

Citizens' Oversight Projects (COPs)

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This comment is regarding the "Notice of Modifications to Proposed Regulations" posted at <https://admin.cdn.sos.ca.gov/regulations/proposed/elections/audits/notice-of-modifications.pdf> regarding risk-limited election audits.

The deadline for submitting comments is January 26, 2020. This is submitted prior to the deadline. These comments and our original submission can be read online at <https://copswiki.org/Common/M1937>

COMMENTS:

1. COMPREHENSIVENESS IS SUPPORTED: The regulations were changed from the original proposed regulation where the SOS choosing one statewide contest and allowing counties to choose only two more contests per county using an unweighted random selection process (which means local contests would most likely choose inconsequential contests, like judge yes/no advisory or uncontested contests) to requiring that all contests be included in the RLA. The original concept was a hybrid audit where those three contests, and any contests that had at least one ballot in the random set would be considered "covered" with no mathematical basis for it, and then do the others using the 1% manual tally (batch comparison) audit. Of course, if you choose only one contest and say the risk limit will be 5% for that contest but there are another 10 you fail to audit at all, the risk is actually 90.5% rather than 5% (90% risk that you miss the contest with a hack, plus the risk for that one contest, which is 5%, so you wind up with 90.5% risk (9.5% confidence).

We support this change, and we appreciate that you decided to comply with the law as written, because it says the RLA audit would be "comprehensive." So this is a big improvement from a mathematical standpoint, even though it will also make it unwieldy and costly to perform.

As mentioned later, to make better auditing feasible and cost-effective, we also support the use of a full (100%) independent ballot-image audit combined with a limited RLA of randomly chosen contests using a weighted selection process which would make the most consequential contests the most likely to be chosen and should exclude uncontested and advisory contests. We recommend this approach because we believe it will not only provide the lowest overall risk, but it will make the audit process predictable and therefore manageable. In its present form, we doubt any district will opt to do an RLA because of the complexity and unpredictable nature of the audit process itself. (See Item 9, below).

2. INCLUDE ALL BALLOTS: These RLA regulations DO admit that they need to include ALL "validly cast" ballots. Interesting that the SOS is finally giving in to the need for all ballots after saying in our court case here in San Diego and then in AB-840 that it is okay to exclude nearly 40% of the ballots from the audit -- the later VBM ballots and provisionals. We give the SOS credit for that (thank you) but we must also assert that the 1% manual tally MUST also include all (or nearly all) ballots in the random selection process. Otherwise, the SOS should explain mathematically why it is okay to exclude them in the 1% manual tally but in this process, they are included. It is simply a fact that all ballots should be included in ANY random selection process regardless how the audit is performed.

3. MULTIPLE-COUNTY JURISDICTION SAMPLE SIZES WRONG: The proposed regulations now results in a situation where number of ballots sampled in state-wide races may be insufficient to meet the risk limit, if the sample size is set based on the margin in any one county. For example, let's say the governor wins by a landslide in red and loses by a landslide in blue counties, but the total is tight overall. The sample size required in any one county will be insufficient to test the result on a statewide basis. There is nothing in the regulations to deal with this case, nor the case of a contest that is split between two counties and has wide and opposite margins in each county. For these cases, there is no mechanism to cooperate among the counties involved so that the sample size is increased accordingly.

Therefore, we recommend that the following text be added:

For statewide contests and any contests that are split between counties, the sample size will be calculated based on the smaller of a) the local county margin and b) the district-wide margin comprising multiple counties. For example, for a statewide contest, assume the margin in the county is 10% but the margin statewide is 2%, the sample size would be based on the statewide margin of 2%. The margin used for the audit will be the latest margin published for the combined area covered by the contest.

4. HAND-MARKED UNIFORM TALLY SHEETS: The regulations continue to push for the use of a "software tool" which amounts to the equivalent of a DRE machine used for the audit. Instead, hand-marked tally sheets that can be scanned and posted to the website so they can be reviewed by the public must be the standard. This is based on the well understood notion of "software independence" in voting systems¹. This notion has been defined as:

A voting system is *software-independent* if an undetected change or error in its software cannot cause an undetectable change or error in an election outcome.

A corollary to this definition is regarding auditing systems:

1 <https://people.csail.mit.edu/rivest/RivestWack-OnTheNotionOfSoftwareIndependenceInVotingSystems.pdf> "On the notion of 'software independence' in voting systems." by Ronald L. Rivest and John P. Wack.

An auditing system is *software-independent* if an undetected change or error in its software cannot cause an undetectable change or error in the audit outcome.

Without hand-marked tally sheets, there is no way we can determine, after the fact, that the data was entered correctly into the auditing system, nor can we determine if the risk limit was met. Hand-marked tally sheets can be marked prior to or simultaneously with entry of data into the auditing software. Such hand-marked tally sheets were used in the RLA pilots, for example in Orange County, CA. We see no reason for auditing software more than just a spreadsheet in most cases, because the calculations are not more complex than what can be written in a single cell of a spreadsheet.

Citizens Oversight has proposed a standard for such tally sheets. See <https://copswiki.org/Common/M1939>

The actual math needed for conventional polling or ballot comparison RLAs can be defined in a single cell of a spreadsheet. For batch-comparison RLAs, it is best if a weighted selection process be used so that the most tweakable batches are most likely selected, and this selection process can be aided by software. But even for this RLA methodology, the calculations for the risk limit can be done in one cell of a spreadsheet. Therefore, we object to this use of software in the audit process and request that hand-marked tally sheets be utilized. If they are, then we can check on the audit system without fear that the audit software itself is hacked.

Using hand-marked tally sheets makes it much more difficult to fix up the audit and it allows oversight groups to check on the RLA itself. Thus, hand-marked tally sheets must be included in the audit.

5. UNIFORM AUDIT REPORT: The regulations do not propose any uniform audit report. We have proposed such a uniform report format: <https://copswiki.org/Common/M1940>. Such a standard report format, which can be human readable and also parsed by computer applications will aide in the deployment of RLAs and will provide a means for rapid and comprehensive oversight of the results.

6. RLAs TOO HARD FOR SMALL AUDIT BOARDS: These procedures consider that a very few people will conduct the audit, whereas we find it is a very long and complex process that requires far more workers. They set up the concept of an audit board, which is under the control of the election officials, both by selection and by pecking order. Although we like the idea of an audit board and that a limited set of people will conduct the audit, we believe this provision is not practical because the complexity of the RLAs is far greater than is understood by those people drafting these regulations, and thus the number of people included in the board is insufficient, particularly in large districts, and if the margin is tight. If the margin is <2%, it will generally be more cost effective to conduct a full hand count from the get-go rather than do any random sampling. This is the case everywhere except in very large districts and with the same ballot throughout. Saying that the audit board must do the full hand count is a bit much. The ballot styles and number of small contests is far greater than most theorists realize, making RLAs a daunting task.

7. BALLOT MANIFEST REQUIREMENTS UNCLEAR AND UNNECESSARY: Creating a ballot manifest "independent of the voting system" will be a very difficult task. Does it mean officials have to count all the ballots by hand, or can they depend on the count of ballots in the boxes? The regulations say "independence" is required but we need to do a better job of explaining what that means, and when some dependence is allowed. It is my view that independence is not as important as is comparing the number of ballots processed with the polling lists, the actual number of voters who voted at polling locations and by mail. There is no standard format for the "poll list" information but some counties do provide the number

of voters who are registered, who voted, and who did not vote, broken down by precinct. There should be a defined reconciliation of the ballot manifest with that poll list information. This should be added to the RLA regulations and the need for absolute independence eliminated or at least explained what independence means.

8. BATCH COMPARISON AUDIT NOT OFFERED AS AN OPTION: Although there are three options for Risk Limiting Audits, including ballot-polling, ballot-comparison, and batch-comparison audits, the SOS neglected to include batch-comparison audits as an option. As mentioned in our original comment to the regulations, if each county just sampled 14 batches overall, that would be a pretty good risk limit on a batch-comparison basis (5% risk assuming no fewer than 20% of the batches would be modified in any attack that would not otherwise be detectable). That assumes also that the batches are selected based using a weighted selection process so the batches that would be most likely modified by a knowledgeable attacker would be more likely selected for audit.

The fact that this is not offered as an option by the SOS to the election officials is a bit mind boggling but it may make sense, because the inappropriate sampling process as allowed by AB-840 and supported by the SOS means sometimes mistakes will be made by the SOS and election officials that may want to short-cut the audits for sake of saving a few bucks. The 1% manual tally audit is a batch-comparison audit, but it is not risk limiting. For very large counties like LA, performing a batch-comparison RLA may make sense by choosing about 14 batches rather than about 45. For San Diego, the number of batches is about right for a 5% risk given the 20% lower limit on batches modified in the attack. For all other counties, the Risk Limiting Batch Comparison audit would require more batches than otherwise would be required. (As the number of batches gets very small, then the number of batches in the audit will drop somewhat. In general, it is the case that in risk-limiting audits, the number of samples is not reliant on the size of the district, but on the margin. This is why a fixed batch-comparison audit, with at least 14 batches randomly selected, makes more mathematical sense than the 1% manual tally. But in either case, the SOS would have to respect the mathematical fact that all ballots must be included in the sampling process in any audit, and the notion that 40% of the ballots can be excluded, as provided in AB-840, should be undone.

I can only speculate that the reason the batch-comparison audit has not been included in the regulations is so the SOS and election officials can continue to ignore mathematical fact, and rely on AB-840 to conduct audits that use an unsound sampling process.

If you would like more information about why I make these statements, I have tested my understanding by using a comprehensive Monte Carlo audit simulator, and I can provide those results to you so your office also will have an understanding.

9. OUR RECOMMENDATION: I will now repeat our recommendation, based on a thorough review of the RLA processes and mathematics. This point of view is more fully described the document "The Four Fatal Flaws of RLA audits" which is available here: <https://copswiki.org/Common/M1938> and included in our original comment.

First and in summary, the flaws are:

1. the audits get very hard and become a full hand count if the margins are $<2\%$
2. Are hard to apply when there are many non-overlapping contests, as a separate RLA with independent sample must be conducted for each non-overlapping domain of ballots.

3. Tend to be applied to just a few contests, as a result, and if that is the case, are not comprehensive.
4. Are subject to "innocent fix-up" because the election officials don't understand they can't correct mistakes in the audit.

Instead, we recommend:

1. A limited RLA audit that will focus on the most consequential contests using a weighed selection process, and
2. A comprehensive ballot image audit that will consider all contests down to the single ballot.

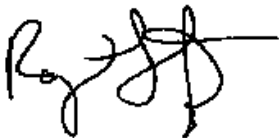
We note that there is no rational reason not to publish the ballot images, and that in fact, San Francisco County is doing so. Other counties should follow suit. Our organization is working with developers to provide a ballot-image audit service, so this can be done on an independent basis and provide a detailed check on the original tabulation. To those who say that the ballot images are not 100% trustworthy, we agree with them and that is the reason for the limited RLA audit. We also are working to develop ballot image security and remote attestation protocols so the scanners used in the election can be largely considered "Trusted Systems" by the SOS. Scanned documents created by Trusted Systems are already accepted by the SOS as equivalent with the originals. See <https://www.sos.ca.gov/archives/records-management-and-appraisal/electronic-records/electronic-records-guidebook/trusted-systems/> where you explain that:

In 2012, California adopted regulations that require state agencies to employ a trusted system for maintaining all electronic records created or stored as an official record. The State of California defines a trusted system as, "a combination of techniques, policies, and procedures for which there is no plausible scenario in which a document retrieved from or reproduced by the system could differ substantially from the document that is originally stored." (Source: California Government Code 12168.7(c))

Thus, the SOS already has embraced the use of electronic documents as official records. We have some improvements to make in the security of ballot images, but with those in place we believe ballot image audits will provide the least risk and most predictable workload for election officials. This proposed approach for auditing was covered in our original comment and we reassert those comments here.

Finally, please undo the mistake of AB-840. There is no basis for excluding 40% of the ballots -- the later VBM ballots -- from ANY type of audit process which performs sampling.

Sincerely,



Raymond Lutz
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Citizens' Oversight Projects