2025

VIRGINIA
STATE BOARD
of ELECTIONS

November 2024 Risk-Limiting Audit Report

January 15, 2025

VIRGINIA DEPARTMENT OF ELECTIONS

EXECUTIVE SUMMARY

Pursuant to §24.2-671.2 of the Code of Virginia, the Virginia Department of Elections is required to coordinate a pre-certification, post-election risk-limiting audit of ballot scanner machines in the Commonwealth.[1] The 2024 November General Election Risk-Limiting Audits (RLA) took place in the weeks following the general election for the United States Senate and United States House of Representatives. During the week of November 18, 2024, localities completed two RLAs: a ballot polling RLA for the U.S. Senate race and a batch comparison RLA for the U.S. 1st Congressional District (District 1) race under the supervision of the Virginia Department of Elections (ELECT). This was the first time that ELECT and the elections community performed two RLAs using two different methods at this scale. ELECT announced the successful completion of the audits on December 2, 2024, successfully meeting the risk limit with over 90% confidence that voting machines accurately reported election results.

In addition to facilitating the audit each year, §24.2-671.2 also requires ELECT to submit a report to the State Board of Elections (SBE) that details the results of the audit and provides an analysis of any detected discrepancies.[2] The following report gives a comprehensive overview of the risk-limiting audits conducted in the Commonwealth during the 2024 General Election cycle.

WHAT IS A RISK-LIMITING AUDIT?

A risk-limiting audit (RLA) is an audit conducted after an election and before the certification of the election results that provides strong statistical evidence that the declared winner of a contest received the most votes. By reviewing a statistically significant sample of ballots,[3] RLAs provide a more cost-effective and efficient alternative to other forms of post-election audits by reducing the total number of reviewed paper ballots needed to confirm election results. In 2017, RLAs were codified into Virginia law as §24.2-671.1 and later recodified as §24.2-671.2 in 2022. Since the first statewide RLA in 2021, ELECT and the elections community have performed twelve RLAs, seven utilizing ballot polling and five utilizing batch comparison.[4] Virginia and sixteen other states have passed legislation requiring or allowing for RLAs or pilot programs.[5].

RLA METHODS USED IN VIRGINIA

The SBE has approved two types of RLA methods: ballot polling and batch comparison for use in the Commonwealth. While ballot polling and batch comparison audits differ in their sampling methodology, both methods achieve the same intended purpose: to confirm that the voting machines reported the correct outcome.

A *ballot polling* RLA is similar to an exit poll. In this case, ballots are randomly selected, tabulated, and compared to the reported result.

A *batch comparison* RLA is similar to a traditional audit. Batches of ballots are randomly selected, counted, and compared to the reported results.

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[1] Code of Virginia §24.2-671.2(C).
[2] Code of Virginia §24.2-671.2(H).
[3] *See* Code of Virginia §24.2-671.2(A).
[4] *See* ELECT, Election Security, Risk-Limiting Audits.
[5] *See* RiskLimitingAudits.org.

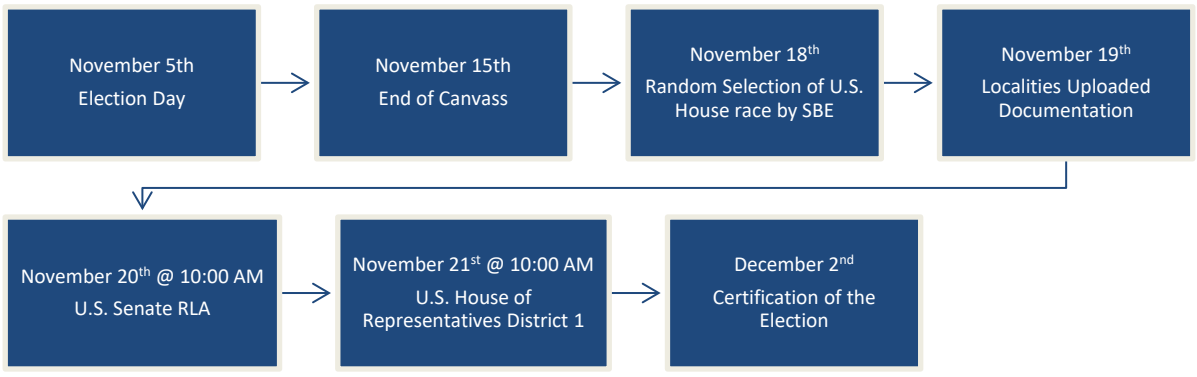
While the batch comparison method reviews more total ballots than the ballot polling method, both provide strong statistical evidence that the declared winner won their election.

HOW IT WORKS IN VIRGINIA

RLAs analyze a randomized sample of hand counted ballots and compare those results to the results reported. To conduct an RLA, a voting system must be in place that uses paper ballots. The ballots sampled must be hand counted, tallied, and entered into the auditing tool. A risk limit is set as a threshold of error and is the largest probability that the risk-limiting audit will fail to correct an election outcome that differs from the outcome that would be found by a full manual tabulation of the votes on all ballots cast in the contested race.[6] For example, a 10% risk limit means that there is a 90% chance that the audit will correct an incorrect outcome. To date, all RLAs conducted in the Commonwealth have utilized a 10% risk limit set by the SBE. The auditing tool, then, performs the calculations necessary to determine if the pre-determined risk limit has been met.

ELECT uses an RLA software called Arlo, a ballot auditing tool created by VotingWorks, to help facilitate the RLA.[7] The auditing tool randomizes the ballots sampled and performs all statistical calculations for the audit. Typically, if the margin of an election is wide, fewer ballots are needed to confirm the contest results; if the margin is narrow, more ballots will be audited. If the risk limit is not met, then a second round of the RLA will need to occur and may result in a full hand count of all ballots.

TIMELINE



RLAs must be conducted after the election but before certification by the SBE. Localities and ELECT staff had 7.5 business days to complete two RLAs, requiring the cooperation and coordination of multiple localities throughout the Commonwealth. During the SBE's September 2024 meeting, the SBE chose to have the U.S. Senate RLA utilize the ballot polling method and

[6] Code of Virginia §24.2-671.2(A).
[7] VotingWorks, Risk-Limiting Audits with Arlo.

the U.S. Congressional District RLA utilize the batch comparison method. The following is an overview of the timeline of the process after Election Day on November 5, 2024:

- The SBE met on Monday, November 18th following the end of the canvass on Friday, November 15th to select a contest for U.S. Congress to audit, draw the random seed numbers for sampling, and set the *risk limit* of the audit.

- On Tuesday, November 19th ELECT staff held meetings to allow for last-minute questions from localities; localities were also required to upload their RLA documents that day into Arlo.

- On Wednesday, November 20th, 93% of localities were required to retrieve certain ballots, chosen at random by Arlo.

- The following day, Thursday, November 21, seven out of eighteen District 1 localities performed their RLA with nineteen batches of ballots.

- The results of the RLA were announced on Monday, December 2nd when the SBE certified the results of the 2024 November General Election.

WHAT WAS THE RESULT OF THE RLAs?

U.S Senate Ballot Polling RLA

The U. S. Senate race underwent a risk-limiting audit utilizing the ballot polling method on November 20, 2024. The U.S. Senate had a margin of victory of 8.98% with a total of 4,523,576 ballots cast. Although all 133 localities were required to submit a ballot manifest, only 125 localities out of 133 were randomly selected to pull a total of 1,878 ballots, about .04% of the total ballots cast. Buena Vista City, Covington City, Emporia City, Highland County, Lee County, Mathews County, Norton City, and Poquoson City were not selected by Arlo, the RLA auditing tool, to hand count ballots although they did submit the required ballot manifest, fulfilling the participation requirement of §24.2-671.2(C)(4).[8] Comparatively, during the last statewide RLA held in 2021, eleven localities were not chosen.[9] The risk limit of 10%, set by the State Board of Elections, was successfully met in the first round of the RLA, confirming the outcome of the race.

U.S. House of Representatives District 1 Batch Comparison RLA

District 1 had a margin of victory of 12.78% with a total of 487,807 ballots cast. While every locality involved in the U.S. House of Representatives District 1 submitted a ballot manifest, 7 out of 18 localities audited 19 randomly selected batches of ballots. A total of 137,627 ballots were reviewed in a single day, about 28% of the total ballots cast. The localities selected for audit included Chesterfield County, Gloucester County, Henrico County, James City County, Lancaster County, Middlesex County, and Westmoreland County. Discrepancies were found

[8] Code of Virginia §24.2-671.2(C)(4). *See also* ELECT, 2024 Risk-Limiting Audit Manual, Section 2.2.
[9] ELECT, March 2021 RLA Report, page 6.

within 14 of the audited batches, totaling 80 ballots or .0167% of all ballots cast in the District 1 election. None of the discrepancies were significant and would not have affected the outcome of the election. An example of a discrepancy is when a voter inadvertently rests their pen on multiple candidate bubbles on the ballot, causing marks and resulting in the ballot being read in the machine as an overvote. When reviewed by a human, the voter intent is clear, and the ballot can be counted for one candidate. The risk limit of 10%, set by the State Board of Elections, was successfully met in the first round of the RLA, confirming the outcome of the race.

LESSONS LEARNED

RLAs and the Post-Election Timeline

In 2024, a law was passed, Acts of Assembly Chapter 738, that extended the time for the electoral board to submit the ascertainment of the results of a general election to ELECT from seven days after the election to ten days after the election.[10] Without additional changes in the timeline, the RLA had three fewer days to be performed, and localities had three fewer days to prepare for the RLA. Further, the period between the end of canvass and certification of the SBE is not only the time to perform the RLA but also the time when ELECT and localities are reviewing their abstracts of votes, a critical and likewise required step in the electoral process. The compression of this timeline put additional stress on local election administrators and resources that had already been exhausted after running at least three major elections in 2024, with 45 days of early voting before each of those elections. It was through the determination and diligence of the election community that the RLAs were completed successfully and before the Thanksgiving holiday. This was best illustrated during the District 1 RLA when several general registrars and their staff aided neighboring localities allowing the District 1 RLA to be completed faster than anticipated. Future considerations should be made to alleviate this timeline to account for the loss of extra time, although options are limited as state certification of election results can not be delayed further due to the timing of the Electoral College in Presidential years.

Batch Comparison at the Congressional District Level

In recent years, batch comparison audits have been conducted on local races, wholly contained within one jurisdiction, in Orange, Loudoun, and Arlington counties. However, the House of Representatives District 1 batch comparison RLA conducted following the 2024 General Election was the largest-scale batch comparison RLA ever conducted in the Commonwealth. The District 1 RLA required 137,627 ballots across seven localities. Before this, Loudoun County had the largest sampling in a batch comparison RLA with a full hand tally in 2023 with 62,303 ballots in a single district in a single locality, less than half of District 1's volume.[11] This was further complicated by also having to conduct an RLA using the ballot polling method earlier in the week. This meant that localities had to be organized and staffed to host two audits using two different methodologies in one week.

No locality in District 1 had yet performed a batch comparison method RLA. There was some confusion about the performance of and preparation for the batch comparison RLA, such as the

[10] *See* 2024 Acts of Assembly Chapter 738.
[11] ELECT, November 2023 Risk-Limiting Audit Report, page 12.

documents required for the RLA, how the documents were to be formatted, and how to interpret marked ballots. However, through proper training and preparation, the RLA was finished within one day. The biggest issue was the batching of ballots, especially the size of the batches chosen by Arlo; this issue is discussed further below as it is an issue that affects both RLA methods.

Concerns were also expressed by local election administrators regarding the volume of ballots that had to be hand counted to complete the audit. Despite having a margin of 12.78%, 137,627 ballots had to be hand counted to complete the District 1 RLA, about 28% of all total ballots cast. Comparatively, the margin of the U.S. House race was 8.98% with only 1,878 ballots reviewed during the RLA, about .04% of all total ballots cast, utilizing the ballot polling method. Both audits proved the accuracy of the voting systems, but the U.S. House RLA required a great deal more manpower than the U.S. Senate RLA despite only having about a 4% difference in their margins of victory. While the U.S. Senate RLA was able to be completed within one day due to the massive amount of manpower that came to assist, future audits with closer margins could result in many more ballots being reviewed with the potential to escalate to a full hand tally or if additional rounds are required to complete the audit. Overall, the expansion of the batch comparison method was successful.

Arlo Improvements

Since 2019, ELECT and VotingWorks have worked together to improve Arlo by providing feedback. As this was the second statewide RLA since being statutorily required, ELECT had more feedback regarding not only the RLA process but also Arlo, the RLA software by VotingWorks. While most localities had positive or neutral experiences with Arlo, some localities found it hard to use or confusing to navigate. Additionally, localities have expressed interest in a sandbox version of Arlo to allow interaction with the software outside of an actual RLA. ELECT will continue to work with VotingWorks to improve locality experience in future RLAs.

Data Entry Quality Assurance

Accurate data entry is important to the RLA process as the data entered informs Arlo's processes. Some data entry errors occurred that were quickly addressed and rectified at both the state and local levels and could have been more easily corrected with more quality assurance steps by RLA administrators. For example, when the participants for the RLA were uploaded into Arlo, the RLA administrators did not notice that they had labeled Virginia Beach as "Virginia Beach City"; this caused a map in Arlo to suggest that Virginia Beach had no data when the general registrar had already uploaded their ballot manifest to Arlo. This caused some confusion and required some additional coordination with VotingWorks to correct the issue. Another example was when Henrico County made a typographical error in their ballot manifest, which was discovered during the RLA process. While the error did not affect the outcome of the RLA it was an error that could have been caught and corrected either at the state or local level with more data entry quality assurance steps. Going forward, ELECT will build more quality assurance steps into its procedures to mitigate such errors, which may include finding ways to include more time for preparation efforts before starting the RLA.

Batching of Ballots

As was discussed in the November 2023 RLA Report,[12] "Strategically storing ballots is key to an easier and smoother RLA process." However, the inability of many localities to do so was presented during this year's RLAs, especially in the District 1 RLA. Many localities had to go through batches of ballots that consisted of several thousand ballots. While it was only through the diligence of local election officials that the RLAs were completed in one day each, the effort could have been eased with the ability of localities to make smaller batches. The purchase of election management systems may assist with this; however, this is an additional cost that is charged by all vendors. Alternatively, allowing access to the memory cartridges or thumb drives of the voting systems may allow for some localities to manage their batches. ELECT will consider these options and explore others as well to assist in the making of smaller batches.

RLA Transition Logistics

Additional logistics were required to ensure a smooth transition from a ballot polling method RLA to a batch comparison RLA. This was the first time localities would have to transition between two RLA methods in one week. Some documentation was the same but required additional edits that were new to these localities, such as combining batches of ballots for a batch comparison RLA but separating batches for a ballot polling RLA. Another issue was how to store the ballots reviewed in the ballot polling RLA in preparation for the batch comparison RLA. It was recommended by VotingWorks that ballots used in the ballot polling RLA earlier in the week stay in the same batch for the purpose of the batch comparison RLA later in the week; previously, this was a decision at the discretion of the locality. Given the unique circumstances, ELECT shared VotingWorks' recommendation with the elections community so that they would be prepared for both RLAs. For future RLAs, when multiple RLAs are required, it may be best for the SBE to choose only one method for both RLAs to reduce confusion and allow more focus on executing one process instead of two.

RLA Training

In preparation for the RLAs, ELECT began messaging and training early in 2024 to the elections community. ELECT provided multiple reminder advisories regarding the RLA throughout the year. The training division of ELECT made two online trainings for the RLA that were released in April. In July, the RLA was also given a priority presentation at the required annual state training for election officials, known as the Virginia Elections Workshop or VEW. Further, an Arlo demonstration was also provided in September to the elections community to provide more insight into the Arlo software itself. ELECT staff also provided three open table discussions in the days preceding the start of the RLA, a total of sixteen hours of open discussion on various topics related to the RLA. While most of the elections community engaged in most of these opportunities, some still struggled to understand the basic principles and procedures of the RLA. ELECT will continue to work with election officials to ensure the training provided is understandable to all election officials and is of the best quality ELECT can provide. Additionally, ELECT will provide more training to local electoral board members on their duties as it relates to RLAs.

[12] ELECT, November 2023 RLA Report, page 4.

RLA and the Public

As RLAs will continue to be used in the Commonwealth, ELECT will provide more education as to an RLA's purpose and how it fits into the mission of having accurate, fair, open, and secure elections in the Commonwealth. Understanding how the RLA fits into the election security process will boost the public's confidence in not only the value of RLAs but also the election process as a whole. Such training should include a focus on explaining the differences between the two methods.

CONCLUSION

The audits of the U.S. Senate and the U.S. House of Representatives District 1 confirmed the election results were accurately reported. The results reflect the hard work of election administrators and further exemplify the integrity and validity of the 2024 General Election. RLAs are an important tool in reassuring the public that every vote counts and provide an excellent check on the democratic process. For more information about the RLA process please consult ELECT's RLA Manual.[13] ELECT remains a leader nationally in the administration of risk-limiting audits and intends to build on this success in the years to come to ensure safe, secure, fair, and free elections in the Commonwealth.

[13] ELECT, 2024 Risk Limiting Audit Manual.

i. 2024 November General Election RLA: Potential Races

Congressional District 1	Congressional District 2	Congressional District 3	Congressional District 4	Congressional District 5	Congressional District 6
James City, York, Gloucester, New Kent, Westmoreland, King William, Northumberland, Lancaster, Middlesex, Essex, Richmond, Mathews, King & Queen Counties; Cities of Williamsburg and Poquoson *Partial: Henrico, Chesterfield, and Hanover Counties*	Accomack, Isle of Wight, Northampton Counties; City of Virginia Beach, Suffolk, and Franklin *Partial: Southampton County; City of Chesapeake*	Cities of Norfolk, Hampton, Newport News, Portsmouth *Partial: City of Chesapeake*	Prince George, Dinwiddie, Brunswick, Greensville, Sussex, Charles City, Surry Counties; Cities of Richmond, Petersburg, Hopewell, Colonial Heights, and Emporia *Partial: Chesterfield, Henrico, and Southampton Counties*	Pittsylvania, Campbell, Louisa, Halifax, Amherst, Mecklenburg, Powhatan, Fluvanna, Goochland, Prince Edward, Buckingham, Nottoway, Appomattox, Nelson, Amelia, Lunenburg, Charlotte, Cumberland Counties; Cities of Lynchburg, Charlottesville, and Danville *Partial: Albemarle, Bedford, and Hanover Counties*	Frederick, Rockingham, Augusta, Harrisonburg, Shenandoah, Warren, Botetourt, Page, Rockbridge, Alleghany, Clarke, Bath, Highland Counties; Cities of Roanoke, Harrisonburg, Winchester, Staunton, Salem, Waynesboro, Lexington, Buena Vista, and Covington *Partial: Roanoke County*

Congressional District 7	Congressional District 8	Congressional District 9	Congressional District 10	Congressional District 11
Stafford, Spotsylvania, Culpeper, Orange, Caroline, King George, Greene, Madison Counties; City of Fredericksburg *Partial: Prince William and Albemarle Counties*	Arlington County; Cities of Alexandria and Falls Church *Partial: Fairfax County*	Montgomery, Franklin, Washington, Henry, Tazewell, Wise, Pulaski, Smyth, Carroll, Wythe, Russell, Lee, Scott, Buchanan, Patrick, Giles, Floyd, Dickenson, Bland, Craig, Grayson Counties; Cities of Norton, Galax, Martinsville, Bristol, and Radford *Partial: Bedford and Roanoke Counties*	Loudon, Fauquier, Rappahannock Counties; Cities of Manassas and Manassas Park *Partial: Prince William and Fairfax Counties*	City of Fairfax *Partial: Fairfax County*

ii. Arlo Results

Contest Name	Sample Size	Risk Limit Met?	P-Value	Audited Votes
U.S. Senate	1,878 Ballots	YES	.038621	Timothy M. Kaine: 983; Hung Cao: 863; Write-In: 4; Ballots not found (counted for loser): 1
U.S. House of Representatives 1st District	19 Batches 137,627 Ballots	YES	.090274	Leslie C. Mehta: 42,558; Robert J. Wittman: 46,559; Write-In: 133