RLA and Colorado

After the Friday3/3/17 RLA meeting at the SOS office, I am even more convinced that an attempt to apply the Berkley theory RLA concept to Colorado is a solution in search of a problem. Even the RLA working Group (of which professor Stark was a participant) in their 10/12 white paper on page 26 identifies the difficulty/impossibility to perform Berkley theory RLA audits in a central scan election paradigm.

Colorado Clerks and the SOS office are obliged to follow statute rather than the Berkley RLA theory. To attempt via rule to make statute the Berkley theory is both a mistake and an operational nightmare.

The Colorado Statutory Definition of RLA is:

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

Since most counties do not have a statistician readily available it makes sense that ballot selection and "<u>**use of Statistical methods**</u>" in the election audit protocol needs to be done by the SOS. Therefore, the one productive accomplishment at the Friday meeting was establishing the contents (fields) of a manifest to be : County, batch #, batch size. However, I would suggest that the lengthy discussion of uniform format of batch # is irrelevant as long as it is an alpha-numeric field of reasonable size as the SOS duty is to randomly select manifest records such as the 10th ballot in the 100th or the $2,716^{th}$ batch irrespective of contents of that manifest record.

As a CPA, I understand that an audit protocol is not just an event but rather a collection of processes and controls that establish validity to the result. In the case of Colorado elections this includes SOS certification of hardware and software, equipment security, LAT pre-election, video surveillance, SCORE, central SOS accounting for voter credits, Post-Election Audit and Canvas Board.

Absent the other elements in an audit protocol, a Berkley theory RLA approach to the Post-Election Audit is futile. I cite as example a failed Arthur Anderson audit protocol I witnessed where they used statistical methods to verify cash transactions but failed to do a bank reconciliation. Statistical methods are not of themselves an audit protocol!

It's time to consider the reality of required sample for a single county wide race using solely statistical methods as confidence in the election. After the 3/3 RLA meeting one of the "Activists" suggested we should only need to pull perhaps as few as 15 ballots to be certain there was not a problem. Obviously, not everyone has a grasp on statistical methods and comprehends the number of random samples that need to be considered for statistical methods to have relevance. Using the Berkley theory:

- For 95% confidence that the outcome is within +/- 10% on 300,000 ballots cast the sample size needs to be 96 voted ballots or you would only need to pull about 96 different batches of 100 to find the randomly selected 96 ballots. For the smaller counties with 2000 ballots you would only need to pull and compare 92 ballots. I'd be lynched if I told my voters I'm pretty confident the results are only right within +/- 10%!*
- For 95% confidence that the outcome is within +/- 3% on 300,000 ballots cast the sample size needs to be 1,063 or you would need to pull about 1,000 different batches of 100 to find the randomly selected 1,063 ballots. For the smaller counties with 2000 ballots you would only need to pull and compare 696 ballots. Since the difference in Clinton beating trump in Colorado was about 6% and it might be assumed that any vote taken from Clinton would go to Trump this

could be representative of the Clerk's effort to attain 95% confidence that Clinton actually won Colorado.*

Some would argue that on a state wide ballot issue, using the Berkley RLA theory, the sample can be taken state wide instead of county by county. Interestingly to use the total statewide ballots for the universe in the last election would only increase the number of samples required state wide to 1,067. However, such an approach would ignore nuances between security, controls, and processes between counties and many counties would not ever be included in the sample. The value of such a model would be greatly diminished because the universe would no longer be homogenous, a central precept of statistical methods.

In the 2016 Presidential election just to achieve Berkley RLA theory state wide races we would need, using statistical methods, to independently sample Governor, Senator, T ,U ,69, 70, 71, 72, 106, 107 and 108 (Not counting the judges). For 95% confidence within +/- 3%, a 300,000 voter county would need to pull about 11,000 (11*1000), 100 ballot batches containing 1,100,000 ballots or more than 300% of the ballots cast.

As a practical matter, the current Colorado audit protocol taken in entirety with respect to central scanned ballots is sound. The current audit protocol that tests all contests and ballots in randomly selected batches meets the statutory requirement of **"makes use of statistical methods".** The only open questions are whether the number of ballots tested is adequate for the desired confidence and interval and that the SOS random sample technique is acceptable. Under the current protocol where randomly selected batches are tested in entirety rather than randomly selected ballots a more manageable number of batches need be pulled and all races are implicitly tested.

- For 95% confidence that the outcome is within +/- 3% on 300,000 ballots cast the sample size needs to be 1,063 ballots or you would need to pull no more than 11 different batches of 100 to have 1,063 randomly selected ballots. For the smaller counties with 2000 ballots cast you would only need to pull and compare all races on all ballots in 7 batches.

Perhaps the Post- Election audit might be enhanced by more formal statistical methods applied to centralized statistical sampling at the SOS level but that question is best answered by the SOS.

The all mail ballot and resulting 93% statewide use of Central Scan already provides an extremely tight audit protocol for central scanned ballots. The potential weak point in the process is the 7% that don't go through central scan.

While the current full audit protocol tests central scan in entirety, the thousands of pieces of VSPC equipment are tested on a sample basis. Unless such equipment is replaced with ballot marking devices such as used by Clear Ballot and Hart and all ballots are central scanned, that 7% of Colorado ballots will always remain suspect due to the thousands of pieces of disbursed election equipment under limited security. Use of statistical methods will not solve this weakness.

In conclusion, replacing the Colorado Post-Election audit protocol with a Berkley theory RLA audit only on state wide issues substantially reduces the confidence in the outcome and ignores other races on the ballot while substantially increasing the amount of scarce resources required. Again, application of a Berkley RLA theory to the Colorado election audit protocol is a solution in search of a problem.

* http://www.surveysystem.com/sscalc.htm#two