

To the Colorado Clerks and the RLA Committee:

I apologize for a miss-statement of fact in the 2/17 RLA committee meeting. I believe I suggested that CD 4 encompasses all or part of 6 or 8 counties. I was quite wrong as in fact CD 4 encompasses all or part of 22 counties. Looking a bit further I see that CD 3 encompasses all or part of 29 counties. Amazing that these 2 Congressional districts constitute 80% of our counties!

Dealing with cross county races such as these is but one example of the complications in applying a system that assumes uniform precinct ballots voted and counted at the precinct level to a multi-style central scan paradigm such as used in Colorado. City Council districts, Cultural district boundaries etc. don't follow precinct lines resulting in cases such as Douglas County which in the last election had 277 different unique styles where most ballots were collected to central scan and processed randomly.

Random selection of every races/styles is problematic in applying the Professor Stark, RLA theory to the realities of executing/completing a Colorado election in a timely manner. To select ballots randomly from the universe, locating a sufficient number of ballots for each of 277 styles to test each contest individually, in which a given style may have as few as 87 ballots or as many as 190,000 ballots would likely result in hand counting more than 100% of the central scanned ballots.

In an article published by Risk-Limiting Audit Working Group October 2012, (Version 1.1) of which professor Stark was a listed participant, on page 26 states:

“Some jurisdictions’ heavy use of vote-by-mail ballots can complicate batch-level audits. Typically, these ballots are counted by central scanners in large batches as they are received, but the canvass results are reported by precinct. To audit these ballots at all entails some way of harmonizing what is reported with what can be audited.....”

Even the RLA Working Group infers without offering a practical solution that the theory falls apart in application in Colorado!

In reality, I have far more confidence in the accuracy of the 99% of my 2015 Coordinated Election ballots, the 99% of my 2016 Primary Election ballots and the 95% of my 2016 General Election ballots that went through central scan than the small balance cast on equipment at VSPC's! As a practical matter the probability of tabulation error and risk of a wrong election conclusion would be substantially higher had these elections been run on 2,000 pieces of election equipment, managed by 800 election judges at 40 VSPC's rather than substantial reliance on tightly controlled Central Scan processes!

The facts are that the all mail ballot paradigm employed by Colorado, Washington and Oregon utilizing predominantly central scan ballot tabulation, enhances internal controls substantially compared to the all voting machine paradigm used by many states. The non-central scan methods may call out for an audit process such as Professor Stark's RLA. However, any attempt to apply this particular RLA concept to Colorado is a square peg/round hole example and provides little in assurance that election results are correct in exchange for a large potential investment in labor, time and dollars.

The Colorado statutory definition of RLA is:

"**Risk-limiting** audit" means an audit protocol that **makes use of** statistical methods and is designed to limit to acceptable levels the risk of certifying a preliminary election outcome that constitutes an incorrect outcome."

As a CPA, I would argue that the Colorado election model has been designed around an audit protocol that does make use of statistical methods as prescribed by statute in addition to other processes required of a sound audit plan. The Colorado audit protocol may not match Professor Stark's RLA "statistical method" vision but rather encompasses additional elements required of an audit that provides a high probability of correct conclusions.

It is important to note that the statute says, "**makes use of statistical methods**". It does not say relies totally on statistical methods. Any sound audit protocol does not rely solely on random sampling and statistical methods to the deference of other audit components such as quantitative balancing, internal controls, and system validation. Antidotally, I remember as a client an Arthur Anderson audit where their team used statistical methods including random sample techniques to test cash transactions with a 100% validation rate but neglected to perform a simple cash account reconciliation and failed to detect that the Bank account was out of balance by more than a million dollars.

Implicit Equipment Risk

DRE, Ballot Marking Device and Central Scan each have different levels of implicit risk of producing a wrong result.

The implicit risk or probability of any one DRE producing wrong results is the same risk as central scan producing wrong results. The mere fact that many DRE's are used in remote, less secure locations lacking 24 hour surveillance, operated by Judges with unknown technical skill sets and individually created CVR's, compounds the risk of erroneous results exponentially compared to that of a highly controlled central scan operation.

In contrast to a DRE, a ballot marking device that prints a completed ballot in the same format as mail ballots that may be proofed by the voter and is then submitted to central scan for tabulation itself creates zero risk of producing wrong results.

Risk of Central Scan producing wrong results is minimal in the Colorado election paradigm due to the tight control Secretary of State has over equipment and software and the multiple layers of security the equipment is under. SOS installed software, certification of the equipment by SOS, security plan required by SOS, secure access and 24 hour camera surveillance and the limited number of pieces of equipment protect the integrity of Central Scan minimizing the potential for intentional or accidental wrongful results.

Accordingly, the case for a Dr. Stark style RLA may have validity in an election paradigm that relies extensively on DRE's. As each DRE is a potential conduit for error it may be argued that each DRE must be audited from an RLA perspective issue by issue. However, since it may be unlikely that an individual DRE exceeds the number of transactions needed for statistical confidence in the outcome such an approach may often result in a 100% audit of each DRE.

Central Scan, processing many ballots, easily meets the threshold of statistical relevance. As the underlying methods in a Central Scan audit plan extensively tests issues, the focused post-election audits of Central Scan can test for probability of wrong results at a ballot or batch level rather than an issue level. Statistical Methods must be used to select the ballots to be tested. Either re-processing individual batches or use of a tool to extract batch totals from CVR and compare results to hand counts

of random selected batches establishes probability of a wrong result and confidence in the correct result.

The implicit risks of wrongful results is drastically reduced by the Colorado, all mail ballot, Central Scan election paradigm. As DRE's remain the largest risk point of error, an audit plan should focus its efforts at that level.

Colorado Election Audit Protocol:

The current Colorado election process encompasses the elements of a sound audit plan and includes these basic requirements:

- 1) Structural/system tests and controls must exist that verify processes.
- 2) Statistical methods such as Random sampling applied to audit ballot selection.
- 3) Audit process must initiate with source document and trace to end calculation.
- 4) Adequate structural and system tests allow the ballot to be the focus of the Colorado post-election audit.
- 5) Multiple hand counts are used to verify machine counts.
- 6) As the audit is a confidence measure, rather than a correction device, election Judge resolution decisions and other discrepancies are not subject to change in the audit process.
- 7) An audit should be heavily weighted to VSPC/DRE ballots, where the highest risk of error exists, rather than ballots processed through central scan where more robust internal controls exist,
- 8) Statistical methods require any material discrepancy to dictate further samples.

Structural/system tests and controls must exist that verify processes.

- The Colorado election model requires that the Secretary of State certify all election hardware and software.
- No Colorado voting or tabulation equipment is connected to internet or other external communications.
- "Logic and Accuracy" tests, "Post-Election" audits and "Canvas Board" processes verify hardware and software consistency.
- Statewide interactive voter credits maintained in SCORE provides validation that number of ballots cast matches ballots tabulated in all elections in all counties.

Random sampling must be applied to ballot audit selection.

- Fundamental to any statistical method is the premise that reliance can be made on a small truly random sample to establish with high probability, validity of the entire universe.
- For purposes of election audits current processes provide that the Secretary of State identifies batches to be audited. This approach provides for unbiased, batch selection. Even if the SOS method of random selection are deemed weak, the fact that the SOS is blind to the contents of a given batch creates validity of the randomness.

Audit process must initiate with source document and trace to end calculation.

- To audit from CVR to source document in central scanned ballots risks multiple CVR's pointing to a single source document. With the relatively small sample required compared to the size of the universe, probability is low that such a condition would be detected.
- An audit must always flow from the source document through each step to the conclusion to confirm that all processes worked as expected.

Adequate structural and system tests allow the ballot to be the focus of the post-election audit.

- Logic and Accuracy tests establish the validity of tabulation of individual races and styles.
- Surveillance, security and SOS software controls provide assurance that processes remain intact
- Post-election audit protocols that randomly sample cast ballots serve the purpose of confirming races are recorded to CVR as voted. Blind selection of such random samples by the SOS provide true randomness as required in statistical methods.
- The integrity of the audit protocol must be viewed in entirety rather than from focus on a single element.

Multiple hand counts are used to verify machine counts.

- A machine is designed/programmed to perform repetitive tasks providing consistent results. Therefore, the expectation is that a machine output will be the same every time with the same inputs.
- If 10 people count the same 100 ballots it can be expected that they will achieve multiple answers. For this reason multiple hand counts must be made of a batch of ballots to confirm that the hand counts are correct let alone that the machine count is correct.

The audit is a confidence measure, rather than a correction device.

- Election Judge resolution decisions and other such discrepancies are not subject to change in the audit process.
- The purpose of audit is to establish confidence in the results. Should an audit fail to provide needed confidence, recount processes should be triggered.

An election audit should be heavily weighted to VSPC/DRE ballots, where the highest risk of error exists

- Every piece of election equipment/software is a theoretical or real risk. The mere fact that VSPC's may have many DRE's etc. creates a higher degree of risk than found in the several pieces of equipment found in central scan.
- Many DRE's at remote VSPC locations, manned by Judges of unknown technical skills, not under 24/7 camera surveillance constitute a higher intrinsic risk of mischief or failure than equipment/software at central scan, sealed by the Secretary of State under continuous camera surveillance.
- The SOS randomly selects DRE's to be audited as part of the post-election process.
- It is my understanding that one other central scan state audits DRE's 100%.

Statistical methods require any material discrepancy to dictate further samples.

- Current methods require additional samples if discrepancies are discovered.

Summary

The Stark RLA model may be a valid approach to confirming election integrity in traditional precinct based and tabulated elections where all ballots contain the same single style (identical races). However, in the Colorado all mail ballot/central scan paradigm this is a solution in search of a problem.

Statistical methods alone do not constitute a sound audit protocol but instead if properly applied provide additional efficient confirmation of accuracy of conclusions. If applied on a contest level to all races in Colorado's randomly central scanned ballots, instead of providing efficiency the Stark RLA audit design may simply require extra cost and time with no benefit in confidence of results. As the weak link in the validation of results in the Colorado election model is the DRE, it may be advisable for Colorado to abandon use of DRE's and instead require use only ballot marking devices or paper ballots in VSPC's.

The Colorado election audit protocol encompasses all elements of a sound audit including quantitative balancing, system and software security, multiple pre and post-election race tabulation tests and utilizes statistical methods required by statute. Today the Colorado election protocol meets the statutory definition of and exceeds the requirement of "an audit protocol that **makes use of** statistical methods and is designed to limit to acceptable levels the risk of certifying a preliminary election outcome that constitutes an incorrect outcome."