VoTeR Center

UConn Center for Voting Technology Research

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Statistical Analysis of Post-Election Audit Data for the November 4, 2025 Municipal Elections

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Summary

This report presents an analysis of the results of the post-election audit performed in the state of Connecticut following the November 4, 2025 municipal elections. The audit involved a randomly selected 5% of the voting locations in which ballots were cast. Since absentee and early voting ballots are tallied at the same place, they are audited together and treated as a single voting location. In each voting location so selected, the ballots cast on election day were either hand-counted or counted with electronic assistance; these totals were then compared against the tabulated totals.[1]

32 voting locations were required to produce an audit report. A total of 30 reports were submitted for analysis, comprising 661 audit records.

The goal of the analysis was to use statistical methods to detect instances of tabulator malfunction. The audit results from the 30 evaluated voting locations show discrepancies between tabulated and audited totals that are consistent with anticipated human error in counting or ballot handling. The analysis revealed no conclusive signs of tabulator malfunction.

[1] Auditors are allowed to use an electronic audit assistance tool, provided that they visually examine each ballot to confirm bubble interpretations.

1 Analysis Description

1.1 Audit Records

The audit returns are presented in a results report in which auditors record information about the precinct under audit, the results of their audit count, and the corresponding count values generated by the tabulator. This analysis considers the vote totals for each candidate as a separate record. Each record consists of three items: the number of ballots containing an "undisputed mark," the number of ballots containing a "questionable mark," and the total votes as reported by the tabulator. An "undisputed mark" is a mark that covers the majority of the bubble and is dark enough that all auditors agree that it should have been read as a mark by a working tabulator. A "questionable mark" is a mark that is not large or dark enough to convince all of the auditors that a working tabulator would have recorded it as a mark. As the intention of these audits is to detect tabulator malfunction, marks are evaluated in the context of anticipated tabulator interpretation rather than voter intent.

1.2 Expected Vote Ranges

For each record, the undisputed hand-counted mark total and questionable hand-counted mark total are used to define an *expected tabulator total range*. The range is defined as having a minimum that is equal to the undisputed mark count and a maximum that is equal to the sum of the undisputed mark count and questionable mark count. If the total as reported by the tabulator is at least the undisputed mark count and no more than the sum of the undisputed and questionable mark counts, the tabulated results are consistent with the hand-counted results. In this case, the tabulator is considered to be functioning properly.

1.3 Discrepancies

Total Vote Count Discrepancies. If the tabulator total falls outside of this expected range, then it is considered an unexplained discrepancy. In general, we measure unexplained discrepancies in different ways for different purposes. First, we define the *raw discrepancy* to be the signed distance between the tabulator count and the expected vote range: Specifically, if the tabulator count lies in the expected range, the raw discrepancy is defined to be zero; if the tabulator count is k larger than the maximum of the range, the raw discrepancy is k; if the tabulator count is k below the minimum of the range, the raw discrepancy is $-k$. The *relative discrepancy* is defined to be the raw discrepancy divided by the total number of ballots cast in the precinct under audit. Finally, we define *discrepancy* to be the absolute value of this relative discrepancy.

If the total ballot count is different from the total number of ballots counted during the audit, and the raw discrepancy value falls somewhere between zero and the ballot count difference, then the source of the discrepancy is potentially attributable to the difference in the ballot count. For this reason, it is important that auditors reconcile the tabulator ballot count and the audit ballot count. As mentioned above, we treat discrepancy as a percentage of the total number of cast ballots. However, in some circumstances, the number of ballots reported by the hand-count audit disagrees with the number of ballots reported by the tabulator. To be conservative, we evaluate relative discrepancy as a percentage of the minimum of these two quantities. (Observe that this convention can only increase the reported discrepancy in comparison with use of either of the individual numbers.) We call this method **Known Ballots Cast**.

Anticipated Human Error. We anticipate that a small amount of error will be present in a hand count. This error presumably depends on a wide variety of factors, including the complexity of the race to be audited, the operational details of the hand counting procedure, and the physical

details of the ballots themselves. The study of Goggin, Byrne, and Gilbert [1] observed an empirical error rate of 1.87% (with a standard error of 0.678%) for Optical Scan ballots; the study adopted simple two-candidate races and averaged over several counting methods. The study also measured human miscounting of the total ballot population, observing an empirical error rate of 0.95% (with a standard error of 0.328%).

With this as a guide, we treat discrepancies of approximately 1% (or less) of the audit ballot count as consistent with errors arising from human hand counting; in particular, such discrepancies do not conclusively indicate tabulator malfunction. Historically, the majority of our observed individual discrepancies are less than 1% of the total number of cast ballots, though discrepancies tend to be higher in more complicated races in which voters can specify multiple candidates.

Records of Interest. We designate records with discrepancies exceeding 1.5% as records of special interest, and include in the report any additional information we have that may put the errors in context.

1.4 Statistical conclusions concerning the entire election

Statistical inference of significant tabulator failures. The probability of observing zero significant failures among s (independent, uniform) samples from a population of M voting locations that in fact has fM significant failures (for a value $f \in [0, 1]$) is no more than

$$(1 - f)^s. \tag{1}$$

Thus, after observation of s voting locations without significant failures, the total fraction of voting locations with significant failures is less than f with confidence $1 - (1 - f)^s$.

2 Analysis Results

Of the 32 voting locations, the VoTeR Center received reports for 30. Of the 661 submitted records, 573 (86.69%) of the tabulator counts were within the range of undisputed votes and undisputed votes + questionable votes found for that record at the audit. For the records for which this was not the case, 87 records (13.16%) showed a discrepancy less than or equal to 1% and one record (0.15%) showed a discrepancy greater than 1%. The cause of the discrepancy greater than 1% is discussed below. We note that all of the received audit reports include both the total ballot count and the total number of ballots hand-counted at the audit. Therefore, we use the Known Ballots Cast method, outlined above, to evaluate all discrepancies in the submitted audit records.

Specific remarks. Discussions with registrars from the town with the discrepancy that exceeded 1% indicated the following relevant circumstances.

- The discrepancy exceeding 1% resulted from a procedural misunderstanding. The auditors omitted write-in ballots from the audit hand count and reported zero write-in votes. After the registrars counted those ballots, the discrepancy fell from 1.69% to 0.13%.

Remarks on rate of questionable marks. Considering the role played by questionable marks in the definition of discrepancy, we note the rate of questionable marks in the election. We observe $3,955$ questionable marks over a population of $34,838$ ballots counted by hand and $217,320$ total cast (non-questionable) marks. The total number of questionable marks as a fraction of the total number of votes cast in the election is 1.79%. This is significantly higher than in previous years.

Town	District
Chaplin	Chaplin Volunteer Fire Department
Cheshire	Highland School
Cornwall	Cornwall Town Hall
Danbury	War Memorial Gym
East Hampton	East Hampton High School
East Hartford	Langford School
Glastonbury	Nayaug Elementary School
Greenwich	Bendheim Western Greenwich Civic Center
Milford	Central Counting - Parson's Government Center Gym
New Britain	Chamberlain Elementary School
New Britain	Holmes Elementary School
New Canaan	Central Counting - New Canaan Town Hall
New Haven	Atwater Senior Center
New Haven	John S Martinez School
New London	New London STEM High School
Newtown	Middle School Gym
Orange	High Plains Community Center - Senior Cafeteria
Ridgefield	Yanity Gym
Rocky Hill	Central Counting - Rocky Hill Town Hall, Council Chambers
Scotland	Firehouse Community Center
South Windsor	Timothy Edwards School
Stamford	Dolan Middle School
Stratford	Chapel School
Stratford	Central Counting - Town Hall, Town Council Chambers
Torrington	City Hall
Torrington	Torrington School 2
Vernon	Central Counting - Center 375 Gym
West Hartford	West Hartford Town Hall
West Hartford	Hall High School
Woodstock	Woodstock Middle School

Table 1: Voting locations analyzed

Discussions with several registrars suggest that the increase in the number of questionable marks is due to the registrars' hesitance to make assumptions about machine behavior. The Office of the Secretary of the State purchased new tabulators in 2024, and only nine towns had deployed them prior to this election [2]. In many towns, registrars were unsure how the tabulator would handle marks that did not entirely fill the bubble; this led them to be liberal in classifying incomplete marks as questionable. As the registrars become more comfortable with the new tabulators, we expect the rate of questionable marks to decrease. We discuss solutions to accelerate this familiarization in Section 3.

2.1 Statistical inference concerning the election

Statistical inference of significant tabulator failures. The 30 sampled voting location reports for which data are available do not indicate significant tabulator error. The missing data from these samples pose a challenge to straightforward statistical analysis of the results. If these samples are simply treated as the results of 30 independent samples, the method described above concludes that the total fraction of voting locations with significant errors is less than 9.6% with 95% confidence. Treating the missing samples as the result of an independent removal process—for example, one that discards a sample independently with fixed probability $\approx 1/16$—does not weaken these conclusions. With the most pessimistic assumptions—entertaining the possibility that the missing data are intentionally suppressed to conceal errors—no meaningful conclusions can be made.

3 Procedural Recommendations

As discussed above, there was an elevated rate at which marks were interpreted as questionable this year due to registrars being unfamiliar with the behavior of the new tabulators. While registrars will surely gain familiarity with the machines by repeated use, we propose the creation of a "Mark Interpretation Guide" to use as a reference sheet during the audits.

The "Mark Interpretation Guide" will display common voter marks alongside the DS300's classification of them as marked, unreadable, or blank. The goal is to increase confidence in the DS300's treatment of marks, and so reduce the number of marks registrars find ambiguous. With current programming, any marks identified as unreadable by the DS300 will either be rejected (for precinct scanners) or reserved for hand counting (for central scanners), so—in principle—audited marks in this category should be infrequent.

4 Conclusion

The University of Connecticut Center for Voting Technology Research (VoTeR Center) received data gathered in the post-election audit performed in the State of Connecticut following the November 4, 2025 municipal elections. The audit involved a randomly selected 5% of the voting locations at which ballots were cast; the audit returns were conveyed by the Office of the Secretary of the State (SotS) to the VoTeR Center. The audit data analyzed by the Center contain 661 records, where each record represents information about a given candidate: date, district, office, candidate, tabulator-counted total, hand-counted total of the votes considered unquestionable by the auditors, hand-counted total of the votes considered questionable by the auditors, and the hand-counted total, that is, the sum of undisputed and questionable votes.

The audit found almost all the discrepancies to be below 1%, the threshold beneath which we assume errors are explained by the inaccuracies of human hand counting. The single discrepancy that exceeded this threshold resulted from a procedural error and fell below the 1% threshold once

resolved. While one always wishes for no discrepancies, the magnitude of the discrepancies observed during the 2025 audit is consistent with anticipated human error.

References

[1] Stephen N. Goggin, Michael D. Byrne, and Juan E. Gilbert. Post-Election Auditing: Effects of Procedure and Ballot Type on Manual Counting Accuracy, Efficiency, and Auditor Satisfaction and Confidence. *Election Law Journal: Rules, Politics, and Policy*, 11(1):36–51, March 2012.

[2] Office of the Secretary of the State, Connecticut. Secretary Thomas Announces Historic Investment in Modernizing Connecticut's Elections Infrastructure: Nine Towns to Soft-Launch New Tabulators in Advance of 2024 General Election. Press release, State of Connecticut, September 2024. Accessed January 22, 2026.