Hawkins, Dennis (Clerk)

From: Allen Rice [redacted]
Sent: Monday, March 21, 2011 11:09 AM
To: Hawkins, Dennis (Clerk)
Cc: Bills, Michael
Subject: Redistricting Commission Should Start with 1% Variance as a Goal
Attachments: TableAdisc04pdf.pdf; TA-06pdf.pdf; TableBdisc13pdf.pdf; TB1-01pdf.pdf; TB2-01pdf.pdf; TB3-01pdf.pdf

Gentlemen,

I attended the second meeting of the Redistricting Advisory Commission last Monday 3/14, and was disappointed to see the Commission shy away from even trying to start with an attempt to get all District populations set to a 1% variability against the mean.

Common sense, at least as I understand it, would suggest that this level of precision OUGHT to be the first goal, only then modifying the numbers to take into account the political goals (communities of interest, etc..)

I suppose much of the Commission's reluctance was based upon the presumption that starting with that level of precision would limit their choices later. I spent some time proving this is not so. That proof is contained in the six PDF files attached to this message. I would appreciate your adding them to the public record and providing them to the Commission members no later than the next meeting, 3/28. I plan to attend.

Regards,
Allen Rice
[redacted]

Districts Status: Starting with Precision

In its meeeting of March 14, the Redistring Advisory Commisson seemed to shy away from trying to begin with a population re-allocation that would fall within a 1% variability range for each existing District. This discussion is intended to show that such an allocation, mathematically, is no more difficult to achieve than is the looser 10%.

Table A is provided in support of this idea. The table, a PDF document derived from an Excel spreadsheet, shows some current analysis for the 10 San Jose City Council Districts, as of March 8, 2011. Population numbers and the contiguous district listings are taken from the documents and District Map provided to the Commission by staff. All other content is generated within the spreadsheet.

Stepping through the document:

City Population is currently 945,942. Since there are 10 Districts in the city, the average population (Mean) for each would be one tenth of that, 94,594, and each District would have 10% of the total population (10 x 10% = 100%). If only population were to be considered, this would be the "perfect" allocation.

The document shows, for each District, data for 3 possible scenarios for the percent +/- variability around the Mean. These appear under one of the 3 columns: +/- .5%, which would allow a total range of 1% of the mean, +/- 2.5%, which would allow a total range of 5%, and +/- 5%, which would allow a total range of 10%. The high and low range limits, for ALL Districts, for each of these possibilities, are shown in the respective column. For example, if a range of 5% (+/- 2.5%) is allowed, then each District's population could range from a high of 96,959 to a low of 92,229. Any population value in between would also be acceptable.

The rest of the Table shows data for each of the Districts, as follows:

District Number: 1 through 10

Population: The District's current population, as provided by staff. Since the mean is 94,594, populations below that are "too small" (the District needs to gain population) and those above are "too large" (the District needs to lose population.)

Current % of Total: The population shown as a percent of the city population. Since there are 10 Districts, each would ideally have 10% of the population. Observing the difference between the desired 10.00% and the calculated percent for each District gives a quick measure of how far off each District currently is from the "perfect" Mean. For example, District 3, at 9.93%, is off by only .07%, low; District 4, at 10.89, is substantially off, by .89%, high.

Max and Min Change Values: Three columns appear under this category, one for each range of variability. In each column, the top one of the pair of numbers shown represents the maximum change that could be made in order to bring the District population within the desired range of variability, and the bottom number is the minimum change that needs to be made. Numbers

without parentheses are positives (to be added to the current population); those in parentheses are negatives (to be taken from the current population.) For example, under the +/- 2.5% scenario, for district 5, as many as 6,096 people could be added, but a minimum of 1,366 must be added. Any number in between also works to bring the total within the desired range.

All Ranges Midpoint: For each District, this value is the midpoint for ALL of the allowed ranges; it applies to each of the 3 of the range scenarios for the particular District. This is very important to note. Regardless of whether the acceptable final range is 1%, 5%, or 10% of the mean, this amount of change will set that district's population exactly to the Mean, 94,594. It makes sense therefore to at first attempt to make the changes work for the 1% scenario, based solely upon the Commission's main requirement, population near-equality, and only later compromise on looser ranges if other factors require it.

Contiguous Districts: A list of Districts that border on the District being considered. In the later analysis (see Table B) population shifts will be made from District to District, one District at a time. These shifts can be made only if the Districts share a border. The border between 6 and 10 is included, in parentheses, only for completeness. The shared border is quite small, and probably not practical as a line which can be moved to accomplish any significant population changes.

TABLE A: Districts Status as of March 8, 2011

City Population = 945,942

Target Average Size per District = 94,594 (= 10%)

	% +/- Variability Around the Mean		
	0.5	2.5	5
High End of Range:	95,067	96,959	99,324
Low End of Range:	94,121	92,229	89,864

District	Population	Current % of Total	Maximum and Minimum Change Values in Each Range			All Ranges Midpoint	Contiguous Districts
1	88,645	9.37	6,422	8,314	10,679	5,949	6
			5,476	3,584	1,219		
2	92,314	9.76	2,753	4,645	7,010	2,280	7, 8, 10
			1,807	(85)	(2,450)		
3	93,896	9.93	1,171	3,063	5,428	698	4, 5, 6, 7
			225	(1,667)	(4,032)		
4	102,976	10.89	(7,909)	(6,017)	(3,652)	(8,382)	3, 5
			(8,855)	(10,747)	(13,112)		
5	90,863	9.61	4,204	6,096	8,461	3,731	3, 4, 7, 8
			3,258	1,366	(999)		
6	100,236	10.60	(5,169)	(3,277)	(912)	(5,642)	1, 3, 7, 9, (10)
			(6,115)	(8,007)	(10,372)		
7	97,868	10.35	(2,801)	(909)	1,456	(3,274)	2, 3, 5, 6, 8, 10
			(3,747)	(5,639)	(8,004)		
8	101,108	10.69	(6,041)	(4,149)	(1,784)	(6,514)	2, 5, 7
			(6,987)	(8,879)	(11,244)		
9	88,853	9.39	6,214	8,106	10,471	5,741	6, 10
			5,268	3,376	1,011		
10	89,183	9.43	5,884	7,776	10,141	5,411	2, (6), 7, 9
			4,938	3,046	681		

Possible Re-allocation Methods and Results

If it has not done so already, presumably staff will at some point explain to the Commission what are the general workings of, and the parameters that need to be provided to, the software that generates the possible redistricting scenarios. The approach discussed here uses a very unsophisticated method, once again emphasizing that it is quite simple to get a "solution" to the redistricting "problem", well within the 1% range. Several examples, provided as Tables B-1, B-2, and B-3, support this claim. Each took an hour or less to create.

The Tables Explained

Each table is a PDF document derived from the completed Excel spreadsheet that the author used to shift populations between adjacent Districts within San Jose, setting the population for each District's population very close to the mean value that applies for all Districts. The City and District population numbers are those provided to the Commission by staff.

Stepping throught the document:

(The reader will also need Table A and the current District map)

City Population is San Jose's current population, 945,942. Since there are 10 Districts in the city, the average population (Mean) for each would be one tenth of that, 94,594, and each District would have 10 percent of the total population (10 x 10% = 100%). If just the population needed to be considered, this would be the "perfect" allocation.

Down the left side of the table is a column showing each of the Districts, by number, with an adjacent column showing the District's current population.

The next ten columns are topped by the District numbers again, making a 10 by 10 table. The intersections of the rows and columns, read along each row, show population shifts that could be made to get District populations within 1% variability. For example, for reasons explained in the example below, the first step in the reallocation process is to add 5900 people to District 1, which can only be taken from District 6. That addition shows at the intersection of the 1 row and the 6 column, as a positive number. The removal of 5900 people from District 6 is shown in the 6 row and the 1 column as a negative number, indicated by the parentheses. This pairing of entries occurs for every population shift; if one District gains, adjacent Districts must lose by the same amount, if a District loses, adjacent Districts must gain. (The author has tried to show these pairings by color coding them.) This worksheet has been completed; the original worksheet starts with no entries to this table.

The Net Change column shows how the District population changes, when the population movements in and out of the District are combined. The original worksheet, prior to any changes, would show all zeros in this column.

Dist. just shows the District Number again, for ease of reference.

Population After Change is the result for the District when the Net Change is added to the current population. For the original worksheet, prior to any changes having been made, this would be the current District population. This worksheet has been completed, and the District populations are very close to being equal.

Percent After Change shows Population After Change as a percent of the whole city population. Recall that the first level goal, keeping District populations equal, would result in each of the 10 districts having 10% of the total population. This completed worksheet shows that has been almost precisely achieved. (The original worksheet would show the current percentages for each District, the same values as appear in Table A.) Note that the measure of adherence to the 1%, 5%, or 10% range of variation can be easily seen in this number. For a 1% variation, this percentage would range from 9.95 to 10.05, for 5% from 9.75 to 10.25, and for 10% from 9.5 to 10.5. The results achieved here are within the 1% range of variation.

Difference to Reach Mean is the difference between the Population After Change and the desired Mean value. As each of the Districts is considered in the process of setting its population to the Mean value, this number indicates what the size of the change needs to be.

How Could the Tables be Used?

In a perfect world, where only population and "one man, one vote" needed to be considered, analysis would be complete with this Table. In the actual world, of course, political concerns such as ethnicity, neighborhood integrity, economic status, etc., come into the picture. Satisfying them will of course affect the perfect numbers shown here. But this first pass at least highlights the borders across which population shifts will need to occur, and gives some idea of the size of the population shifts that will need to take place.

Working With the Spreadsheet

Start with a copy of the spreadsheet, with the District changes area blank. Following are the rules for working with the spreadsheet:

1) When choosing which Districts to work with, start with the most constrained District(s). (Called DP in the following discussion) Referring to Table A, District 1 is the most constrained, since population can move between only it and District 6. Districts 4 and 9 are the next most constrained, since their populations can be moved to only two other districts. District 7 is least constrained, since its population can be moved to six other districts.

2) Rounded to the nearest hundred, change the population for the chosen DP by an amount that will bring its population as close as possible to the desired District Mean. This will always be the amount in the District's Difference to Reach Mean column. (Rounding is not strictly necessary; it is done to make mental calculation easier.)

3) Balance the DP population change by making corresponding changes to the Districts that border the DP. If the population for the DP is being reduced, add that total amount to the

adjacent Districts. If the population is being increased, take that total amount from the adjacent Districts. But see Rule 5.

4) When changes are being made to two or more adjacent Districts, make the changes, when possible, in such a way that the resulting populations in those Districts are set equal.

5) Once the necessary changes have been made, to the DP and to the adjacent Districts, mark the DP completed, and DO NOT make any further changes to it. Also, in Table A, review the Contigous Districts lists for Districts not yet completed. If the DP District number appears in any of these lists, strike it, as it is no longer available to have population moved into or out of it.

So, if these rules are precisely followed, how is it possible to have 3 different sets of results? The "slack" appears in the choice of DP. At any given step there may be two or more Districts that have the same degree of constraint. The choice of which to use first of course affects all the downstream choices. In this case, for Table B-1, the choice was made arbitrarily. For Table B-2, the District that was farthest North was chosen. For Table B-3, the Districts were listed in order, and the Disrict coming first in the list was selected.

An Example (for Those Interested)

The entire process by which Table B-1 was generated is described here. An interested person following along could regenerate the Table by working with the spreadsheet and doing exactly what is described here. Otherwise, steps 1 to 4 cover most of the basic concepts and operations, and the remaining steps need not be considered.

1) Choose the starting DP. This needs to be the most constrained District (Rule 1). This is **District 1**, contiguous to only one District, 6.

Its population must be made approximately equivalent to the Mean by adding 5949, which, rounded, is 5900. (Rule 2). The only District from which this population can be drawn is District 6. Therefore, add 5900 to the District 1 row in the column under District 6, and subtract 5900 in the District 6 row under District 1. (Rule 3) Rule 4 does not apply. Mark District 1 as having been done, and remove it from the list of contigous Districts for District 6. (Rule 5)

2) The next 2 most constrained Districts are 4 and 9, which each have 2 adjacent Districts. We'll arbitrarily choose to start with **District 4** as the current DP. This District currently has 8382 people more than it needs to match the mean. That amount, rounded to 8400, needs to be taken from District 4 and given to Districts 3 and 5, which are adjacent to it and have not been marked done. District 3 currently has about 3000 more population than District 5. So the first 3000 of the 8400 being moved goes to District 5 to bring it even with 3, with the rest (5400) being given equally to District 3 and 5. (Rule 4) So, District 5 gets 3000 + half of 5400 (2700), for a total of 5700. District 3 gets 2700. In the row for District 4, subtract 2700 in the column for District 3 and subtract 5700 in the column for District 5. In the row for District 3, add 2700 in the District 4 column. In the row for District 5, add 5700 in the District 4 column. Mark District 4 complete, and remove it from the contiguous District list for Districts 3 and 5.

3) **District 9** is the only remaining District constrained to 2 adjacent Districts, and is therefore the next DP. It currently has a shortage of about 5700 which must be taken from its adjacent Districts, 6 and 10. Because of the move of 6900 from 6 to 1 earlier (see 1 above), 6 now has a population of about 94,300. 10 has a population of about 89,200, about 5100 less. Consequently, 5100 needs to be taken first from 6 to bring it even with 10, and the remaining 600 needs to be taken equally from 6 and 10. So, 6 provides 5100 plus 300 = 5400, and 10 provides 300. In the row for District 9, add 5400 under District 6 and 300 under District 10. In rhe row for District 6, subtract 5400 under 9. In the row for District 10, subtract 300 under 9. Mark District 9 complete, and remove it from the contiguous District list for Districts 6 and 10

4) It might now be supposed that the next choice should be made between Districts 2, 8, and 10 for consideration as the next DP, as each of them has 3 listed contiguous Districts. BUT: Of the listed districts, 2, 7, 9 for District 10, 9 has been just been marked complete in 3 above. Therefore, District 10 is in fact constrained to just 2 Districts, 2 and 7. Further, District 6, which previously had 1, 3, 7, 9 available to it, lost 1 in step 1, and has just lost 9, so it also has only 2 Districts, 3 and 7, available to it, so the choice must first be made between 6 and 10. We arbitrarily choose to work with **District 10**. 5700 must be moved into 10. 7 has an excess of about 5500 over 2, and the remaining 200 needed can be taken equally from 2 and 7, so that 7 gives 5600 and 2 gives 100. 10 is now marked complete, etc.

5) Since 10 has now been marked complete, District 2, which originally was constrained to 3 Districts, 7, 8, 10, now has only 2 Districts available to it, and joins 6 as a DP candidate. We arbitrarily choose to work with **District 6**. 6 needs about 5700, taken from 3 and 7. 3 has an excess of about 4300 over 7. The remaining 1400 is taken evenly from 3 and 7, so 3 gives 5000 and 7 gives 700. 6 is marked complete, etc.

6) But now District 3, which previously had 4, 5, 6, 7 available to it, has only 5 and 7, making it a candidate for DP along with 2. We arbitrarily choose to work with **District 2**. 2 needs about 2400, which must come from 7 and 8. 8 has an excess of almost 10,000 over 7, so the entire 2400 comes from 8. 2 is marked complete, etc.

7) Now District 8 has only two Districts available, 5 and 7, and also becomes a candidate for DP along with 3. We arbitrarily choose to work with **District 3**. 3 needs about 3000, which must come from 5 and 7. 5 has about 5000 more than 7, so the entire 3000 comes from 5. 3 is marked complete, etc.

8) But this leaves 5 and 7 each with only two Districts available, and they become DP candidates along with 8. We arbitrarily choose to work with **District 5**. 5 needs about 1000, which must come from 7 and 8. 8 has 7000 more than 7, so the entire 1000 is taken from 8. 5 is marked complete, etc.

9) Only **Districts 7 and 8** are still incomplete. 7 has about 3000 too few, 8 has about 3100 too many. Split the difference, and move 3050 from 8 to 7. 7 and 8 are marked complete.

All Districts are complete, and redistricting has been accomplished within the 1% variability range, using only the population basis..

Table B-1: One Possible Re-allocation Based on Population Alone

City Population = 945,942

Target Average Size per District = 94,594 (= 10%)

		District														
District	Current Population	1	2	3	4	5	6	7	8	9	10	Net Change	Dist.	Population After Change	Percent After Change	Difference to Reach Mean
1	88,645						5,900					5,900	1	94,545	9.99	49
2	92,314								5,200		(2,900)	2,300	2	94,614	10.00	(20)
3	93,896				2,700	200	(2,200)					700	3	94,596	10.00	(2)
4	102,976			(2,700)		(5,700)						(8,400)	4	94,576	10.00	18
5	90,863			(200)	5,700			(1,800)				3,700	5	94,563	10.00	31
6	100,236	(5,900)		2,200				3,500		(5,450)		(5,650)	6	94,586	10.00	8
7	97,868					1,800	(3,500)		1,300		(2,800)	(3,200)	7	94,668	10.01	(74)
8	101,108		(5,200)					(1,300)				(6,500)	8	94,608	10.00	(14)
9	88,853						5,450				250	5,700	9	94,553	10.00	41
10	89,183		2,900					2,800		(250)		5,450	10	94,633	10.00	(39)
												0				

Table B-2: One Possible Re-allocation Based on Population Alone

City Population = 945,942

Target Average Size per District = 94,594 (= 10%)

		District														
District	Current Population	1	2	3	4	5	6	7	8	9	10	Net Change	Dist.	Population After Change	Percent After Change	Difference to Reach Mean
1	88,645						5,900					5,900	1	94,545	9.99	49
2	92,314							(4,200)	6,500			2,300	2	94,614	10.00	(20)
3	93,896				8,400		(6,000)	(1,700)				700	3	94,596	10.00	(2)
4	102,976			(8,400)								(8,400)	4	94,576	10.00	18
5	90,863							3,700				3,700	5	94,563	10.00	31
6	100,236	(5,900)		6,000						(5,700)		(5,600)	6	94,636	10.00	(42)
7	97,868		4,200	1,700		(3,700)					(5,400)	(3,200)	7	94,668	10.01	(74)
8	101,108		(6,500)									(6,500)	8	94,608	10.00	(14)
9	88,853						5,700					5,700	9	94,553	10.00	41
10	89,183							5,400				5,400	10	94,583	10.00	11
												0				

Table B-3: One Possible Re-allocation Based on Population Alone

City Population = 945,942

Target Average Size per District = 94,594 (= 10%)

		District														
District	Current Population	1	2	3	4	5	6	7	8	9	10	Net Change	Dist.	Population After Change	Percent After Change	Difference to Reach Mean
1	88,645						5,900					5,900	1	94,545	9.99	49
2	92,314								2,300		(50)	2,250	2	94,564	10.00	30
3	93,896				2,700	1,000	(3,000)					700	3	94,596	10.00	(2)
4	102,976			(2,700)		(5,700)						(8,400)	4	94,576	10.00	18
5	90,863			(1,000)	5,700			(1,000)				3,700	5	94,563	10.00	31
6	100,236	(5,900)		3,000				2,750		(5,400)		(5,550)	6	94,686	10.01	(92)
7	97,868					1,000	(2,750)		4,200		(5,650)	(3,200)	7	94,668	10.01	(74)
8	101,108		(2,300)					(4,200)				(6,500)	8	94,608	10.00	(14)
9	88,853						5,400				300	5,700	9	94,553	10.00	41
10	89,183		50					5,650		(300)		5,400	10	94,583	10.00	11
												0				