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March 26, 2020

COMMENT ON AB-2400 "Election results: risk-limiting audits"
https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB2400

The deadline for submitting comments is March 26, 2020. This is submitted prior to the deadline. These comments and our original submission can be read online at https://copswiki.org/Common/M1944

COMMENTS:

INTRODUCTION
This bill modifies the recently added RLA provisions in the election code by allowing election officials to conduct a hybrid election audit, where some contests are conducted using statistical sampling and requiring escalation possibly to a full hand count, while the rest can be treated using the existing 1% manual tally provisions (Election Code Section 15360). The existing law requires that all contests are included in the RLA if it is used. These changes would allow officials to pick and choose which contests to audit with RLA and which to use 1% manual tally.

BIG PICTURE
The legislature just recently passed a very robust Risk-Limiting Audit law, which includes "each contest" in the county and also cross-jurisdictional contests. So why the need for a change?

The reality is this: Risk Limiting Audits ("RLAs") sound good on paper, but the reality is that they are not a good match to the realities of most complex elections.

Now, we see a push to water-down the RLA election code provisions so election districts might try them, while unfortunately also ignoring the existing flaws in the 1% Manual Tally audit law (Election Code Section 15360). Our careful review of this situation has led us to promote independent "Ballot Image Audits" as the best way to improve election audits while still reducing the workload on election officials substantially.

WHY AREN'T RLAs THE ANSWER?
It seems reasonable. Take a sample of ballots and compare them with the official results (either ballot-by-ballot, or by comparing the margin of victory, or comparing batch results) and this can quickly and easily validate the results of the election without needing to do nearly as much work as the 1% Manual Tally. Indeed, they say that by taking a single combined sample, it can cover all the contests in the election and provide 95% confidence that the election is correct.

Strictly speaking, they are 100% correct in those statements except for the "quickly and easily" and "not so much work" parts. The reality is that RLAs are neither quick nor easy unless the margins in the election are quite large. Even if the number of samples may be few, keeping the ballots in order so they can be randomly chosen without bias is harder than just doing the 1% Manual Tally. The calculations are largely not understood by most of the people promoting them, and the public understands even less. This is not the way forward to greater transparency and trustworthly elections.

As I have an advanced degree in engineering, I do understand the equations and have even modeled how well the specific proposals will pan out in practice using Monte Carlo simulations (where many thousands of audits are run in software). The result of all this work is this paper: "The Four Fatal Flaws of RLA Audits" at this URL: https://copswiki.org/Common/M1938 and attached to this comment.

I actually had great hopes that RLA audits would indeed work and we would have thousands of districts using them. My hopes were dashed when I learned that those promoting RLAs had no intention to cover all contests in the audits, and those in Colorado, include only one statewide and one countywide contest per county, and thus are not comprehensive at all, and indeed are far from a "gold standard" you may hear about.

In summary, the flaws are:

1. **Too much work:** The audits get very hard and become a full hand count if the margins are <2% (or sooner).
2. **Difficult in complex districts:** RLAs are hard to apply when there are many non-overlapping contests, as a separate sample must be conducted for each non-overlapping domain of ballots, and are difficult to apply to cross-jurisdictional contests.
3. **Not Comprehensive:** Tend to be applied to just a few contests, which if randomly chosen dilutes the confidence
4. **Hazardous:** Are subject to "innocent fix-up" because the election officials may improperly correct mistakes in the audit, and seek to provide "clean" results rather than report errors in their own process.

We must also add that RLA audits require a great deal of human processing and are not compatible with social distancing now required in this age of COVID19 hazards.

THESE CHANGES
The proposed changes puts the use of RLA audits on more of a "pilot" footing, as it is optional to use it, and any district can use it for some contests and not others. I imagine election officials will choose to use RLA auditing only on those contests where it looks easier than doing the 1% manual tally, and will use the 1% manual tally for close contests where any RLA will explode into a full hand count. If an RLA begins to require escalation, then they will switch over to the 1% Manual Tally instead.

These changes will eliminate the escalation normally required in RLA audits, because if the RLA procedure calls for escalation, the county will just go with the 1% manual tally instead. Therefore, I believe these changes are only an admission that RLA Audits are hopelessly broken.

Please consider the following points:

1. INCLUDE ALL BALLOTS: These RLA provisions DO admit that they need to include "all validly cast ballots" in the scope of the audit. This is good:

> ...all ballots, including provisional ballots and vote by mail ballots whose status has not yet been resolved, shall be taken into account in the audit to ensure that if a full manual tally of the votes on all validly cast ballots would show an electoral outcome that differs from the reported outcome, there is at most a five percent chance that the audit will not require such a tally.

Regarding the missing ballots that are to be "taken into account" yet not included: these are typically handled by assuming they are all voted for the underdog. Then, you have to show that the margin of victory in votes is large enough to account for all those missing ballots, and then sample to verify the margin. This is technically impossible if the number of missing ballots (provisional, conditional, etc) is greater than the margin of victory.

For example, in the 2016 primary, 37% (285,000) of the ballots were left out of the 1% manual tally audit, but the margin of victory of Clinton over Sanders was only 16,000. Since this was a partisan primary, only about half of those 285,000 ballots were able to vote on the Democratic Presidential Primary contest, so that would be about 142,500 ballots (estimated). It is mathematically impossible to prove to any level of confidence while leaving out 142,500 ballots that Clinton was the correct winner of the election if the margin was only 16,000 ballots using a statistically sampled audit.

And the number of Provisional ballots was about 75,000 ballots. If those are left out, then you also can't show that there is 95% chance that the results are correct.

The number of ballots left out would need to be significantly fewer than the margin of victory in votes, if the worst-case assumption is made, that is that those left out would be assumed to be voted for the underdog.

What we don't want to see is a risk limiting audit performed with a subset of the ballots with a very large portion (nearly 40%) omitted. If you do this then there is no mathematically sound procedure to sample the other 60% and be able to show with 95% confidence that a full hand tally of all validly cast ballots will produce the same result. The only way that could be true is if the margin was larger than 40%, or the required change in the vote could be hidden in the portion of the vote not audited.

This is particularly true since the portion of the ballots that is left out of the audit is well known by any fraudster who may wish to modify the outcome, and that portion could be targeted and changed in the central tabulator and the audit would not detect it.

Therefore, we assert that it is necessary to include nearly all ballots in any risk-limiting audit process, and if the RLA process relies on the 1% Manual Tally to audit those contests not subjected to the RLA procedure <u>must also include nearly all ballots</u>.

2. 1% MANUAL TALLY (15360) SHOULD ALSO INCORPORATE NEARLY ALL BALLOTS:
It is still the case that the provisions pushed through in AB-840 to allow election officials to exclude the later Vote-by-mail (VBM), provisional and conditional ballots from the scope of the 1% Manual Tally audit are mathematically incorrect and imprudent. This is particularly true with these new RLA provisions that rely on the 1% manual tally to deal with all the contests that are too much trouble to audit with a risk-limiting audit procedure.

We must assert that <u>the 1% manual tally MUST also include all (or nearly all) ballots in the random selection process.</u> 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.

The RLA law should at least clarify that all or nearly all ballots must be included in the 1% Manual Tally as well, for all the contests not included in the RLA.

This is one of the severe deficiencies in the predominantly used election audit process. We find that it is imprudent for the legislature to continue to work on risk-limting audits while neglecting to fix the problems in the existing election audits.

3. CROSS-JURISDICTIONAL CONTESTS:

The proposed provisions will result in a situation where cross-juristictional contests cannot be included in a risk-limiting audit, and therefore, a 1% manual tally must be conducted for those precincts included in the portion of the jurisdiction.

Apparently, the definition of "cross-jurisdictional" contests includes all state-wide contests (such as governor and other state-wide seats), presidential contests, federal senate seats, and any congressional seats that have footprints that include portions of more than one county. <u>Clearly, these are some of the most consequential contests in any elections.</u> We are left with county-wide seats (board of supervisors, sheriff, etc), congressional seats fully included in one county, and any local seats such as school district boards, water boards, and city mayors. These remaining seats are more difficult to include in any RLA because the number of samples in the audit are related to only the margin in the contest, rather than the total number of votes.

We suggest that counties be allowed to include the cross-jurisdictional contests.

It is true that the 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. In the existing RLA provisions, there is nothing 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.

<u>Therefore, we recommend that the following text be added:</u>

> Elections officials may include cross-jurisdictional contests in the risk limiting audit procedures, such as statewide contests and any contests that are split between counties, as follows: the sample size will be calculated based on the smaller of a) margin of the votes of voters in the county, 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. BATCH COMPARISON AUDIT NOT OFFERED AS AN OPTION:

Although risk-limiting audit advocates agree that there are three options for RLA audits, including ballot-polling, ballot-comparison, and batch-comparison audits, the current law and proposed changes neglect to include <u>batch-comparison audits</u> as an option. For any contest, if election officials were to sample just 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). The batches should be 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.

Yes, the math involved here is more complex, but the process is easier because it is the most like the 1% manual tally process and the process used in any recount.

The fact that this is not offered as an option in the existing RLA law nor in this bill is a surprise, and should be changed. The 1% Manual Tally audit IS a batch-comparison audit, although it is not risk limiting, and is not designed to escalate when margins are close or there are many discrepancies found.

Despite these shortcomings, election officials are most accustomed to performing the batch-comparison audits. 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.

Indeed, even if the batch-comparison RLA audit is included, it does not eliminate the Four Fatal Flaws mentioned earlier.

5. HAND-MARKED UNIFORM TALLY SHEETS: The SOS 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 systems[1]. 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:

> 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.

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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.

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 comparision 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.

In this era of COVID-19 precautions, it is very difficult for officials to provide for adequate oversight by the public of the data being entered into the DRE-like data entry, while manual tally sheets can be easily scanned and posted to the website.

Using such hand-tally sheets can dramatically reduce the amount of data entry, either by a factor of about 20 or 100, depending on the type of audit used.

Therefore, we propose the following changes to item (G):

> (G) Establish procedures and requirements to ensure the audit process is observable and verifiable by the public, including disclosing the methods used to select samples and to calculate the risk, providing public opportunity to verify that the correct ballots were inspected during the audit, and providing public opportunity to observe the inspection of the voters' marks on the ballots during the audit. The audit shall utilize hand-marked tally sheets for all ballots inspected by the audit team that can be easily scanned and posted to the website so that the public need not witness every data entry step.

Also to section (c):

> (c) The risk-limiting audit shall be a public and observable process, with the elections official providing at least a five-day public notice of the time and place of both the risk-limiting audit and the selection of the ballots to be used when conducting the risk-limiting audit. Video recording shall be allowed to provide a means for the public to witness the process while not being physically present.

6. 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.

Therefore, we propose the following revisions. First, in the section regarding SOS regulations, add this provision:

(b)(2)(H) Establish a uniform audit report which shall be both human readable and easily parsed by computer applications to aid in the deployment of RLAs and provide a means for rapid and comprehensive oversight of the results.

Revise provision (d)

(d) The elections official conducting the risk-limiting audit shall publish a report on the results of the risk-limiting audit in the certification of the official canvass of the vote using the standard reporting format as defined by the Secretary of State.

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. OUR RECOMMENDATION: I will now repeat our recommendation, based on a thorough review of the RLA processes and mathematics. We recommend:

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

Scanned documents created by "Trusted Systems" are 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 the SOS explains 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 admit that there are improvements to be made in the security of ballot images and we are working to establish standards so the ballot images cannot easily be modified. 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.

The legislature should add the availability of an "Automated Independent Audit" similar to the audits

allowed in Florida per Florida Statute "TITLE IX - ELECTORS AND ELECTIONS, Chapter 101 - VOTING METHODS AND PROCEDURE, 101.591 - Voting system audit.", specifically, this section has the following provisions (selected from the full text):

101.591   Voting system audit.—

(1)   Immediately following the certification of each election, the county canvassing board or the local board responsible for certifying the election shall conduct a manual audit or an automated, independent audit of the voting systems used in randomly selected precincts.

...

(c)   The division shall adopt rules for approval of an independent audit system which provide that the system, at a minimum, must be:

1.   Completely independent of the primary voting system.

2.   Fast enough to produce final audit results within the timeframe prescribed in subsection (4).

3.   Capable of demonstrating that the ballots of record have been accurately adjudicated by the audit system.

(3)   The canvassing board shall post a notice of the audit, including the date, time, and place, in four conspicuous places in the county and on the home page of the county supervisor of elections website.

(4)   The audit must be completed and the results made public no later than 11:59 p.m. on the 7th day following certification of the election by the county canvassing board or the local board responsible for certifying the election.

We recommend, however, that the independent automated audit be conducted prior to certification, and that it include all precincts, rather than a random selection of precincts.

Florida has defined the requirements for approval of an automated independent audit system, available at this URL: https://www.flrules.org/gateway/ruleNo.asp?id=1S-5.026

We have been developing an independent Ballot Image Audit system called "AuditEngine" which we will be submitting for approval in Florida, and we believe this general direction will also be the best choice for audits in California. Citizens' Oversight is willing to work with the committee working on these laws to refine the language to make these audits acceptable.

9. CHANGES TO IMPROVE THE 1% MANUAL TALLY:
Please do not ignore changes needed in the 1% manual tally law. Specifically, we suggest:

A) 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.

B) In any case, the semifinal official canvass, the results that will be used in the 1% manual tally, should

be complete and published PRIOR TO the start of the random draw. Current law states that the random draw can occur no earlier than the closure of the polls. What we see is election officials are doing the random draw prior to even completing the scanning and tabulation process. In Los Angeles this season, they had no reports completed prior to the draw, and only the number of batches they thought they would eventually have. After the batches are determined, any insider could change the results of all the the other batches in the computer and the audit would never catch it.
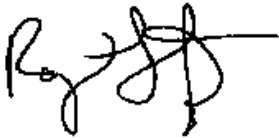
The provision should be changed from at closing of the polls, to "after completing tabulation of the semi-final official canvass and the results posted, with subtotals for each of the precincts or batches which are to be audited."

C) Video Recording of the Random Draw and Manual Tally should be allowed to allow for remote observation by the public to observe social distancing best practices.

D) The total vote counts in the precincts or batches included in the 1% Manual Tally should be included in the audit report.

E) The random draw should not use a random selection computer program as these cannot be remotely validated, and instead use the roll of ten-sided dice as the preferred method.

Sincerely,

Raymond Lutz
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