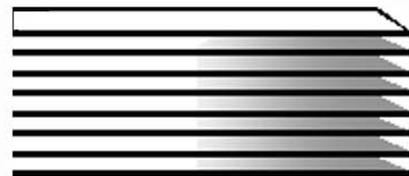


# **Wisconsin's Post-election Voting-machine Audit Practices**

Report of the  
**Election Integrity Action Team**  
of the Wisconsin Grassroots Network

July 2013







## Wisconsin Grassroots Network Election Integrity Action Team

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Of all the measures that can be undertaken to ensure election results accurately reflect the will of the people, post-election audits may be the most cost-effective. Low-tech, low-cost hand counts can determine our voting machines' accuracy and, when adequately publicized and performed transparently with a statistically meaningful sample, can do more to support voter confidence than dozens of behind-the-scenes security measures or hard-to-understand information technology (IT) reviews of the election software.

While pre-election machine testing can deter some deliberate fraud, only post-election audits can detect unanticipated machine malfunction or electronic fraud designed to operate only on Election Day.

Post-election audits may cover the entire election process from voter registration through ballot-printing and the ballots' chain of custody before, during, and after Election Day. However, Wisconsin law does not require such audits. This report focuses on those audit activities that determine whether our machines counted our votes accurately.

Following Wisconsin's November 2012 elections, voting-machine audits were conducted in 109 wards randomly selected by GAB staff from the state's 3,541 reporting units. Volunteers from the Wisconsin Grassroots Network Election Integrity Action Team observed nine of these audits. In addition, we reviewed national literature on post-election audit practices and interviewed GAB staff regarding our observations and conclusions. We are grateful for the help and gracious cooperation we received from them and from all nine municipalities in which we observed, and we are looking forward to GAB's report of the results of the audits.

In several ways, Wisconsin is better situated than many states to make the most of voting machine audits. Overall, Wisconsin's county and municipal clerks are conscientious and committed to honest, fair, and transparent elections. Our statewide elections authority is nonpartisan, and dedicated citizens and volunteers are willing to assist local officials in election tasks. Most importantly, many Wisconsin jurisdictions continue to rely on voter-marked paper ballots, which provide the most authoritative and reliable audit record among all available types of voting systems. For those municipalities that rely on touch-screen voting machines (also known as direct-recording electronic systems, or DREs), state statutes forbid the use of models that do not print a voter-verifiable paper audit trail.

In addition to these strengths, some changes in state statutes or GAB guidance could provide additional protection for Wisconsin's elections at a cost that could be justified several times over by their benefits. These are described in the following report and include:

- State statutes should be amended to require voting-machine audits to follow every election, not just November general elections. Currently, anyone considering electronic fraud in Wisconsin's partisan primaries or nonpartisan elections knows interference that escapes detection in simple pre-election testing and that produces results outside a recountable two-percent victory margin will almost certainly remain undetected. (See the discussion starting on page 8.)
- Statutes or GAB interpretation of statutes should be revised to require voting-machine audits to be completed *before* machine-tabulated results are certified as final, not after. We find that Wisconsin residents are nearly universally astonished to learn that their common-sense expectation—that machine-tabulated results are audited before being certified as final—is not true. In addition, in the event that a voting-machine audit discovers errors or fraud, the damage done to election officials' credibility and to the legitimacy of government will be much less if the audit is completed before, rather than after, election officials have certified the erroneous results as final. (See discussion starting on page 10.)
- Wisconsin's current statutes mandate post-election audit standards that are unworkable for separating immaterial findings from more troubling discrepancies that should trigger an expanded audit and investigation into the causes. We believe statutes should be amended to incorporate a workable standard. Further, to minimize the risk of divisive controversy, we believe GAB should not wait until an audit discovers deliberate interference or a serious error to adopt more detailed procedures for investigating and resolving such a discovery, but should direct its staff to develop more detailed written standards and procedures for post-audit investigation in the event that they are needed. (See discussion starting on page 11.)

Again, we wish to acknowledge and thank the county and municipal staff who welcomed us as we observed their audits, and the GAB staff who answered our questions and discussed our observations with us. We hope this report is useful to them and to all citizens and officials who cherish the self-government for which honest, fair, and accurate elections are necessary.

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**Wisconsin’s Post-election Voting-machine Audit Practices**  
**Report of Election Integrity Action Team**  
**of the Wisconsin Grassroots Network**  
**July 2013**

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# Wisconsin's Voting-machine Audit Practices

## Report of Wisconsin Grassroots Network Election Integrity Action Team

July 2013

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**O**f all election-security measures, rigorous and transparent post-election audits are uniquely cost-effective in building voter confidence. Because they rely on local officials and citizens, post-election voting-machine audits can be quicker and less expensive than reviews by computer-security professionals while producing more understandable—and hence more convincing—results. Unlike pre-election measures, post-election audits can detect miscounts regardless of whether they are caused by unexpected malfunction, human error in programming or operating the machines, or deliberate tampering.

In addition, well-publicized post-election voting-machine audits provide the most effective deterrence of electronic fraud, because although hackers can design malicious software to escape detection by routine computer tests, they cannot design it so that its effects are undetectable when the machines' totals are compared to the voters' ballots. Finally, well-publicized post-election audits provide the public with conclusive evidence that the entire package of voting-machine security measures was successful.

**W**isconsin already has the strengths and resources needed for high-quality post-election voting-machine audits. Overall, Wisconsin's county and municipal clerks are conscientious and committed to honest, fair, and transparent elections. Our state's highest elections authority is nonpartisan, and dedicated citizens and volunteers are willing to assist local officials in election tasks. Most importantly, Wisconsin law has wisely maintained a system that creates a paper record of every vote.

Wisconsin law currently requires post-election auditing after the November general elections. Members of the Wisconsin Grassroots Network's Elections Integrity Action Team observed nine of the 109 audits conducted after the 2012 general elections, and were generally pleased with their conduct. We were able to identify a few simple practices that could increase the value and reduce the cost of these audits without changing current laws or regulations.

This report also discusses additional changes in policy—either in state law or in GAB's administrative policies—that could reduce the possibility of undetected miscounts and greatly improve citizen confidence in Wisconsin's elections, perhaps even while reducing the cost of election security.

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## The unique value of post-election auditing

**O**ur grandparents made sure their election results were correct by hand-counting votes in public while double-checking every total. For speed and convenience we now use computers to count our votes. However, machine counting is not observable by human eyes, and machine tabulations are not double-checked.

Human error and mechanical glitches cause computers occasionally to malfunction even in the presence of quality-assurance programs costing much more than those of our local governments. Sabotage is another sad fact of life. In recent months, we learned hackers had penetrated the computers of the Federal Reserve Bank, the Washington Post, the New York Times, and former President Bush's AOL email account.

Both private and public sectors use many of the same basic information technology (IT) security safeguards—"hardening" their computers, limiting the number of people authorized to access the machines, maintaining physical security for the software and machines while in their possession, and strictly controlling their computers' connections to the Internet.

However, large private corporations often write their own critical software and subject it to thorough continuous review, while elections officials rely on off-the-shelf operating systems and software written and maintained by out-of-state companies that often claim proprietary secrecy, which prevents local IT staff from monitoring its integrity. Large corporations maintain physical control of all their equipment at all times, while election officials rely on memory devices that leave their possession between elections. Private-sector security efforts often operate independent backup or 'mirror' systems, while elections officials rely on only one.

**Organizations with IT quality-control resources and expertise exceeding those available to election officials expect machine malfunctions.**

Despite massive, full-time, professional computer-security capability, even the largest global corporations know that they will suffer malfunctions and malicious interference. Basic prudence causes them continuously to audit their computers' performance, asking "Are we detecting any malfunctions in time to prevent harm? Have our security measures worked?" That is the same question that citizens who cherish the integrity of our elections must also ask.

**T**herefore, the United States General Accountability Office in its 2005 report<sup>1</sup> on security and reliability of electronic voting systems identified post-election auditing as one of five critical management activities for an electronic voting system. Knowing this, it is level-headed and prudent to acknowledge that Wisconsin must conduct demonstrably effective routine post-election voting-machine audits to ensure that only actual winners are ever certified.

Fortunately a strong program of voting-machine audits is well within Wisconsin's abilities and resources.

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## Basic characteristics of a prudent post-election audit program

In its February 2012 *Elections Performance Index*, the Pew Foundation singled out assessment of vote-counting accuracy as the least-developed area of elections performance measurement. In no state, including Wisconsin, could Pew find reliable data to document that election results are accurate. Pew noted practices related to measuring electronic vote-counting accuracy are “still in their infancy” and stated that the issue “is one in which more effort must be expended in the future.”

**The practices used to ensure accurate, fraud-free counting of votes before computers have been abandoned and not replaced.**

Several factors explain why voting-machine auditing is the least-developed area of election security. First, most types of error or fraud can be deterred or detected by the same types of safeguards that worked before computers. Pre-computer methods that ensured accurate vote-counting, however, are no longer useful. When humans counted votes, two people counted independently—often while being observed by others. When one human developed a ‘glitch’, his or her errors were identified and corrected before the count was considered final. This safeguard was abandoned with the introduction of vote-counting computers. Operating two independent computer systems was never a feasible quality-assurance measure. As a result, when a single computer counts our votes, any glitches it develops on Election Day can easily go undetected.

**Unlike malfunctions in other computers, malfunctions in vote-counting computers cannot be detected without deliberately looking for them.**

Another reason post-election assessment of computer accuracy is still in its infancy is because election administration faces unique challenges not present for other industries. Every other industry that uses computers has the opportunity to detect malfunctions without specifically looking for them.

Bank customers, for example, will notice and inform the bank if an ATM is dispensing incorrect amounts of cash or if a deposit is not credited to the correct account. In contrast, no voter has the ability even to notice—never mind report—if his or her vote is credited to the wrong candidate. If a bank’s computer miscalculates total assets and liabilities, the error will be detected by multiple internal checks. In comparison, if a vote-counting machine declares the wrong winner, the error will most likely remain undetected. As a result, election administrators cannot simply adopt computer-auditing practices that serve other industries well.

**Elections experts have identified basic characteristics of a prudent post-election audit program, but wide acceptance of a specific set of methods does not yet exist.**

Although the discipline is in its infancy, enough work has been done in elections administration and related fields such as statistical quality assurance to enable us to envision the basic characteristics of a credible, effective program of post-election auditing.<sup>2</sup> A review of the election administration literature reveals six commonly identified common-sense attributes of an effective post-election audit program, listed on the following page.

## **Basic Characteristics of a Prudent Post-Election Audit Program**

- 1. Elections need to be documented well enough to be audited.** Audits are possible only when the elections process creates the necessary documents, including a paper record of each voter's ballot and a well-documented, secure chain of custody of election materials and equipment.
- 2. Design and regulation of the audits needs to be the responsibility of officials other than those who conduct the elections.** Policy-making and oversight of post-election audits should be the responsibility of officials other than those who conduct the elections, although the actual work of post-election audits may be performed by local election officials if done in a transparent way.
- 3. The audit process needs to be fully transparent.** Audit instructions need to be documented and clear to both the auditors and to the public, and the process must provide the public with the opportunity to observe and assess the procedures in all phases of the audit, while maintaining its integrity from interference.
- 4. Audits should verify the outcome for each contested election for national or statewide offices or referenda.** Few contests need a full hand count to confirm the outcome. Well-established and common-sense practices that use only partial counts can determine whether correct outcomes were produced in most contests.
- 5. Audits should be timely.** If election officials are going to avoid occasionally certifying incorrect outcomes, audits need to be conducted before results are certified as final, so official totals can be corrected if the audit reveals problems.
- 6. Post-audit procedures should specify performance standards and include procedures for responding to evidence of fraud or error.** Performance standards should distinguish between discrepancies that will be considered immaterial and those that will trigger additional investigation and corrective action. Investigations of serious discrepancies need to be independent and transparent so that they provide credibility to the eventual findings and need to include corrective action that ensures any lessons learned are used to improve the quality of future elections.

This specific list of characteristics has not been adopted or endorsed by any national authority or organization. It is a compilation of attributes that appear on several lists compiled or endorsed by various organizations. For sources, see endnote 2.

## Wisconsin's 2012 post-election audit practices

Following the November 2012 elections, voting-machine audits were conducted in 109 precincts selected randomly by GAB staff from the 3,541 reporting units (wards or combinations of wards in which votes are tallied) statewide. Volunteers from the Wisconsin Grassroots Network Election Integrity Action Team observed nine of these audits.

Considering the types of sampling currently used, Wisconsin's voting-machine audit practices are reasonably efficient, exempting contests that will be recounted under §9.01, Wis. Stats., and employing many long-established techniques for efficient hand counting. The local election officials we observed were thoughtful in their conduct of the audits. However, some municipalities were able to conduct the audits more efficiently than others. In a separate memo to GAB staff, included in this report as an attachment, we have described some practices used by those municipalities, including relying on elections inspectors rather than municipal staff and having at least one person present who has previous experience in audits.

For each of the six basic characteristics of a good post-election audit, this section describes what we observed.

### **1. Standard: Elections need to be documented well enough to be audited.**

Audits are possible only when the elections process creates the necessary documents, including a paper record of each voter's ballot and a well-documented, secure chain of custody of election materials and equipment.

Wisconsin legislators and election officials have wisely provided Wisconsin with an election process that requires every ballot to be preserved as an individual paper record either in the form of a voter-marked paper ballot or a machine-created voter-verifiable paper trail.<sup>3</sup> Voter-marked paper ballots support voter confidence better than computer-created paper trails, which can be altered by malfunction or malicious software<sup>4</sup> and which are verified in practice by only a small percentage of voters.<sup>5</sup> However, Wisconsin's elections are better protected than elections in states that do not require a paper record of each ballot, a prerequisite for audits of any kind.

Although it is possible for vote-recording computers to fail to create an auditable paper trail for at least some votes, such as when the paper does not advance between voters who either do not notice the problem or do not bring it to the attention of election inspectors, WGN volunteers noted no such problems in the audits we observed in jurisdictions that use computer-created paper ballots.<sup>6</sup>

In the nine voting-machine audits observed by WGN volunteers, we noted no problems with ballot security or chain of custody at the beginning of the audits or during their conduct. However, in apparent attempts to make sure the audits went quickly, several clerks had broken the seals and removed ballots from the bags before the audit started, so citizen observers had no opportunity to observe evidence that the chain of custody had remained secure. Future audits will have greater value if they begin with a publicly observable display of the evidence that documents the chain of custody of the ballots.

**2. Standard: Design and regulation of the audits needs to be the responsibility of officials other than those who conduct the elections.**

Policy-making and oversight of post-election audits should be the responsibility of officials other than those who conduct the elections, although the actual work of post-election audits may be performed by local election officials if done in a transparent way.

Wisconsin's voting-machine audit policies meet this standard. The GAB and its staff currently exercise leadership for policy-making relating to voting-machine audits and provide regulation and guidance for the conduct of those audits, while local election officials carry out the audits<sup>7</sup> and are required to follow procedures providing for adequate transparency.

However, the GAB provides only limited oversight to the audits. It does not send staff to assist municipalities in following proper procedures or independently to observe and assess compliance. GAB depends on the municipalities' written reports to assess the conduct of the audits. In addition, technical assistance from GAB staff is not available outside normal business hours, when many audits were performed. Because local election officials knew that we had observed several other audits, they turned to us on occasion for clarification of the instructions. While we were happy to share information about how other municipalities had resolved the same questions, such clarification should more suitably come from GAB staff. While no local official reported that inability to obtain timely, authoritative answers impaired the quality of their audit, more accessible timely guidance from GAB could have allowed the audits to be more efficient. We suggest that GAB could usefully provide a hot line during business hours, evenings, and weekends in the two-week period when audits are performed, to provide local election officials with quick, authoritative answers to technical questions.

We believe that GAB should also request and the Legislature should provide sufficient GAB staff to provide more accessible support and quality-improvement oversight for the audits from GAB professionals.

**3. Standard: The audit process needs to be fully transparent.**

Audit instructions need to be documented and clear to both the auditors and to the public, and the process must provide the public with the opportunity to observe and assess the procedures in all phases of the audit, while maintaining its integrity from interference.

Again, current Wisconsin law and GAB guidance provide a useful basis for the transparent conduct of voting-machine audits, and in our limited observation appear to have been implemented reasonably well. In particular, GAB makes the audit instructions and forms available on its website, which enhances transparency over what it would be without such ready availability.

We were able to note a few opportunities for improvement with little or no change in current policy, and are optimistic that advancements being developed in other states, if brought to Wisconsin, could improve transparency even more.

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**Instructions** — Clear instructions for post-election audits are even more important than one might expect. Although audits are simple in concept, many detailed steps are necessary to ensure consistency, reliability, and transparency. With Wisconsin's only-a-small-sample-only-once-every-two-years audit program, not all of the county clerks and few of the municipal clerks outside the larger cities have previous auditing experience when they are called upon to perform an audit, so the large majority of auditors are working on their first audit.

We noted several instructions that were either absent or ambiguous, causing minor confusion or uncertainty in each of the nine audits we observed. We provided GAB staff with suggestions for improving these instructions in the correspondence that is attached at the end of this report.

**Public observation** — Without exception, local officials in the nine jurisdictions where we observed were cordial, cooperative, and welcoming to the observers while protecting the integrity of their work. Among an additional 45 municipalities we contacted seeking information about the audits' time and place, we received cordial cooperation from all but one.<sup>8</sup> County and municipal officials were helpful and responsive to our requests for information. Only our shortage of volunteers able to observe during working hours prevented us from observing more audits.

Because GAB staff do not observe the audits, citizens and organizations such as political parties or civic groups can be reassured of the audits' quality only by being present as they are performed. Local officials who do not already schedule the audits to occur outside normal business hours could improve voter confidence by doing so. If more citizens could see what we saw, we believe these audits could strengthen public understanding of the election process, improve perception of election officials' integrity and competence, and reduce demand for hard-to-manage citizen audits. Conducting the audits on evenings or weekends also reduces disruption of the municipal office's normal working-day business. The WGN Election Integrity Action Team intends to work to increase citizen attendance at audits and at other opportunities for observation of election activities, and would appreciate active GAB support in encouraging and supporting municipalities to schedule future audits on evenings or weekends.

Opportunities for public participation could also be improved with slight changes to the scheduling and noticing process. Citizens reading the GAB website shortly after the election could learn which municipalities were selected and that the audits would start as soon as election results were state-certified. However, the uncertainty of that date caused scheduling difficulty for both local officials and the citizens who wanted to observe. In future years, GAB staff could make it easier for both local officials and citizens by announcing a specific date on which the audits can begin. Although GAB staff cannot with certainty predict the date they will certify the results of statewide contests, they could identify a certification date about which they are quite confident and select a date on which audits can begin that is a week or two later than that.<sup>9</sup>

Municipal officials should also consider publicizing the audits more widely by specifically inviting local residents such as newspaper editors, civic groups, local political organizations, or high school civics classes. In the few municipalities where we asked about this sort of publicity, none had been done. Several municipalities provided ample

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notice of the audits. We believe all could choose voluntarily to provide more than the minimum public notice standard set by law (24 hours) or by GAB guidance (48 hours).

**4. Standard: Audits should verify the outcome for each contested election.** Few contests need a full hand count to confirm the outcome. Well-established and common-sense practices that use only partial counts can determine whether correct outcomes were produced in most contests.

**T**his standard contains two parts: the purpose of post-election audits should be to verify the outcomes, not just that the machines operated as intended; and the audits should occur after every election, not just some elections. Wisconsin's post-election audit practices currently fulfill neither.

**T**he stated purpose of Wisconsin's current post-election audits is limited to determining "how the electronic voting system performed on Election Day, using the actual votes cast by electors."<sup>10</sup> While this is certainly critical, post-election procedures would have more value for supporting voter confidence, quality assurance, and deterring fraud of all kinds if they were designed to determine whether all significant aspects of the election were conducted appropriately.

For example, current election guidelines contain redundant checks to determine whether more ballots were cast than the number of voters marked in the poll books—that is, whether anyone stuffed the ballot box. However, no post-election procedures routinely verify whether ballots other than those counted by the machines were counted accurately or even at all, nor do they assess other aspects of election administration, such as the secure handling of marked ballots and the disposition of unmarked ballots. We will be studying post-election audit practices in other states, and we encourage the Legislature and Government Accountability Board to do the same.

**E**ven if the purpose of post-election audits remains limited to verification of the machines' totals, audits should follow every election. Statutes currently require audits only after November general elections, and GAB does not encourage municipal elections officials to do any more audits than required. The known absence of audits following the Spring elections and primaries provides assurance to anyone considering election fraud that interference will be undetected if the fraud produces a wide enough victory margin to avoid a recount.<sup>11</sup> In contrast, announcing that an audit is possible after any contest would inform would-be hackers around the world<sup>12</sup> that all Wisconsin elections are off limits to them, not just those that occur in November.

Performing audits after every election would have additional benefits. Audits provide election officials with evidence of the success of their time-consuming pre-election voting-machine security safeguards, with which they could alleviate voter concerns over the reliability of the machines. In addition, when only some elections are audited, suspicious partisans—both winners and losers—may suspect political motives for each race that is selected or not selected for audit. By its obvious fairness, auditing every contest would provide election officials with protection against charges of partisanship or bias.

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We believe that statutes should be amended to require post-election audits after every election, and that even in the absence of new legislation GAB guidance should encourage and support local election officials to undertake well-publicized, random, unpredictable post-election audits after all elections.

**T**o Wisconsin citizens—accustomed to thinking of an audit as a full hand count—the idea of verifying the outcome of every contest is daunting. However, if the purpose of an audit is limited to verifying the correct outcome rather than replicating the exact total for each candidate, a full hand count is statistically necessary in only rare contests, which would often be subjects of recounts anyway.

Nationally, many election experts have now accepted recommendations of the American Statistical Association<sup>13</sup> and endorsed a practice known as "risk-limiting audits" as a way to ensure that machine-counted results are accurate while making the most effective use of taxpayers' money and election officials' time.

Explaining this method in detail is outside the scope of this paper, but several well-written descriptions are available on the Internet.<sup>14</sup> In brief, the 'risk' that is limited is the chance that election officials will certify the machine-tabulated outcome of any contest for which a full hand count would yield a different outcome. The sample size depends upon the margin of victory—larger margins need smaller samples—and hand-counting randomly selected ballots until the sample size reaches statistical certainty either that the machine-count was correct or that it was not, in which case a full hand count is required.

Jurisdictions around the United States are beginning to pilot or adopt risk-limiting audits.<sup>15</sup> After several California counties performed risk-limiting audits, that state's top election official reported:

“Despite the high number of ballots hand tallied for the 1% manual tally, analysis showed this statutorily-mandated manual tally to be ineffective and inefficient at confirming election results. The risk-limiting audits were able to confirm with 90% confidence that election results were correct after hand counting very few randomly selected ballots. By contrast, requiring 100% of ballots in 1% of the precincts to be hand counted in the same elections gave very little statistical proof that the election outcomes were correctly calculated by the voting system.”<sup>16</sup>

We suggest that the GAB, working with local election officials, citizens and statisticians with expertise in audit design, look into the possible benefits and drawbacks of risk-limiting audit methods or similar methods that target audit resources more economically than do current practices, so that audits can economically be conducted following every election.

**O**ne exciting opportunity for detecting machine miscounts and deterring fraud—even in the absence of official audits—lies with a technology GAB has already used with good results: scanning documents and making digital images available to the public. The Humboldt County Election Transparency Project has conducted trial programs in which digital images of every ballot are created and uploaded to the Internet or made available on DVD, enabling any voter or civic organization with an interest in the election to audit the election results independently.<sup>17</sup> This process consumes less of the local officials' time than supervising a citizen audit, protects the original ballots, and sends a powerful message about the officials' confidence in the integrity of the elections. GAB's experi-

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ence with scanning and uploading of the recall petitions to the Internet, we believe, demonstrated the effect of such measures in combating rumors and quelling suspicions, and we look forward to the day when similarly conclusive evidence is available to all who are skeptical of the accuracy of Wisconsin election results.

**5. Standard: Audits should be timely.**

If election officials are going to avoid occasionally certifying incorrect outcomes, audits need to be conducted before results are certified as final, so official totals can be corrected if the audit reveals problems.

National elections experts recommend that random voting-machine audits begin no later than 9 A.M. the day after polls close, with the ballots being protected at the precincts by law enforcement officers overnight.<sup>18</sup> In addition to allowing prompt correction of any errors, the short time between the initial count on Election Night and the audit reduces the opportunity for events that could render the audit suspect or useless, such as inadvertent or deliberate mishandling of the audit materials.

However, GAB currently interprets statutes in such a way that municipalities, including those selected for voting-machine audits, must wait until after both the county board of canvassers and the GAB have certified election results as final to determine whether those results are correct. The GAB's reasoning is that any review of machine-tabulated vote totals before results are certified is considered a recount governed by §9.01, Wis. Stats., which cannot be initiated by any election official except in response to an appropriate petition from a candidate.<sup>19</sup> Most voters are astonished to learn that Wisconsin's election clerks do not verify the accuracy of machine-counted results before they certify them, and in fact are even discouraged from doing so.

Waiting to audit election results until after they are certified puts election officials in an avoidably difficult situation if an audit should discover a miscount. In voters' eyes, official incompetence will appear compounded if votes are not only miscounted on Election Night, but are then certified before the error is detected. Few events could be more corrosive of voters' confidence.

Statutes are currently silent about the timing of voting-machine audits, but we believe they should be amended to require voting-machine audits be performed before election results are certified. In addition, we believe it would be in everyone's best interest—citizens, taxpayers, candidates, and election officials—if GAB would reconsider and revise its interpretation of current state statutes to allow municipalities and county boards of canvassers to examine the accuracy of their preliminary election results *before* certifying them. Recounts and voting-machine audits are different activities that use different processes and standards, and municipal clerks naïve about the interpretation that prohibits auditing before certification have done so with no ill effect.

**6. Standard: Post-audit procedures should specify performance standards and include procedures for responding to evidence of fraud or error.**

Performance standards should distinguish between discrepancies that will be considered immaterial and those that will trigger additional investigation and corrective action. Investigations of serious discrepancies need to be independent and transparent so that they provide credibility to the eventual findings; and need to include corrective action that ensures any lessons learned are used to improve the quality of future elections.

If audits are to have any effect on the quality of our elections, they must go beyond looking for discrepancies to determining which discrepancies deserve additional investigation, and investigations must lead to resolution of any significant problems. To do this, audits need realistic standards for distinguishing between immaterial discrepancies and more troubling discrepancies.

Wisconsin statutes currently require GAB to investigate and take remedial action whenever an audit discovers an error rate of more than 1 vote in 500,000.<sup>20</sup> This standard—an error rate no greater than two ten-thousandths of one percent (0.0002%) or 99.9998% accuracy—was developed by the federal elections commission for use in laboratory testing of new voting systems.

In federally-approved laboratories, an error would be noted if the machine failed to read an unambiguous but lightly-marked vote; if it read a crease on a folded ballot to be a vote where the ballot indicated no intended vote; and other similar situations where the machine inaccurately responded to the voter's indicated intent. Tests are conducted with decks of marked ballots for which the laboratories know precisely how each vote would be correctly counted. As a result, testing laboratories are able to detect the microscopic error rate prescribed in federal regulations.

In actual elections, however, more than 1 in every 500,000 marked votes will be ambiguous, such that unbiased individual auditors could come to different conclusions about the correct way to count the vote. The level of precision assumed in the laboratory-test standard is, therefore, greater than the level of precision present in the actual ballots, making the federal standard unrealistic and inappropriate for use in post-election audits. If GAB were to implement this statute precisely and faithfully as written, it would need to order remedial action following almost every municipal audit.

Wisconsin statutes do not provide a definition of 'error' for this purpose, which has allowed GAB staff to comply with this unworkable law by using the test laboratories' error rate while using its own definition of 'error.' GAB instructs municipal clerks that that "Auditors should count votes as the machines would have counted them. Voter intent is not a factor."

Using these instructions, when municipal clerks notice that the machine was unable to read unambiguous but lightly-marked votes, or that it read random marks to be votes where no votes were intended, GAB instructs them: "...as long as you can reasonably explain any difference in the totals by reference to specific ballots, this is not considered to be an error with the voting system."

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In one audit we observed, auditors entertained without apparent alarm the hypothesis that a small discrepancy between their hand count and the machine-tabulated total could be attributed to the optical scanner's inability to read the votes of disabled voters who marked their ballots using the AutoMARK device. That explanation may have been reasonable and sufficient to explain the discrepancy,<sup>21</sup> but it would not be considered anything other than unacceptable error by the voters who had used the device.

A more extreme case might helpfully illustrate the inherent problems with an instruction that auditors are to try to read the ballots as the machine would have read them. Consider the 2004 malfunction that disenfranchised more than 600 voters in Medford, Wisconsin.<sup>22</sup> Had an audit been performed, the Medford clerk would have found the discrepancy. If the clerk had further noted that the number of undervotes reported by the machines equaled the number of actual undervotes plus the number of straight-party votes, he would have been able to provide a reasonable explanation: The machine had not read any straight-party votes. That explanation would have been more than reasonable; it would have been verifiably accurate. This would have brought the calculated error rate down to zero.

We trust that neither GAB staff nor the municipality would have followed the instruction in that case, had an audit discovered the discrepancy. The problem is that, ***with only an unworkable statute to guide their audit findings, Wisconsin election officials have no workable, realistic standard with which objectively and consistently to separate immaterial discrepancies from those that should prompt a wider audit or further investigation and action.*** Without such a standard, borderline cases will become contentious case-by-case judgment calls and cause issues with consistency among jurisdictions.

For as long as the current statute remains in effect, GAB officials could continue to comply by instructing municipalities to calculate official error rates only after excluding any discrepancies that can be explained with reference to how the machine read the votes.

At the same time, however, auditors could be instructed to discern voter intent in the same way as in recounts or any other hand-count situations—that is, to discern voter intent. It is not actually possible, of course, for human auditors reliably to “count votes as the machines would have counted them.” Human eyes and judgment operate differently than voting machines' graphite detectors and programmed sensitivity settings. Municipal auditors could also continue to report to GAB—as they do now—the raw hand-count results before any discrepancies have been excluded as ‘errors.’

We believe GAB should publicly release these raw audit results, regardless of whether the discrepancies are considered errors for compliance purposes, so that voters have meaningful information about their machines' ability to count votes in the way voters intended them to be counted. There is no reason to believe that voters would respond with any more alarm or mistrust to immaterial discrepancies found in an audit than they do to those found in recounts. For example, if voters in one precinct were told that their voting machine correctly counted voter intent on 879 out of 880 votes (an rate more than 500 times greater than the error rate currently allowed by statute), we believe voters would be both satisfied and well-informed, particularly if comparable information was available from other jurisdictions.

In addition, until statutes are amended to replace the testing-laboratory standard with a standard appropriate to post-election audits, we encourage the Board to instruct GAB

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staff to supplement current procedures with additional guidance for identifying truly troubling audit results—regardless of whether those results are counted in the official error rate that is calculated for statutory compliance purposes. Such results might include:

- Any apparent pattern in the discrepancy, such as something that appears to have affected primarily the votes of a certain type of voter (e.g., those who used the AutoMARK or those who voted a straight-party ticket)
- Any discrepancy that appears to have disproportionately affected the votes for one candidate or referendum option;
- Any discrepancy that appears to have affected more than a certain percentage of the votes in a single race. While an error rate of 0.0002% is unworkable outside test-laboratory conditions, a case can be made for larger numbers, such as 0.5 percent—the margin of victory that would trigger a recount; and
- Any discrepancy in one jurisdiction that appears to be larger than that typically found in voting-machine audits with similar types of voting machines in other jurisdictions.

None of the audits we observed found any serious discrepancies or errors, regardless of how those terms are defined, so we cannot comment from first-hand observation how investigation and remedial action might have taken place if they had.

However, we encourage GAB to take a close look at its current written policies and procedures for initiating a broader audit; for initiating an investigation following an audit; for conducting an investigation in the event one is needed; and for taking remedial action in the event that a serious problem is documented. In particular, GAB should make certain that its procedures provide for the expansion of any audit that discovers a problem that might have affected precincts other than those selected for the random audit. For example, if a miscount similar to the 2004 Medford incident were to be discovered again, a thorough GAB response would include examining the results of every other precinct in which voting machines were programmed by the same vendor, to discover the full extent of the problem.

In our review of GAB policies and in discussion with GAB staff, we developed concerns that GAB does not now have specific post-audit standards and procedures in place ahead of time. Waiting to develop these standards and procedures as needed on a case-by-case basis risks significant difficulty and delay, considering the contentious debate and accusations that will likely follow a seriously miscounted contest. Having published post-audit standards and procedures *before* a controversy erupts is key to enabling GAB staff to conduct a timely, unbiased, transparent, and conclusive investigation and to take effective remedial action following a serious miscount, while being able to defend the Board against predictable allegations of incompetence, cover-up, favoritism, or worse.

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## Methods

Five citizens observed voting-machine audits in 9 municipalities: City of Beloit in Rock County; Village of Grafton in Ozaukee County; City of Kenosha in Kenosha County; Town of Lowville in Columbia County; City of Madison, Ward 83, in Dane County; Village of Pardeeville in Columbia County; Town of Ripon in Fond du Lac County; Town of Rock Falls in Lincoln County, and the Village of South Wayne in Lafayette County. We would like again to extend our appreciation to the clerks who cordially provided us with information about the time and place of the audits, and sometimes even gave us turn-by-turn directions to get there and suggestions about the best place to go for lunch.

The observers were:

- A retired state employee who worked as a quality assurance manager in the Department of Health Services and a program-evaluation supervisor with the Legislative Audit Bureau, who served as the lead for the project;
- An attorney who has served as a municipal clerk;
- A retired teacher;
- A classical musician who worked for the 2010 Census as census taker and crew leader assistant; and
- A citizen activist near Stevens Point.

The observers' training consisted of reading through the instructional materials provided by the Government Accountability Board to the municipal clerks and discussing observations with the other observers during the two-week period of the audits.

Our observations focused primarily on two questions:

1. Are these audits conducted as efficiently as possible? If not, what measures might make them more efficient?

The Wisconsin Grassroots Network is interested in efficiency because the primary objection to performing these valuable audits is that they "take too long" or that they require "too much work". We believe that accurate, experience-based information about the time necessary for these audits will dispel some objections. However, we were not able to observe enough audits to draw conclusions about normal or optimal time they take.

2. Are the audits designed well for the purpose of detecting the extent to which the voting machines can accurately detect and count votes?
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## Attachment: Memorandum regarding audit efficiency

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Date: April 18, 2013  
From: Karen McKim, Wisconsin Grassroots Network  
To: Sherri Charleston, GAB  
Subject: Post-election audits and areas of frequent confusion or inefficiency

Only a small percentage of the people who perform Wisconsin's post-election audits have previous experience with hand-counting ballots, because of the frequency with which post-election audits are performed and turnover among county and municipal clerks. Therefore, the forms and written instructions are critical.

As we observed nine post-election audits, we were able to note a few areas in which auditors frequently, even invariably, experienced confusion about the directions. In none of these cases was the confusion serious enough to invalidate the audit but in at least two municipalities, the confusion led to errors that required re-doing as much as two hours of work.

Because we are eager for post-election audits to be performed more frequently, and because we know time is a frequently-cited concern, we want to do what we can to help improve the efficiency with which the audits are performed. So, we are sharing these suggestions with you, in the hopes that they will enable you to be more helpful to the municipal clerks.

### Clarifications in the tally sheet

The tally sheet contains a few ambiguities that caused confusion. If they can be clarified, future audits will proceed more efficiently.

- **Substitute “Write-in candidate” for “scattering.”**  
Few auditors knew the term ‘scattering’ and in most municipalities auditors spent several minutes in guessing and discussion about what the term might mean. All figured it out eventually, but it consumed unnecessary time particularly in municipalities where one auditor understood it differently than the others and the difference was not noted until counts were compared.
  - **Substitute “Blank or not valid” for “Undervote”**  
Auditors were to tally three kinds of votes here—blank ballots, overvotes, and machine-unreadable votes. Labeling the row ‘undervote’ led to some confusion. As above, all figured it out eventually, but it consumed unnecessary time, particularly when differences in interpretation were not noticed until after entire sets of 100 ballots had been counted.
  - **Substitute a more descriptive column header for the numbers “20,” “40,” “60” etc.**  
In several municipalities, at least one auditor would complete the first tally sheet by making 20 hash marks in the first column before moving on to the second column. This defeated the purpose of maintaining stacks of 20 ballots. The attached tally sheet has an example of a more instructive column heading.
  - **Substitute a more informative column header for “ST”**  
In most municipalities, auditors were initially uncertain about what “ST” meant. It was not until they had worked through the first set that they could see the value of that column as a subtotal for the set of 100 ballots, and were confident in using it as a subtotal column.
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- **Set the final three columns apart with a clear heading.**  
In most municipalities, auditors noticed the bold vertical line separating the final three columns from the first seven, but many auditors assumed they needed to be filled in on every tally sheet and so spent time guessing and discussing how they should be completed. We've presented one suggestion on the attached; another solution might be to remove those three columns to a separate form.
- **Although it's defined in the instructions, "EVM" confused most auditors.**  
We've presented one suggestion on the attached as to how the form could be designed to avoid this abbreviation.

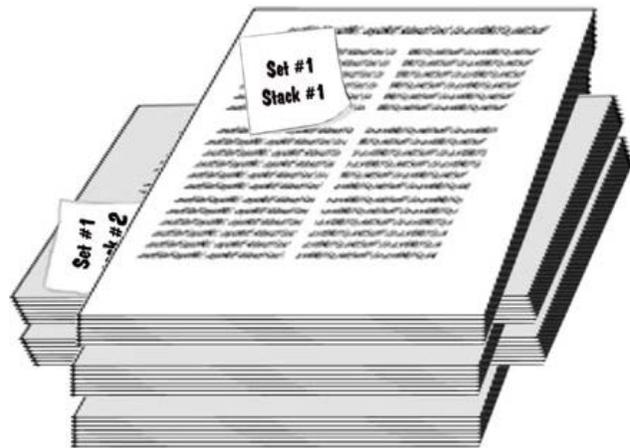
### Clarifications in the instructions

Auditors had trouble understanding or figuring out a few items in the instructions.

- **Labeling the sets and stacks**  
In several audits, the instruction "Label stacks-each ballot will have a unique number" was misunderstood to instruct the auditors to place a number on every single ballot. Despite thinking they had been instructed to number each ballot, auditors in only one municipality seriously considered doing that, so wasted time was limited to the discussion.

Even then, practices for labeling the sets and stacks varied, and the audits that used less-effective labeling paid for it in additional time spent resolving differences. The most efficient option seemed to be a post-it note on each stack of 20, with labels indicating both set and stack number, e.g., "Set 2, Stack 4." In one municipality, the clerk prepared the post-it notes the night before, saving additional time during the audit.

This is difficult to explain in easy-to-read instructions. It might help if the instructions included a simple illustration showing a set of 100 ballots in alternating stacks of 20, with a numbered post-it note on the top stack.



- **Emphasize that write-ins and undervotes are to be tallied**  
The misunderstanding that most frequently created a need to re-do work was the tallying of write-ins and undervotes. In one of the nine audits we observed, auditors had to re-do two hours' work because the auditors had different understandings about how to tally undervotes and write-ins.

Instructions could be revised to contain a highlighted statement along the lines of "Before beginning to tally votes, MAKE SURE EACH AUDITOR UNDERSTANDS THAT WRITE-INS AND UNDERVOTES MUST BE TALLIED on the line labeled *Blank or not valid*."

**Other observations about efficiency**

Additional suggestions could be passed along to the municipalities to reduce the number of inefficient audits.

- **Use several teams of auditors.**

Reviewing instructions does not take significantly longer for four or six people than for two and in some cases—such as when one person asks a question that another had not thought to ask—can even make instructions more effective. The counting, of course, goes faster with several teams.

- In one 664-ballot audit, two auditors worked from 9:00 AM to about 3:00 PM without a lunch break or any interruption for regular office work, counting only three races. (The district attorney race was uncontested.) The pace was difficult, and the two auditors seem fatigued and disheartened by the task.
- In a 1,106-ballot audit, four auditors (two teams of two) also worked from around 9 AM to 3 PM, but counted all four races, took a lunch break, and were able to attend to a few non-audit related office tasks that arose during the day. The auditors did not mind the pace, and in fact developed a good-natured competition to see which team could achieve the fastest time through sets of 100 ballots.

- **Use elections inspectors rather than office staff.**

Municipal or county clerks must supervise the audits, but elections inspectors generally were more efficient than office staff. Unlike elections inspectors, office staff occasionally interrupted audit work to discuss other work-related matters and were sometimes pulled away from the audit task for non-audit work. This sometimes required the other member of the counting team to sit idly until the absent person returned. More subjectively, we observed that elections inspectors generally seemed more knowledgeable about the elections process and more interested in the audit work.

In addition, in those municipalities that relied entirely on office staff, clerks remarked the audits disrupted the office's routine functioning, which was not a problem in those municipalities that relied mainly on elections inspectors, particularly those in which audits were conducted on evenings or weekends.

One caution with using elections inspectors: Clerks should take care to invite only elections inspectors who have the ability to read votes quickly and accurately and who have the manual dexterity to make small tally marks and handle paper ballots quickly. Some auditors with weaker eyesight or less nimble fingers were slower, particularly in jurisdictions that use direct-recording electronic systems (DREs) instead of voter-marked paper ballots, where the votes are in fainter ink and the paper more difficult to handle.

- **Label each tally sheet with the number of the set of 100 ballots.**

We noted one audit in which an inability to match tally sheets with 100-ballots sets caused delay at reconciliation, and one audit in which marking the tally sheets with the set number saved time.

- **Flag ballots with ambiguous votes as they are tallied.**

Using either small post-it notes or a separate log, municipalities in which auditors noted the ballots with ambiguous votes as they tallied them had an easier task reconciling any differences between the auditors or between the hand-count and machine-count totals.

- **Mark the tally sheets with pencils and use erasers, not white-out, to correct errors.**

Pencils and erasers were most efficient; pens with white-out were more time-consuming. Most time-consuming was when auditors had to pass white-out around the table.

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- **Provide auditors with calculators**

Arithmetic errors are easy to make, easy to avoid, and can be time-consuming when auditors confuse addition errors for errors in counting the votes. One municipality spent about 15 minutes trying to resolve two auditors' different totals by looking at ballots before they realized the error was in the addition, not the tallying.

- **Compare totals between auditors after the first two stacks of 20 have been tallied, rather than after the first two sets of 100.**

When an auditor fails to understand the instructions correctly, the problem is identified the first time tallies are compared, and all the ballots tallied up to that point need to be re-tallied. The municipalities that stopped for an early comparison spent less time correcting errors and counting over than did those that did not.

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<b>November 2012 Post-Election Audit of Electronic Voting Equipment – Tally Sheet</b>							Page ___ of ___			
County _____ Municipality _____ Ward _____							<b>Reporting Unit Totals</b>			
Name of Auditor _____ Equip. type _____										
	Votes in 1 <sup>st</sup> 20-ballot stack	Votes in 2nd 20-ballot stack	Votes in 3rd 20-ballot stack	Votes in 4th 20-ballot stack	Votes in 5th 20-ballot stack	Subtotal for set	Total ballots cast	Handcount Total	Machine Total	Diff- erence
<b>President/VP</b>										
Romney/Ryan										
Obama/Biden										
Goode/Clymer										
Johnson/Gray										
La Riva/Ramirez										
White/Scherrer										
Stein/Manski										
Write-in candidates										
Blank or not valid										
<b>Total</b>										
<b>State Senator</b>										
Write-in candidates										
Blank or not valid										
<b>Total</b>										
<b>Rep. to the Assembly</b>										
Write-in candidates										
Blank or not valid										
<b>Total</b>										
<b>District Attorney</b>										
Write-in candidates										
Blank or not valid										
<b>Total</b>										



## Notes

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- <sup>1</sup> *Federal Efforts to Improve Security and Reliability of Electronic Voting Systems Are Under Way, but Key Activities Need to Be Completed.* U.S General Accounting Office, September 2005: <http://www.gao.gov/assets/250/247851.pdf>
- <sup>2</sup> Many organizations, academics, and government agencies have described different sets of best audit practices or attributes of a sound post-election auditing program. The list presented in this report is a compilation. We reviewed only the most widely cited sources for this paper.
- One frequently cited compilation of widely accepted criteria for post-election audits is *Principles and Best Practices for Post-Election Audits* (2008) by Mark Lindeman, Bard College; Mark Halvorson, Citizens for Election Integrity Minnesota; Pamela Smith, Verified Voting; Lynn Garland; Vittorio Addona, Macalester College; and Dan McCrea, Florida Voters Foundation. This set of criteria has been endorsed by a number of reputable organizations including the Brennan Center for Justice, the American Statistical Association, and Verified Voting. It is available on the Internet at [electionaudits.org/principles](http://electionaudits.org/principles). Other sources used for this paper include:
- *American Statistical Association Calls for Audits to Increase Confidence in Electoral Outcomes*, American Statistical Association (2008)  
<http://www.amstat.org/newsroom/pressreleases/asacallsforaudits.pdf>
  - *Best Practices for Post Election Audits*, Verified Voting (2012)  
[www.verifiedvoting.org/resources/post-election-audits](http://www.verifiedvoting.org/resources/post-election-audits)
  - *The Machinery of Democracy: Voting System Security, Accessibility, Usability, and Cost* The Brennan Center for Justice, Voting Technology Assessment Project. Lawrence Norden, Project Director (2006)  
<http://nob.cs.ucdavis.edu/~bishop/notes/2006-votesauc/2006-votesauc.pdf>
  - *Post-Election Audits: Restoring Trust in Elections*, Lawrence Norden, Aaron Burstein, Joseph Lorenzo Hall and Margaret Chen. Published by the Brennan Center for Justice at New York University School of Law and the Samuelson Law, Technology & Public Policy Clinic at the University of California, Berkeley School of Law. (2007)  
[electionaudits.org/files/Brennan%20Center%20Report%20on%20Post-Election%20Audits.pdf](http://electionaudits.org/files/Brennan%20Center%20Report%20on%20Post-Election%20Audits.pdf)
- <sup>3</sup> §5.91(18), Wis. Stats.: “If the device consists of an electronic voting machine, it generates a complete, permanent paper record showing all votes cast by each elector, that is verifiable by the elector, by either visual or nonvisual means as appropriate, before the elector leaves the voting area, and that enables a manual count or recount of each vote cast by the elector.”
- <sup>4</sup> A national task force on computer security reported that the easiest, though not the only, way to manipulate a voting machine’s voter-verifiable paper trail would be for one person (authorized programmer or hacker) to program the machines to switch votes on Election Day while printing the paper trail to show the candidate selected by the programmer/hacker rather than the voter. Because most voters do not examine the paper trail, most of these changes would be undetected even though clearly displayed to the voter. Voters who did notice the switch could cancel the vote and vote again, and in this case the machine could be programmed to print a paper trail showing the voter’s choice. Because the whole process was observed by no one other than the voter, even multiple instances in one precinct on Election Day would not be noted, because both the voter and the elections inspector would attribute the ‘glitch’ to voter error. Notice that if a voting machine was tampered with in this way, even a hand-counted audit after the election could not detect the fraud.
- The Machinery of Democracy: Voting System Security, Accessibility, Usability, and Cost* The Brennan Center for Justice, Voting Technology Assessment Project. Lawrence Norden,
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Project Director (2006)

<http://nob.cs.ucdavis.edu/~bishop/notes/2006-votesauc/2006-votesauc.pdf>.

- <sup>5</sup> Multiple studies have examined voter behavior when using voting machines that create voter-verifiable audit trails (VPAT). All have found that a majority of voters do not look at the paper trail; an even smaller proportion notice errors when present; and an even smaller proportion report the errors rather than quietly cancelling and changing their vote.
- An example of one of these is *An Active Approach to Voting Verification* by Ted Selker and Sharon Cohen of MIT, published by the Caltech/MIT Voting Technology Project in May 2005. ([www1.cs.columbia.edu/~unger/articles/selkerVerifPpr.pdf](http://www1.cs.columbia.edu/~unger/articles/selkerVerifPpr.pdf)) These researchers ran laboratory-condition elections using actual voting machines. They noted “The most startling results from our study concerned the number of errors that voters were able to identify.” Out of 108 errors introduced by researchers into the audit trail as the test subjects were voting, three voters appeared to recognize the error as they used the machine but none spontaneously reported any errors to the researchers. In post-election interviews, only 8 percent of the voters correctly agreed with the statement “There were errors in the paper trail,” although errors were present for each voter.
- <sup>6</sup> One municipality, the Village of South Wayne in Lafayette County, noted to the observer that they did have problems with the machine tape on Election Day. However, they had been prepared with sufficient paper ballots to allow voters to continue voting while the voting machine was being restored to operation.
- <sup>7</sup> Some citizens question whether independent authorities—rather than local election officials—should conduct the post-election audits, noting correctly that human nature could prevent them from perceiving problems that more disinterested auditors might note, and that self-auditing provides opportunity to hide fraud. However, having local election officials conduct their own audits has multiple benefits for the much larger number of conscientious officials, including efficiency, economy, building expertise among those who can use it to improve the conduct of the next election, and avoiding additional chain-of-custody complications, while strong procedures and standards—if followed—can limit problems caused by the natural human tendency to overlook problems, and full transparency—if provided—can reduce the likelihood that fraud could be hidden.
- <sup>8</sup> Unfortunately, the exception was Waukesha County, where a publicly observed audit process could arguably have been most beneficial in restoring public confidence. On the day after GAB had certified the election results—the first day that audits could be performed—a WGN volunteer called a municipality in Waukesha County to ask when that municipality’s audit would be performed. The office staff informed the volunteer that the four audits that would be performed in that county were all being performed centrally in the Waukesha County Clerk’s office and that the volunteer should call there for the time and place. Upon calling that office, the volunteer was told that the audits had begun the previous day and were underway. When asked which municipalities’ audits had already been completed, the staff person stated that information was not available because the audits were being conducted behind closed doors and staff person had been instructed that the auditors were not to be disturbed. Unfortunately, WGN had no volunteers available at that moment to go to the county offices to confirm or disprove those statements, which call into question the county’s and municipalities’ compliance with notice requirements and requirements that the public be allowed to observe the audits.
- <sup>9</sup> In addition, we believe that audits could more usefully be conducted *before* election results are certified, which would improve the ability of GAB to set begin- and end-dates for the required audits. See page 10 for this discussion.
- <sup>10</sup> *Voting System Audit Requirements*, State of Wisconsin Government Accountability Board. Undated. Available at [gab.wi.gov/sites/default/files/page/voting\\_system\\_audit\\_procedures\\_pdf\\_16346.pdf](http://gab.wi.gov/sites/default/files/page/voting_system_audit_procedures_pdf_16346.pdf)
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- <sup>11</sup> Pre-election tests of voting machines are useful for verifying that the machines are set up appropriately to count votes for the contests on that election's ballots, but are incapable of detecting malicious software designed to operate only during the hours the polls are open. For a thorough inventory of the vulnerabilities of the optical scanners and direct-recording electronic voting machines of the types used in Wisconsin, see *The Machinery of Democracy: Protecting Elections in an Electronic World*, by Lawrence Norden and Eric Lazarus, which describes the findings of a 2006-2007 study conducted by the nation's leading election and computer-security experts from the government, private sector, and universities.
- <sup>12</sup> When students and faculty of the University of Michigan successfully hacked into the computers used in Washington, D.C. elections, they noted evidence of simultaneous attempts to defeat the computers' security coming from the Persian Gulf University in Iran, and from New Jersey, India, and China. More information: *Attacking the Washington, D.C. Internet Voting System*, in the Proceedings of the Sixteenth Conference on Financial Cryptography & Data Security, Feb. 2012. Scott Wolchok, Eric Wustrow, Dawn Isabel, and J. Alex Halderman <https://jhalderm.com/pub/papers/dcvoting-fc12.pdf>
- <sup>13</sup> *American Statistical Association Statement on Risk-limiting Post-election Audits*, American Statistical Association, 2010: [www.amstat.org/policy/pdfs/Risk-Limiting\\_Endorsement.pdf](http://www.amstat.org/policy/pdfs/Risk-Limiting_Endorsement.pdf)
- <sup>14</sup> For example, see *A Gentle Introduction to Risk-limiting Audits* Mark Lindeman and Philip B. Stark, IEEE Security And Privacy Special Issue On Electronic Voting, March 2012. [www.statistics.berkeley.edu/~stark/Preprints/gentle12.pdf](http://www.statistics.berkeley.edu/~stark/Preprints/gentle12.pdf)
- <sup>15</sup> "Such risk-limiting audits are being piloted in California, Colorado and Ohio; Colorado law requires moving to risk-limiting audits by 2014. Currently only North Carolina legally requires the use of statistical methods in the selection process, while Oregon, New Mexico and New Jersey laws require taking the margin of victory into account when determining what (fixed) percentage to audit. (New Jersey's law is not yet implemented). Ten California counties conducted pilot risk-limiting audits recently. Among other state grants, the U.S. Election Assistance Commission awarded California \$230,000 in federal grant money to fund up to 20 such pilot audits following elections held in California counties throughout 2012." Verified Voting website: [www.verifiedvoting.org/resources/post-election-audits](http://www.verifiedvoting.org/resources/post-election-audits)
- <sup>16</sup> *Report of the Post-Election Risk-Limiting Audit Pilot Program*, April 2011, California Secretary of State Debra Bowen [www.sos.ca.gov/admin/reports/2012/post-election-audit-report-20120301.pdf](http://www.sos.ca.gov/admin/reports/2012/post-election-audit-report-20120301.pdf)
- <sup>17</sup> The Humboldt County Election Transparency Project (ETP) is overseen by officials from the Humboldt County Elections Office, most notably County Clerk and Registrar of Voters Carolyn Crnich, with the cooperation of California Secretary of State Debra Bowen and the Elections Administration Research Center at University of California-Berkeley. Volunteers perform much of the work, as described by project leader Tom Pinto on the project's website ([humtp.com](http://humtp.com)):
- "These volunteers, working on weekends, holidays, and evenings, use a high-end office scanner to scan all of the paper ballots that are cast in an election. The scanner produces digital images of the ballots. The ballots are "digitally signed" to mark their authenticity and uploaded to the Internet for distribution. These images are also available on DVD at the Elections Office. One notable feature is that each ballot is imprinted with a unique serial number before it is imaged. Part of the serial number contains information about which box the ballot comes from. This feature allows us to "tie together" an image with the paper ballot."

In only the second election for which this process facilitated validation of the machine-tabulated results, the process discovered 197 uncounted ballots, and that inaccurate results had been certified. The Secretary of State investigated and determined that the Diebold/Premier software had systematically deleted the votes.

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- <sup>18</sup> *The Machinery of Democracy: Voting System Security, Accessibility, Usability, and Cost*  
The Brennan Center for Justice, Voting Technology Assessment Project. Lawrence Norden,  
Project Director (2006)  
<http://nob.cs.ucdavis.edu/~bishop/notes/2006-votesauc/2006-votesauc.pdf>
- <sup>19</sup> GAB does allow—in fact it requires—local election officials to check on election night that the number of *ballots* counted by each voting machine equals the number of voters recorded in the poll books as having voted, but it forbids them from checking that the number of *votes* is correct at any time before the election results are certified as final, except when a the margin of victory in a close race is less than 2% and the losing candidate fulfills the requirements for obtaining a recount.
- <sup>20</sup> Wisconsin Statutes section 7.08(6) requires the GAB to “following each general election, audit the performance of each voting system used in this state to determine the error rate of the system in counting ballots that are validly cast by electors. If the error rate exceeds the rate permitted under standards of the federal election commission in effect on October 29, 2002, the board shall take remedial action and order remedial action to be taken by affected counties and municipalities to ensure compliance with the standards. Each county and municipality shall comply with any order received under this subsection.”
- <sup>21</sup> GAB staff explained to us this was not a fanciful notion, although it was not the explanation the municipal clerk included in the final audit report. Some optical scanners require a certain percentage of graphite to be present in the proper spot on the ballot, and if an AutoMARK device is prepared with the wrong kind of ink, votes cast on those ballots may appear blank to the optical scanner.
- <sup>22</sup> In March 2005, a political consultant compiling data on registered voters in the previous November’s elections noticed that the number of people recorded as having voted was much higher than the number of votes counted. Knowing that voters rarely go to the polls only to cast a ballot on which they made no marks, the consultant reported the discrepancy to local election officials. A recount and investigation determined that the voting machine vendor—ES&S—had misprogrammed the machines so that the machines could not discern straight-party ticket votes. The election results had been certified months earlier and included a presidential contest that would have embarrassed the entire state had the error changed the results. However, the error affected voters of both major parties equally and many local races were uncontested, and so the error luckily did not change any outcomes.
-