Received 1/29/2022 2:06:32 PM Commonwealth Court of Pennsylvania

Filed 1/29/2022 2:06:00 PM Commonwealth Court of Pennsylvania
464 MD 2021

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

Carol Ann Carter, Monica Parrilla, Rebecca Poyourow, William Tung, Roseanne Milazzo, Burt Siegel, Susan Cassanelli, Lee Cassanelli, Lynn Wachman, Michael Guttman, Maya Fonkeu, Brady Hill, Mary Ellen Balchunis, Tom DeWall, Stephanie McNulty, and Janet Temin, *Petitioners*,	**CASES CONSOLIDATED**
v.	
Leigh Chapman, in her official capacity as the Acting Secretary of the Commonwealth of Pennsylvania; Jessica Mathis, in her official capacity as Director for the Pennsylvania Bureau of Election Services and Notaries, *Respondents*,	No. 464 M.D. 2021
Philip T. Gressman, Ron Y. Donagi, Kristopher R. Tapp, Pamela Gorkin, David P. Marsh, James L. Rosenberger, Amy Myers, Eugene Boman, Gary Gordon, Liz McMahon, Timothy G. Feeman, and Garth Isaak, *Petitioners*,	
v.	
Leigh Chapman, in her official capacity as the Acting Secretary of the Commonwealth of Pennsylvania; Jessica Mathis, in her official capacity as Director for the Pennsylvania Bureau of Election Services and Notaries, *Respondents*.	No. 465 M.D. 2021

POST-TRIAL SUBMISSION OF
GRESSMAN MATH/SCIENCE PETITIONERS

Petitioners Philip T. Gressman, Ron Y. Donagi, Kristopher R. Tapp, Pamela Gorkin, David P. Marsh, James L. Rosenberger, Amy Myers, Eugene Boman, Gary Gordon, Liz McMahon, Timothy G. Feeman, and Garth Isaak (the "Gressman Math/Science Petitioners") respectfully make the following post-trial submission:

The Gressman Math/Science Petitioners took to heart the Court's request for post-trial submissions that would be helpful not only to their interests, but also to the Court as it faces the "unwelcome obligation," *League of Women Voters v. Commonwealth*, 178 A.3d 737, 823 (Pa. 2018), of selecting a congressional redistricting plan from the thirteen plans submitted by the parties and *amici curiae*. Accordingly, the Gressman Math/Science Petitioners provide two items that they believe will assist the Court in the work that lies ahead.

First, attached as Exhibit 1 are two tables that provide the Court with an assessment of every single redistricting criterion the Supreme Court mandated for congressional redistricting plans and the associated metric, for each and every plan—whether proposed by the parties or by *amici*—and calculated in exactly the same way each time. The nonpartisan Gressman Math/Science Petitioners were the only party whose expert analyzed each plan, top to bottom, and provided all the data to the Court. That data, along with various other data from the evidentiary hearing, is compiled in Exhibit 1. The Court need not wrestle with how to translate metrics between experts or parties; instead, the Court can use these two tables to make

comprehensive, data-driven, apples-to-apples comparisons between all thirteen plans.

Second, attached as Exhibit 2 are proposed findings of fact and conclusions of law, with citations throughout to the evidentiary record. This document sets forth the evidentiary and legal basis for the Court to determine that the Gressman Plan most scrupulously adheres to *all* the constitutional and other legal requirements that apply to the congressional redistricting process.

CONCLUSION

For the reasons set forth more fully in the attached proposed findings of fact and conclusions of law, the Gressman Math/Science Petitioners respectfully request that this Court adopt their proposed redistricting plan.

Dated: January 29, 2022

Respectfully submitted,

By: /s/ Kim M. Watterson

Kim M. Watterson (PA 63552)
Devin M. Misour (PA 311892)
REED SMITH LLP
225 Fifth Avenue, Ste. 1200
Pittsburgh, PA 15222
(412) 288–3131
kwatterson@reedsmith.com
dmisour@reedsmith.com

Shannon E. McClure (PA 164502)
REED SMITH LLP
Three Logan Square
1717 Arch Street, Ste. 3100
Philadelphia, PA 19103
(215) 851–8100
smcclure@reedsmith.com

Counsel for Petitioners

Sam Hirsch (PHV)
Jessica Ring Amunson (PHV)
Lindsay C. Harrison (PHV)
Tassity S. Johnson (PHV)
Claire M. Lally (PHV)
JENNER & BLOCK LLP
1099 New York Avenue, NW, Ste. 900
Washington, DC 20001
(202) 639–6000
SHirsch@jenner.com
JAmunson@jenner.com
TJohnson@jenner.com
LHarrison@jenner.com
CLally@jenner.com

April A. Otterberg (PHV)
JENNER & BLOCK LLP
353 North Clark Street
Chicago, IL 60654–3456
(312) 222–9350
AOtterberg@jenner.com

CERTIFICATE OF COMPLIANCE

I certify that this filing complies with the provisions of the *Case Records Public Access Policy of the Unified Judicial System of Pennsylvania* that require filing confidential information and documents differently than non–confidential information and documents.

Submitted by: Kim M. Watterson

Signature: /s/ Kim M. Watterson

Name: Kim M. Watterson

Attorney No. PA 63552_____

PROOF OF SERVICE

On January 29, 2022, I caused a copy of the foregoing to be served on all counsel of record via the electronic filing system, PACFile:

/s/ Kim M. Watterson
Kim M. Watterson (PA 63552)
REED SMITH LLP
225 Fifth Avenue, Ste. 1200
Pittsburgh, PA 15222
(412) 288–3131
kwatterson@reedsmith.com

EXHIBIT 1

Comparison of the Parties' Proposed Congressional Plans

REDISTRICTING PRINCIPLE	METRIC	GMS	CARTER	HB 2146	GOV'R	CONG. INTERV. 1	CONG. INTERV. 2	HOUSE DEMS.	SEN. DEMS. 1	SEN. DEMS. 2	2018 PLAN
Population Equality	Maximum Population Deviation	1 person	2 people	1 person	1 person	1 person	1 person	2 people	1 person	1 person	1 person
Contiguity	Non-Contiguous Districts	0	0	0	0	0	0	0	0	0	0
Compactness	Mean Polsby-Popper *(larger is more compact)*	0.33	0.31	0.31	0.37	0.35	0.34	0.27	0.30	0.32	0.32
	Mean Reock *(larger is more compact)*	0.40	0.41	0.38	0.40	0.43	0.41	0.39	0.37	0.38	0.43
	Mean Convex Hull *(larger is more compact)*	0.80	0.78	0.78	0.81	0.81	0.80	0.75	0.77	0.79	0.79
	Cut Edges *(smaller is more compact)*	5,546	5,896	5,882	5,154	5,061	5,208	6,821	6,016	5,476	5,789
Respect for Political Subdivisions*	Split Counties	15	14**	15	16**	13	13	16**	17**	16	14**
	Split Municipalities	19 (incl. 3 boroughs on county lines)	23 (incl. 3 boroughs on county lines)	21 (incl. 5 boroughs on county lines)	22 (incl. 4 boroughs on county lines)	20 (incl. 4 boroughs on county lines)	20 (incl. 4 boroughs on county lines)	24 (incl. 6 boroughs on county lines)	25 (incl. 6 boroughs on county lines)	21 (incl. 5 boroughs on county lines)	29 (incl. 6 boroughs on county lines)
	Split Wards	15	21	18	25	25	24	21	17	14	29***
	Total Splits	49	58	54	63	58	57	61	59	51	72
	County Pieces	17	17	18	19	16	16	18	19	18	20
	Municipality Pieces	17	21	18	19	17	17	19	20	17	24
	Ward Pieces	15	21	18	25	25	24	21	17	14	29***
	Total Pieces	49	59	54	63	58	57	58	56	49	73
	Split Cities	1	2	1	2	2	2	1	2	2	1
	Philadelphia Pieces	3	3	4	3	3	3	3	3	3	3
	Pittsburgh Pieces	1	1	1	2	1	1	1	2	2	1
Minority Electoral Opportunity	Majority-Minority Districts (MMDs)	3	2	2	2	2	2	2	2	2	2
	MMDs with Latino Citizens as the Largest Minority Group	1	0	0	0	0	0	0	0	0	0

REDISTRICTING PRINCIPLE	METRIC	GMS	CARTER	HB 2146	GOV'R	CONG. INTERV. 1	CONG. INTERV. 2	HOUSE DEMS.	SEN. DEMS. 1	SEN. DEMS. 2	2018 PLAN
Partisan Fairness	Majority Responsiveness *(closer to zero is better; equal split between the two parties is better)*	3 (1 D; 2 R)	3 (1 D; 2 R)	5 (all R)	4 (2 D; 2 R)	6 (all R)	6 (all R)	3 (1 D; 2 R)	3 (all R)	3 (2 D; 1 R)	1 (R)
	Potentially Competitive Districts *(larger is better; equal split between remaining districts is better)*	7 (remaining districts 5 D, 5 R)	8 (remaining districts 5 D, 4 R)	8 (remaining districts 5 D, 4 R)	7 (remaining districts 6 D, 4 R)	9 (remaining districts 5 D, 3 R)	9 (remaining districts 5 D, 3 R)	7 (remaining districts 6 D, 4 R)	7 (remaining districts 6 D, 4 R)	8 (remaining districts 5 D, 4 R)	8 (remaining districts 5 D, 5 R)
	Average Mean-Median *(closer to zero is better)*	-0.8%	-1.6%	-2.9%	-1.0%	-2.7%	-2.6%	-0.9%	-1.9%	-0.3%	-1.9%
	Average Efficiency Gap *(closer to zero is better)*	0.8%	-0.4%	-6.3%	0.6%	-7.8%	-7.8%	3.3%	-2.5%	1.0%	-2.6%
	Dr. Duchin's Eguia Metric *(closer to zero is better)*	-0.0486	-0.1663	-0.9898	-0.0486	-1.2251	-1.2251	0.0102	-0.4015	-0.0486	N/A
	PlanScore Efficiency Gap *(closer to zero is better)*	1.4% R	1.8% R	6.6% R	1.9% R	6.4% R	6.3% R	1.2% D	2.5% R	2.4% R	2.9% R
	PlanScore Declination *(closer to zero is better)*	0.03 R	0.05 R	0.19 R	0.05 R	0.19 R	0.18 R	0.04 D	0.07 R	0.07 R	0.08 R
	PlanScore Partisan Bias *(closer to zero is better)*	0.9% R	1.3% R	6.3% R	1.1% R	6.2% R	5.9% R	1.9% D	1.8% R	1.5% R	2.1% R
	PlanScore Mean-Median Difference *(closer to zero is better)*	0.4% R	0.4% R	2.3% R	0.4% R	2.4% R	2.4% R	0.7% D	0.6% R	0.5% R	0.8% R
Incumbent Pairings	Districts with Paired Incumbents Who Are Seeking Re-Election	0	1	1	2	2	1	2	1	2	N/A

All metrics are as calculated and reported by Dr. Daryl R. DeFord, except where expressly noted.

* With respect to the "pieces" metrics, if a political subdivision is wholly contained in one district, it has one *piece*; if a political subdivision is divided between two districts, it has two *pieces*; and so on. Dividing a municipality by drawing a district boundary along a county boundary does not create an additional piece. The pieces numbers subtract the minimum required pieces; for example, 67 county pieces are required because there are 67 counties in the Commonwealth.

** Includes a split of the discontiguous piece of Chester County.

*** This figure is from *League of Women Voters* materials and is based on ward boundaries at the time. Ward pieces assumes 4,310 wards existed at the time.

Comparison of the Gressman Proposed Congressional Plan and the Congressional Plans Proposed by *Amici*

REDISTRICTING PRINCIPLE	METRIC	GMS	DRAW THE LINES	CITIZEN VOTERS	ALI ET AL.	VOTERS OF PA	2018 PLAN
Population Equality	Maximum Population Deviation	1 person	1 person	1 person	8,676 people	1 person	1 person
Contiguity	Non-Contiguous Districts	0	0	0	0	0	0
Compactness	Mean Polsby-Popper *(larger is more compact)*	0.33	0.37	0.34	0.34	0.38	0.32
	Mean Reock *(larger is more compact)*	0.40	0.44	0.42	0.41	0.44	0.43
	Mean Convex Hull *(larger is more compact)*	0.80	0.79	0.79	0.79	0.79	0.79
	Cut Edges *(smaller is more compact)*	5,546	5,202	5,144	5,233	5,120	5,789
Respect for Political Subdivisions*	Split Counties	15	14	14**	16**	15	14**
	Split Municipalities	19 (incl. 3 boroughs on county lines)	22 (incl. 6 boroughs on county lines)	19 (incl. 3 boroughs on county lines)	24 (incl. 6 boroughs on county lines)	23 (incl. 5 boroughs on county lines)	29 (incl. 6 boroughs on county lines)
	Split Wards	15	16	21	33	41	29***
	Total Splits	49	52	54	73	79	72
	County Pieces	17	16	17	19	16	20
	Municipality Pieces	17	17	17	19	19	24
	Ward Pieces	15	16	21	33	41	29***
	Total Pieces	49	49	55	71	76	73
	Split Cities	1	2	2	2	2	1
	Philadelphia Pieces	3	3	3	3	3	3
	Pittsburgh Pieces	1	2	1	2	1	1
Minority Electoral Opportunity	Majority-Minority Districts (MMDs)	3	2	2	2	2	2
	MMDs with Latino Citizens as the Largest Minority Group	1	0	0	0	0	0

REDISTRICTING PRINCIPLE	METRIC	GMS	DRAW THE LINES	CITIZEN VOTERS	ALI ET AL.	VOTERS OF PA	2018 PLAN
Partisan Fairness	Majority Responsiveness *(closer to zero is better; equal split between the two parties is better)*	3 (1 D; 2 R)	2 (all R)	2 (all R)	3 (1 D; 2 R)	3 (all R)	1 (R)
	Potentially Competitive Districts *(larger is better; equal split between remaining districts is better)*	7 (remaining districts 5 D, 5 R)	9 (remaining districts 4 D, 4 R)	8 (remaining districts 5 D, 4 R)	8 (remaining districts 5 D, 4 R)	8 (remaining districts 5 D, 4 R)	8 (remaining districts 5 D, 5 R)
	Average Mean-Median *(closer to zero is better)*	-0.8%	-1.2%	-2.0%	-1.8%	-2.7%	-1.9%
	Average Efficiency Gap *(closer to zero is better)*	0.8%	-1.6%	-2.6%	-2.7%	-4.8%	-2.6%
	Dr. Duchin's Eguia Metric *(closer to zero is better)*	-0.0486	-0.3427	-0.5192	-0.4604	-0.6957	N/A
	PlanScore Efficiency Gap *(closer to zero is better)*	1.4% R	3.5% R	4.6% R	2.4% R	6.8% R	2.9% R
	PlanScore Declination *(closer to zero is better)*	0.03 R	0.10 R	0.13 R	0.07 R	0.20 R	0.08 R
	PlanScore Partisan Bias *(closer to zero is better)*	0.9% R	2.9% R	4.3% R	1.9% R	6.5% R	2.1% R
	PlanScore Mean-Median Difference *(closer to zero is better)*	0.4% R	1.0% R	1.7% R	0.7% R	2.2% R	0.8% R
Incumbent Pairings	Districts with Paired Incumbents Who Are Seeking Re-Election	0	2	2	2	2	N/A

All metrics are as calculated and reported by Dr. Daryl R. DeFord, except where expressly noted.

* With respect to the "pieces" metrics, if a political subdivision is wholly contained in one district, it has one *piece*; if a political subdivision is divided between two districts, it has two *pieces*; and so on. Dividing a municipality by drawing a district boundary along a county boundary does not create an additional piece. The pieces numbers subtract the minimum required pieces; for example, 67 county pieces are required because there are 67 counties in the Commonwealth.

** Includes a split of the discontiguous piece of Chester County.

*** This figure is from *League of Women Voters* materials and is based on ward boundaries at the time. Ward pieces assumes 4,310 wards existed at the time.

EXHIBIT 2

IN THE COMMONWEALTH COURT OF PENNSYLVANIA

Carol Ann Carter, Monica Parrilla, Rebecca Poyourow, William Tung, Roseanne Milazzo, Burt Siegel, Susan Cassanelli, Lee Cassanelli, Lynn Wachman, Michael Guttman, Maya Fonkeu, Brady Hill, Mary Ellen Balchunis, Tom DeWall, Stephanie McNulty, and Janet Temin, *Petitioners*,	:	**CASES CONSOLIDATED**
v.	:	No. 464 M.D. 2021
Leigh Chapman, in her official capacity as the Acting Secretary of the Commonwealth of Pennsylvania; Jessica Mathis, in her official capacity as Director for the Pennsylvania Bureau of Election Services and Notaries, *Respondents*,	:	
Philip T. Gressman, Ron Y. Donagi, Kristopher R. Tapp, Pamela Gorkin, David P. Marsh, James L. Rosenberger, Amy Myers, Eugene Boman, Gary Gordon, Liz McMahon, Timothy G. Feeman, and Garth Isaak, *Petitioners*,	:	
v.	:	No. 465 M.D. 2021
Leigh Chapman, in her official capacity as the Acting Secretary of the Commonwealth of Pennsylvania; Jessica Mathis, in her official capacity as Director for the Pennsylvania Bureau of Election Services and Notaries, *Respondents*.	:	

PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

INTRODUCTION

The task before the Commonwealth Court is to select a new congressional redistricting plan for the people of Pennsylvania. All parties agree that the current plan is unconstitutionally malapportioned. Joint Stipulation ¶¶ 1–3. Based on the results of the 2020 Census, Pennsylvania lost a congressional seat: Its new map must include 17—not 18—districts. *Id.*

Ordinarily, "the primary responsibility" for redistricting rests "squarely with the state legislature." *League of Women Voters of Pa. v. Commonwealth*, 178 A.3d 787, 821 (Pa. 2018) [hereinafter "*League of Women Voters I*"]. And just like any other law, a map proposed by the General Assembly must be signed into law by the Governor. 101 Pa. Code §§ 9.122, 9.125. On January 24, 2022, the General Assembly adopted a new 17-district congressional districting map, but the Governor vetoed it two days later.[1] *Bill Information—History: House Bill 2146*, PENNSYLVANIA GENERAL ASSEMBLY (last visited Jan. 28, 2022), https://www.legis.state.pa.us/cfdocs/billinfo/bill_history.cfm?syear=2021&sind=0

[1] House Bill 2146 was passed along party lines. In the House, it received no Democratic votes, and only two Republicans voted against it. *See* Pennsylvania House of Representatives, *House Roll Calls*, https://www.legis.state.pa.us/CFDOCS/Legis/RC/Public/rc_view_action2.cfm?sess_yr=2021&sess_ind=0&rc_body=H&rc_nbr=708 (last visited Jan. 29, 2022). In the Senate, it received no Democratic votes and no Republicans voted against it. *See* Pennsylvania State Senate, *Senate Roll Calls*, https://www.legis.state.pa.us/CFDOCS/Legis/RC/Public/rc_view_action2.cfm?sess_yr=2021&sess_ind=0&rc_body=H&rc_nbr=708 (last visited Jan. 29, 2022).

&body=H&type=B&bn=2146. As a result, no constitutional map is in place for the 2022 congressional election cycle, and nomination papers for candidates seeking to appear on the primary elections are scheduled to begin circulating on February 15, 2022.

PROCEDURAL BACKGROUND

Two sets of Pennsylvania voters who reside in malapportioned districts have petitioned this Court for relief. First were the Carter Petitioners, 16 voters affiliated with the Democratic Party. *See* Carter Pets.' Pet. for Rev. Next were the Gressman Petitioners, a nonpartisan group of 12 Pennsylvania professors and research scientists seeking a data-driven, fair redistricting process. *See* Gressman Pets.' Pet. for Rev. The petitions for review were filed against respondents Leigh Chapman, in her official capacity as the Acting Secretary of the Commonwealth of Pennsylvania, and Jessica Mathis, in her official capacity as Director for the Pennsylvania Bureau of Election Services and Notaries. The Court accepted the petitions for review, and on December 20, 2021, consolidated the two cases and entered a scheduling order requiring petitions to intervene to be filed no later than December 31.

Ten groups sought to intervene. These included six sets of elected officials: (i) Speaker Bryan Cutler and Majority Leader Kerry Benninghoff of the Pennsylvania House of Representatives, joined with President Pro Tempore Jake Corman and Majority Leader Kim Ward of the Pennsylvania Senate; (ii) Tom Wolf,

Governor of the Commonwealth of Pennsylvania; (iii) Pennsylvania State Senators Maria Collett, Katie J. Muth, Sharif Street, and Anthony H. Williams; (iv) Senator Jay Costa and members of the Democratic Caucus of the Senate of Pennsylvania;[2] (v) Representative Joanna E. McClinton, Leader of the Democratic Caucus of the Pennsylvania House of Representatives; and (vi) Congressman Guy Reschenthaler, Swatara Township Commissioner Jeffrey Varner, Tom Marino, Ryan Costello, and Bud Shuster. The intervention applicants also included four Pennsylvania voter groups: (1) Leslie Osche and other voters, who call themselves the Citizen Voters; (2) Voters of the Commonwealth of Pennsylvania, a group of Republican voters; (3) Khalif Ali and other voters, affiliated with Common Cause and other organizations involved in redistricting and election matters; and (4) a group of voters associated with another organization involved in redistricting, Draw the Lines PA.

After various submissions from the parties concerning intervention and scheduling matters, as well as a hearing on intervention, the Court entered an order permitting the elected-official groups to intervene as parties and the voter groups to participate as *amici curiae*. Jan. 14, 2022 Order ¶ 2. The Court also established an expedited schedule for further proceedings. Parties and *amici* were to submit one or two proposed 17-district maps by 5:00 p.m. on January 24, along with briefs and

[2] The Collett et al. and Costa et al. applications to intervene were later joined, so these intervenors participated as a single party. Jan. 14, 2022 Order ¶ 2.

expert reports in support of their proposed maps. *Id.* ¶¶ 3, 6. The parties' responsive briefs and expert reports addressing those submissions were due two days later, by 5:00 p.m. on January 26. *Id.* ¶ 4. The Court scheduled an evidentiary hearing for January 27 and 28. *Id.* ¶ 11.

On January 24, 2022, most of the parties and some of the *amici curiae* submitted proposed maps, briefs, and/or expert reports, for a total of 13 timely proposed maps. The parties filed responsive briefs and/or expert reports on January 26, and the following day, the Court commenced the evidentiary hearing.

Over the course of two days, the Court heard testimony from six expert witnesses, and the reports authored by these experts were admitted into evidence by stipulation of counsel. Dr. Jonathan Rodden, Professor of Political Science at Stanford University and the founder and director of the Stanford Spatial Social Science Lab, testified on behalf of the Carter Petitioners. Dr. Daryl DeFord, Assistant Professor of Data Analytics in the Department of Mathematics and Statistics at Washington State University, testified on behalf of the Gressman Petitioners. Dr. Moon Duchin, Professor of Mathematics and a Senior Fellow in the Jonathan M. Tisch College of Civic Life at Tufts University, testified on behalf of Governor Wolf. Dr. Michael Barber, Associate Professor of Political Science at Brigham Young University and faculty fellow at the Center for the Study of Elections and Democracy, testified on behalf of the Pennsylvania House Republican

Caucus. Dr. Keith Naughton, co-founder and principal at Silent Majority Strategies, testified on behalf of the Congressional Intervenors. Dr. Devin Caughey, Associate Professor of Political Science at the Massachusetts Institute of Technology, testified on behalf of the Pennsylvania Senate Democratic Caucus.

Following the evidentiary hearing, the Court received post-trial submissions from the parties on January 29.

JURISDICTION

The Court has jurisdiction over this case under 42 Pa. C.S. § 761(a)(1), which gives the Commonwealth Court original jurisdiction over cases against a government officer in his or her official capacity. The Court has authority to adopt a redistricting plan as an exercise of its power to issue "every lawful writ or process necessary or suitable for the exercise of its jurisdiction and for the enforcement of any order which it may make." 42 Pa. C.S. § 562. Adoption by the Commonwealth Court of a lawful congressional redistricting plan is an appropriate and necessary remedy to support this Court's exercise of original jurisdiction over this case. *See* Order, *Gressman v. Degraffenreid*, 142 MM 2021 (Pa. Jan. 10, 2022).

LEGAL STANDARDS

Mellow v. Mitchell, 607 A.2d 204 (Pa. 1992), was the last time, in the wake of the political branches reaching an impasse on congressional redistricting, that Pennsylvania's courts were "thrust into this role, with no feasible option except to

take one entire plan or the other." *Id.* at 224. In identifying which plan to adopt as a remedy for the current malapportionment of Pennsylvania's congressional districts, the Court is guided by the Supreme Court's seminal decision in *League of Women Voters of Pennsylvania v. Commonwealth*. In *League of Women Voters I*, the Supreme Court determined that the Pennsylvania congressional map, enacted in 2011 by the General Assembly and signed by the Governor, was unconstitutional under the Free and Equal Elections Clause. 178 A.3d at 741. In assessing the map's legality, the Supreme Court identified and applied the relevant federal and state legal requirements that apply to Pennsylvania's congressional districting plan. *Id.* at 814–818 & n.72. After providing the General Assembly and Governor with a period during which they could compromise their differences and agree to a new, constitutional plan, during which no new plan was enacted, the Court itself adopted a redistricting plan to comply with all federal and state requirements in *League of Women Voters of Pennsylvania v. Commonwealth*, 181 A.3d 1083, 1087 (Pa. 2018) [hereinafter "*League of Women Voters II"*]. This plan is referred to as the "2018 Plan." The requirements of federal and state law that the Supreme Court articulated in *League of Women Voters* are discussed below.

Population Equality

Chief among the legal requirements for redistricting is the principle of "one person, one vote." Both Pennsylvania and federal constitutional law mandate strict

population equality for congressional districting plans. *See* PA. CONST. art. II, § 16 (requiring that districts be "as nearly equal in population as practicable"); *Abrams v. Johnson*, 521 U.S. 74, 98 (1997); *Wesberry v. Sanders*, 376 U.S. 1, 7–8 (1964). The command under Article I, Section 2 of the U.S. Constitution "that Representatives be chosen 'by the People of the several States,'" *Wesberry*, 376 U.S. at 7, has been interpreted to require "absolute population equality" in congressional districts, *Karcher v. Daggett,* 462 U.S. 725, 732 (1983). Accordingly, the 2018 Plan limited the deviation between the 2018 Plan's largest and smallest districts to a single person. *See League of Women Voters II*, 181 A.3d at 1087 ("[N]o district has more than a one-person difference in population from any other district, and, therefore, the Remedial Plan achieves the constitutional guarantee of one person, one vote.").

The Fourteenth Amendment and the Voting Rights Act

Any redistricting plan the Court adopts also must comply with the Fourteenth Amendment to the U.S. Constitution, which bars both the excessive and unjustified use of race and racial data in redistricting and the intentional dilution of minority voting strength. *See Shaw v. Reno*, 509 U.S. 630, 639–57 (1993); *Rogers v. Lodge*, 458 U.S. 613, 616–28 (1982). Further, the plan must comply with Section 2 of the Voting Rights Act ("VRA"), 52 U.S.C. § 10301, which prohibits the denial or abridgment of the right to vote on account of race, color, or membership in a language minority group. *See Holt v. 2011 Legislative Reapportionment Comm'n*,

38 A.3d 711, 738 (Pa. 2012) [hereinafter "*Holt I*"]. The VRA prohibits both intentional and unintentional vote dilution. *Thornburg v. Gingles*, 478 U.S. 30, 43–44 (1986). It provides that, irrespective of discriminatory intent, members of a racial or language-minority group must not "have less opportunity than other members of the electorate" to "nominat[e]" and "elect representatives of their choice," based on "the totality of circumstances." 52 U.S.C. § 10301(b).

To guard against potential liability under Section 2, a redistricting plan must provide effective opportunities for minority-group members to nominate and elect their preferred candidates in a number of districts that is "roughly proportional" to the minority groups' share of a state's citizen voting-age population, or "CVAP." *League of United Latin Am. Citizens v. Perry (LULAC)*, 548 U.S. 399, 436–38 (2006); *see Johnson v. De Grandy*, 512 U.S. 997, 1000 (1994). Whether a proposed plan complies with the VRA depends on the actual electoral opportunity for minority voters, not on any "particular numerical minority percentage." *Ala. Legis. Black Caucus v. Alabama*, 575 U.S. 254, 275 (2015); *see also Cooper v. Harris*, 137 S. Ct. 1455, 1469 (2017); *Bethune-Hill v. Va. State Bd. of Elections*, 137 S. Ct. 788, 799, 801–02 (2017); *Bush v. Vera*, 517 U.S. 952, 969–72 (1996) (plurality opinion).

Requirements from the Pennsylvania Constitution

The Supreme Court in *League of Women Voters I* also applied the requirements of the Pennsylvania Constitution. It concluded that the Pennsylvania

Constitution's specific redistricting commands, which refer expressly to state-legislative districts, apply equally to congressional districts. *League of Women Voters I*, 178 A.3d at 814. Article II, Section 16 requires districts to be "composed of compact and contiguous territory as nearly equal in population as practicable" and mandates that, "[u]nless absolutely necessary no county, city, incorporated town, borough, township or ward shall be divided" into more than one district. PA. CONST. art. II, § 16. These criteria—compactness, contiguity, population equality, and respect for six specified types of political subdivisions—are referred to here as "traditional redistricting criteria."

Compactness: To assess compactness, the first traditional criterion, the Supreme Court applied objective measures and conducted subjective, visual evaluations. *League of Women Voters I*, 178 A.3d at 771–72, 818. In holding the 2011 redistricting plan unconstitutional, the Supreme Court noted that results on objective measures of compactness "comport[ed] with a lay examination" of the plan, which revealed "tortuously drawn," "oddly-shaped," and "sprawling" districts. *Id.* at 819. As for objective measures, the Supreme Court held that its 2018 Plan achieved compactness levels that were "superior or comparable to other submissions" according to the Reock, Schwartzberg, Polsby-Popper, Population Polygon, and Minimum Convex Polygon compactness measures. *League of Women Voters II*, 181 A.3d at 1087.

Contiguity: As for contiguity, the second traditional criterion, a contiguous district is "one in which a person can go from any point within the district to any other point (within the district) without leaving the district, or in which no part of the district is wholly physically separate from any other part." *Commerce ex rel. Specter v. Levin,* 293 A.2d 15, 17–18 (Pa. 1972) (internal quotation marks omitted), *abrogated on other grounds by Holt v. 2011 Legislative Reapportionment Comm'n*, 38 A.3d 711 (Pa. 2012); *see also League of Women Voters I*, 178 A.3d at 819 (discussing contiguity in criticizing the 2011 plan).

Respect for Political Subdivisions: The last traditional criterion is respect for political subdivisions. PA. CONST. art. II, § 16. In *League of Women Voters I*, the Supreme Court held that evidence of more divided, or split, political subdivisions than necessary was "compelling evidence" of the partisan intent behind the 2011 plan. 178 A.3d at 818–19. However, the Court has recognized that "some divisions are inevitable" given the competing demand of population equality, *Holt I*, 38 A.3d at 758, especially given the federal constitutional requirement of perfect population equality for congressional districts.[3] Consistent with the plain text about "absolutely

[3] *Holt I* and *Holt v. 2011 Legislative Reapportionment Comm'n*, 67 A.3d 1211 (Pa. 2013) [hereinafter "*Holt II*"], are both relevant here, even though those cases addressed legislative reapportionment plans rather than congressional reapportionment plans. *See League of Women Voters I*, 178 A.3d at 817 (discussing *Holt I*, 38 A.3d at 1235). Except for *Holt I's* approach to the equal-population requirement, which is much more flexible than federal law allows for congressional

necessary" divisions, our Constitution tolerates dividing, or splitting, political subdivisions only to accommodate population equality or other constitutionally mandated traditional redistricting criteria, not to accommodate factors such as "preservation of prior district lines, protection of incumbents, or the maintenance of political balance." *League of Women Voters I*, 178 A.3d at 817. Overall, however, the Supreme Court has declined "to convey in absolute terms what is an acceptable number of political subdivision splits." *Holt I*, 38 A.3d at 754 n.33.

Protections Against Vote Dilution: A redistricting plan must also comply with the Constitution's Free and Equal Elections Clause. *See League of Women Voters I*, 178 A.3d at 820; PA. CONST. art. 1, § 5 ("Elections shall be free and equal; and no power, civil or military, shall at any time interfere to prevent the free exercise of the right of suffrage."). The Supreme Court has explained that a congressional districting plan violates the Free and Equal Elections Clause when it "dilutes the potency of an individual's ability to select the congressional representative of his or her choice." *League of Women Voters I*, 178 A.3d at 816.

The Supreme Court held the 2011 plan unconstitutional because it was "clear, plain, and palpable" that it "subordinate[d] the traditional redistricting criteria in the service of partisan advantage." *Id.* at 818. Subordination of the traditional criteria

---

plans, *see Holt I*, 38 A.3d at 756, 759, the *Holt* Court's analyses of Pennsylvania's redistricting requirements apply here.

is not "the exclusive means by which a violation" of the Free and Equal Elections Clause may be established, but it can provide powerful evidence of vote dilution. *Id.* at 817.

The Pennsylvania Constitution mandates not only compliance with the traditional criteria, but also a redistricting plan that allows every Pennsylvanian vote to "be ***equalized to the greatest degree possible*** with all other Pennsylvania citizens." *Id.* at 817 (emphasis added). The Supreme Court recognized that it is possible "to engineer congressional districting maps" that comply with the traditional redistricting criteria but "nevertheless operate to unfairly dilute the power of a particular group's vote for a congressional representative." *Id.* Therefore, the Supreme Court has mandated that, in addition to evaluating a plan's compliance with the traditional redistricting criteria, the Court must also evaluate whether a plan will nonetheless operate to unfairly dilute the power of a particular group's vote for a congressional representative. *Id.* The parties in this case refer to this principle as "partisan fairness." In *League of Women Voters I*, the Supreme Court relied on expert evidence about a number of measures of partisan fairness in performing its analysis, including the "efficiency gap" and the "mean-median difference," which are discussed further below. *Id.* at 774.

Other Factors: The Supreme Court also recognized that "other factors have historically played a role in the drawing of legislative districts, such as the

preservation of prior district lines, protection of incumbents, or the maintenance of the political balance which existed after the prior reapportionment," but noted that these facts are "wholly subordinate to the neutral criteria" established by our Constitution. *League of Women Voters I*, 178 A.3d at 817.

ANALYSIS

After careful consideration of all the submitted plans, and applying the legal requirements discussed above, the Court orders that the Gressman Math/Science Plan proposed by the Gressman Petitioners be adopted for the reasons that follow.

Plans Considered

At the outset, the Court notes that it considered on an equal footing all of the plans submitted by all the parties and *amici*.[4]

The Republican Legislative Leader Intervenors asked this Court to give their proposed plan "special consideration" because that plan was described in House Bill 2146, which passed in the General Assembly on January 24, 2022. That bill, however, was vetoed by the Governor. The Court declines to accord deference to a redistricting proposal that has failed in the political process. To adopt the Legislature's proposed map on this basis would effect a judicial override of the Governor's veto, in violation of the separation of powers. *See Mental Health Ass'n*

[4] The Concerned Citizens for Democracy's proposed redistricting plan was filed late, the group was thus denied *amicus* status, and its proposed plan therefore will receive no consideration.

in Pa. v. Corbett, 54 A.3d 100, 104 (Commw. Ct. 2012) ("'A basic precept of our form of government is that the executive, the legislature, and the judiciary are independent, co-equal branches of government.'" (quoting *Sweeney v. Tucker*, 473 Pa. 493, 507–08 (1977))). For this same reason, other courts have routinely declined to accord deference to a map that made it only partway through the legislative process but failed to become law. *See, e.g.*, *O'Sullivan v. Brier*, 540 F. Supp. 1200, 1202 (D. Kan. 1982) (three-judge court) ("[W]e are not required to defer to any plan that has not survived the full legislative process to become law."); *Carstens v. Lamm*, 543 F. Supp. 68, 79 (D. Colo. 1982) (three-judge court) (explaining that a vetoed legislative plan "cannot represent current state policy any more than the Governor's proposal"); *Hippert v. Ritchie*, 813 N.W.2d 379, 380 n.6 (Minn. 2012) ("[B]ecause the Minnesota Legislature's redistricting plan was never enacted into law, it is not entitled to … deference."); *Wis. State AFL–CIO v. Elections Bd.*, 543 F. Supp. 630, 632 (E.D. Wis. 1982) (three-judge court). Accordingly, the Court has evaluated the plan embodied in House Bill 2146 on an equal footing with all other plans presented to the Court.

Population Equality

Under both Pennsylvania and federal law, a plan must have districts "as nearly equal in population as practicable." *League of Women Voters II*, 181 A.3d at 1087. Where possible, districts should have a maximum deviation of just one person when

comparing the largest and smallest district populations. *See Karcher*, 462 U.S. at 732. This is referred to as absolute population equality or "zero-balancing." *See* DeFord Report ¶ 20; *see* 1/27/22 Tr. 203:24–204:3 (Dr. DeFord).

Perfect population equality is indeed possible, and the Gressman Math/Science Plan achieves it. DeFord Report ¶ 22 & Table 1; 1/27/22 Tr. 203:18–204:3 (Dr. DeFord). No district in the Gressman Math/Science Plan has more than a one-person difference in population from any other district. DeFord Report ¶ 22. Specifically, the plan contains twelve districts with 764,865 persons each and five districts with 764,864 persons each. *Id.* ¶¶ 21–22.

In making this determination, the Court notes that the Gressman Math/Science Plan relies on "Data Set #1" released by Pennsylvania's Legislative Reapportionment Commission ("LRC"). DeFord Report ¶¶ 15, 17; DeFord Rebuttal ¶ 13. Parties and *amici* in this case each used one of three different datasets to draw their proposed plans. First, most parties and *amici* relied on the LRC's Data Set #1, *see* 1/27/22 Tr. 331:25–332:17 (Dr. Duchin), which takes the 2020 Census Redistricting Data (Public Law 94-171) Summary File for Pennsylvania and adjusts it "to contain the most recent voting precinct boundaries in Pennsylvania, reflecting any boundary changes that occurred after the data was last submitted to the Census Bureau." Pennsylvania Redistricting: Maps, https://www.redistricting.state.pa.us/maps/#congressional-districts (last visited Jan.

29, 2022); *see also* 1/27/22 Tr. 332:4–10 (Dr. Duchin). Second, several parties relied on the unadjusted 2020 Census State Redistricting Data (Public Law 94-171) Summary File for Pennsylvania. *See* 1/27/22 Tr. 331:25–332:3 (Dr. Duchin), 332:14–16 (Dr. Duchin). Third, one *amicus* relied on the LRC's Data Set #2, which "contains the same updated geography as Data Set #1, but also contains population adjustments to account for the reallocation of most prisoners to their last known addresses prior to incarceration." Legislative Reapportionment Comm'n, Pennsylvania Redistricting: Maps, https://www.redistricting.state.pa.us/maps/#congressional-districts (last visited Jan. 29, 2022); *see also* 1/27/22 Tr. 332:10–13 (Dr. Duchin); *id.* at 332:17–20 (Dr. Duchin). The Court selects a plan that relies on Data Set #1, consistent with the Supreme Court's approach in *League of Women Voters II*, 181 A.3d at 583 n.8, and in *Mellow*, 607 A.2d at 218–19. The Court concludes that Data Set #2 should not be used at this time for congressional districting. *See* Pa. House Res. 165 (requiring the use of Data Set #1 in any congressional redistricting legislation before the 2030 Census). Under Data Set #1, three plans submitted to the Court do not achieve one-person population deviation: the Carter Plan, the House Democratic Caucus Plan, and the *Ali* amicus plan. *See* Rodden Report at Table 4; House Dem. Caucus Br. at 9; 1/27/22 Tr. 204:4–20 (Dr. DeFord), 421:12–23 (Dr. Duchin); DeFord Rebuttal Report ¶ 13 & Table 1, and App'x A.

Contiguity

The next redistricting criterion is contiguity, which is the principle that districts should be connected. *See Specter*, 293 A.3d at 17–18. All of the plans submitted to the Court, including the Gressman Math/Science Plan, contain 17 contiguous districts. DeFord Rebuttal ¶ 27; 1/27/22 Tr. 91:7–20 (Dr. Rodden), 285:9–12 (Dr. DeFord), 333:2–7 (Dr. Duchin).

Compactness

The term "compactness" refers to a district's or a redistricting plan's geographic or geometric regularity. DeFord Report ¶ 54. There are several measures of compactness and, as Dr. DeFord explained, it is important to consider several such measures because each "represents a different, potentially relevant portion of the full geometric information" and "no single compactness measure can perfectly capture all facets of the regularity of a shape." *Id*. ¶ 57; *see also* 1/27/22 Tr. 94:2–7 (Dr. Rodden), 214:10–17 (Dr. DeFord), 333:14–334:14 (Dr. Duchin). The Supreme Court in *League of Women Voters I* likewise considered multiple measures of compactness. 178 A.3d at 771–72.

Most of the plans submitted to the Court contain districts that are reasonably compact, including the Gressman Math/Science Plan. *See* 1/27/22 Tr. 218:1–7 (Dr. DeFord). Across all plans provided to the Court, the Gressman Math/Science Plan scores the best in the minimum Convex Hull measure of compactness (meaning

every district in the plan scores at least 0.70), and the Gressman Math/Science Plan also is among the top five of proposed plans in most other measures of compactness, including mean Reock, mean Polsby-Popper, mean Convex Hull, and Cut Edges. DeFord Rebuttal ¶¶ 25–26 & Table 8; 1/27/22 Tr. 214:19–24 (Dr. DeFord); *see also* DeFord Report ¶¶ 55–56, 61 (defining compactness metrics).

It is noteworthy that the Gressman Math/Science Plan achieves these levels of compactness despite two districts following a portion of the Pittsburgh border to keep that city intact in a single district. As Dr. DeFord testified, because of Pittsburgh's irregular shape, plans that follow Pittsburgh's border to keep it intact will tend to have somewhat lower Polsby-Popper scores for the two districts that touch Pittsburgh, as compared to maps that split Pittsburgh. *See* 1/27/22 Tr. 215:13–217:25 (Dr. DeFord). This is an example of a tradeoff in optimizing multiple redistricting criteria—here, compactness and respect for the integrity of the boundaries of Pennsylvania's second largest city. *Id.* at 215:13–218:7 (Dr. DeFord); *see also id.* at 338:6–18 (Dr. Duchin). The Gressman Math/Science Plan keeps Pittsburgh whole and still achieves superior or comparable compactness across all 17 congressional districts.

Respect for Political Subdivisions

The Pennsylvania Constitution states, "Unless absolutely necessary no county, city, incorporated town, borough, township or ward shall be divided" in

forming districts. Pa. Const. art. II, § 16. Several experts testified about how to measure compliance with this criterion, also known as how a map "splits" these constitutionally enumerated political subdivisions. *See* 1/27/22 Tr. 94:11–95:13 (Dr. Rodden), 205:1–13 (Dr. DeFord), 335:21–336:6 (Dr. Duchin).

Many parties discussed their own performance on only certain aspects of this criterion, such as their minimal number of county splits, *see, e.g.*, 1/27/22 Tr. 97:11–25 (Dr. Rodden); 1/28/22 Tr. 1045:10–15 (Cong. Intervenors' Closing). However, the constitutional criteria require keeping **six** different types of political subdivisions intact, stating that "[u]nless absolutely necessary no **county, city, incorporated town, borough, township or ward** shall be divided" into more than one district. PA. CONST. art. II, § 16 (emphasis added). The Gressman Math/Science Plan performs better than all the other plans proposed to the Court in preserving the overall integrity of all political subdivisions. *See* 1/27/22 Tr. 206:14–19 (Dr. DeFord), 209:4–17 (Dr. DeFord), 209:20–210:13 (Dr. DeFord), 210:19–25 (Dr. DeFord), 422:15–423:11 (Dr. Duchin); 1/28/22 Tr. 797:10–799:7 (Dr. Naughton). The Gressman Math/Science Plan splits only 15 counties, 1 city, 3 boroughs, 15 townships, and 15 wards. DeFord Rebuttal Report ¶ 21, Table 6. The total number of splits across all those subdivisions—49—is lower than in any other plan. *Id.* In addition, 3 of the 15 county splits and the 1 city split are required by population, and all the borough splits are along county lines. DeFord Report ¶¶ 29–33. As Dr. DeFord testified, it

is useful to look to the sum of the splits across the six classes that are listed in the Pennsylvania Constitution because doing so accounts for tradeoffs that may occur where a plan, for example, splits fewer counties, but, as a result, is then forced to split more municipalities to achieve population balance. 1/27/22 Tr. 211:11–212:9 (Dr. DeFord).

The Gressman Math/Science Plan is tied for first across all plans proposed to the Court in creating the lowest number of total pieces[5] across the six political subdivision types enumerated in the Constitution. DeFord Rebuttal ¶ 23, Table 7; 1/27/22 Tr. 212:18–213:12 (Dr. DeFord); 1/28/22 Tr. 799:1–7 (Dr. Naughton).

Finally, regarding Pennsylvania's two largest cities, the Gressman Math/Science Plan splits Philadelphia into the smallest possible number of pieces that is mathematically possible (dictated by population-equality requirements) and keeps Pittsburgh intact in a single district. DeFord Report ¶ 38. The Gressma Math/Science Plan is one of just two plans that splits Philadelphia (as it must) into the minimum-population-required pieces (three) and no other cities. DeFord Rebuttal ¶ 17 & Table 4.

[5] Pieces accounts for the number of times a political subdivision is split. For example, a county that is split once creates two pieces, each in different districts. DeFord Opening Report ¶ 26. Dr. DeFord's pieces totals for municipalities exclude pieces created when a municipality that crosses county lines is split along the county line. *Id.* ¶ 27.

In sum, better than any other proposed plan before the Court, the Gressman Math/Science Plan avoids splitting political subdivisions unless "absolutely necessary." Pa. Const. art. II, § 16.

Compliance with the Voting Rights Act and the Fourteenth Amendment

To guard against potential liability under Section 2 of the VRA, a redistricting plan should provide effective opportunities for minority-group members to nominate and elect their preferred candidates in a number of reasonably compact districts that is "roughly proportional" to the minority group's share of a state's CVAP. *League of United Latin Am. Citizens*, 548 U.S. at 436–38; *Johnson v. De Grandy,* 512 U.S. 997, 1000 (1994).[6] Almost 20% of the Commonwealth's adult citizen population (or "CVAP"), belongs to a racial or language minority group, with Latinos constituting a fast-rising 6% of the Commonwealth's CVAP. *See* 1/27/22 Tr. 242:11–15 (Dr. DeFord); DeFord Opening Report ¶ 140. In a 17-district plan, 20% of 17 districts would equal 3.4 districts. Under the VRA's "rough" proportionality principle, Pennsylvania should have at least three congressional districts where

[6] In *Mellow*, the Pennsylvania Supreme Court relied on a similar proportionality analysis to conclude that an additional district in which Black voters would have an opportunity to nominate and elect their candidates of choice should be included in the congressional plan. *See* 607 A.2d at 206–07 (discussing the need for two out of 21 districts in which Black voters would have the opportunity to nominate and elect their candidates of choice "in light of Pennsylvania's 9% African-American population").

minority voters have a realistic opportunity to nominate and then elect their preferred candidates.

The Gressman Math/Science Plan satisfies this principle. Unlike any of the other parties' plans, the Gressman Math/Science Plan includes three majority-minority districts in which minority citizens will have such an opportunity, one of which is a district where Latino adult citizens would constitute the largest minority group. Both of these features would be firsts for the Commonwealth. The GMS Plan therefore guards against the potential that a plan adopted by this Court is later challenged in federal court under the VRA.

Moreover, the Court identified no evidence that race predominated the drawing of the Gressman Math/Science Plan. No such evidence was presented, and Dr. DeFord testified that the Gressman Math/Science Plan and the data underlying it contained no indications that it was created to specifically benefit any particular racial group or to hit an arbitrary or mechanical threshold of minority voting-age population. 1/27/22 Tr. 243:13–244:3 (Dr. DeFord); *see also Cooper*, 137 S. Ct. at 1469; *Bethune-Hill*, 137 S. Ct. at 799, 801–02; *Ala. Legis. Black Caucus*, 575 U.S. at 267, 275; *Bush*, 517 at 969–72 (plurality opinion). Each of the three minority districts in the GMS Plan is compact and respectful of municipal and ward boundaries and therefore raises no issues of potential liability under the *Shaw v. Reno*, 509 U.S. 630 (1993), line of Fourteenth Amendment cases.

Protections Against Vote Dilution Under the Free and Equal Elections Clause

The "overarching objective" of the Pennsylvania Constitution's Free and Equal Elections Clause in any redistricting case "is to prevent dilution of an individual's vote by mandating that the power of his or her vote in the selection of representatives be equalized to the greatest degree possible with all other Pennsylvania citizens." *League of Women Voters I*, 178 A.3d at 817. Accordingly, the Court reviewed the plans to determine the extent to which they appeared likely to treat Pennsylvania voters of both parties equally.

Based on the evidence presented, the Gressman Math/Science Plan complies with the Free and Equal Elections Clause by treating voters of both parties equally "to the greatest degree possible." *Id.* As discussed above, the Gressman Math/Science Plan achieves the best or near-best scores on all the traditional redistricting criteria. That is evidence that the Gressman Math/Science Plan may be fair to voters of both political parties. *Id.* at 816–17. But as the Supreme Court recognized, it sometimes may be possible "to engineer congressional districting maps, which, although minimally comporting with these neutral 'floor' criteria, nevertheless operate to unfairly dilute the power of a particular group's vote for a congressional representative." *Id.* at 817; *see id.* (citing testimony about "the concept of an efficiency gap based on the number of 'wasted' votes for the minority political party under a particular redistricting plan"); *see also* 1/27/22 Tr. 487:5 (Dr. Duchin)

(testifying that it is possible to draw a map that complies with traditional redistricting criteria yet maximizes the benefit for one political party). Accordingly, the Court considered substantial expert evidence regarding the partisan fairness of the submitted maps.

Across three different measures of partisan fairness, as well as measures provided by the independent, nonpartisan PlanScore.org website, the Gressman Math/Science Plan achieves the best, or near-best, scores of all the plans submitted by the parties and *amici*. These measures of partisan fairness do not precisely predict election outcomes, but they are accepted measures for assessing bias toward one party or the other. *See* DeFord Opening Report § V.E.3; *see also* 1/27/22 Tr. 222:7–24 (Dr. DeFord). Fundamentally, each metric is a different way of getting at the Supreme Court's concerns about vote dilution and equality, asking in different ways whether and to what extent under a given map, winning a majority of the votes will allow a party to win a majority of the districts. 1/27/22 Tr. 219: 4–18 (Dr. DeFord).

The Court starts with the mean-median measure and the efficiency gap measure, both of which were credited by the Pennsylvania Supreme Court in *League of Women Voters I*. *See* 178 A.3d at 774. The mean-median measure captures how much of the vote in a state is needed to capture half of the representation. Duchin Opening Report at 17; DeFord Opening Report at 26; Barber Opening Report at 27. As Dr. DeFord explained, the mean-median score is a metric related to partisan

symmetry: A plan that exhibits partisan symmetry is one that is likely to treat the parties evenhandedly in terms of seat outcomes, given equal votes received by the two major parties' candidates statewide. DeFord Opening Report ¶ 78; *see also* 1/27/22 Tr. 227:18–228:10 (Dr. DeFord). In other words, if one party is expected to turn a 55%-to-45% statewide vote advantage into a 10-to-7 seat advantage, then a symmetric result would require the other party to achieve the same seat advantage with the same statewide vote advantage. DeFord Opening Report ¶ 78.

To calculate the mean-median measure, Dr. DeFord first identified the actual election results obtained in a body of 18 statewide general elections from 2012 through 2020. DeFord Opening Report ¶ 68. He then determined what the actual election results would have been had the districts been defined by the boundaries of each of the proposed plans. *Id*. ¶ 70. Next, he identified the share of the vote that the Democratic and Republican candidates would have obtained in each election, for each district in each proposed plan. *Id*. ¶¶ 78–79. He then compared the vote share that the Democratic candidate would have obtained in each election in each proposed plan's "median" district—the ninth most Democratic and ninth most Republican district in each 17-district proposed plan— with the vote share that the same candidate garnered statewide. *Id*. ¶ 79. That comparison is Dr. DeFord's mean-median score. *Id*. ¶ 78. If the mean-median score is close to zero, then about half the districts in the proposed plan are more Democratic than the state as a whole, and

about half the districts are more Republican than the state as a whole—an intuitively sensible property for any truly fair map. *Id.* ¶ 79; *see also* 1/27/22 Tr. 228:12–231:20 (Dr. DeFord).

As Dr. DeFord reported, the Gressman Math/Science Plan has an average mean-median score, across 18 separate statewide general elections (from 2012 to 2020), of -0.008, which is close to zero, and the second-best mean-median score of all plans submitted by all parties and *amici*. DeFord Rebuttal Report ¶ 38, Table 12 & App'x. A, Table 12a; 1/28/22 Tr. 228:5–231:7 (Dr. DeFord). For the most recent elections from 2018 through 2020, the Gressman Math/Science Plan has the best average mean-median score of all plans submitted by all parties and *amici*. DeFord Rebuttal Report ¶ 39, Figure 3.[7] The Gressman Math/Science Plan scored the very best of all the plans in its mean-median score as calculated by PlanScore.org (DeFord Rebuttal Report at Appendix D)—an independent site that Dr. Caughey testified is

[7] Other experts also calculated the mean-median scores of each plan, though with different, less comprehensive sets of election results. While Dr. DeFord relied on the results of 18 statewide elections from 2012 to 2020, Dr. Duchin relied on 12 elections (Opening Report at 18–19), Dr. Rodden relied on 11 elections (Rebuttal Report at 7), and Dr. Barber relied on 17 elections (Rebuttal Report at 13 n.5). But no matter which set of elections is used, the Gressman Math/Science Plan scored close to zero, the ideal score. *See* Duchin Rebuttal Report at 4 (showing total mean-median of .0385 for the Gressman Math/Science Plan); Barber Rebuttal Report at 21. Indeed, Governor Wolf's expert, Dr. Duchin, admitted that the Gressman Math/Science Plan is an "excellent plan" and had partisan-fairness scores better than several of the plans that she rated as "dominating the field" in partisan-fairness metrics. 1/27/22 Tr. 424:23–433:20 (Dr. Duchin).

nonpartisan, transparent, and available to any member of the public, *see* 1/28/22 Tr. 962:21–964:8, 1009:10–23.[8]

Next, the Court heard testimony about the efficiency gap—another measure of partisan fairness credited by the Supreme Court in *League of Women Voters I*. The efficiency gap is "a formula that measures the number of 'wasted' votes for one party against the number of 'wasted' votes for another party," where "the larger the number, the greater the partisan bias." *League of Women Voters I*, 178 A.3d at 777; *see also* DeFord Opening Report ¶ 80; Duchin Opening Report at 17. As Dr. DeFord explained, a vote is considered "wasted" by this measure if it was a vote for the losing candidate in a district or a vote for the winning candidate beyond the number needed to win the district, on the theory that "the most efficient distribution of votes is to carry as many districts as possible by as narrow a margin as possible, while having the opposing party win its districts by large majorities." DeFord Opening

[8] The PlanScore.org website allows anyone to submit a proposed redistricting plan and receive a calculation of four partisan-fairness measures—partisan symmetry/bias, the efficiency gap, the mean-median difference, and declination—based on election data from Pennsylvania's presidential and congressional elections between 2012 and 2020. *See* 1/28/22 Tr. 915:21–916:7 (Dr. Caughey), 926:24–927:13 (Dr. Caughey), 1014:10–1015:8 (Dr. Caughey); *see also* Unified District Model, PLANSCORE (Dec. 2021), https://planscore.campaignlegal.org/models/data/2021D/. The Gressman Math/Science Petitioners submitted PlanScore.org results for all plans submitted to the Court by all parties and all *amici.* DeFord Rebuttal Report ¶ 51 & App'x D. Of all maps submitted by the parties or by *amici*, the Gressman Math/Science Plan achieved the best scores on each of the partisan-fairness measures calculated by PlanScore.org. *Id.* ¶ 51.

Report ¶ 80. An efficiency gap that is close to zero suggests that neither political party is unfairly favored in the redistricting plan. *Id.* ¶ 97.

Again, with the efficiency gap the Gressman Math/Science Plan is among the best of the submitted plans, with a mean score very close to zero (0.008). DeFord Rebuttal Report at 15 (Table 13). And as calculated by PlanScore.org, the Gressman Math/Science Plan scored better than all but one of the other plans on the efficiency-gap metric. *See* DeFord Rebuttal Report at App. D; 1/28/22 Tr. 968:16–969:9 (Caughey).

Another measure of partisan fairness is a majority-responsiveness measure based on the plan's seats-votes curve. Deford Rebuttal Report at 11–12; Duchin Report at 14; 1/28/22 Tr. 900:20–903:23 (Caughey). This measure directly evaluates the extent to which a proposed redistricting plan allows each political party to convert a majority of votes into a majority of seats, without making it harder for one party or the other to do so. DeFord Opening Report at 27–30; 1/27/22 Tr. 361:9–364:9 (Dr. Duchin). The Gressman Math/Science Plan is again among the best by this measure, with only three instances across the 18 studied elections in which a majority of votes would not have been converted into a majority of the seats. DeFord Rebuttal Report at 11 (Table 9). And these three instances were split between the political parties, suggesting that the plan does not make it hard for one particular political party to convert a vote-share majority into a seat-share majority. *Id.*; *see*

also DeFord Opening Report ¶ 84. By contrast, most other plans submitted to the Court had more instances when a majority vote did not translate into a majority of the seats, and those instances tended to harm one party's voters significantly more often than the other party's. *See* DeFord Rebuttal Report at 11 (Table 9).

The Gressman Math/Science Plan also achieves perfect balance on a measure of districts that are potentially responsive or competitive between the political parties: Again looking across 18 separate statewide general elections, the plan contains 5 districts that have consistently voted Democratic, 5 districts that have consistently voted Republican, and 7 districts that have swung for either party. DeFord Rebuttal Report ¶ 33 & Table 11; 1/27/2022 Tr. 224:16–226:4 (Dr. DeFord). The Gressman Math/Science Plan is the only plan that achieves a perfect balance on this measure, with an equal number of districts that consistently have voted in favor of each party. *Id.*

The Court heard testimony from Dr. Michael Barber concerning his evaluation of the partisan fairness of the Gressman Math/Science Plan compared to the results of a computer-generated simulation of 50,000 redistricting plans. *See* Barber Rebuttal Report; 1/27/22 Tr. 516:4–517:12 (Dr. Barber). He testified that the 50,000 redistricting plans were created using an algorithm programmed to create 17 districts of roughly (though not exactly) equal population that do not split municipalities other than Philadelphia. Barber Opening Report at 14. Dr. Barber

then compared each of the proposed plans to his simulated set of plans, to assess their partisan lean. His theory was that Pennsylvania's political geography creates a natural Republican bias that flows not from intentional gerrymandering but rather from the geographic distribution of Democratic and Republican voters throughout the state. Barber Opening Report at 10. Accordingly, he testified, if a map is drawn with fidelity to the neutral criteria but nevertheless contains a partisan bias in favor of Republicans, that bias ought not be considered intentional but rather natural. 1/27/22 Tr. 509:10–512:5 (Dr. Barber).

On cross-examination, however, Dr. Barber acknowledged that voters can be harmed even by an unintentional partisan gerrymander. 1/27/22 Tr. 581:13–18. And he also acknowledged that if two maps are equivalent with respect to the traditional redistricting criteria, it is better to choose one with less bias and more fairness or symmetry than one that is more biased and less fair or symmetrical. 1/27/22 Tr. 582:17–586:3 (Dr. Barber).

Even if a plan may be an "outlier" as compared to a simulation, its outlier status has no legal relevance so long as it performs well on the traditional redistricting criteria and treats voters of each party fairly and evenhandedly. Indeed, this follows directly from the Supreme Court's statement in *League of Women Voters I* that the Free and Equal Elections Clause's "overarching objective" is "to prevent dilution of an individual's vote by mandating that the power of his or her vote in the

selection of representatives be ***equalized to the greatest degree possible*** with all other Pennsylvania citizens." 178 A.3d at 817 (emphasis added).

Incumbent Pairings

Although subordinate to the traditional criteria of population equality, compactness, contiguity, and minimization of political-subdivision splits, the protection of incumbents has also played a historic role in Pennsylvania's redistricting process. *See League of Women Voters I*, 178 A.3d at 817. Incumbent pairing also has a relationship to partisan fairness because maps may be designed to disproportionately pair the incumbents of one political party, forcing them to run against each other or to move to a new district.

The Gressman Math/Science Plan is the only plan that does not pair in the same district any incumbent Representatives who are seeking reelection in 2022. DeFord Rebuttal ¶ 45, Table 15; 1/27/22 Tr. 240:14–241:7 (Dr. DeFord). Dr. DeFord testified that some of the pairings in certain plans have a partisan imbalance. 1/27/22 Tr. 241:8–25 (Dr. DeFord). The lack of incumbent pairings is therefore another, albeit less significant, indication of the overall fairness of the Gressman Math/Science Plan.

Least Change

The preservation of prior district lines, or "least change," is another subordinate factor the Court may consider in determining which plan to adopt.

League of Women Voters I, 178 A.3d at 817. The Court finds that using least-change metrics here is of limited utility because an 18-district plan is being replaced by a 17-district plan, and there may be a number of ways to measure "least change." Nonetheless, even under a least-change approach, the Gressman Math/Science Plan shows a remarkable degree of overlap in the physical location of the districts. Just to highlight a few of many examples, in both the 2018 Plan and the Gressman Math/Science Plan, Pittsburgh is kept whole, District 3 remains entirely in the same area of Philadelphia, and the Lehigh Valley remains united in District 7. Moreover, to the extent "least change" means a similar level of compliance with Pennsylvania's traditional redistricting criteria as found in the 2018 Plan, the Court finds that the Gressman Math/Science Plan achieves similar—and for most criteria, better—compliance with the applicable state and federal constitutional mandates.

CONCLUSION

The Court concludes that, of the plans presented to it, the Gressman Math/Science Plan best satisfies, collectively, all the legal requirements that apply to a congressional redistricting plan. Its 17 districts are compact, contiguous, and perfectly population-balanced; it keeps political subdivisions intact to the greatest extent that appears possible, splitting fewer total political subdivisions than any other proposed plan; it includes three districts in which members of minority groups are

the majority of the voting-age population; and it treats all Pennsylvania voters fairly and symmetrically, regardless of their partisan affiliation.