BRIEF OUTLINE OF STEPS IN COLORADO RISK-LIMITING AUDITS

This outline borrows from an architectural overview from Ron Rivest and Philip Stark, and Mark Lindeman's summary of Harvie Branscomb's Audit Steps document. It does not yet discuss how to extend audits to non-CVR counties. To minimize detail, some steps are described functionally, and not all necessary preparation is specified.

Overall Architecture

- The Secretary of State will create and manage a statewide Audit Center (AC), including a public web site that provides information and data to counties and aggregates data sent from counties.
- We audit contests to, among other things, limit the risk that the declared result is incorrect. Contests with tighter margins of victory generally require more auditing.
- Contests can be *active* (and thus audited whenever they are seen on ballots which are selected) or *settled* (their risk limit has been achieved, and they are not audited on subsequent ballots).
- Before the election, contests are put into three categories: (1) *uncontested* (which we consider settled from the start, and ignore during the audit), (2) *mandatory*, and (3) *opportunistic*. Mandatory contests will be factored into the sampling calculations, with enough ballots sampled so that the specified risk limit will be achieved for all of them, after which they become settled. Policy may designate some particularly hard-to-audit contests (e.g. ones which will only show up on a small fraction of the ballots) as *opportunistic,* and thus not subject to a pre-determined risk limit. These will still be opportunistically audited whenever they are active and appear on ballots selected for other contests. It may be that the risk limit is met for an opportunistic contest, in which case it becomes settled, but this is not guaranteed.The risk level that was achieved will be nevertheless be measured for these contests.

AUDIT STEPS
Before election day

- Audit Center publishes procedures, data formats, and algorithms to be used in the audit, so that observers can verify all the calculations and results themselves.
- Each county informs Audit Center (AC) of all its contests.
- Identify privacy issues related to rare ballot styles; designate #s of ballots for late scanning
- Publicly announce the time and place for dice-rolling ceremony to provide random input for the Pseudo-Random Number Generator.

Starting on election night

- Counties provide AC with tallies to date, corresponding CVRs, and ballot manifests with ballot counts by contest based on voter registration or signature verification data.
- AC provides rough estimates of initial audit workload by county and contest for planning purposes.
  - County accepts proposals for targeted audit units, vets them, and schedules auditing for

them as convenient.

Nine days after election, or after all ballots are tallied

- ● Complete scanning; update manifests, CVRs, and tallies; AC has now published full CVR enumeration. AC updates workload estimates.
- ● Centrally, in a publicly observable setting, using physical randomness (e.g., variety of stakeholders/citizens each throw a ten-sided die) and "fingerprints" (hashes) of the CVRs, generate and publish a seed for the PRNG.
- ● AC uses PRNG to determine specific ballots to be audited and publishes that list on the web.

Ten days after election (Friday): start of manual audit

- ● In each county, auditors retrieve paper ballots to be audited; judges interpret them in a publicly observable setting, prepare Audit CVRs (without referencing the corresponding original CVRs), and send them to the AC.
  - o All active contests are audited. If discrepancies are detected, counties can immediately investigate them.
- ● AC aggregates Audit CVRs, compares to original CVRs, factors in discrepancies, and reports which contests have been settled, which generally includes all mandatory contests for which no more than the expected number of discrepancies were found. AC determines an additional sample size for any mandatory contests that must continue. Counties retrieve any additional ballots selected for their county and continue as above, auditing any contests which remain active on them. This process may repeat.

Thirteen days after election (Monday): intended end of audit

- ● Any additional auditing for mandatory contests is completed. (Rarely, it is determined that a full recount is required.)
- ● AC produces final report of audit results with measured risk levels for all contests.
- ● Discrepancies are researched and findings are reported.

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