if they get done.
MR. TUCKER: The other option -- I don't know, Lawrence, if -- if he did want to put Intervenors on, whether or not they would be available as well.
MR. TABAS: Your Honor, I thought we were going to do ours on Friday. I'm trying to work out to see if I can't do some kind of a written arrangement with the Petitioners.
THE COURT: I think you-all can work -- I think you-all can work together and realize that we can't afford to waste

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any courtroom time at this proceeding.
MR. TUCKER: We'll figure it out, Your Honor.
THE COURT: That's exactly what I wanted to hear.
Thank you very much.
We're in recess until 9:30 tomorrow morning.
THE CLERK: The Commonwealth Court is now adjourned.

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(Whereupon, the trial adjourned at 5:48 p.m., to reconvene on Wednesday, December 13, 2017, at 9:30 a.m.)

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COMMONWEALTH OF PENNSYLVANIA:

I, Cindy L. Sebo, a court reporter within and for the Jurisdiction aforesaid, do hereby certify that the foregoing proceeding were pursuant to notice, at the time and place indicated; that the testimony of said was correctly recorded in machine shorthand by me and thereafter transcribed under my supervision with computer-aided transcription; that the proceedings are true record of the testimony given; and that I am neither of counsel nor kin to any party in said action, nor interested in the outcome thereof.

Cindy L. Sebo, RMR, CRR, RPR, CSR, CCR, CLR, RSA, LiveDeposition Authorized Reporter, and Notary Public