Ray Lutz
Executive Director, Citizens Oversight
771 Jamacha Rd
El Cajon, (San Diego County) CA 92019

raylutz@citizensoversight.org
619-820-5321 (mobile)
619-440-3646 (support)

June 26, 2024

Dr. Janice Johnston
State Election Board, Georgia
2 MLK Jr. Drive   **REF: M2016**
Suite 802 Floyd West Tower
Atlanta, Georgia 30334

jjohnstonmd.seb@gmail.com

CC: Georgia State Election Board, GA Secretary of State

Dear Dr. Johnston, Georgia State Election Board, and GA Secretary of State:

Georgia has recently become aware of the dangers of relying on the QR Codes on Ballot Marking Device (BMD) ballots. Voter-verifiability and auditing is improved by using hand-marked paper ballots and avoiding Ballot Marking Devices except for use by voters with disabilities. Ballot anonymity can be preserved by using the same formats for BMD devices as are used on the hand-marked paper ballots.

As a result of recent lawsuits by the Coalition for Good Governance (and perhaps for other reasons), SB189[1] was signed into law on May 7, 2024[2]. This bill provides, among other things, that QR Codes should not be used on ballots to encode votes.

In Section 11 of this bill, an auditing pilot project is defined:

> **SECTION 11.**
>
> Said chapter is further amended by adding a new Code section to read as follows:

---

[1] https://legiscan.com/GA/text/SB189/2023

[2] https://www.usatoday.com/story/news/politics/elections/2024/05/07/georgia-governor-signs-election-bill-sb189/73597202007/

"**21-2-498.1.** The Secretary of State shall create a pilot program for the auditing of paper ballot images using optical character recognition technology or other related technology which shall verify the human-readable text portion of the ballot. Such auditing program shall not be based on or tabulate any QR code, bar code, or similar machine coding that may be printed on such ballots. Such audits shall include all ballot types, and the audit findings shall be reported prior to final certification of the election."

Robust Audits by AuditEngine

Our auditing platform, "AuditEngine" has been specifically designed to audit all ballot images, and it does not rely on QR Codes, bar codes, or other machine coding to evaluate the votes on each sheet, and it can audit all ballot types, including BMD ballots and hand-marked paper ballots.

We provide **Class 1 and Class 2 BIA audits**; we OCR and do not use QR Codes or Barcodes. Please see "Exhibit 2 -- Not all Ballot Image Audits are created equal" which provides these classifications and comparisons with other lesser alternatives.

Plus, AuditEngine has more:

- **Independent:** Employs software entirely written without any use of voting system code.

- **Full Comparison:** We process all ballot images and compare the number of all ballot images with CVR records.

- **Checks for <u>repeated</u> ballot images**, which can occur (and has occurred) due to accidental double uploads of computer media. AuditEngine can normally remove these repeated images that are due to double-uploads.

- **Checks for <u>missing</u> ballot images,** which can occur (and has occurred) due to not uploading digital media from voting machines.

- **Avoids Voting System Configuration:** Uses a methodology for checking mapping of ovals on hand-marked paper ballots that does not rely on configuration data that might be incorrect.

- **Does not rely on logic and accuracy tests**, but rather uses human-eye checking using "Redline Proofs" of two kinds to expedite the configuration

checks.

- **Uses adaptive thresholding and heuristics** to make intelligent guesses as to the correct voter intent, in the case of overvotes, hesitation marks, and scratch-outs. Recent testing shows that AuditEngine and the voting system agree on 99% of votes, and human reviews show AuditEngine is right on 93% of the disagreements, for an overall accuracy of 99.93%. The remainder are extremely difficult to understand without human-eye review. When thresholding and heuristics are used to interpret the votes, these are also marked as "gray" so they can all be checked later by human-eye review.

- **Can check for foreign ballots:** no ballots mixed in from any other nearby county or recent election if the county name is consistently included on ballots. This occurred in Fulton County in the 2020 election and AuditEngine was the first to locate this issue.

- **Ballot-level Comparison:** Can compare with the official result on a ballot-by-ballot basis, both regarding the original CVR and also the modified CVR after any adjudication is applied by election staff.

- **Measures Privacy:** Provides a measure of ballot privacy considerations due to election structure, where rare ballot styles may allow malicious actors to reveal how a specific voter voted by deanonymizing the ballots. Fulton County had some issues with rare styles largely due to separating the few federal-only ballots into precincts instead of treating them as a group with the same federal contests in each group.

- **Full Reports:** Provides reporting by contest, precinct or any other reporting group.

- **Secures audit data:** Routinely secures audit data using hash values and digital signatures and provides a full audit trail that can be inspected and reviewed.

- **Can Validate Images:** AuditEngine supports review of proposed digital signatures of images by the original scanner if provided (which will allow the detection of malicious changes to images).

- **ScanEngine Supports paper Scanning:** Can support processing batches of paper ballots scanned by non-voting system scanners to verify that the

images are not corrupted, something that has been hypothetically possible but has not been detected in any election to date.

AuditEngine Findings

Unlike other auditing procedures that try to review a minimum amount of data, AuditEngine reviews _ALL_ ballot images and _ALL Cast Vote Records_. Therefore, there is no "risk" associated with sampling. Thus, the "risk limit" which is evaluated by Risk Limiting Audits and due to sampling is 0%.

Since our audits are so meticulous, we have a plethora of findings from recent audits, which is summarized in the following document "AuditEngine Findings", which will also be attached.

https://docs.google.com/document/d/1uraII_fTsaPdUbTaidmBTwsCSdiRk31oAVzm-eUC_SA/edit?usp=sharing

That document includes findings from audits performed in Georgia, including in Bartow County, Fulton County, and DeKalb County.

Please include AuditEngine in your BIA pilot project

Recently, we conducted a pilot audit with the state of Maryland, specifically for the Rockville City municipal election. I have to say we were quite impressed with the consistency of their data as it allowed us to further enhance our mapping process so it now only requires inspection of a spreadsheet table, which compares the strings used on the ballots and those used in the CVR. We always use two different sets of proofs to allow us to check on the mapping before we run the audit. Maryland uses a top-down model where all counties use the same (ES&S) voting equipment and the SOS handles all machine configuration. As a result, they are quite sophisticated in their understanding of the issues that will make the audits run smoothly.

I can't help but mention that we recently worked with a number of groups in New Jersey to perform audits of Burlington, Mercer, Monmouth and later Hunterdon Counties.

Indeed, we did detect repeated ballot images in Monmouth County. Thus, hand counts were conducted and one contest was overturned. We were able to find the exact ballot images that were accidentally included twice, when six thumb drives were uploaded twice.

We found issues in Mercer County due to new voting machines that had the styles configured incorrectly. It is good that they moved to paper-based voting systems

instead of purely DRE machines with no audit trail, and some pains of transition are to be expected. However, in that case, they had the voting system vendor configuring the machines and this configuration was incorrect, thus, the machines would not accept the ballots on election day.

We summarized a number of findings that we have encountered in the elections we have been able to audit, and I am including that document with this letter. My understanding is that none of the other groups or auditing methods have found any useful information.

AuditEngine Pricing Model

To be able to conduct the meticulous audits of every ballot in the election means we must have clean data or the process is far too much work. Therefore, we are primarily targeting districts that are willing to do a little bit of work up-front to reduce the variations and inconsistencies in the election data, especially with regard to the contest and option names used in various places, such as in the Cast-Vote Records, Paper Ballot, BMD ballot, and results reports.

We have developed a more concrete pricing model so you will be aware of what prices are feasible with our solution, as long as the data is "clean", and if not, then what additional costs are required.[3] (A PDF of this document is attached with this document when sent.)

- This pricing model provides that, for clean data, the cost can be $5,000 for the first 25,000 sheets and $0.07 per sheet thereafter.
- This pricing model may change due to results in the pilot.

This model is a guide. If data is not clean or if issues are detected, then additional costs (and time) will be necessary. Conversely, if we get very complete and clean data with election staff cooperation, such as uploading all data directly to our secure data center, performing human-eye checks, and accepting automated reports, then costs may be further reduced.

---

[3] AuditEngine Pricing Model --
https://docs.google.com/document/d/1K4kW0r_heZKIU00WnwVN4etkgohRZB87TYu9njVocIE/edit?usp=sharing

"Election Design to Enable BIA Auditing"[4] -- (This document will be included with this document when sent). It provides tips and hints for designing your election to avoid many pitfalls we have seen in recent audits we have performed.

- Most importantly, **contest names** and **option names** should be uniform across different ballot types and data files.

- We need the BMD strings, exactly as printedon BMD ballots for accurate OCR processing, to be exported in a consistent format from all counties.

- We need pdfs of blank ballots two weeks before we process the images, so we can automate the mapping process, which we verify with human-eye checking using two types of proofs.

Georgia Specific Considerations

- Georgia has a very large number of counties, compared with other states. We encourage the SOS and the election board to consider grouping smaller counties together to reduce the sheer number of counties that are separately processed, probably to about 25 instead of 159. The counties could still remain independent in all respects, except that the processing of ballots would be consolidated to one set of styles for all precincts across multiple counties, with 6 to 10 in a group of counties.

- The pricing estimate is based on CLEAN DATA, COOPERATION, SINGLE SHEET ballots and TURNOUT comparable with 2020 level at 65%. In addition, the number of REGISTERED VOTERS is probably incorrect in the table below. Therefore, these are estimates and the actual costs will be adjusted based on the actual count of sheets we process and any clean data exceptions.

- This pricing model provides that, for clean data, the cost can be $5,000 for the first 25,000 sheets and $0.07 per sheet thereafter. Thus, the exact cost will depend on the number of sheets processed.

---

[4] Election Design to Enable BIA Audits --
https://docs.google.com/document/d/1o81zAhyN63RNLZsqnSRx08A5T5lnBLSqHqpvXiQEq_U/edit?usp=sharing

- We can note that Georgia follows the "Pareto Principle" (i.e. 80/20 rule) almost exactly, where nearly 80% of the voters exist in about 20% of the counties. Therefore, we should keep this in mind to cover the entire state.

Number of GA Counties (most populous)	Percent of the counties	Percent of the electorate	Approx. Cost per pricing model
10	6.3%	50%	$175K
17	10.7%	60%	$230K
26	16%	70%	$285K
32	20%	75%	$320K
42	26%	80%	$370K
75	47%	90%	$532K
100	62%	95%	$660K
159	100%	100%	$950K

- **Custom Narrative Report:** We recommend a custom narrative report be produced for the pilot project. Normal cost is $10K per county but, to be cost considerate, we can produce a single custom written report for the entire state for $100K.

ALTERNATIVE 1: All 159 Counties:

Total cost for processing all 159 counties (without any reorganization or combining of counties) will be around $950K, again including the considerations, CLEAN DATA, COOPERATION, SINGLE SHEET ballots, and calculated based on actual turnout and number of sheets per ballot. Special investigations and reports are at additional cost.

ALTERNATIVE 2: Top 10 plus 10 Random Counties:

The most populous 10 counties include about 50% of the electorate. We propose randomly selecting 10 additional counties from the remaining 149 counties. We

recommend that Coffee County be included. The total cost will be dependent on the total number of sheets, but we can estimate about $250K.

ALTERNATIVE 3: Incremental Pilot

In this alternative, we concentrate on the three counties we have previously audited, Fulton, DeKalb, and Bartow, and add perhaps Cobb and Coffee counties to demonstrate how our solution will work out when applied to all counties. After we complete this first set, we can decide if it is feasible, based on how clean the data has been so far, to complete more.

Total for this potion is estimated to be about $100K (depending on turnout).

COUNTY	Registered Voters (approx)	Sheets at 65% turnout	sheets over first 25K	Base cost $5K ea	Per sheet Total @ $0.07	Total Including $5K Base
FULTON	806451	524193	499193	5000	$34,943	$39,943
DEKALB	546711	355362	330362	5000	23,125	28,125
GWINNETT	463681	301392	276392	5000	19,347	24,347
COBB	460075	299048	274048	5000	19,183	24,183
CHATHAM	173365	112687	87687	5000	6,138	11,138
CLAYTON	154445	100389	75389	5000	5,277	10,277
CHEROKEE	145689	94697	69697	5000	4,878	9,878
HENRY	137332	89265	64265	5000	4,498	9,498
RICHMOND	126024	81915	56915	5000	3,984	8,984
FORSYTH	120980	78637	53637	5000	3,754	8,754
MUSCOGEE	120024	78015	53015	5000	3,711	8,711
HALL	96672	62836	37836	5000	2,648	7,648
BIBB	93856	61006	36006	5000	2,520	7,520
COLUMBIA	90764	58996	33996	5000	2,379	7,379
HOUSTON	89928	58453	33453	5000	2,341	7,341
PAULDING	86790	56413	31413	5000	2,198	7,198
COWETA	84822	55134	30134	5000	2,109	7,109
DOUGLAS	82786	53810	28810	5000	2,016	7,016
FAYETTE	80863	52560	27560	5000	1,929	6,929
CLARKE	67125	43631	18631	5000	1,304	6,304
CARROLL	64925	42201	17201	5000	1,204	6,204
NEWTON	64894	42181	17181	5000	1,202	6,202
LOWNDES	61726	40121	15121	5000	1,058	6,058
BARTOW	58994	38346	13346	5000	934	5,934
DOUGHERTY	58498	38023	13023	5000	911	5,911
ROCKDALE	56751	36888	11888	5000	832	5,832
WALTON	55719	36217	11217	5000	785	5,785
TOTAL TOP 27	**4,449,890**	**2,892,416**	**2,217,416**	**$135,000**	**$155,208**	**$290,208**
REMAINING 132 Counties	**1,807,614**	**1,174,889**	**27,034**	**$660,000**	**$1,889**	**$661,889**
TOTAL ALL 159 COUNTIES	**6,257,504**	**4,067,305**	**2,244,450**	**$795,000**	**$157,097**	**$952,097**

- **No need for image verification.** Georgia normally performs an RLA audit which will effectively validate that there are no major differences between the images, which the CVR is based on, and the paper. At this time, there is not a need for image verification but we have that capability if we wish to use it in

the future.

- **Limitations of a Pilot** We anticipate some logistics issues that may arise due to the fact that these are new procedures for the state of Georgia. Therefore, although we can normally meet aggressive timing goals, a pilot may require some additional time to complete, particularly with regard to preparing a custom narrative report about the pilot project.

  A pilot need not include all counties, if we wish to mainly evaluate the solution and logistics. However, given the consternation about the current voting system, it will be best to process all counties, even if it may not be completed in the pilot prior to the certification deadline.

- **Pricing does not include investigations.** If we find issues in the election, we can perform investigations to determine what and how mistakes were made.

With our OCR audit of all ballots, which eliminates the auditing of any barcodes or QR Codes, we will fully eliminate any risk that the BMD machines have been hacked or that configuration errors have crept in. Thus, you can put off the $330 million cost as mentioned in Exhibit 1, by prudently using our service for about $1M per election.

I hope this information is helpful. Please call me directly at any time if you have any questions or would like to chat about your pilot project, and how we can get involved.

Sincerely,

Ray Lutz
Executive Director, CitizensOversight
(619) 820-5321 (direct)
(619) 440-3546 (customer support desk)

Please find the following files attached:

AuditEngine Findings.pdf
AuditEngine Pricing Model.pdf
Election Design to Enable BIA Auditing.pdf

EXHIBIT 1

Section 7 of SB189 provides the following:

> **SECTION 7.**
> Said chapter is further amended in Code Section 21-2-379.23, relating to requirements for ballot display, role of Secretary of State, and printed paper ballot controls during recount, by revising subsection (d) as follows:
>
> "(d) The text portion of the paper ballot marked and printed by the electronic ballot marker indicating the elector's selection shall constitute the official ballot and shall constitute the official vote for purposes of vote tabulation, any recount conducted pursuant to Code Section 21-2-495, and any audit conducted pursuant to Code Section 21-2-498. The official tabulation count of any ballot scanner shall be based upon the text portion or the machine mark, provided that such mark clearly denotes the elector's selection and does not use a QR code, bar code, or similar coding, of such ballots and not any machine coding that may be printed on such ballots."

Further, implementing this law was claimed to cost "tens of millions of dollars" and up to "$300 million"[5]

> "We're talking about an expense of about $25-to-$26 million, to about $300 million, depending on how you want to do it," Gabe Sterling, the chief operating officer in the secretary of state's office...
>
> Lawmakers have already pushed the effective date back two years — from 2024 to 2026 — but did not make the change contingent on providing funding. So if the governor signs the bill now, it's not clear where election officials will get the money.

---

[5]
https://www.votebeat.org/2024/05/02/georgia-voting-bill-strips-qr-code-from-ballots-cost-gabe-sterling/

EXHIBIT 2

Not all Ballot Image Audits are created equal

We can consider a number of "classes" of BIA audits that can be conducted.

AuditEngine is designed to accomplish Class 1 and Class 2 audits, which provide the highest level of assurance, including the fact that we do not rely on any barcodes or QR Codes, and still audit all ballots and all contests. The Class difference is only due to turn-around time. In Class 1, we can provide initial results within about 24 hours during the election (allowing for corrections to be made prior to certification), and Class 2 is just as thorough. However, Class 2 is designed to be conducted after all the data is released. We need election related information prior to the election to provide Class 1 service.

In contrast, there exists more ad-hoc reviews using manual viewing of ballots. Those would be Class 4 or 5. They are not worthless, but we have found that it is just not feasible to manually review all the ballots, whereas an audit system like AuditEngine has been able to find discrepant ballots while reviewing every contest on every ballot.

Here is the current structure of the classes (we are continuing to discuss and refine these classes, and not everything we do is expressed in the description.)

BIA Class 1:
This class involves a full re-interpretation and vote count of all ballot images and all contests published by the auditing system prior to obtaining the Cast Vote Record (CVR), with no use of barcodes or QR codes. A full ballot-level comparison with the CVR is then conducted. This requires the Cooperative Workflow, and it can produce initial results in about 24 hours after we obtain the images.

BIA Class 2:
Similar to Class 1, this class includes some metadata (excluding votes) from the CVR prior to the election. Then, after the full evaluation of the vote, it compares ballot images, as in Class 1, with the CVR to provide a discrepancy report that includes all ballots and all contests. We generally have to use this class when we don't have cooperation with the district to get information early.

BIA Class 3:
Ballots are rescanned using a non-voting system scanner and compared by batch. This method has offsetting benefits and drawbacks: the benefit of detecting hazards related to images that do not match the paper, and the drawback of reduced diagnostic precision. Thus, it is ranked below methods with higher diagnostic

precision. It also is a higher cost solution because it requires scanning of paper ballots. We generally don't recommend this approach, but we do offer rescanning batches of ballots to confirm the images are accurate.

BIA Class 4:
This class starts with the CVR and compares the results of images with the CVR, known as a CVR-based audit. This can be performed by hand, by reviewing the entries in the CVR and then clicking a link to view the ballot image to check it, or using vendor-provided tools, which are available from Dominion and Hart, for example.

BIA Class 5:
An Image Only audit, which does not use the CVR. This method can be used with Dominion images that include an "AuditMark," where staff or volunteers will review the ballot image and compare the human-eye interpretation of the vote with the AuditMark page. This can detect QR code errors, such as was recently the case in DeKalb County, GA (and where they since have made QR Codes illegal). Because we can also detect these errors and many others by comparing with the CVR, we don't offer this approach at this time.

AuditEngine offers Class 1 and Class 2 audits and includes numerous reconciliations of the number of images with official counts prior to the start of the audit. We believe that AuditEngine should be considered for your pilot program due to its comprehensive approach and ability to ensure election integrity. In addition, we also can provide the other types of audits, as we now have the ability to handle independent scanning, and our "AdjudiTally" app makes it easy to review discrepancies. Thus, any ballot can be reviewed and tallied using a structured approach.