STATE OF MINNESOTA DISTRICT COURT

COUNTY OF HENNEPIN FOURTH JUDICIAL COURT

Minnesota Voters Alliance, et. al., Court File No. 27-CV-08-35.

Plaintiffs,

v.

The City of Minneapolis, et. al., **Affidavit of Kathy Dopp, MS. Mathematics**

Defendants,

and

FairVote Minnesota, Inc.,

Intervenor-Defendant.

Introduction

I, Kathy Dopp, after reviewing the statements contained within this affidavit, before a Notary Public, do affirm as true:

1. I am currently the Executive Director of the National Election Data Archive, a group of volunteer statisticians and mathematicians interested in the integrity and accuracy of U.S. election results. I am the author of a paper *Realities Mar Instant Runoff Voting - 18 Flaws and 4 Benefits* June 10, 2008, updated August 7, 2008. I have co-authored dozens of papers on the topic of voting systems, exit poll and election data analysis, and developing and describing methods for auditing the accuracy of election outcomes. My master's of science degree is in mathematics with emphasis in computer science, and I have written dozens of papers on the topic of voting systems with Ph.D. computer scientists affiliated with various universities.

2. A copy of my curriculum vitae and a list of some of my co-authors are attached as Exhibits A and B.

3. This affidavit addresses:

The claim that "STV promotes the election of public officials with popular mandates" is incorrect.

The claim that "STV eliminates the role of "spoiler" candidates" is incorrect.

The claim that "STV simplifies the election process and saves money" is incorrect.

The Minneapolis Ranked Choice Voting (RCV) method has key mathematical weaknesses.

"STV" and "RCV" are used interchangeably in this document to refer to the "ranked choice voting" or the "single transferable voting" method that was adopted by The Minneapolis City Council in its Chapter 167 amendment to Title 8.5.

The Claim that "STV Promotes the Election of Public Officials with Popular Mandates" is Incorrect and Misleading.

5. The Single Transferable Vote (STV) winner *in a final round* often receives *less than a majority of votes cast in the election contest* because many voters' ballots are not considered during the final counting round. The definition of "majority" is 50% of the votes cast in an election contest plus one (1) vote.

6. **Example 1:** Let us examine a situation where there 100 cast ballots for three candidates in an election contest. A majority of 100 voters is 51 voters. Voters do not have to rank all three candidates to have a legal ballot. This example is from http://www.answers.com/topic/irv

#voters	ballot ranking
42	C > B
39	A > B
10	B > A
4	B
5	B > C

	candidates				
round	A	B	C		voters' ballots left
1	39	19	42	B eliminated	4 voters eliminated
2	49	x	47		A wins with 49% of votes

7. In practice, it is common for the RCV method to fail to find a majority winner. In *all six* cases in San Francisco 2006 and 2004 RCV elections whenever there was not an immediate first-round majority winner, the final RCV winner received less than a majority of votes cast in the election contest.[1] The winner of the Cary, North Carolina RCV/IRV election contest won with 42% (1401 out of 3022) of the votes cast for three candidates and a few write-in candidates. See Exhibit F.

8. Unlike in primary elections followed by general elections, the Minneapolis RCV method only considers some voters' ballots that still have continuing candidates on them in the final IRV round. Normal primary and general elections are therefore more likely to elect public officials with popular mandates than the Minneapolis RCV method.

9. Example 1 also reflects that candidate C in the first round is the "popular mandate" winner with 42% plurality of the 1st choice votes. The result also weighs the second choices of some voters equal to the first choices of other voters, and greater than the second choices of other voters. If the second choices of all voters were weighed equally, then candidate B would be the overall winner because candidate A has only 49 1st and 2nd choice votes, but candidate B has 100 1st and 2nd choice votes. Candidate B is also the pair wise winner, the candidate preferred over the other two candidates by

[1] See *IRV Exhaustion* by Warren Smith http://www.rangevoting.org/IrvExhaustionSF.html

more voters than any other candidate. In other words, RCV achieves its overall winner, candidate A, by differential treatment of voters' ranked choices.

STV Does Not Eliminate the Role of "Spoiler" Candidates" As Claimed.

10. A "spoiler" candidate is a non-winning candidate whose presence or absence in an election contest changes the outcome (who wins) the contest. FairVote uses a narrower definition of "spoiler" candidate - "a candidate with little chance of winning a plurality on their own whose presence on the ballot sometimes leads to the election of candidates who are most opposed to their positions."

11. STV does *not* eliminate the phenomenon of "spoiler" candidates.

12. **Example 2:** Let us examine a situation where there are 100 voters, 40% who prefer candidate A over candidate C, and 60% who prefer candidate C over candidate A, so candidate C would be the winner.

#voters	ballot ranking
40	A > C
60	C > A

	candidates		
round #	A	C	Result
1	40	60	C Wins

13. Now, with the same number of voters and voters' rankings, introduce another candidate B who can not win. The introduction of candidate B causes candidate C to be eliminated in the first round and now candidate A is the declared winner, despite the fact that candidate C is preferred over A by 60 out of 100 voters.

#voters	ballot ranking
40	A > B > C
35	B > C > A
25	C > A > B

	candidates			
round	A	B	C	Result
1	40	35	25	C is eliminated
2	65	35		A Wins

14. The introduction of non-winning candidate B changes who wins the STV election and candidate B is therefore a "spoiler" candidate.

STV Does Not Simplify The Election Process And Does Not Save Money.

15. In fact, the Minneapolis STV method increases the complexity and administrative burdens for the election process to the point where ensuring the accuracy and integrity of election outcomes becomes unreasonably difficult and costly – as shown below.

The STV Method Requires Centralized Vote Counting and is Not Additive

16. The Minneapolis STV method is "non-additive" in the sense that the sums calculated for each precinct or each batch vote count of the number of 1st, 2nd, and 3rd choice votes for each candidate can *not* be used to correctly tally the overall results. The accuracy of any counting round depends on the accuracy of the entire count for all ballots cast in the election contest in the prior counting round. In each counting round, the choices on each individual ballot must be examined to determine how to reallocate, if possible, the votes cast for any eliminated or non-continuing candidate.

17. The City Council of The City of Minneapolis ordinance "Amending Title 8.5 of the Minneapolis Code of Ordinances relating to Elections by adding a new Chapter 167 relating to the Municipal Elections; Rules of Conduct", establishes a "Ranked-Choice Voting Tabulation Center" and requires that "election judges must then securely transfer all electronic voting data and ballots from the precinct to the ranked-choice voting tabulation center…". Even though the ordinance requires that "the election judges shall record and publicly declare the number of votes at each ranking on the ballot" at each precinct, these 2nd, 3rd, 4th, choices cast for each candidate in each precinct are *not* used to tally the overall election results. See Exhibit C.

The Minneapolis STV method requires delaying the time when initial counting of ballots can begin, thus delaying the public release of election results.

18. No accurate count of an STV election contest can be performed until all the absentee, provisional, overseas and military ballots have been verified eligible by election officials and are available for counting. If the results of the first or subsequent rounds of a Minneapolis STV election changes due to the later addition of absentee, provisional, overseas, or military ballots - then all subsequent rounds need to be recounted from the beginning to examine the ballot choices from all redistributed absentee, provisional, overseas, and military ballot votes. In other words, the precinct or batch vote counts are *non- additive* in the Minneapolis method RCV election. See Exhibit C.

19. Accurate counting for any Minneapolis RCV election can not begin until after the eligibility for all absentee, provisional, overseas and military ballot voters has been determined – a process that could take days or weeks. Due to Minneapolis RCV method's non-additive nature, the start of counting a Minneapolis RCV election must be delayed until all the ballots cast in the entire election contest are available for counting.

The Minneapolis STV Method Increases the Complexity and Difficulty of Counting Votes and Increases the Likelihood of Errors

20. None of the members of the "Ranked Choice Voting Issues Group" of the Technical Advisory Committee (TAC) whose mission was to "propose standards which can be applied statewide in Minnesota" for STV elections and whose discussion "focused on the … voting equipment system" seem to have expertise or education in computer science or computerized voting systems design. The TAC's January 31, 2008 report focused on desired functionality issues, ignoring issues like computer voting system reliability,[2] security, accountability, auditability, and accuracy. .

21. The complexities of counting votes using the Minneapolis RCV method does not reflect the need to assure voters of the accuracy, viability, and reliability of the final tabulations and election challenges. The City Council's Ordinance, Chapter 167[3] does not address:

    - the need to track the changing values of each ballot during counting rounds in the RCV multi-seat method (See Exhibit G),

[2] See the publicly posted "RANKED CHOICE VOTING ISSUES GROUP TECHNICAL ADVISORY COMMITTEE REPORT" here: http://www.ci.minneapolis.mn.us/council/2008-meetings/20080229/Docs/RCV_TechnicalAdvCommittee_RPT.pdf

[3] The Minneapolis City Council's Ordinance is posted here: http://www.ci.minneapolis.mn.us/council/2008-meetings/20080418/docs/AMENDED_REV_Ordinance.pdf

- the need to separately reallocate each non-continuing candidate's votes by individually examining the choices on each reallocated ballot during each counting round,
- the large number of separate piles and sub-piles of ballots that have to be meticulously kept track of whenever manually counting using the Minneapolis RCV method,
- the need to manually handle most ballots dozens of times to separately count all the contests on the ballot, and
- the need to recalculate the winning threshold in every round to compensate for a lesser number of votes available for continuing candidates due to both exhausted ballots and to winning candidates in multi-winner contests having been removed.

22. All of the RCV election examples in this affidavit and the examples provided by proponents of the Minneapolis RCV method are overly simplified. For instance, when there are only 3 candidates in an election contest, there are $\sum_{i=0}^{2} \frac{3!}{(i)!} = 15$ possible unique rank choice ballots that voters may cast, as shown below for candidates A, B, and C:

	15 Possible voter ranked choice ballots for 3 candidates A,B,C		
	1st choice	2nd choice	3rd choice
1	A		
2	A	B	
3	A	C	
4	A	B	C
5	A	C	B
6	B		
7	B	A	
8	B	C	
9	B	A	C
10	B	C	A
11	C		
12	C	A	
13	C	B	
14	C	A	B
15	C	B	A

23. The mathematical formula $\sum_{i=0}^{R-1} \frac{N!}{(i+N-R)!}$ gives the number of possible ranked choice ballots that voters might create, where N = the number of candidates and R= the maximum number of candidates that voters are allowed to rank on a ballot. If there are four (4) candidates and voters may rank up to three (3) candidates on a ballot, then there are $\sum_{i=0}^{3-1} \frac{4!}{(i+4-3)!} = 40$ possible ranked choice ballots that voters may cast. If there are eight (8) candidates in an election contest, then the number of possible ranked choice ballots that voters may cast in Minneapolis would be $\sum_{i=0}^{3-1} \frac{8!}{(i+8-3)!} = 450$.

24. During the Minneapolis 2005 primary election, there were 12 candidates for Mayor – one seat election (See Exhibit H at p. 1); for the multi-seat Library Board there were 16 candidates (See Exhibit H at p.27); for the multi-seat at-large Park and Recreation Commission there were 8 candidates (See Exhibit H at p.21).

25. Under STV replacing primary elections, the number of candidates normally in the primary election would appear on the general election ballot. The subsequent STV calculations for the number of unique rank choice orderings on voters' ballots would be 1,464 for the Mayoral contest, 3,616 for the Library Board and 450 for the Park and Recreation Commission! In order for the public to be able to check the accuracy and integrity of the vote counts by reviewing publicly posted precinct totals, for each precinct, either *all* of the voters' individual ballot choices would have to be publicly published, or the 1,464 possible sub-totals for each precinct for the Mayor's race, and the 3,616 sub-totals for each precinct for the Library Board and the 450 sub-totals for *each* precinct for the Park and Recreation Commission would have to be publicly published. (See Exhibit C.)

26. Using these precinct sub-totals or alternatively the entire list of all individual ballot choices of all voters would be the only way for the public to double-check the accuracy of the election results due to the non-additive nature of the Minneapolis RCV method. (See Exhibit C.)

27. In order for the public to be able to verify electoral accuracy in any election and prevent manipulation of the votes after polls close, precinct totals *that add up to the final result* must be published publicly, Yet the Minneapolis City Council ordinance and the report of the "Ranked Choice Voting Issues Group" Technical Advisory Committee do not require or even recommend the publication of any additive precinct sub-totals that the public could use to check the integrity of RCV election results!

28. Even if provided the opportunity to check the integrity of the election results using the huge number of these precinct sub-totals, how many citizens would have the time or the expertise to be able to do so? The Minneapolis RCV method thus eviscerates transparency and oversight over the integrity of the electoral process for the average citizen.

29. When manually counting using the Minneapolis RCV method, the number of piles and sub-piles of ballots that would have to be meticulously kept track of in order to perform an accurate count could be huge. In fact, the January 31, 2008 "RANKED CHOICE VOTING ISSUES GROUP TECHNICAL ADVISORY COMMITTEE REPORT" whose mission was to "propose standards which can be applied statewide in Minnesota"[4] stated that:

> "voting equipment systems remain the primary obstacle to implementation, especially *in large jurisdictions where a hand-count is not feasible*."

30. If, according to the technical advisory committee, a "*hand-count is not feasible*", then how is the accuracy of the humanly programmed voting machine counts going to be checked?

31. According to the Technical Advisory Committee and the Voting Technology Council, it takes "54 months" for "new product development and implementation" that is needed to provide certified voting equipment that is capable of counting Minneapolis RCV method election contests.[5]

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[4] See the publicly posted "RANKED CHOICE VOTING ISSUES GROUP TECHNICAL ADVISORY COMMITTEE REPORT" here: http://www.ci.minneapolis.mn.us/council/2008-meetings/20080229/Docs/RCV_TechnicalAdvCommittee_RPT.pdf

[5] Ibid footnote #2.

The Minneapolis STV method Increases the Difficulty and Costs for Auditing the Accuracy of Voting Machine-Counted Election Results

32. Auditing in any field requires committing the data prior to beginning the audit. No matter what voting method is used, the first step required to check the accuracy of machine-counted election results is to publicly publish all separate auditable vote counts that tally to the overall reported election results. After these unofficial auditable vote counts are publicly posted, then some of them can be randomly selected for manual counting in order to check the accuracy of the machine tallies. Not publicly committing the vote count data prior to auditing would be an open invitation to fraudulently manipulate the unpublished vote counts after the audit in order to match erroneous election results.

33. Because RCV elections are non-additive and the correctness of the overall results depends on the accuracy of the centrally counted totals and subtotals of all ballots, there are only three methods available for doing valid independent post election audits of IRV/STV elections:

    1. A 100% manual hand count; or
    2. Publicly publishing 100% of voters' ranked ballot choices prior to the manual audit and then randomly selecting individual ballots to verify the ballot choices were correctly recorded. This method requires that all voters' individual ranked ballot choices for each precinct have printed on them a humanly identifiable mark so that individual ballots could be randomly selected and the accuracy of the tallying could be verified. This would raise other concerns with ballot privacy and cost and would be virtually impossible for the average voter to check the tabulations without the help of a trusted programmer; or
    3. The tallies for all possible unique voter ranked choices for each auditable vote count (a number of tallies that may be greater than the number of voters in each precinct) could be publicly published prior to randomly selecting auditable vote counts to manually audit, and then those auditable counts manually checked. Because this is a huge number of tallies to publicly report, this method may be impractical and too confusing for auditors and election officials. If there were ten (10) candidates and voters were allowed to rank three (3) candidates, then 800 vote totals would have to be publicly reported for *each* precinct to use this method.

34. In other words, any manual post-election audit to check the accuracy of an IRV result would require a resorting and restacking and recounting *all* the ballots for the entire election contest, or either publicly posting all voters' ballots choices for the entire election contest state-wide, along with a humanly-readable identifier marked on each ballot, or alternatively publicly reporting all of the $\sum_{i=0}^{R-1} \frac{N!}{(i+N-R)!}$ (where N = number of candidates and R= maximum number of candidates voters are allowed to rank on a ballot) tallies for each auditable vote count that could be used to tally the votes. Checking the accuracy of Minneapolis RCV machine-counts would be significantly more difficult than checking the accuracy of election results counted by other methods.

35. Of the three possible methods of manually auditing Minneapolis RCV elections, the only practical method that is transparent and simple enough for the public to verify would be to conduct a full manual 100% hand recount of all Minneapolis RCV elections. Needless to say, this will be

administratively burdensome and costly for the City of Minneapolis and, according to the Technical Advisory Committee's report is "not feasible".

36. Virtually all other election methods are additive and so can be audited with high confidence in the accuracy of machine-counted election outcomes by making random selections of a proportion of the auditable vote counts that sum to the final totals reported for each candidate.

The Minneapolis STV method Increases the Costs for Ballots, Voting Equipment, and Election Administration

37. In addition to the current requirements for administering, the Minneapolis STV method will require:
    - Costly new voting equipment,
    - More expensive longer ballots,
    - More voter, poll worker, and auditor training and education,
    - More costly and time-consuming ballot counting and post-election auditing methods.

38. Due to the increase in complexity and time required for all administrative tasks related to ballot programming, ballot design, vote casting, vote counting, and auditing – not only costs, but the likelihood of undetected error that could disenfranchise voters or cause errors in the vote counts is greatly increased.

The Minneapolis STV method increases voter disenfranchisement by confusing voters, thus increasing rates of uncounted votes due to over-votes.

39. Voters are confused by STV ballots, disenfranchising voters from participating who do not properly fill out their ballots.

40. **Example 3: Cary, NC**

41. Oct 17, 2007, USA TODAY, *To stem runoff votes, new ballots have voters rank top 3*

> Winning candidate Frantz said he heard from many confused voters on the campaign trail. "I found myself, when I was at some places, that's all I was doing … explaining the new voting system," he said. http://www.usatoday.com/news/politics/2007-10-17-Runoff_N.htm

42. Oct 19, 2007, Times-News, *Voter finds new system frustrating*

> Hendersonville: Bill Modlin wasn't happy with his first experience with the new "instant runoff" voting when he cast his ballot for Hendersonville City Council on Thursday. ..."It doesn't make any sense to me, and I can guarantee you because of the way they have it set up there are people in this town that are going to lose their vote," he said. ..."I call it instant confusion," he said. http://www.blueridgenow.com/article/20071019/NEWS/710190361

43. Jan 17, 2008, News & Observer, *Instant-runoff voting mulled*

> Maxwell was among those who spoke at Thursday's public hearing. She said instant-runoff voting made campaigning difficult because she had to spend time explaining the system to voters and asking non-supporters to choose her as the second-best candidate. "It's kind of hard to sell yourself second," she said. Other opponents of the voting process said it was complicated. They complained that the results had to be counted by hand because software currently does not exist

for scanning the runoff ballots.
http://www.ncvoter.net/downloads/IRV_Jan_18_08_Instant_Runoff_Mulled_NewsObserver.pdf

44. Jan 21, 2008, Eugene Weeks, Chairman of the Wake County Voter Education Coalition, *Public Comments to the Wake County, North Carolina Board of Elections*

> "The ballot that is being used now is already confusing to some voters, yet you want to antagonize and confuse the voters more by asking them to not only vote for one candidate, but indicate a second and third choice before leaving the voting booth. Where is the voter's rights in this process? ... IN OLD PLAIN ENGLISH-KEEP THE VOTING SIMPLE-NOT CONFUSING." See Exhibit D for the full text of Week's comments.

45. **Example 4: San Francisco, CA** Ranked choice voting was not understood by voters and poll workers in its November 2007 election, as reported by the San Francisco Grand Jury report issued July 3, 2008.[6] Some voters told the Grand Jury that they did not understand how to vote for candidates. Analysis of over-vote rates where voters incorrectly filled out ballots so that their votes were not counted found a 0.082% overvote rate in plurality contests compared to a 0.60% overvote rate in the IRV election contests, a difference that is statistically significant.[7]

The Minneapolis Ranked Choice Voting (RCV) Method Has Key Mathematical Weaknesses

46. Key mathematical weaknesses of the Minneapolis STV/RCV method include giving some voters' rankings more numeric weight and more consideration than other voters', and voters not knowing how to rank their favorite candidate in order to help their favorite candidate win.

The Minneapolis STV method gives some voters more numeric votes and more consideration in deciding the election outcome than it does other voters.

47. The STV method gives some voters' votes more weight, consideration, and numeric value than other voters' votes. Exhibit G demonstrates that in a multi-seat Minneapolis STV election the values of voters' ballots could vary from a number slightly over ½ to values greater then 1.

48. Some voters have *all* their ballot choices considered, other voters do not. Some voters participate in all rounds, others do not.

[6] *The 2007-2008 Civil Grand Jury For The City and County of San Francisco - A Year of Five Elections For the City/County of San Francisco*, July 3, 2008 http://www.sfgov.org/site/uploadedfiles/courts/divisions/Civil_Grand_Jury/year-of-five-elections-for-sf.pdf

[7] Data and analysis available at http://rangevoting.org/SPRates.html More information available here: http://rangevoting.org/Irvtalk.html#nospoilageincrease . There is also a study that goes into more detail at http://www.gregdennis.com/voting/sf_irv.pdf

49. **Example 5:** In Example #1 above, only 15 out of 100 voters (15%) have both their first and second choices considered and that 4 out of 100 voters' ballots (4%) are not considered in the final counting round.

	#Voters
1st ballot choice considered	100
1st & 2nd ballot choices considered	15

	#Voters
Participate in all Counting Rounds	96
Do Not Participate in all Counting Rounds	4

50. Unlike in normal primary and general elections in Minneapolis STV elections some voters' candidates would be eliminated and their ballots are not considered during the final round(s) of counting, prohibiting these voters from participating in final choices. Example #1 above demonstrates how some voters' ballots are exhausted before the final counting round.

STV voters can sometimes give their favorite candidate a *better chance to win by voting for another candidate and ranking their favorite candidate last or not at all*!

51. A key mathematical weakness of the Minneapolis RCV method is that it does not pass the monotonic test." In mathematics, a monotonic function f(x) is one that preserves order. (A function is monotonically increasing or non-decreasing, if whenever $x \leq y$ then $f(x) \leq f(y)$.)

52. A method of counting votes is monotonically increasing if whenever a candidate receives more votes from more voters, the candidate's chances of winning increases. The Minneapolis RCV method for counting votes is non-monotonic because when voters increase their votes for their favorite candidate, it may cause their favorite candidate to lose, whereas if these same voters vote for a different candidate or rank their favorite candidate last, their favorite candidate may win!

53. **Example 6:** Consider the following example of the non-monotonicity in a single seat IRV election, where six voters have cast their votes for candidates A, B, and C,

#voters	Votes 1st/2nd/3rd
6	B>A>C
5	C>B>A
4	A>C>B

	candidates			
round	A	B	C	
1	4	6	5	A eliminated - votes transfer to C
2	X	6	9	C Wins

54. Candidate C wins this contest because candidate A is eliminated in round one, giving 4 more votes to candidate C, resulting in 6 votes for B and 9 votes for C in round 2.

55. If two additional new voters whose real preferences are B > A > C vote their real preferences,

#voters	Votes 1st/2nd/3rd
8	B>A>C
5	C>B>A
4	A>C>B

	candidates			
round	A	B	C	
1	4	8	5	A eliminated - votes transfer to C
2	X	8	9	C Wins

56. Then the two voters' least favorite candidate C wins with 8 votes for B, and 9 votes for C.

57. However, if these same two voters vote A>C>B (rank their second favorite candidate A first and their favorite candidate last *or not at all*) *then their favorite candidate B wins*!

#voters	Votes $1^{st}/2^{nd}/3^{rd}$
6	B>A>C
5	C>B>A
6	A>C>B

	candidates			
round	A	B	C	
1	6	6	5	C eliminated - votes transfer to B
2	6	11	X	B Wins

58. This time C, the two voters' least favorite candidate loses the first round and their favorite candidate B wins!

59. In other words, if these two voters want their first choice candidate B to win, they must *not* rank B as their first choice and must rank candidate B as their *last choice or not at all* instead!

60. **Example 7:** Consider the following example of RCV's non-monotonicity in a multi-seat election contest where 24,998 voters have cast their votes for candidates AA, A, B, and C.

#voters	ballot ranking
4500	AA > C
4500	AA > B
7997	A > B
4000	B > C
2000	C > A
2001	C > B
24998	

2 Seat Election		candidates				
round	threshold	AA	A	B	C	
1	8334	9000	7997	4000	4001	AA wins a seat
distribute winner's excess votes		-666		333	333	
eliminate lowest scorer		8334	7977	4333	4334	
distribute loser's votes		W		-4333	4000	333 ballots exhausted
2	5438		7977	0	8334	C wins a seat

61. Then two additional voters whose favorite candidate is candidate A come to the polls to vote,

#voters	ballot ranking
4500	AA > C
4500	AA > B
7997	A > B
4000	B > C
2000	C > A
2001	C > B
2	A
25000	

2 Seat Election		candidates				
round	threshold	AA	A	B	C	
1	8334	9000	7999	4000	4001	AA wins 1st seat
distribute winner's excess votes	0	-666		333	333	
eliminate lowest scorer B	25000	8334	7999	4333	4334	
distribute loser's votes		W		-4000	4000	333 ballots exhausted
2	5445		7999	0	8334	C wins 2nd seat

but the two voters' favorite candidate loses, and candidate C wins the 2^{nd} seat instead.

Kathy Dopp 435-658-4657 kathy@electionarchive.org

62. However, *if the same two voters vote for candidate B instead, then their favorite candidate A wins*!

#voters	ballot ranking
4500	AA > C
4500	AA > B
7997	A > B
4000	B > C
2000	C > A
2001	C > B
2	B
25000	

2 Seat Election		candidates				
round	**threshold**	**AA**	**A**	**B**	**C**	
1	8334	9000	7997	4002	4001	AA wins 1st seat
distribute winner's excess votes		-666		333	333	
eliminate lowest scorer C		8334	7997	4335	4334	
distribute loser's votes		W	2000	2001	-4001	333 ballots exhausted
2	5445		9997	6336	0	**A wins 2nd seat**

63. The Minneapolis RCV method is non-monotonic because *increasing* a vote for a candidate may cause that candidate to *lose*, whereas *decreasing* a vote for the same candidate may cause that candidate to *win*!

64. In other words, with the Minneapolis RCV method, a *voter can not know how to cast a vote in a way that will help a favorite candidate* because increasing a ranking for a candidate X, may cause candidate X to *lose.*[i]

Dated: September 29, 2008

_____
Kathy Dopp

Sworn and signed before me
this 29th day of September 2008
in the County of Summit
State of Utah

_____
Notary Public

[seal]

EXHIBIT A: Kathy Dopp Resume

Kathy Dopp

P.O. Box 680192
Park City, UT 84068
Phone: 435-658-4657
kathy@electionarchive.org

Professional Profile

***National Election Data Archive (NEDA)*, Founder and Executive Director**, November 2004 - present
This nonprofit, nonpartisan research and public service organization – comprises primarily statisticians and mathematicians who are dedicated to developing scientifically sound methodologies to ensure that the announced winners of elections are actually the candidates whom the voters selected.
http://electionarchive.org (501(c)(3)).

Professional Activities to 2005

Authored collaborative scientific papers on

- election auditing mathematics and methods
- voting and election system selection with nationally recognized computer scientists
- exit poll discrepancies in the 2004 presidential election with renowned statisticians

Authored papers for election officials regarding methods to ensure the accuracy of vote counts via

- post-election independent audits
- detailed election data analysis.

Collected and analyzed election data and edited scientific papers on election results patterns in the 2004 presidential race in Florida and New Mexico.

Designed with computer professionals' collaboration systems for collecting, normalizing and analyzing nationwide detailed election results data.

Attended NASED 2005 Summer Conference and NASS 2005 Summer Conference.

US Count Votes, DBA National Election Data Archive, Accomplishments in 2006

http://electionarchive.org/ucvInfo/US/2006-USCV-ExemptPurposes.pdf
The above section is not updated yet for 2007 and 2008.

Some Vote Count Auditing Papers through 2008

Mandatory Vote Count Audit - A Legislative & Administrative Proposal
http://electionarchive.org/ucvAnalysis/US/paper-audits/legislative/VoteCountAuditBillRequest.pdf

Derivation of the formula for the number of selection rounds for the Probability Proportional to Margin Error Bound (PPMEB) method for determining samples for Vote Count Audits (2/28/2008)
http://electionarchive.org/ucvAnalysis/US/paper-audits/PPMEB-Auditing.pdf

Mandatory Post-Election Vote Count Audits -- Probability Proportional to Error Bound (PPEB) Method (February, 2008)

http://utahcountvotes.org/legislature/VoteCountAudits-PPMEB.pdf

History of Confidence Election Auditing Development (1975 to 2007) & Overview of Election Auditing Fundamentals, (October, 2007 updated last on 9/08)
http://electionarchive.org/ucvAnalysis/US/paper-audits/History-of-Election-Auditing-Development.pdf

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http://electionarchive.org/ucvAnalysis/US/paper-audits/Critique-McCarthy-NJ-Audits.pdf

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http://electionarchive.org/ucvAnalysis/US/paper-audits/ComparisonFederalElectionAuditProposals.pdf

First US Scientific Election Audit Reveals Voting System Flaws But Questions Remain Unanswered – Critique of the Collaborative Public Audit of Cuyahoga County Ohio's November 2006 Election (May 7, 2007) http://electionarchive.org/ucvAnalysis/OH/CuyahogaElectionAudit.pdf

Federal Election Audit Costs, (March 21 2007)
http://electionarchive.org/ucvAnalysis/US/paper-audits/FederalAuditCosts.pdf

Fool Me Once: Checking Vote Count Integrity, (March 3, 2007)
http://electionarchive.org/ucvAnalysis/US/paper-audits/TierElectionAuditEval.pdf

Dopp et Al., *One-Page Concept Proposal for Election Reform Legislation,* (March 2007)
http://electionarchive.org/ucvInfo/US/EI-FedLegProposal-v2.pdf

Dopp and Frank Stenger, *The Election Integrity Audit* (version as of September 25, 2006)
http://electionarchive.org/ucvAnalysis/US/paper-audits/ElectionIntegrityAudit.pdf

Dopp and Joycelynn Straight et Al., *Legislative Vote Count Audit Proposal* – Written for Utah, (May 2006, updated in November 2006, November 2007, January-February 2008)
http://electionarchive.org/ucvAnalysis/US/paper-audits/VoteCountAudit-UT.pdf

Dopp & Ron Baiman, *How Can Independent Paper Audits Detect and Correct Vote Miscounts?* (June 30, 2005, updated July 25, 2006)
http://electionarchive.org/ucvAnalysis/US/paper-audits/Paper_Audits.pdf

Some Voting & Elections Issues Papers through 2008

Realities Mar Instant Runoff Voting - 18 Flaws and 3 Benefits
(June 2008, last updated August 2008)
http://electionarchive.org/ucvAnalysis/US/RCV-IRV/InstantRunoffVotingFlaws.pdf

Were the Super Tuesday Presidential Primary Vote Counts Accurate? (February 2008)
http://electionarchive.org/ucvAnalysis/US/exit-polls/SuperTuesday2008/SuperTuesday2008DemPrimary.pdf

Dopp, Beth Clarkson, and Ron Baiman, *New Hampshire Democratic Primary Election Results - Hand Count versus Machine Counts* (January 2008)
http://electionarchive.org/ucvData/NH/DemPrimary2008-PairedPrecinctStudy.pdf

The Utah Voter Magazine, Volume 76: Winter 2008, Issue 3, *"Ten Precepts of Election Administration"*[8](January 2008) http://www.lwvutah.org/VOTERS/Winter%20Voter%2008.pdf

2004 Presidential Election – Compendium of Attempts to Dismiss "Vote Fraud" (July 2006)

[8] There is one factual error in this article that I tried to have corrected. It is only 7 states, not 20 states, which have implemented Election Day voter registration.

http://electionarchive.org/ucvAnalysis/US/IncorrectElectionDataAnalysis-06.pdf

The 2004 Presidential Election: Exit Poll Error or Vote Miscount? (September 2005)
http://electionarchive.org/ucvAnalysis/US/exit-polls/USCV_exit_poll_analysis.pdf

How Can We Ensure Accurate Election Results via Independent Audits & Election Data Monitoring? (August, 2005) http://electionarchive.org/ucvAnalysis/US/election_officials/Audits_Monitoring.pdf

What Election Data Can Election Offices Collect and Publicly Release in Order to Monitor Elections for Accuracy? (July 2005)
http://electionarchive.org/ucvAnalysis/US/election_officials/ElectionArchive_advice.pdf

Analysis of the 2004 Presidential Election Exit Poll Discrepancies (March 2005)
http://electionarchive.org/ucvAnalysis/US/Exit_Polls_2004_Mitofsky-Edison.pdf

Study of the 2004 Presidential Election Exit Poll Discrepancies (January 2005)
http://uscountvotes.org/ucvAnalysis/US/USCountVotes_Re_Mitofsky-Edison.pdf

Summary: Utah Voting Equipment Selection Advice (October 20, 2004)
http://utahcountvotes.org/voting_system_advice.pdf

Response to "American Attitudes about Electronic Voting" Survey (September 24, 2004)
http://utahcountvotes.org/Voting_systems.pdf

Concept for Proposal: Utah Voting & Elections System (UVES) (August, 2004)
http://utahcountvotes.org/UVES_concept.pdf

Response to Request for Proposal (July 19, 2004) http://utahcountvotes.org/response.pdf

Professional Presentations on Elections & Voting Issues

Houston Election Assistance Commission - Panelist
Oakland Teach-in - Instructor
Nashville Election Reform Conference - Presenter
Pittsburgh, Pennsylvania - Featured Speaker
Cold Springs, New York - Featured Speaker
Woodstock, New York - Featured Speaker
Colorado Springs, CO - Featured Speaker
Boulder, CO - Featured Speaker

Education

M.S. in Mathematics with distinction, U. of Utah 1989 – Elected to Pi Mu Epsilon in recognition of superior achievement in the field. B.S., *cum laude* in Education, U. of Utah, 1986.

Personal Activities

- Amateur architect focused on my passive solar home in Utah.
- Enjoy kayaking, bicycling, RVing, and swimming.

Historical Background

Founder, Utah Count Votes June 2004
Mathematics Teacher, NY, 2003 - 04

Internet Service Provider, Owner 1994 - 2001- Founded the first Internet Service Provider business in Summit County, Utah and the third one in Utah.
Actuary - Chubb & Sons and Equitable Life and Casualty
Teaching Assistant, University of Utah Mathematics Department 1986-1989
Solved complex CAD graphics problem for University of Utah CS department research project - translated Bezier curves to arcs and lines to enable milling of complex aviation & other parts.
Speaker at 1981 Eastern Colleges Science Conference - Discovered a four-dimensional framework for categorizing information to conserve the environment while meeting human needs.

EXHIBIT B: Kathy Dopp - List of Some Co-authors

Reviewers/contributors to
Mandatory Vote Count Audit - A Legislative & Administrative Proposal
http://electionarchive.org/ucvAnalysis/US/paper-audits/VoteCountAuditBillRequest.pdf

- Joycelynn Strait, former board member of the LWV of UT.
- Ron Baiman, Ph.D. Institute of Government and Public Affairs, University of Illinois at Chicago
- Frank Stenger, Ph.D. Professor of Numerical Analysis, School of Computing, University of Utah
- Philip Stark, professor of statistics at U of Berkeley and a member of the California Secretary of State's post-election auditing working group.
- Ron Rivest, professor of mathematics at M.I.T. and member of the Technical Guidelines Committee for the US Election Assistance Commission
- Andy Bardwell, PhD, statistics, owns a business which does work for federal and state government entities
- Utah Legal Counsel and Legislative Analyst Eric Weeks
- Javed Aslam, Raluca Popa, PhD collaborators of MIT professor Ron Rivest.
- Alan McEwan, County Clerk/Auditor of Weber County;
- Julio Garcia, Election Director of Salt Lake County
- Sherrie Swensen, Salt Lake County Clerk
- Anthony Stevens, Deputy Secretary of State of New Hampshire
- Alice Steiner, Co-President of the League of Women Voters of Utah
- Kathy Dopp, MS Mathematics, Executive Director of the National Election Data Archive, a volunteer group of statisticians and mathematicians interested in election integrity issues

Co-Authors with Kathy Dopp of Other Voting and Election Systems or Election Data Analysis Work

- Ron Baiman, Ph.D. Institute of Government and Public Affairs, University of Illinois at Chicago
- Barbara Simons, former IBM researcher and former Chair of the Association of Computing Machinery
- David Webber, VP and CTO of Open Voting Solutions
- David Dill, Professor of Computer Science, Stanford

- Alan Dechert, Founder and President of the Open Voting Consortium
- Arthur Keller, Visiting Associate Professor of Computer Science at the University of California at Santa Cruz and is now affiliated with the Technology and Information Management program at UCSC
- Erik Brunvand, Associate Professor of Computer Science, University of Utah
- John Carter, Associate Professor of Computer Science, University of Utah
- Samuel H. Drake, Research Associate Professor, School of Computing and Dept. of Mechanical Engineering, University of Utah
- Ganesh C Gopalakrishnan, Professor of Computer Science, University of Utah
- Michael Jones, Assistant Professor of Computer Science, Brigham Young University
- David Hanscom, Professor, Clinical, School of Computing, University of Utah
- Arthur Lee, Associate Professor of Computer Science, University of Utah
- Dow W. Patten, Esq.
- John Regehr, Assistant Professor of Computer Science, University of Utah
- Kent Seamons, Assistant Professor of Computer Science, Brigham Young University and Director, Internet Security Research Lab
- Peter Shirley, Associate Professor of Computer Science, University of Utah
- Pamela Smith, National Coordinator, Verified Voting Foundation
- Phillip Windley, Associate Professor of Computer Science, Brigham Young University and Former Chief Information Officer (CIO) of the State of Utah
- Steven F. Freeman, Ph.D. Visiting Scholar & Affiliated Faculty, Center for Organizational Dynamics, University of Pennsylvania
- Brian Joiner, Ph.D. Professor of Statistics and Director of Statistical Consulting (ret), University of Wisconsin
- Victoria Lovegren, Ph.D. Lecturer, Department of Mathematics, Case Western Reserve University
- Josh Mitteldorf, Ph.D. Temple University Statistics Department
- Campbell B. Read, Ph.D. Professor Emeritus, Department of Statistical Science, Southern Methodist University
- Richard G. Sheehan, Ph.D. Professor, Department of Finance, University of Notre Dame
- Jonathan Simon, J.D. Alliance for Democracy
- Paul F. Velleman, Ph.D. Associate Professor, Department of Statistical Sciences, Cornell University
- Other election integrity advocates who helped edit and revise voting and election papers that are listed here: http://electionarchive.org/ucvInfo/staff/KathyDopp.pdf If I have omitted anyone, please inform me by email to kathy.dopp@gmail.com

EXHIBIT C: The Minneapolis RCV method can *not* be counted in precincts

Counting votes in precincts and then both publicly posting the precinct totals at the polling locations and sending the precinct totals to the county and to statewide election offices has been norm in the U.S. for as long as any of us have lived.

A switch to IRV (instant runoff) voting requires that all ballots for any election contest whose district crosses county lines would have to be transferred en masse to a statewide central tabulating center; eliminating precinct and county subtotals that could be summed to obtain the overall results.

It would be a huge change in election procedures, financing, and organization, and makes vote counting more vulnerable to centrally-organized election frauds and eviscerates local checks of vote count accuracy.

To make it clearer why there is no such thing as a precinct "subtotal" if we use IRV voting consider the following example that shows that Instant Runoff Voting is not "additive."[9]

Precinct I	
#voters	**Their Vote**
6	A
4	B
3	C > B > A

Precinct II	
#voters	**Their Vote**
6	C
4	B
3	A > B > C

In precinct I, IRV eliminates C, and then **B wins** 7 to 6. In precinct II (same as precinct I but the roles of A and C are reversed), **B also wins** 7 to 6.

But in the combined 2-precinct contest, B has 8 top-rank votes, A and C each have 9, so B is eliminated and either A or C wins.

Thus merging two precincts both won by Bush under IRV, can produce an IRV victory for Gore.

There is no such thing as a "precinct subtotal" in the Minneapolis RCV method. This reduces the transparency and check-ability of elections.

Even if a precinct counts its ballots locally under direction of the ranked-choice voting tabulation center, which could inform all precincts which candidates to redistribute what value of second choice votes from or who to eliminate next, then *it still cannot publish its subtotals* because there is no such thing as a "precinct subtotal for each candidate for each election contest". This method also won't work if the communication technology is disabled, broken, misused, or attacked.

The lack of precinct totals that add up to the overall result reduces the transparency and check-ability of elections. Precinct totals that the public can use to tally the election results need to be published to assure election accuracy and integrity, and to assist in the facilitation of election challenges in a reasonable and timely manner.

[9] This example and some of the text in this exhibit is taken from Warren Smith's web page: http://rangevoting.org/IrvNonAdd.html

IRV *could only* be counted in precincts by reporting the total number of voters who had cast each possible unique combination of candidate rankings, but this is not practically feasible because each Minneapolis precinct would have to publicly report a number of totals for *each* election contest for *each* precinct shown in the table below.

# RCV Candidates	Unique ballot rankings to report for *each* precinct for each RCV contest
3	15
4	40
5	85
6	156
7	259
8	450
9	585
10	820
11	1,111
12	1,464
13	1,885
14	2,380
15	2,955
16	3,616
17	4,369
18	5,220
19	6,175
20	7,240

For the Minneapolis RCV method, if N is the number of candidates and voters are allowed to rank up to three (3) candidates, then $\sum_{i=0}^{3-1} \frac{N!}{(i+N-3)!}$ is the formula for the number of vote totals that would have to be reported for each precinct. The table above gives the number of precinct vote totals that would have to be reported for each election contest having N = 3 to 20 candidates.

If Minneapolis were to allow voters to rank *more than three (3)* candidates for an election contest, then the number of possible unique ballot rankings and thus the number of precinct vote totals that would need to be reported for *each* election contest for *each* precinct to be able to tally to the final result from these reported sub-totals would be much greater than that shown in the table above.[10]

Passing all the voters' ballot choices to the central ranked-choice voting tabulation center could be easier than passing all the possible subtotals that could be used to tally a Minneapolis RCV election contest. In either case, this would defeat ballot secrecy and open the door to vote-selling and voter coercion and it is doubtful that many of the public would be able to figure out how to take a list of all such published sub-totals or voters' ballots for each precinct, and, in a timely fashion, check the accuracy of a reported STV election outcome.

In Australia's 24 November 2007 elections, the Election Commission was unable to determine the composition of parliament until over 1 month later because of numerous races which were difficult for them to count.

[10] For instance, with 4 candidates, the number of unique ballot rankings if all candidates could be ranked by voters rather than just three would be 64, with 5 candidates 325, with 6 candidates 1,956.

EXHIBIT D: Public comments made to the Wake County, North Carolina Board of Elections objecting to the IRV experiment in Cary North Carolina by Eugene Weeks, Chairman of the Wake County Voter Education Coalition:

From: "eweeks1"
To: Cherie Poucher
Sent: Monday, January 21, 2008 7:59 PM
Subject: Public Forum Pilot Program IRV January 17, 2008

Good Morning, I am Eugene Weeks, 2509 Foxgate Drive, Raleigh, NC and Chairman, Wake County Voter Education Coalition. The Voter Education Coalition vehemently oppose the Instant Runoff Voting because it is a very bad idea and it is confusing to some of the voters.

a. We feel that IRV will disenfranchise certain segments of voters-especially the challenged and impaired voters. The ballot that is being used now is already confusing to some voters, yet you want to antagonize and confuse the voters more by asking them to not only vote for one candidate, but indicate a second and third choice before leaving the voting booth. Where is the voter's rights in this process?

b. Every voter goes into a polling place with their candidate in mind. Under the IRV, you are now asking the voter to choose a second and third choice on the ballot before leaving the booth. We feel that this erodes the rights of the voter to make their choice for their candidate.

Questions for you:
If a voter only marks for one candidate, is the ballot valid or void?
If a voter marks the same candidate for the second and third choice, is the ballot valid or void?
How will the voter find out if his or her ballot is counted?
What happened to the voter's rights to choose only his candidate in this process?

c. We know sometimes a candidate will modify or change some of their positions on issues between an election and the run-off period. Now in the IRV system, the voters have been eliminated from hearing the candidates a second time. This is unfair to the voters and candidates.

d. The IRV Pilot Program was conducted in Cary and Hendersonville, NC. Looking at the demographics of these areas, the make up of voters are not a true sampling of voters in North Carolina. What I am stating is that your IRV Pilot Program is not a sufficient and scientific method for all voters in North Carolina. It does not reflect the demographic or representation of voters in North Carolina. For example, look at the demographics of voters in Cary and Hendersonville against the demographics on voters in Raleigh, Charlotte, Winston-Salem or Greensboro, North Carolina. There is no way for your IRV Pilot Program to produce "TRUE" scientific results of this project.
***It is a bad experimental process and the results would be misleading to the SBOE and the NC Legislature to tell them that IRV is best for North Carolina.
***It is also a bad choice because the Wake County Board of Elections still has not stated what the "NET SAVINGS" would be. They only repeated there would be a cost savings for the counties. Again, "Where is the Net Savings"? We know it will take additional funds for the new software for IRV (which is not available in NC yet) new ballots and new voting machines.

IN OLD PLAIN ENGLISH-KEEP THE VOTING SIMPLE-NOT CONFUSING.

Submitted by Mr. Eugene Weeks
Chairman, Wake County Voters Education Coalition

EXHIBIT E: Excerpts from the San Francisco Grand Jury report issued on July 3, 2008

http://www.sfgov.org/site/uploadedfiles/courts/divisions/Civil_Grand_Jury/year-of-five-elections-for-sf.pdf

Note: San Francisco is the largest jurisdiction in the US to have IRV, and they have had it for the longest, adopted in 2003, implemented in 2004. We know they spent $1.87 per voter and 700 public outreach events the first year, for a city with around 418,000 reg voters.

The 2007-2008 San Francisco Civil Grand Jury reviewed five elections for the city/county of San Francisco. Instant runoff was not understood by voters and poll workers says San Francisco Grand Jury report issued on July 3, 2008. San Francisco. The report says that some voters and poll workers do not understand IRV, and that a back up plan is needed in case the new Sequoia system is not certified.

Excerpts from *The 2007-2008 Civil Grand Jury For The City and County of San Francisco*

The 2007-2008 San Francisco Civil Grand Jury reviewed the materials provided by the Department of Elections for the November 2007 and February 2008 elections.

Ranked-Choice Voting and Absentee (Vote By Mail) Ballots

RCV ballots were used in the November 2007 election for the offices of Mayor, District Attorney, and Sheriff. Some poll workers and voters told the Jury that they did not understand how to vote for candidates where RCV ballots were used. In the November 2008 election, RCV ballots will be used for some local offices. Additional education and outreach need to be provided to the voters to clarify the RCV process so that the ballots accurately reflect the intentions of the voters.

Findings: 11. Some poll workers and voters do not understand the procedures for voting for candidates where Ranked-Choice ballots are used.Findings14. While the DOE does meet these legal requirements, additional outreach efforts are needed on voter registration requirements and deadlines, the Ranked-Choice Voting process and the requirements for submitting a valid Absentee Ballot.

Recommendations3. The DOE should publicly establish a date certain by which Sequoia must receive the Secretary of State's certification regarding the counting of RCV ballots. This date should be no later than September 15, 2008.

Response required: Department of Elections; Elections Commission

4. TO prepare for the possibility that Sequoia fails to obtain the required certification, DOE must develop a contingency plan for counting RCV ballots, which should be in final form by October 6, 2008.

Response required: Department of Elections; Elections Commission

8. The DOE's outreach program needs to improve voter instructions on the Ranked-Choice Voting process and the use of Absentee Ballots.

Response required: Department of Elections; Elections Commission

9. In addition to established communication approaches, the DOE should explore enhance techniques to communicate information on the less understood aspects of voting such as partisan primary elections, Ranked-Choice Voting and Absentee Ballots.

Final Report and Certification of Election Results and Canvass Procedures - The Secretary of State's certification of the Edge II machines requires the DOE to manually count all voter Verified Paper Audit Trails and compare those results to the machines electronic records.
http://www.sfgov.org/site/uploadedfiles/courts/divisions/Civil_Grand_Jury/year-of-five-elections-for-sf.pdf
also at
http://instantrunoff.blogspot.com/2008/07/instant-runoff-not-understood-by-voters.html

EXHIBIT F: Wake County, North Carolina Instant Runoff Voting Election Results

From the official reported vote counts of the October 9, 2007 Wake County, North Carolina IRV

http://msweb03.co.wake.nc.us/bordelec/downloads/2007OCT_summary-official.htm Run Date: 10/16/07 12:51 PM

COUNCIL MEMBER C-B 1 CARY MUNICIPAL DISTRICT B		
Don Frantz	1,151	38.09
Vickie Maxwell.	1,075	35.57
Nels Roseland	793	26.24
WRITE-IN.	3	.10
Total		3022

And the final round numbers showing 1401 voters whose ballots are counted in the final round:

http://msweb03.co.wake.nc.us/bordelec/downloads/cary_irv_results.htm

EXHIBIT G: Demonstration of the Need to Track Changing Ballot Values and How Different Voters' Votes Receive Different Values when Counting Minneapolis Multi-Seat RCV Elections

This example of a 5 candidate Minneapolis method RCV race for 3 seats, with 3,000 voters demonstrates:

- The need to track individual ballot values for each possible ballot ranking and to recalculate these values whenever excess votes are redistributed in any round, and
- The different weights and values that different voters' ballots receive

The right-most column in the table shows the total value that each voter's ballot receives, ranging from 0.5005 of one vote to 1.4995 votes. The value of each voter's ballot depends on the number of rounds that their ballot participates in, the value allotted to each candidate from their ballot in each round and the amount of that vote that is transferred to another candidate in each round. The 500 voters whose ballot rankings were A>C>D receive the most numerical power in this RCV contest because candidates A and C received excess votes.

3,000 Voters Cast 19 out of 80 Possible Rankings				Group ballot values				Individual ballot values		
# Voters	1st choice	2nd choice	3rd choice	Value to highest cand. in rnd #1	Value to next choice in round #1	Value to highest cand. In rnd #2	Value to next choice in rnd #2	round 1 indiv. ballot value	round 2 indiv. ballot value	Total Indiv. Ballot Values for Voter Group
450	A			225.225	0	**0**	0	0.5005	exhausted	**0.5005**
250	A	B		125.125	124.875	0	0	0.5005 for A and 0.4995 for B	exhausted	**1**
100	A	B	C	50.05	49.95	27.5	0	0.5005 for A and 0.4995 for B then C	0.275	**1.275**
350	A	C		175.175	174.825	96.25	0	0.5005 for A and 0.4995 for C	0.275 for C	**1.275**
350	A	C	B	175.175	174.825	96.25	0	0.5005 for A and 0.4995 for C	0.275 for C	**1.275**
500	A	C	D	250.25	249.75	137.5	362.5	0.5005 for A and 0.4995 for C	0.275 for C and 0.2245 for D	**1.4995**
20	B			20	0	0	0	1	exhausted	**1**
40	B	A		40	0	0	0	1	exhausted	**1**
60	B	C	D	60	60	33.03	26.97	1	0.5505 for C and 0.4495 for D	**1**
20	B	D	C	20	20	11.01	0	1	1	**1**
10	B	C		10	10	5.505	0	1	0.5505	**0.5505**
150	C			150	0	82.575	0	1	0.5505 for C	**0.5505**
250	C	A		250	0	137.625	0	1	0.5505 for C	**0.5505**
300	C	B		300	0	165.15	0	1	0.5505 for C	**0.5505**
100	C	D		100	0	55.05	44.95	1	0.5505 for C and 0.4495 for D	**1**
400	D	A	C	400	0	400	0	1	1	**1**
100	D			100	0	100	0	1	1	**1**
125	E			125	0	125	0	1	1	**1**
375	E	B		375	0	375	0	1	1	**1**

Kathy Dopp 435-658-4657 kathy@electionarchive.org

The table below shows the total vote values for each candidate in the above election contest, during each counting round and demonstrates the complexity of counting a multi-seat Minneapolis RCV method election contest, and shows how some voters, in this example 19%, are inevitably excluded from participating in the final Minneapolis STV counting round.

round #	threshold values	A	B	C	D	E	exhausted ballots	total voters left in round
1	1,001	2,000	150	850	500	500	0	4,000
distribute winner A's excess votes		-999	174.83	599.40			450	
Totals after distributing A's excess votes	A Wins a Seat	1,001	324.83	1,449.40	500	500		
eliminate lowest scorer B & redistribute B's votes			-324.83	119.95	20		310	
2	864			1,569.35	520	500		3,240
distribute winner C's excess votes				-705.35	71.92		350	
Totals after distributing C's excess votes	C & D Win Seats			864	591.92	500		81% of voters

The total possible numerical value for all second choice votes transferred from candidate A in round one is 2,000 minus the threshold of 1,001 = 999. The transfer value for each one of candidate A's votes is 999/2,000 = 0.4995, and the retained value for each of the 1,001 votes retained by candidate A is 1,001/2,000 = 0.5005. However, 450 voters who ranked candidate A first did not rank another candidate, so these ballots are exhausted and do not transfer, so that 450*0.4495 or approximately 225 votes do not transfer. The amount of excess votes that candidate A transfers to candidate B in round one is 0.4995 times 350, the number of ballots that rank candidate A first and candidate B second, = 174.83 votes. The number of transfer votes given to candidate C is likewise 0.4995 times 1200, the number of ballots that rank candidate A first and candidate C second, = 599.40. Transferring the excess votes of candidate C during round two is more complex because if candidate C's ballots were first transferred from candidate A, then those ballots already have values less than one and the new transfer value is obtained by multiplying (1,569.35 – 864)/1569 = 0.4495 times the old transfer value of 0.4995 to obtain a value of 0.2245. The retention value for ballots transferred from A and kept by C is 864/1569.35 = 0.5505 times their old transfer value of 0.4995 to obtain a new value of 0.2750.

The complexity of hand counting a multi-seat RCV election is exacerbated by the need to track a large number of piles and sub-piles of ballots and the fact that the same ballots may exist "in" two or more sub-piles for two or more candidates due to excess vote transfers above the thresholds in each round. The example above is simplified compared to any real election because only 19 out of the possible 80 unique ballot rankings for five candidates are used.

EXHIBIT H: Attached Official Canvass Report City of Minneapolis Primary Election September 13, 2005

[i] For other examples see http://rangevoting.org/Monotone.html or http://www.mnvoters.org/images/MVALitiBack.pdf Also see "Boxed In" by Peter C. Baker. The Nation's article concludes that "IRV has many flaws". Baker provides an interesting example of another vagary of the IRV method by illustrating how a winning candidate could lose by **gaining more votes** from a losing candidate, thus causing a different candidate to be eliminated in the first round. See https://thenation.com/ or http://rangevoting.org/Baker2BookRev.html