9/24/2021

Maricopa County Forensic Audit

Volume I: Executive Summary & Recommendations

Work Performed For:
Arizona State Senate
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1 DOCUMENT OVERVIEW

This document includes the Executive Summary of the Maricopa County Forensic Audit, a listing of findings within the Findings Summary, as well as Recommendations based on our work in the audit.

For more details about the Methodology & Operations of the audit, please see "Maricopa County Forensic Audit – Volume II – Methodology and Operations".

For more details about the Findings of the report, or to review the results from the hand-tallying of the 2.1 Million ballots, please see "Maricopa County Forensic Audit – Volume III – Result Details".

2 EXECUTIVE SUMMARY

The preamble to our Constitution reminds us that our nation is always pursuing greater perfection, seeking to establish "… a more perfect Union" so that we can "...secure the Blessings of Liberty to ourselves and our Posterity". Nothing is more essential in establishing liberty than free and fair elections. To that end, Cyber Ninjas was engaged by the Arizona Senate to audit the 2020 General Election and determine in what areas legislative reform may enhance our current process so that our elections may continue to get better, becoming "more perfect". In doing so, it was our goal to restore faith in American elections by either proving the results valid or identifying areas where legislation could resolve any identified issues.

This audit has been the most comprehensive and complex election audit ever conducted. It involved the hand counting of 2.1 million ballots, a forensic paper inspection of all ballots, a forensic review of the voting machines, and an in-depth analysis of the voter rolls and the 2020 General Election final files.

What has been found is both encouraging and alarming. On the positive side there were no substantial differences between the hand count of the ballots provided and the official canvass results for the County. This is an important finding because of concerns ahead of the audit.

However, while it is encouraging for voters, it does not allay all of the concerns:

- None of the various systems related to elections had numbers that would balance and agree with each other. In some cases, these differences were significant.
- There appears to be many ballots cast from individuals who had moved prior to the election.
- Files were missing from the Election Management System (EMS) Server.
- Ballot images on the EMS were corrupt or missing.
- Logs appeared to be intentionally rolled over, and all the data in the database related to the 2020 General Election had been fully cleared.
- On the ballot side, batches were not always clearly delineated, duplicated ballots were missing the required serial numbers, originals were duplicated more than once, and the Auditors were never provided Chain-of-Custody documentation for the ballots for the time-period prior to the ballot's movement into the Auditors' care. This all increased the complexity and difficulty in properly auditing the results; and added ambiguity into the final conclusions.

Had Maricopa County chosen to cooperate with the audit, the majority of these obstacles would have easily been overcome. By the County withholding subpoena items, their unwillingness to answer questions as is normal between auditor and auditee, and in some cases actively interfering with audit research, the County prevented a complete audit.

This did not stop the primary goal of offering recommendations for legislative reform to the Arizona Senate, but it did leave many questions open as to the way and manner that the 2020 General Election was conducted. As a result, while many areas of concern were specifically identified, our full audit results validating the 2020 General Election are necessarily inconclusive.

Furthermore, there are sufficient discrepancies among the different systems that, in conjunction with some of our findings, suggest that the delta between the Presidential candidates is very close to the potential margin-of-error for the election. It is recommended that legislative reform be passed that tightens up the election process to provide additional certainty to elections going forward and that several specific findings of our audit be further reviewed by the Arizona Attorney General for a possible investigation.

3 Finding Summary

The following is a list of findings covered within the report. Details on all these findings as well as the results of the hand-tallying can be found in the document "Maricopa County Forensic Audit – Volume III – Results Details".

NOTE: Ballots Impacted is intended to give a gauge on the potential impact for the finding. While it is based on the number of ballots impacted by the finding, it is not generally expected that any single finding would completely favor a candidate. In many cases there could be legitimate and legal votes within the Ballots Impact amount. For more details, please see the write-up for the finding within Volume III.

Finding Name	Phase	Ballots Impacted	Severity
Mail-in Ballots Voted from Prior Address	Voter History	23,344	Critical
Potential Voters that Voted in Multiple Counties	Voter History	10,342	Critical
More Ballots Returned by Voter Than Received	Certified Results	9,041	High
Election Management System Database Purged	Voting Machine	N/A	High
Election Files Deleted	Voting Machine	N/A	High
Corrupt Ballot Images	Voting Machine	N/A	High
Official Results Does Not Match Who Voted	Certified Results	3,432	Medium
More Duplicates Than Original Ballots	Ballot	2,592	Medium
In-Person Voters Who Had Moved out of Maricopa County	Certified Results	2,382	Medium
Voters Moved Out-of-State During 29-Day Period Proceeding Election	Voter History	2,081	Medium
Missing Ballot Images	Voting Machine	N/A	Medium
Failure to Follow Basic Cyber Security Practices	Voting Machine	N/A	Medium
Subpoenaed Equipment Not Provided	Voting Machine	N/A	Medium
Anonymous Logins	Voting Machine	N/A	Medium
Dual Boot System Discovered	Voting Machine	N/A	Medium
EMS Operating System Logs Not Preserved	Voting Machine	N/A	Medium
Votes Counted in Excess of Voters Who Voted	Certified results	836	Low
Voters not part of the Official Precinct Register	Voter History	618	Low
Ballots Returned Not in the Final Voted File	Certified Results	527	Low
Duplicated Ballots Incorrect & Missing Serial Numbers	Ballot	500	Low
Mail-In Ballot Received without Record of Being Sent	Certified Results	397	Low

Voters With Incomplete Names	Voter History	393	Low
Deceased Voters	Voter History	282	Low
Audit UOCAVA Count Does Not Match the EAC Count	Ballots	226	Low
Late Registered Voters with Counted Votes	Voter History	198	Low
Date of Registration Changes to Earlier Date	Voter History	194	Low
Duplicate Voter IDs	Voter History	186	Low
Multiple Voters Linked by AFFSEQ	Voter History	101	Low
Double Scanned & Counted Ballots	Ballot	50	Low
UOCAVA Electronic Ballots Double Counted	Ballot	6	Low
Duplicate Ballots Reuse Serial Numbers	Ballot	6	Low
EMS Operating System Logs Not Preserved	Voter History	N/A	Low
Election Data Found from Other States	Voter History	N/A	Low
Audit Interference	Ballot	N/A	Informational
Batch Discrepancies	Ballot	N/A	Informational
Commingled Damaged and Original Ballots	Ballot	N/A	Informational
Early Votes Not Accounted for In EV33	Certified Results	N/A	Informational
High Bleed-Through Rates on Ballots	Ballot	N/A	Informational
Improper Paper Utilized	Ballot	N/A	Informational
Inaccurate Identification of UOCAVA Ballots	Ballot	N/A	Informational
Missing Subpoena Items	Ballot	N/A	Informational
No Record of Voters in Commercial Database	Voter History	N/A	Informational
Out of Calibration Ballot Printers	Ballot	N/A	Informational
Real-Time Provisional Ballots	Voter History	N/A	Informational
Voter Registration System Audit Access	Voter History	N/A	Informational
Questionable Ballots	Ballot	N/A	Informational

4 RECOMMENDATIONS

The following sections outline the key recommendations that were determined over the course of this audit.

4.1 Result Reconciliation

Legislation should be considered that does not allow an election to be certified until the Official Canvas and the Final Voted File is fully reconciled. Furthermore, full records for every ballot sent, ballot received, ballot rejected, and ballot voided should have to be fully reconciled within a defined period after the election.

4.2 Voter Registration

Legislation should be considered that requires voter rolls to be entered in an individual's full legal name, and creates penalties for Counties that enter rolls in any other format.

4.3 Voter Rolls

Legislation should be considered that links voter roll registration to changes in driver's licenses or other state identification, as well as requiring the current voter rolls be validated against the United States Postal Service (USPS) National Change of Address (NCOA) at a predefined period prior to every election. Any voter roll software should validate that there is only one entry in the state database per identification number, such as a driver's license number.

Laws already exist for interstate reporting of changes in residence, addresses, and driver's licenses. Tying voter roll registration to these forms of identification would greatly increase the likelihood that voter registration details would be kept up to date. Individuals are much more likely to remember their license needs to be updated immediately than voter registration, and since most states now offer the ability to register to vote when getting a license, license updates could also update voter rolls.

It is recommended that the voter rolls be validated against the NCOA both 30 days or more prior to the election, in addition to a week before mail-in ballots are sent out. This check would not be utilized to purge the rolls, but to validate that a mail-in ballot should be sent prior to that ballot going out. The legislature may also want to consider whether a change of address should suspend Permanent Early Voting List (PEVL) enrollment.

In addition, legislation should be considered to require the voter rolls to periodically be compared against ERIC, the Social Security's Master Death List, or other commercially available tools that gives access to this information. Failure to do this at least once a year should come with financial penalties to the County.

4.4 Election Software

Legislation should be considered that would require applications developed and utilized for voter rolls or voting to be developed to rigorous standards that ensure the confidentiality and integrity of the systems. Specifically, its recommended that the Open Web Application Security Project (OWASP) Application Security Verification Standard (ASVS) Level 3 be applied to all applications associated with voter rolls or voting and that it be required that this be fully validation no less than once every two years. Part of this testing should be explicitly testing an programming interface access to validate that no external party has the capability to manipulate the voter rolls.

Furthermore, it should be required that whoever builds the software be required to rotate vendors doing the OWASP ASVS Level 3 assessment a minimum of once every four years, with a rotation of no less than three vendors before returning back to a vendor utilized in the past.

The vendor who performs this work must be willing to attest that their assessment fully covered the ASVS Level 3 requirements that there are no critical or high vulnerabilities detected, and that there is a remediation plan for any moderate risk vulnerabilities.

4.5 Voting Machines

Legislation should be considered that would prohibit connecting tabulators, or the Election Management System Servers or similar equipment from being connected to the internet or any other mechanism that could allow remote access to these systems.

Furthermore, County employees should have access to all administrative functions of all election equipment and have sufficient access to independently validate any configuration items on the device without requiring the involvement of any 3rd party vendor.

In addition, electronic voting machines must always have a paper backup of all ballots which can be used to confirm that votes were cast as intended; and these machines must be regularly maintained according to the vendors recommended maintenance schedule. Failing to do so should have a financial impact on the County.

Legislation should be considered that would require that paper stocks utilized on election day should conform to manufacturer recommendations to ensure that the paper that has been tested in the device is what is actually utilized to cast votes.

4.6 Election Audits

Legislation should be considered that creates an election audit department in charge of regularly conducting audits on a rotating basis across all counties in Arizona after elections. This department should validate that the County follows all processes and procedures outlined in the Elections Procedure Manual (EPM), and have the ability to financially impact the County for repetitive EPM failures, or other failures that make auditing more difficult.

Legislation should be considered that requires batches of ballots to be clearly labeled, separated from each other in a manner where they cannot easily mix together, and easily connected to the batches run through the tabulation equipment for easy auditing of the system. Failure to follow these practices should have financial implications for the County.

Legislation should be considered with have financial and criminal penalties for purposely inhibiting a legislative investigation, or an officially sanction audit of an election.

4.7 Ballots

Legislation should be considered that will make ballot images and the Cast Vote Record artifacts from an election that is publicly published within a few days of the results being certified for increased transparency and accountability in the election process.

Legislation should further be considered that would require all ballots to be cast on paper by hand utilizing paper with security features such as watermarks or similar technology; with a detailed accounting of what paper(s) and the quantities utilized for any given election cycle.

Mail-in voting should incorporate an objective standard of verification for early voter identification, similar to the ID requirements required for in person voting.

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2 REVISION HISTORY

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Date	Revision	Notes	Updated By
	DRAFT		

3 TABLE OF CONTENTS

1 Document Overview

The audit was designed to be a comprehensive review of the results from the Maricopa County 2020 General Election to confirm the effectiveness of existing legislation in governing elections, and to provide additional insights on possible areas of legislative reform that could ensure an even greater level of integrity and accuracy in how elections are conducted. This audit is the most comprehensive election audit that has been conducted. It involved reviewing everything from the voter history for the election, to retallying all 2.1 million ballots by hand, to performing forensic photography and review of the ballot paper, to conducting cyber forensic imaging and analysis of the provided voting equipment. This extensive process involved over 1,500 people who contributed a total of over 100,000 hours of time over the course more than 5 months from when setup began, to when this report is completed.

This volume of the report serves to outline details of the audit operations and the conduct of the audit in general; as well as cover the audit methodologies behind various actions performed during the audit.

2 Audit Operations

The audit was primarily conducted at the Arizona Veterans Memorial Coliseum on the Arizona State Fair Grounds in Phoenix, Arizona. On two separate occasions, everything related to the audit was moved to the Green Building on the Arizona State Fair Grounds during the course of the audit; the first time to temporarily store the ballots, voting machines, and audit equipment outside of the Coliseum while another event took place; and the second time to finish outstanding audit activities. Each of these moves represented substantial operational challenges that were successfully managed with the chain of custody of all ballots and devices fully maintained. The following sections outline the aspects required to be managed from an operational standpoint.

2.1 Facility Inspection and Setup

Health, safety and security were extremely important factors of the audit. Once the location of the facility was determined, a full inspection of the premises was conducted. This included an exterior and interior evaluation to identify logistics needed and any challenges that may arise. The primary focus was the health, safety, and security of the workers along with security of the ballots and voting machines.

Focus Points included:

- Security perimeter development and stationing, parking, entrance/check-in control and locating a first aid station
- Identifying, designing, and completing layout of meeting space, engineering space, counting and paper examination space and machine staging space
- Locker logistics, hospitality such as meals, snack, water stationing and an evacuation and reunification plan
- Training classroom location and setup, tally aggregation station setup and logistics, security and tactical operation room positioning and staging, administrative workstations, and ballot storage/security
- Technology workspace and monitoring, supply storage and central receiving for incoming shipments

2.1.1 Audit Enhancements

The audit process had to take a break due to high school graduation ceremonies taking place in the arena. All equipment and tables had to be broken down and removed. However, the setup was reconfigured based on lessons learned after the break, which increased the counting and imaging productivity immensely.

Due to the number of volunteers, it became apparent that a building entry reconfiguration had to be done to ensure covid protocols were continually adhered to and security checks were of the highest standard. One major enhancement aside from traffic control panels was entrance scheduling, which was utilized by reporting times in fifteen-minute increments. Each counting/paper examination team entered at a different time to avoid long lines at the entry point.

During the course of the audit, improved signage and traffic control points were implemented to streamline the access control process. In order to avoid bottlenecks, pre-shift start staging areas were implemented for half of the teams reporting to enter from the west end of the arena. This greatly reduced foot traffic congestion that could pose an impediment to evacuation in case of emergency.

Please see Exhibit A for detailed information regarding the Health and Safety Plan.

2.2 Information Security (Technology and Data Storage)

The information security procedures followed CIS benchmarks of industry standards for the auditing process. Key components to the design included an air gapped system which is not internet linked, therefore no firewall was necessary. The air gapped design ensured the most secure means of integrity in protecting all aspects of video and data storage.

There were 33 servers and numerous network video recorders used during the course of the audit; 32 of these servers were utilized for data storage purposes to support the Paper Examination work, with additional backups stored on, Network Attached Storage (NAS), Solid State Drives (SSD).

All files were hashed as they were written to multiple locations to allow for tamper detection. Secure Digital (SD) cards were placed in each ballot box which contained all ballot images for each box. All aggregation data was stored on one server with a backup server being used to ensure a secondary means of data storage. See also 5.10.

2.2.1 Audit Enhancements

Initial projections for required data storage were estimated at less than 50 terabytes. By the end of the audit, over two petabytes had been procured for storage, backups, and copies. The additional servers were required to meet the storage demands of higher quality imaging, the incorporation of additional security cameras and the overall duration of time to complete the audit.

Additional servers, Solid State Drives (SSD), Network Video Recorders (NVR)s and Secure Digital (SD) cards had to be procured for the expansion of storage. Also, an increased number of laptops had to be acquired for paper examination tables as well as microscopes and the rental of DSLR cameras.

Please see Exhibit B for detailed information regarding the information security policy.

2.3 Human Resource Acquisition

A chain of command was implemented to ensure the organizational structure was sound. The organizational chart included a CEO-Vice President model followed by management/technology leads along with pod and table managers. Leadership for the audit was identified and placed into strategic roles to ensure a stable management process. Qualifications of paid staff was extremely vital to ensure a solid chain of command and a well-managed operation.

Numerous people for this audit were needed. Therefore, a team was set up to on-board both paid and volunteer workers. Individuals were brought in from all over the country to include, but not limited to, Pennsylvania, Ohio, Florida, New York, New Jersey, New Mexico, Arizona, and Washington D.C.

Furthermore, staff were assigned to recruit volunteers and other potential employees to work the audit through a temporary employee agency or via online recruitment through the audit website. Political affiliation was not a requirement to work the audit and approximately 1200 volunteers and over 300 paid positions who successfully passed a background check and social media vetting were brought in.

Once an individual was identified to work, he or she was scheduled for Orientation/Training. Upon arrival and with only approved access from law enforcement checking the security list, individuals were covid screened, credentialed and processed. At this point, the individuals received a comprehensive orientation/training.

The occupations of the volunteers and paid positions brought about a wide range of experience to include a retired Air Force General, former District Attorney, recently retired FBI, IRS and Treasury Agents, and a County Manager. There were Professional Development Trainers, Election Investigators, Election Supervisors, Data Analysts, Election poll workers, CPA's, Fraud investigators, Forensic Specialists, Crime Scene Investigators, Police Officers and Firefighters. Others include a Heart Surgeon, College Professors, Nurses and an Aerospace Engineer. There were Psychologists, Military Service Members, Coaches, CEO's and Business Owners/Developers, Consultants, Cyber Security professionals, Accountants, Lawyers, Teachers, Real Estate Brokers, Software Developers, Investors, Engineers and several other occupations that comprised the team.

By the conclusion of the audit there were more than 1500 people that volunteered or were compensated for their work.

2.3.1 Audit Enhancements

A few weeks into the audit, the background investigation process was streamlined to enable rapid applicant intake. Furthermore, it became important that a scheduling system called Zoom Shift be utilized to ensure that the appropriate staff was assigned to each shift based on their training and skill set.

Please see Exhibit C for additional information regarding Human Resources.

2.4 Orientation and Training

A comprehensive training program was set up and constantly upgraded throughout the duration of the audit. This program included an orientation of operational logistics and concentrated training in counting and paper examination. There was also supervised on-the-job training for positions moving into table management, aggregation, or in the ballot corral.

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Key training topics included:

- The mission of the audit, importance of the non-disclosure agreements, transparency, and integrity of the audit, along with the floor rules to include prohibited items on the floor.
- A review of all job descriptions with trainees as well as health and safety protocols, evacuation and re-unification processes, check-in, staging, scheduling, hospitality and dine-in services.
- A broad overview of the goals and expectations from management

Training classes were conducted two to five times a day with a wide range of class counts which was mandatory for any person working or observing on the floor.

All floor training provided workers with the necessary essential skills to enter the arena floor fully prepared to engage in the counting or paper examination process. *Specifically, all trainees were trained to understand the different types of ballots that they may come across and how to adjudicate ballots per the standards of Maricopa County and/or the Secretary of State's Office*. Video review training along with a hands-on counting training utilizing training ballots and tally sheets were used to provide all workers with a firsthand understanding of each of the processes. A training lab was also set up to display the counting and Paper Examination Process.

The ballot counting training utilized a set of training ballots and a tally sheet exercise to include tallying results and filling out all boxes with the vital information to ensure an understood process was mastered by trainees. Once every individual was finished with the training exercise, they were ready for deployment to the floor.

Paper Examination Training included video instruction and display of the process followed up with a hands-on lab experience that would enable the trainee to work directly with the technology including both the software and the operation of the Digital Single Lens Reflex (DSLR) camera and microscopes. During this training, the importance of image quality along with speed and accuracy of the process was emphasized.

New trainees being placed in an "Aggregation" role had to have prior experience in working with excel spreadsheets or have accounting or data entry experience. Individuals brought on to work in the secure ballot corral also went through the orientation/training program to understand both counting and paper examination. Any individual going to work in the corral received additional on-the-job training and was supervised by a corral manager prior to working independently. The same applied for individuals that were elevated to table management positions. Much of their training encompassed observation and supervised on-the-job floor training.

2.4.1 Training Enhancements During the Audit

Training was constantly modified to match all floor operations. For example, if a form change was made on a Tally sheet, the training Tally sheet was as well. Other changes in training included:

- Evacuation/Reunification Planning education
- Tally Sheet Training Exercise Programs
- Counting Table mockup was added
- Paper Examination Training Labs were added
- Scheduling training for trainees was added.

4 AUDIT METHODOLOGY

The audit was designed to be a comprehensive review of the results from the Maricopa County 2020 General Election to confirm the effectiveness of existing legislation in governing elections, and to provide additional insights on possible areas of legislative reform that could ensure an even greater level of integrity and accuracy in how elections are conducted. For this reason, the audit focused on four main areas of the election process: voter history, paper ballots, voting machines, and the certified results. These four areas enabled the audit team to focus on factors that impact elections in order to highlight areas of concern.

2.5 Voter History

The focus of the Voter History Phase was to validate that those individuals who showed as voted was an accurate representation of who voted; and that only individuals who were properly qualified to vote did in fact vote in the election. This was originally designed to be conducted in two main phases, the Data Analysis Phase, and the Canvassing Phase. However, the Arizona Senate put the canvassing phase on indefinite hold and did not authorize it to be conducted. As a result, Cyber Ninjas was not able to perform any canvassing as part of the audit. However, since members of the volunteers we originally brought in to do the data analysis regularly canvassed as part of their own grass roots group; they chose to do canvassing to validate some of our results. We have integrated those results for the completeness of our report.

2.5.1 DATA ANALYSIS

During the Data Analysis, the Maricopa County voter rolls and voter participation official files were compared against historical data as well as various datasets to identify anomalies that might identify duplicate voters, voters that don't really exist, voters who moved, dead voters, and other classes that might disqualify a voter. This information was then originally planned to be utilized to target three entire precincts to fully canvass. This canvassing would allow the validation and confirmation that anomalies identified in the Data Analysis Phase represented real and legitimate issues.

With the canvassing officially on hold, these three precincts have not been canvassed; but a limited amount of the data has been able to be validated by Independent Canvassing conducted outside of the audit.

2.5.2 INDEPENDENT CANVASSING

A grassroots selection of individuals led by Liz Harris has been canvassing in Maricopa County since late November 2020. These efforts have focused on validating that voter roll data is accurate and identifying individuals on the voter rolls who don't appear to exist at the addresses listed. Individuals were asked if they voted in the 2020 General Election in Maricopa County, and if so, what method of voting was utilized — whether that be mail-in, early voting, or election day voting. Confirmation was also made on who at the residence was currently registered to vote.

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2.6 Paper Ballots

The focus of the Paper Ballots Phase was to hand-count the federal races for all the 2.1 million ballots, as well as to capture digital imagery of each ballot to allow a review of the paper while maintaining chain-of-custody documentation and a high level of transparency. The end-goal was an accurate and transparent count with a high-level of accountability.

2.6.1 Ballot Storage and Chain of Custody

Ballot security and maintaining the chain of custody was paramount to everything that was done during the Paper Ballots Phase. For this reason, ballot boxes that were not actively being processed were always stored within a ballot corral, and a ballot box never left that corral without the proper chain-of-custody forms being signed putting the box in the care of a single individual.

The ballot corrals were made of 6' security fence material and were constantly under both 24/7 video surveillance; and 24/7 view of a law enforcement officer. While counting or paper inspection was taking place, the corral gates would be open with corral workers in there to handle the transfer of chain of custody. But the remainder of the time the ballot corral gates were closed and under lock and key.

There were two secured areas that had three sections for storage of ballots. The unprocessed and the in-progress ballot pallets were both housed in the same corral. The other corral was for special ballots that included large print, braille, or damaged ballots.

Security access to the ballot corral(s) were limited to trained corral personnel, the floor attorney, state senate and Cyber Ninjas' designee(s).

Staging tables for ballot check in/check out were positioned strategically and only two keys existed for locking and unlocking the ballot corral. Those keys were held by a corral manager and the attorney.

2.6.2 Vote Tallying

The Vote Tallying process comprised three main components: tallying, aggregation, and quality control. These procedures allowed the accurate counting of ballots, the aggregation of those counts into the final numbers, as well as helping ensure quality and consistency was held through the process.

2.6.2.1 Tallying Procedures

The tallying process was set up with the use of round tables that each had a ballot pedestal spinning system, like a lazy Susan. Other rectangular tables were used to stage ballots for placing ballots on the pedestal and removing ballots off the pedestal.

A last out, first in method was used when it came to handling ballots. The last ballot out of the box was the first ballot back into the box. This ensured that the ballots would be returned the same way they were received by Maricopa County.

A team color coding method was used that encompassed a comprehensive process of identifying workers in each pod. Corresponding colored paper that matched the pod was used to provide a distinct identity of what pod and even table number did the counting for a particular box of ballots. It was important to ensure individuals were designated to their work environment which also served the purpose for shift reporting times and ultimately start times. Pod colors included red, blue, yellow, and green.

Each table had three counters versus a two-person team the state of Arizona required. Each counter independently counted every individual ballot at the table as the ballot went past him or her on the ballot pedestal, marking the tallies on a tally sheet. These tally sheets from the three counters were then compared by the Table Manager roughly every 50 ballots to validate the results. A successful tally was a match as long as two of the three counters had identical ballot/vote counts, and the third counter could not be off by a calculation of more than two votes for every 100 ballots counted in a race.

If a successful tally didn't happen, the Tally sheets were designed in a manner where all tallies were done in groups of 5 ballots. As a result, the Table Manager would identify which group(s) of 5 ballots needed to be re-tallied; and would rerun these through the table with the same three counters. The counters would then utilize a red pen to fix any mistakes they had made on their tally sheet, rather than the green pens they utilized for the original tallying. This process would be repeated as needed until a successful tally had occurred. As a result, there was no speed in tallying without accuracy.

In addition to counters and Table Managers, tables also had a ballot placer/picker. Table counts ranged from 900 ballots to 2200 ballots in a single 5-hr shift. At its peak setup, there were 44 counting tables.

All Tally sheets that were completed had to be approved and signed off for delivery to the aggregation station for data entry. All Tally sheet movement followed a strict chain of custody process.

2.6.2.1.1 Audit Enhancements

On day one, prior to counting starting, it was determined that the pen color would need to be changed from blue to green when using the marking device on a Tally sheet. This change was instituted after determining the ballots in Maricopa County allowed the use of blue ink, and before any ballots were out on the floor.

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To enhance speed and increase quality, a couple of weeks into the audit, changes were made separating out the imaging process from counting which resulted in the two initiatives becoming two independent processes.

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Counting Tally sheets were changed and reformatted to make the Tally sheet more user friendly which enabled the counter to add more quickly and consistently.

2.6.2.2 Aggregation

The aggregation group was responsible for collecting the Tally sheets from the counting tables, validating that the Tally sheets met the criteria for a successful tally, entering those Tally sheets into a spreadsheet to aggregate the numbers, and scanning the Tally sheets for a digital record. All of this is done while maintaining a strict chain of custody over the Tally sheets that tracked with their own chain of custody forms, with many layers of validation. Any problems with unclear tallies were sent back to the associated Table Manager for correction before the tallies were processed.

The aggregation data entry forms were built in Excel and had built-in checks to catch common typos, validate that proper tallies occurred, and track who was performing the data-entry. Periodically, these Excel sheets would be rolled up utilizing a program in order to create a master aggregation of all of the data.

2.6.2.2.1 Audit Enhancements

There were a lot of enhancements to the processes and Excel sheets utilized to consolidate the aggregation results over time. These enhancements were so significant and beneficial, that all Tally sheets originally aggregated in the first three weeks of counting were re-entered in the new forms.

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The Tally sheets were also originally organized by the color and table that had performed the counting; but was later shifted over to be organized by pallet, box, and batch; to more easily facilitate validation and quality control.

Commented [DL7]: Review again.

2.6.2.3 Quality Control

Quality Control (QC) was an essential aspect of the Vote Tallying process to ensure the highest quality of the final results. Various QC activities took place during the Paper Ballot Phase, but the majority of these operations were conducted in the latter half of Paper Ballot Phase. Activities labeled Quality Control (QC), went above the normal safeguards and checks built into the process in order to identify issues. For example, part of the aggregation process was for someone besides the individual who entered the Tally sheet data to validate that the data did not have typos in it and were correct. While this maintained quality, it did not follow under this section as "Quality Control".

QC operations were focused on areas where there were clear discrepancies among the various distinct numbers that were received. There were total ballot counts from Maricopa County, total ballot counts from the tallying tables, and image counts from the Paper Examination operations. When these numbers were not in agreement, the corresponding Tally sheets and data entries would be reviewed; and depending on the questions presented this would kick off a Quality Control Count (QCC), a Quality Control Tally (QCT), or a Quality Control Paper Examination (QCPE).

QCCs involved counting the number of ballots in a batch or a box to see if the total count of the number of ballots was correct.

QCT's involved re-tallying the entire batch or box following the normal Tallying Procedures.

QCPE involved redoing the images for an entire batch or box because there were not enough images relative to how many ballots that were within that batch or box.

2.6.3 Paper Examination

During the Paper Examination phase all ballots were fully imaged utilizing DSLR cameras, and images were captured from a series of microscopes. The goal of this phase was to capture critical information that could be utilized with Kinematic Artifact Detection to identify and categorize the types and nature of the paper utilized in the ballots and the way they were filled out, as confirmed by paper experts.

The Paper Examination setup utilized custom designed tables and DSLR mounts to allow a consistent and simple workflow when capturing the digital imagery. This setup was built for every paper examination station and when fully optimized, there were 64 tables in operation.

Microscopes were mounted to a single plate in locations that enabled the ballot to be imaged looking at specific areas. Once the ballot was placed onto the back lit plate, only one microscope needed adjustment, which is positioned on a sliding jig to ensure the proper image will be taken once lined up over the marked presidential oval.

Commented [DL8]: Add more about various microscopes utilized

The paper examination process captured the following images on every ballot:

- Front and back side DSLR images
- The Presidential oval mark
- An evaluation of the fiber of the paper
- The print alignment
- Color versus black and white print

2.6.3.1 Audit Enhancements

Originally the paper examination process was attached to the same as the counting tables. However, it became apparent that, to fully optimize the two initiatives, there would be a need to separate out each of the processes. Therefore, the paper examination stations were set up in a separate location on the arena floor.

In addition, the need for further optimizing the software and enhancing the microscope and camera technology became apparent so the paper examination tables were reconfigured and retrofitted with the best possible technology for acquiring images.

Document cameras were originally utilized but due to the need for a higher quality image, DSLR cameras and digital microscopes were added which drove up the demand for more equipment and memory. See 5.2 and 5.10 for more information.

Please see Exhibit G for a more detailed summary of the Paper Examination Process.

2.6.4 Transparency & Accountability

Transparency and accountability have been at the center of how all things with the audit were designed. For this reason, it was imperative to have high-definition streaming 24/7 of all audit operations, as well as having observers present to watch things as they happened. Camera technology and regular people observers were involved in the entire process.

2.6.4.1 Cameras & Live Streaming

Technological transparency for this audit was unlike any other recount or audit ever conducted. There were nine live streaming cameras also recording that were operating 24 hours a day 7 days a week throughout the entire audit. Ballots did not move without a live camera and additional security cameras operating to ensure the chain of custody was adhered to. This even included situations when the ballots had to be transported to other buildings.

In addition, there were over 100 cameras used for security, and recording was stored via the use of Network Video Recorders (NVR). This included all counting activity and aggregation data entry. Each counting table had two cameras assigned. A top view camera observed the counting personnel and a ballot closeup camera recorded all ballot information to include the voter's selection. Cameras were all assigned a designated use even down to a table number in each pod. Cameras recording all ballots on the ballot pedestal at the identifying table number and color can be researched by its file identifier to include date and time stamp. *All camera recording can be crossed checked with the results of the tally sheet and verification of recorded video. This was important to ensure the integrity of the process and that there is irrefutable proof that no tampering of any ballot ever took place while in the care and custody of audit staff.*

A series of cameras were also set up in the aggregation data entry area. The primary function of these cameras was to ensure that the data taken from all tally sheets and input into the system, would demonstrate irrefutable evidence that the data entered was accurate and could be cross checked via recorded video.

Several other cameras were set up in key locations to ensure that the servers and computer technology on the floor was not tampered with. All security cameras (excluding streaming cameras) were set up on a separate air gap platform physically segmented from any other network.

Commented [DL9]: Information about court order abou viewing ballots.

2.6.4.1.1 Audit Enhancements

As the number of counting tables expanded so too did the number of cameras needed to ensure all transparency was addressed. Up to 40 additional cameras were purchased and brought online to handle the expansion of counting tables and aggregation data entry stations.

Additional memory had to be acquired for the expansion of the additional cameras.

2.6.4.2 Observers

Another element of transparency was the observer process. This initiative went far beyond the normal observer access because it allowed observers to be up close to evaluate the counting, paper examination, aggregation, and chain of custody process. Observers were utilized throughout the entire audit to ensure accountability, provide feedback on any irregularity that may have occurred and to serve as additional support to ensure that the overall operation held itself to standards with the highest of integrity, accountability, and transparency. The observers selected included a multipartisan group of individuals. Potential observation volunteers must have applied using an official application form found on Arizona Audit website. Upon completion of the application the standard process involved:

- Data was retrieved from the website and the applicant's name, contact information and availability was logged in centralized spreadsheet
- A background check was conducted
- Applicants were required to provide a voter ID card and 3 letters of reference, or be referred by observation leads
- Applicants were required to read and agree to terms and conditions of their expectations and hours
- If any documents or information was missing, the clearance coordinator contacted the applicant for missing documentation

Commented [DL10]: Validate this with Shelby and could this be testified with court.

There were two sets of observer groups to include authorization from one group commissioned by the State Senate and a second group authorized by the Secretary of State.

2.6.5 Audit Enhancements

Early into the audit process, all observers were provided the option to attend a training session. However, it was determined that an orientation and training would be of great benefit to observers, so it became mandatory that all observers attend orientation and training. This requirement served the purpose of providing a better understanding of operational expectations and logistics. It also alleviated many questions that in some cases were a distraction to the floor personnel or the attorney for the audit. The training provided a clear understanding on the counting and paper examination process as well as the purpose for aggregation and ballot corral procedures. It also placed a heavy emphasis on the chain of custody.

2.7 Voting Machines

The focus of the Voting Machine phase was to evaluate the physical voting machines to see if there was any indication of outside manipulation, connections to the internet, or other activities that could influence the outcome of the elections. This work comprised three main phases: Digital Acquisition, Operating System Analysis and Application Analysis.

2.7.1 Digital Acquisition

During the Digital Acquisition phase all voting machine and digital related items were received from Maricopa County, cataloged and secured; and then each one was forensically imaged. These forensic images were captured utilizing industry best practices which includes the use of "write blocker" technology so that it is physically impossible for any drive contents to ever be changed. All later analysis was only done on copies of these original forensic images.

For more details about the handling of the voting machines or the policies and procedures governing the acquisition of the forensic images; please see CyFIR's Digital Evidence Handling Policies, and the corresponding AZ Audit Evidence Handling Memo. These can be found as Appendix XXXX.

Commented [11]: Fill out when assigned an appendix.

All operations during the Digital Acquisition phase were fully covered under 24/7 livestreamed cameras, and a law enforcement officer was always stationed outside of the evidence lockers to be sure no devices were ever tampered with.

In addition, notice was sent to Maricopa County to invite Dominion Voting Systems to have an observer during this phase; but Dominion chose not to send a representative.

2.7.2 Operating System Analysis

During the Operating System Analysis all forensic images were reviewed for any indications of network activity, malware, or other suspicious or malicious activities. This involved reviewing configuration files, log files, windows event logs, unallocated disk space; and other resources to determine what activities had been done on the machines and how they were configured.

2.7.3 Application analysis

During the Application Analysis, the voting machine software as well as all databases, logs and media associated with it were reviewed to validate the data on them were consistent with what was reported, and that there were no indications of suspicious or otherwise malicious behavior.

2.8 Certified Results

During the Certified Results phase, all of the results from the prior phases, and the resulting counts, tallies and other details; were compared with the official results to identify if there were any discrepancies or other problems that could indicate an issue.

Commented [12]: Really need to revisit this when this is done and give a tone more details.

3 About Cyber Ninjas

Commented [DL13]: Add backgrounds of everyone into this section.

Cyber Ninjas is an application security consulting company specializing in ethical hacking, training, and security program development. Our staff represents over 20 years of experience in a variety of areas including application support, development, product management, and application security. This experience across all areas of the software development life cycle gives us a unique perspective on how to build security into your existing processes. We can help you build a software security program, expand the capabilities of your existing staff, or simply perform a security assessment of your software or your company. With everything we do, our goal is to build the knowledge within your organization. We strongly believe that "Security comes with knowledge."; and that it is our job as Cyber Ninjas to train and teach through every engagement to build up capabilities within your organization.

9/24/2021 Deleted: 9/20/2021

Maricopa County Forensic Audit

Volume III: Result Details

Work Performed For:
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4 Document Overview

The audit was designed to be a comprehensive review of the results from the Maricopa County 2020 General Election to confirm the effectiveness of existing legislation in governing elections, and to provide additional insights on possible areas of information based legislative reform that could ensure an even greater level of integrity and accuracy in how elections are conducted.

This audit is the most comprehensive election audit that has been conducted. It involved reviewing everything from the voter history for the election, to retallying all 2.1 million ballots by hand, to performing forensic photography and review of the ballot paper, to conducting cyber forensic imaging and analysis of the provided voting equipment. This extensive process involved over 1,500 people who contributed a total of over 100,000 hours of time over the course of more than 5 months from when setup began, to when this report is completed.

This volume of the report serves to outline details of the results from the audit; including all the data and evidence to support the conclusions of this report.

5 Tally Results

The audit included a full hand-recount of all 2.1 million ballots from the 2020 General Election. During this process all original ballots were counted, as well as those ballots returned from duplication. Ballots that were duplicated included various categories of ballots that were not able to be run through the voting machines, such as damaged ballots or Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) ballots. The tallies from the original ballots sent to duplication, and the ballots received back from duplication were kept separate so that a comparison could occur. As can be found in audit finding, "More Duplicates Than Original Ballots", there were more duplicates than there were originals. For this reason, we utilized the counts of the originals for all official tallies.

5.1 Presidential Race

The chart below summarizes the results of the hand-recount of the Presidential Race of the Maricopa County Forensic Audit. These tallies are based on the tallies from all original ballots and does not include the ballots duplicated from the originals.

	Trump	Biden	Jorgenson	Write In / Over / Under	Total
Maricopa County Forensic Audit	995,404	1,040,873	31,501	20,791	2,088,569
Official Maricopa County Canvass	995,665	1,040,774	31,705	21,419	2,089,563
DELTA	(261)	99	(204)	(628)	(994)

5.2 Senate Race

The chart below summarizes the results of the hand-recount of the Senate Race of the Maricopa County Forensic Audit. These tallies are based on the tallies from all original ballots and does not include the ballots duplicated from the originals.

NOTE: Vote totals are slightly off primarily due to small differences in hand counts among the 2.1M million ballots.

	McSally	Kelly	Write In / Over / Under	Total
Maricopa County Forensic Audit	983,662	1,064,336	40,398	2,088,396
Official Maricopa County Canvass	984,203	1,064,396	40,964	2,089,563
DELTA	(541)	(60)	(566)	(1,167)

6 Voter History, Ballot, and Certified Results Findings

The following section outlines all findings related to voting history, ballots and the certified results. This section covers everything that directly impacts the counting and accounting of results.

6.1 Ballot Scoring Methodology

Ballot related findings are scored based on the total number of potential ballots impacted by the finding. Based on the range by which this falls within a Severity is assigned, as can be seen in the chart to the right. In these circumstances a severity will still be assigned to the finding based on the potential impact the finding has on the overall integrity of the election.

Ballots Impacted	Severity
10,000+	Critical
5,000 – 9,999	High
1,500 – 4,999	Medium
Less than 1,500	Low

6.2 Finding Summary Table

#	Finding Name	Phase	Ballots Impacted	Severity
6.3.1	Mail-in Ballots Voted from Prior Address	Voter History	23,344	Critical
6.3.2	Potential Voters that voted in multiple counties	Voter History	10,342	Critical
6.4.1	More Ballots Returned by Voter Than Received	Certified Results	9,041	High
6.5.1	Official Results Does Not Match Who Voted	Certified Results	3,432	Medium
6.5.2	More Duplicates Than Original Ballots	Ballot	2,592	Medium
6.5.3	In-Person Voters Who Had Moved out of Maricopa County	Certified Results	2,382	Medium
6.5.4	Voters Moved Out-of-State During 29-Day Period Proceeding Election	Voter History	2,081	Medium
6.6.1	Votes Counted in Excess of Voters Who Voted	Certified results	836	Low
6.6.2	Voters not part of the official precinct register	Voter History	618	Low
6.6.3	Ballots Returned Not in the Final Voted File	Certified Results	527	Low
6.6.4	Duplicated ballots incorrect & missing serial numbers	Ballot	500	Low
6.6.5	Mail-In Ballot Received without Record of Being Sent	Certified Results	397	Low
6.6.6	Voters With Incomplete Names	Voter History	393	Low
6.6.7	Deceased Voters	Voter History	282	Low
6.6.8	Audit UOCAVA Count Does Not Match the EAC Count	Ballots	226	Low
6.6.9	Late Registered Voters with Counted Votes	Voter History	198	Low
6.6.10	Date of Registration Changes to Earlier Date	Voter History	194	Low
6.6.11	Duplicate Voter IDs	Voter History	186	Low
6.6.12	Multiple voters linked by AFFSEQ	Voter History	101	Low
6.6.13	Double Scanned & Counted ballots	Ballot	50	Low
6.6.14	UOCAVA Electronic Ballots Double Counted	Ballot	6	Low
6.6.15	Duplicate Ballots Reuse Serial Numbers	Ballot	6	Low
6.7.1	Audit Interference	Ballot	N/A	Informational
6.7.2	Batch Discrepancies	Ballot	N/A	Informational
6.7.3	Commingled Damaged and Original Ballots	Ballot	N/A	Informational
6.7.4	Early Votes Not Accounted for in EV33	Certified Results	N/A	Informational
6.7.5	High Bleed-Through Rates on Ballots	Ballot	N/A	Informational
6.7.6	Improper Paper Utilized	Ballot	N/A	Informational
6.7.7	Inaccurate Identification of UOCAVA Ballots	Ballot	N/A	Informational
6.7.8	Missing Subpoena Items	Ballot	N/A	Informational
6.7.9	No Record of Voters in Commercial Database	Voter History	N/A	Informational
6.7.10	Out of Calibration Ballot Printers	Ballot	N/A	Informational
6.7.11	Real-Time Provisional Ballots	Voter History	N/A	Informational
6.7.12	Voter Registration System Audit Access	Voter History	N/A	Informational
6.7.13	Questionable Ballots	Ballot	N/A	Informational

Deleted: In-Person Voters Who Had Moved out of Maricopa County…

Deleted: Early Votes Not Accounted for in EV33

6.3 Critical Findings

6.3.1 Mail-in Ballots Voted from Prior Address

Ballots Impacted 23,344

Mail-in ballots were cast under voter registration IDs for people that should not have received their ballots by mail because they had moved, and no one with the same last name remained at the address. Through extensive data analysis we have discovered approximately 23,344 votes that meet this condition. Mail-in ballots are, by Arizona law A.R.S. § 16-558.01, never forwarded[1]. If a registered voter does not have a secondary mailing address listed with the county and no longer lives at the address listed on their voter registration, they should not receive their mail-in ballot. In certain circumstances it may be possible for them to receive a ballot, for example, if they know the present occupant, or if the ballot is improperly forwarded.

The Final Voted File, or VM55, was cross-checked against a commercially available data source provided by Melissa[2] called Personator. Personator is a best-in-class identity and address validation tool. It confirms that an individual is associated with an address, indicates prior and current addresses, tracks when and where the individual moves, tracks date-of-birth and date-of-death. To accomplish this, it utilized both private and government data sources such as the US Postal Service's National Change of Address (NCOA) service, and the Social Security Administration's Master Death List.

Addresses were not included in the results if there was a valid secondary mailing address as part of the voting record. Only moves prior to October 5, 2020, are included in the move numbers.

NOTE: While high quality commercial database sources were utilized to assemble these findings, a small percentage of error is expected within these results. To further validate these findings, it is recommended that canvassing be conducted.

NOTE: A full list of the Voter IDs affected can be found in Appendix X. There are potential ways that a voter could receive their ballot which in some cases would not violate the law. Additional investigation by the Attorney General is recommended for any conclusive determination.

Commented [DL1]: Replace

Description	Ballots
Mail-in votes from voters who moved within Maricopa County prior to the registration deadline	15,035
Mail-in votes from voters who moved out of Arizona prior to registration deadline	6,591
Mail-in votes from voters who moved within Arizona but out of Maricopa prior to registration deadline	1,718

6.3.1.1 References

- A.R.S. § 16-101 – Qualifications of registrant[3]
- A.R.S. § 16-558.01 Mailing of Ballots[4]

[1] https://www.azleg.gov/ars/16/00558-01.htm
[2] https://www.melissa.com
[3] https://www.azleg.gov/ars/16/00101.htm

[4] https://www.azleg.gov/ars/16/00558-01.htm

- State of Arizona – 2019 Elections Procedures Manual[5]

6.3.1.2 Data Files Utilized

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.3.1.3 Recommendation

Legislation should be considered that links voter roll registration to changes in driver's licenses or other state identification, as well as requiring the current voter rolls be validated against the United States Postal Service (USPS) National Change of Address (NCOA) at a predefined period prior to every election.

Laws already exist for interstate reporting of changes in residence, addresses, and driver's licenses. Tying voter roll registration to these forms of identification would greatly increase the likelihood that voter registration details would be kept up to date. Individuals are much more likely to remember their license needs to be updated immediately than voter registration, and since most states now offer the ability to register to vote when getting a license, license updates could also update voter rolls.

It is recommended that the voter rolls be validated against the NCOA both 30 days or more prior to the election, in addition to a week before mail-in ballots are sent out. This check would be utilized to determine if a mail-in ballot would be sent to the address since ballots are not allowed to be forwarded. The legislature may want to consider whether a change of address should suspend Permanent Early Voting List (PEVL) enrollment.

6.3.2 Potential Voters that voted in multiple counties

Ballots Impacted 10,342

Comparing the Maricopa County VM55 Final Voted File to the equivalent files of the other fourteen Arizona counties resulted in 10,342 voters with the same first, middle, last name and birth year. While it is possible for multiple individuals to share all these details; it is not common, and this list should be fully reviewed.

The comparison yielded two groups of potential duplicate voters.

- Possible duplicate voters within one county.
- Possible duplicate voters between counties.

6.3.2.1 References

- State of Arizona – 2019 Elections Procedures Manual[6]
- A.R.S. § 16-120 – Eligibility to vote[7]

[5] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[6] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[7] https://www.azleg.gov/ars/16/00120.htm

6.3.2.2 DATA FILES UTILIZED

File Name	**MD5 Hash**
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
Apache County - 01_02_2021 Party CD-2021-02-09T00 22 11Z.csv	be4c0af2563848085d58ba6b35a486d9
Cochise County Voter File 01022021.csv	6839d6c54e5da7b5440018b23c239a80
Coconino County - 11-3-20 General Voter List with Voting History.csv	aa92299b3af0188e0d477d30929ff2e8
Gila County - votinghistoryexport_637454437931504987.csv	ea8475adc98ba6d488c1cf772333c750
Graham County - votinghistoryexport022021.csv	a967c66261fc118b12a7673cfc140293
Greenlee Party Report Active voters with voting history 1-6-2021-2021-01-06T17 47 47Z.csv	9f911e1249c0c6303d393e88f435057c
La Paz County - votinghistoryexport11032020-2020-12-09T19 37 25Z.csv	a94f953df2f4843ee1a753f2102ef589
Mojave County - Party File 1-2-2021.csv	427dfa3347df1c9a373d1c60250d71d3
Navajo County - Parties List January 21-2021-02-10T22 08 47Z.csv	1aea8fc97eaad284ba27de8689774315
Pima County - ActiveVoters20210105112009.csv	93bbfb0586d83cc714b8d02b2ad8d8e3
Pinal County - Active Voter List 01052021.csv	44d10afdac81cf1dea2bd5faffda50dc
Santa Cruz County - 1ST QTR ACTIVE VOTER LIST REPORT 01202021.csv	73e8599aab7c084c94605621f0c148e2
Yavapie County - 11-10-2020 votinghistory-Yavapai.csv	2e68ec2f922a0eda6999f3fc5b1c0638
Yuma County - Voting History Export_Include ALL Registered Voters.csv	d87c732fc069e85db4a92974bd7c689b

6.3.2.3 RECOMMENDATION

Legislation should be considered which requires the Secretary of State to search the statewide voter roll details for duplicate licenses and social security numbers to identify potential voters across multiple counties. While Maricopa and Pima counties currently have their own voter roll software, this software by law synchronizes with the statewide system which would allow this check to be possible.

6.4 High

6.4.1 More Ballots Returned by Voter Than Received

Ballots Impacted 9,041

9,041 more ballots show as returned in the EV33 Early Voting Returns File for a single individual who voted by mail than show as sent to that individual within the EV32 Early Voting Sent File. In most of these instances an individual was sent one ballot but had two ballots received on different dates.

This situation could be explained in a number of different ways:

- More than one ballot could have been sent out, but an entry was missed within the EV32 file.
- The same ballot could have been processed more than once on different days, resulting in two EV33s for one ballot.
- Checking into Early Vote in person may not have recognized that a mail-in ballot was already received and both the Early Vote In-Person and the mail-in may have generated an EV33.
- A fraudulent ballot was sent via mail and both the legitimate ballot sent and the fraudulent ballot generated EV33 entries.

NOTE: An EV33 indicates that a ballot is received and does not necessarily mean the ballot was counted. It is assumed that only the first ballot was counted.

Ballots Sent to Voter	Ballots Received for Voter	Quantity of Voters
1	2	8,875
1	3	163
1	4	3

6.4.1.1 References

- A.R.S. § 16-246 – Early Balloting[8]
- A.R.S. § 16-542 – Request for ballot[9]
- A.R.S. § 16-558.01 – Mailing of Ballots[10]

6.4.1.2 Data Files Utilized

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
EV33-1377-10-09-2020_101111.txt	f1daa7089f7300237f6b4ff779661cf9
EV33-1377-10-12-2020_113210.txt	72e4e6c102e3539b4dd15b4454357b69
EV33-1377-10-13-2020_111553.txt	9b14841281c031533322b50aabb86a24
EV33-1377-10-14-2020_112757.txt	1b7537d7d9b927dbf4e462ed5ee8f97c
EV33-1377-10-15-2020_121331.txt	dec7d08dde4970c26e32b8c844f4a9ab
EV33-1377-10-16-2020_113522.txt	f0a632c3fd9b5f177d48504dc119be31

[8] https://www.azleg.gov/ars/16/00246.htm
[9] https://www.azleg.gov/ars/16/00542.htm
[10] https://www.azleg.gov/ars/16/00558-01.htm

File Name	MD5 Hash
EV33-1377-10-19-2020_111708.txt	db80b692a9188add0844a8974e227287
EV33-1377-10-20-2020_112351.txt	57d1795db8be71d516e29350e347fb3a
EV33-1377-10-21-2020_111843.txt	56c3b5a11651c68735164c578eade4e1
EV33-1377-10-22-2020_111714.txt	03551f170bf758efc90c013d0fe2e467
EV33-1377-10-23-2020_112614.txt	dbfdd369ac148723540c83f614cca454
EV33-1377-10-26-2020_111318.txt	0b68adff779f59c70a530000bf989aca
EV33-1377-10-27-2020_111413.txt	a6fc7377bf6c6fe6653f539c5970a6f7
EV33-1377-10-28-2020_111331.txt	43758b9290f90d0305d5ed84aa10becb
EV33-1377-10-29-2020_111300.txt	410b30b06f2ca73022f27173fe114038
EV33-1377-10-30-2020_111804.txt	5cb44e5ea214f40227e04345d4355ff7
EV33-1377-11-02-2020_111214.txt	5d15bb8686a022f53400550cfe010a07
EV32-1377-09-18-2020_075112.txt	ab22e9ba4ad54af1b7a47f8381d506c7
EV32-1377-09-30-2020_111728.txt	2e4df9ccf2e5e64fd7e164628ff7667a
EV32-1377-10-01-2020_113125.txt	92538fe838c7c872957d155a98290874
EV32-1377-10-02-2020_125658.txt	be7d44838daa2aa758a0adb1dfe88acd
EV32-1377-10-05-2020_112338.txt	31a356a1a1826639759fc66afb812498
EV32-1377-10-06-2020_114600.txt	cb70c4468ebd51142003e46e3e1257c4
EV32-1377-10-07-2020_111951.txt	185d423606927ba15f827e19329c02aa
EV32-1377-10-08-2020_111639.txt	4f82598b6fab071300e92b8f56407451
EV32-1377-10-09-2020_112718.txt	bdf22cce7eca5eeb0b52dbb9f87a54b6
EV32-1377-10-12-2020_113153.txt	67a7ab52ab0850127528b18667eaf5c6
EV32-1377-10-13-2020_111535.txt	81af1c0b010368d0e11cc68e8a21f2e6
EV32-1377-10-14-2020_112738.txt	e88cce6a8a27b5bf755765f516710c48
EV32-1377-10-15-2020_121305.txt	2f12b801d981afc0e4e114bdfbf4241c
EV32-1377-10-16-2020_113410.txt	46a251f88fdd1d2e2352ac1dc61fffa9
Maricopa_EV32-1377-10-19-2020_111633-2020-10-20T14 53 30Z.txt	9cd6e80c07e1f33129cf98302930abb6
Maricopa_EV32-1377-10-20-2020_112309-2020-10-21T15 13 12Z.txt	e3cc25b520b5710090f4dfff2d7fce7f
Maricopa_EV32-1377-10-21-2020_111759-2020-10-22T15 08 54Z.txt	e786fec02788d0b7c4392ca5b1cd284e
Maricopa_EV32-1377-10-22-2020_111639-2020-10-23T15 03 40Z.txt	86ea315f6bce7c0c902027b5373f6e2c
Maricopa_EV32-1377-10-23-2020_112532-2020-10-26T15 00 59Z.txt	ca42553da16ea38cf2b72f29b81a990f

6.4.1.3 RECOMMENDATION

It is recommended that the Attorney General inquire of Maricopa County as to the reason for this discrepancy, and if a sufficient explanation is not received an investigation be opened to investigate this further.

6.5 Medium Findings

6.5.1 Official Results Does Not Match Who Voted

Ballots Impacted 3,432

The official result totals do not match the equivalent totals from the Final Voted File (VM55). These discrepancies are significant with a total ballot delta of 11,592 between the official canvass and the VM55 file when considering both the counted and uncounted ballots.

Official Results verses Final Voted File (VM55) – Counted Ballots

Description	Type	Official Results	Final Voted (VM55)	Delta
Early Vote	Mail In (R)	N/A	1,702,981	
	In Person (B)	N/A	209,112	
	Total	1,915,487	1,912,093	3,394
Election Day Vote	Regular	167,878	N/A	
	Provisional	6,198	N/A	
	Total	174,076	(P) 174,038	38
Total Counted:		2,089,563	2,086,131	3,432

NOTE: Please see Appendix X for a full break-down by precinct of the differences between the Official Results and the Final Voted File (VM55).

Commented [DL2]: Attach proper reference

6.5.1.1 Data Files Utilized

File Name	MD5 Hash
11-03-2020-1 Final Official Summary Report NOV2020.pdf[11]	321a78c74d4f442da0659014b29cb091
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.5.1.2 Recommendation

Legislation should be considered that would require the Official Canvass to fully reconcile with the Final Voted File. The number of individuals who showed up to vote should always match the number of votes cast. Failing to have systems that reconcile does not breed confidence in the election systems utilized. At best its sloppy, at worst it could cover for fraud that could significantly impact the election results.

6.5.2 More Duplicates Than Original Ballots

Ballots Impacted 2,592

Maricopa County reported "In this election, Maricopa County had 27,869 duplicate ballots pertaining to the Presidential Electors."[12] The audit team counted 29,557 duplicate ballots. However, only 26,965 original ballots that were sent to duplication.

[11] https://recorder.maricopa.gov/electionarchives/2020/11-03-2020-1%20Final%20Official%20Summary%20Report%20NOV2020.pdf
[12] https://ecf.azd.uscourts.gov

Description	Ballots Count
Maricopa County Forensic Audit - Original Ballots Sent to Duplication	26,965
Maricopa County Forensic Audit – Duplicate Ballots Counted	29,557
Maricopa County – Reported Duplicate Ballots	27,869

A comparison of the total number of original ballots sent to duplication vs the total number of duplicate ballots shows that Maricopa County counted 2,592 more duplicate ballots than original ballots sent to duplication. The audit team attempted to resolve the discrepancies, but those efforts were impeded by the County's failure to properly identify duplicate ballot batches and failure to assign unique serial numbers to each damaged ballot sent to duplication and then match that number to the duplicate ballot printed to replace it.

The County reported 1688 fewer ballots sent to duplication than identified by the audit team. The County provided 904 fewer original ballots than they reportedly duplicated.

6.5.2.1 REFERENCES

- Maricopa Clerk of Court Duplicate Ballots[13]
- State of Arizona – 2019 Elections Procedures Manual[14]
- A.R.S. § 16-621 – Proceedings at the counting center[15]

6.5.2.2 RECOMMENDATION

Legislation should be considered that requires regular audits of elections within a year of the election. Among the mandatory items required to perform in the audit should be a review of the duplicate ballot process.

6.5.3 IN-PERSON VOTERS WHO HAD MOVED OUT OF MARICOPA COUNTY

Ballots Impacted 2,382

The VM55 Final Voted File, was cross-checked against a commercially available data source provided by Melissa called Personator and 2,382 ballots were cast voter IDs for individuals that moved outside of Maricopa County prior to 10/5/2020. Personator is a best-in-class identity and address validation tool. It confirms that an individual is associated with an address, indicates prior and current addresses, tracks when and where the individual moves, tracks date-of-birth and date-of-death. To accomplish this, it utilized both private and government data sources such as the US Postal Service's National Change of Address (NCOA) service, and the Social Security Administration's Master Death List. Only moves prior to October 5, 2020, are included in the move numbers.

NOTE: While high quality commercial database sources were utilized to assemble these findings, a small percentage of error is expected within these results. To further validate these findings, it is recommended that canvassing be conducted.

Description	Ballots

[13] https://www.clerkofcourt.maricopa.gov/home/showpublisheddocument/1902/637425888214000000
[14] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[15] https://www.azleg.gov/ars/16/00621.htm

In-Person votes from voters who moved out of Arizona prior to registration deadline	1,528
In-Person votes from voters who moved within Arizona but out of Maricopa prior to registration deadline	854

6.5.3.1 REFERENCES

- Maricopa County – 11-03-2020 - General Election Canvass Summary[16]

6.5.3.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.5.3.3 RECOMMENDATION

Legislation should be considered that links voter roll registration to changes in driver's licenses or other state identification, as well as requiring the current voter rolls be validated against the United States Postal Service (USPS) National Change of Address (NCOA) at a predefined period prior to every election.

Laws already exist for interstate reporting of changes in residence, addresses, and driver's licenses. Tying voter roll registration to these forms of identification would greatly increase the likelihood that voter registration details would be kept up to date. Individuals are much more likely to remember their license needs to be updated immediately than voter registration, and since most states now offer the ability to register to vote when getting a license, license updates could also update voter rolls.

It is recommended that the voter rolls be validated against the NCOA both 30 days or more prior to the election, in addition to a week before mail-in ballots are sent out. This check would be utilized to determine if a mail-in ballot would be sent to the address since ballots are not allowed to be forwarded. The legislature may want to consider whether a change of address should suspend Permanent Early Voting List (PEVL) enrollment.

6.5.4 VOTERS MOVED OUT-OF-STATE DURING 29-DAY PERIOD PROCEEDING ELECTION

Ballots Impacted 2,081

Arizona law and the 2019 Election Procedures Manual address the specific voting eligibility of a person who moves out of Arizona during the 29-day period before the election. A person that moved out of Arizona between 10/5/2020 and 11/03/2020, was no longer legally considered a "resident", however was eligible by law to vote a presidential-only ballot. See the image below taken from the 2019 Elections Procedure Manual (pg. 30).

[16] https://recorder.maricopa.gov/electionarchives/2020/11-03-2020-1%20Final%20Official%20Summary%20Report%20NOV2020.pdf

ARIZONA SECRETARY OF STATE
2019 ELECTIONS PROCEDURES MANUAL

If a registrant moves to a different state during the 29-day period preceding the next election, the registrant is not a qualified elector (and is therefore ineligible to vote) in Arizona. However, a registrant retains the right to vote in Arizona for President of the United States (and no other races) at the general election during a Presidential election year. A.R.S. § 16-126. Requesting a presidential-only ballot requires the County Recorder to cancel the registrant's record "promptly" following the general election. A.R.S. § 16-165(A)(6).

The 2019 Elections Procedure Manual states "A registrant is a "resident" if they have physical presence in the county along with an intent to remain. A registrant may be temporarily absent from the jurisdiction without losing their residency status, as long as they have an intent to return. A.R.S. § 16-103." (pg. 12)

The Final Voted File, or VM55, was cross-checked against a commercially available data source provided by Melissa[17] called Personator. Personator is a best-in-class identity and address validation tool. It confirms that an individual is associated with an address, indicates prior and current addresses, tracks when and where the individual moves, tracks date-of-birth and date-of-death. To accomplish this, it utilized both private and government data sources such as the US Postal Service's National Change of Address (NCOA) service, and the Social Security Administration's Master Death List.

The cross-check resulted in 2,081 instances of a voter that moved out of the state of Arizona during the 29-day period before the election who cast a ballot in the 2020 general election.

The ballot definitions on the Dominion EMS do not include a "Presidential-Only" ballot. The Dominion voting machines would not be able to read a ballot for which a ballot definition does not exist. Additionally, in examining the EV33 sent ballot files for ballot codes, the ballot images, and the cast vote record, no presidential-only ballots as specified by A.R.S. § 16-126 and the 2019 Election Procedures Manual were found to be cast in this election.

6.5.4.1 REFERENCES

- Arizona State - 2019 Elections Procedure Manual[18]
- A.R.S. § 16-126 – Authority to vote in a presidential election after moving from state[19]
- A.R.S. § 16-103 – Qualified person temporarily absent from the state[20]

6.5.4.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.5.4.3 RECOMMENDATION

Legislation should be considered that links voter roll registration to changes in driver's licenses or other state identification, as well as requiring the current voter rolls be validated against the United States Postal Service (USPS) National Change of Address (NCOA) at a predefined period prior to every election.

[17] https://www.melissa.com
[18] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[19] https://www.azleg.gov/ars/16/00126.htm
[20] https://www.azleg.gov/ars/16/00103.htm

Laws already exist for interstate reporting of changes in residence, addresses, and driver's licenses. Tying voter roll registration to these forms of identification would greatly increase the likelihood that voter registration details would be kept up to date. Individuals are much more likely to remember their license needs to be updated immediately than voter registration, and since most states now offer the ability to register to vote when getting a license, license updates could also update voter rolls.

It is recommended that the voter rolls be validated against the NCOA both 30 days or more prior to the election, in addition to a week before mail-in ballots are sent out. This check would be utilized to determine if a mail-in ballot would be sent to the address since ballots are not allowed to be forwarded. The legislature may want to consider whether a change of address should suspend Permanent Early Voting List (PEVL) enrollment.

6.6 Low Findings

6.6.1 Votes Counted in Excess of Voters Who Voted

Ballots Impacted 836

An underlying principle of a free and fair election is that the number of votes cast cannot exceed the number of voters who participate in the election. An analysis of the Maricopa County Official Canvass and the VM55 Final Voted file from November 2020 show that multiple precincts counted votes in excess of the number of voters who participated in the 2020 General Election.

Reconciliation of the voters who participated to ballots cast is first required at a every vote center for election day voting. The County Audit Board is required to reconcile the voters who participated with the ballots cast for each precinct prior to certifying the Official Canvass. The expected delta should be more voters who voted than cards cast because some ballots were rejected by the county. There were 277 precincts with a voter deficit, 65 precincts with an equal number of voters who voted, and cards cast. There were 401 precincts with the expected surplus. See ten precinct examples below:

2020 Maricopa County Official Canvass			VM 55	Delta
Precinct Name	Registered Voters	Cards Cast	Voters who Voted	Voter Deficit
0191 DIXILETA	6842	6079	6022	-57
0704 WADDELL	10131	8747	8720	-27
0714 WEST WING	9128	8167	8140	-27
0521 PYRAMID PEAK	8946	7895	7869	-26
0733 WILDER	3324	3051	3025	-26
0527 RANCHO PALOMA	3262	2949	2924	-25
0005 ADORA	7974	7075	7052	-23
0730 WIGWAM	8779	7709	7686	-23
0238 FORT MCDOWELL	617	367	345	-22
0183 DESERT SAGE	6586	5800	5779	-21

From the Arizona Election Procedure Manual, the Audit Board has several responsibilities:

"1. Receives the Official Ballot Reports for each voting location and any supplemental information from the election boards that could explain any discrepancies.

2. Receives the signature rosters, poll lists (or scanned copies), or reports from e-pollbooks that show voter check-ins and signatures…"

"9. Identifies discrepancies in the reports following final tabulation of duplicated ballots and provisional ballots.

10. Resolves problems that appear to be of major significance in the presence of political party observers; and

11. Resolves and documents all discrepancies. The functions of the Audit Board must be completed prior to the acceptance of the canvassing."

Note that the Audit Board must consider discrepancies after the final tabulation which would include discrepancies in the number of votes counted vs. the number of voters who participated in the election. This would include mail ballots, duplicated ballots and provisional ballots for voters in every precinct. Maricopa County failed to resolve these discrepancies prior to acceptance of the canvass.

REFERENCES

- State of Arizona – 2019 Elections Procedures Manual[21]

6.6.1.1 DATA FILES UTILIZED

File Name	MD5 Hash
11-03-2020-2b Final SOV and Official Canvass Report NOV2020.csv	e907163ef4b0d99e116c24fcb98a6969
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.6.1.2 RECOMMENDATION

Maricopa County Election Officials and Audit Board should examine all records and resolve all discrepancies prior to certification of election results. Each legal voter should be permitted to vote one and only one time.

6.6.2 VOTERS NOT PART OF THE OFFICIAL PRECINCT REGISTER

Ballots Impacted 618

The list of individuals who are eligible and able to vote in an election, also known as the official precinct register, is established 10 days prior to the election. This means that for the 2020 General Election this was established on October 22nd. At that point in time everyone who was officially on the voter rolls for the election should have been on the rolls. It should not require an earlier or a later voter roll file to find a complete list of everyone who was eligible and actually voted in the election. However, a review of the VM55 Final Voted File for the 2020 General Election shows voter IDs that do not show on either the October 2, 2020, voter rolls or on the November 7, 2020, voter rolls. To match up all the voter IDs that show on the VM55 Final Voted File for the 2020 General Election it requires that you look back to the April 9, 2017, voter rolls to find all the IDs: in addition to also requiring the December 4, 2020, rolls. In total it takes 12 different months VM34 Monthly Voter Roll files to find and match-up all voters in the 2020 General Election. This can be seen in the diagram below.

VM34 File Date	# Of Matched Voters
12/4/2020	605
11/7/2020	2,089,465
9/5/2020	1
8/8/2020	1
7/3/2020	1
6/6/2020	1
12/6/2019	2
10/5/2019	3
4/5/2019	1
2/2/2019	1

[21] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf

5/6/2017	1
4/9/2017	1

6.6.2.1 REFERENCES

- A.R.S. § 16-168 - Precinct registers[22]

6.6.2.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
Maricopa County-VM34 Voter Registration Oct 2, 2020	99a4440ae9bab7f0de96d7656b4e739d
Maricopa County-VM34 Voter Registration Nov 7, 2020	d7bfc018296832836d2bd8de440cba53
Maricopa County-VM34 Voter Registration Dec 4, 2020	255f69007b253c7f2737b050c439f269

6.6.2.3 RECOMMENDATION

Legislation should be considered that will require that the precinct registers be complete and comprehensive of every individual who could legally vote for the election.

6.6.3 BALLOTS RETURNED NOT IN THE FINAL VOTED FILE

Ballots Impacted 527

Ballots show as returned in the EV33 Early Voting Returns File but there is no matching record in the VM55 Final Voted File. All entries in the EV33 file show with a ballot status of "Returned" and the only other status of "Voided Early Ballot" is not used anytime in the 2020 General Election.

The most likely explanation is that these ballots represent rejected ballots. However, the number of ballots in question, 2,449, does not match the 2,976 ballots that were rejected (2,042) or late (934). It is expected there should be a full accounting of all ballots received and voted that can be matched up to individual voter participation.

6.6.3.1 REFERENCES

- A.R.S. 16-542 – Request for ballot[23]
- A.R.S. 16-246 – Early Balloting[24]

6.6.3.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
EV33-1377-10-09-2020_101111.txt	f1daa7089f7300237f6b4ff779661cf9
EV33-1377-10-12-2020_113210.txt	72e4e6c102e3539b4dd15b4454357b69

[22] https://www.azleg.gov/ars/16/00168.htm

[23] https://www.azleg.gov/ars/16/00542.htm
[24] https://www.azleg.gov/ars/16/00246.htm

EV33-1377-10-13-2020_111553.txt	9b14841281c031533322b50aabb86a24
EV33-1377-10-14-2020_112757.txt	1b7537d7d9b927dbf4e462ed5ee8f97c
EV33-1377-10-15-2020_121331.txt	dec7d08dde4970c26e32b8c844f4a9ab
EV33-1377-10-16-2020_113522.txt	f0a632c3fd9b5f177d48504dc119be31
EV33-1377-10-19-2020_111708.txt	db80b692a9188add0844a8974e227287
EV33-1377-10-20-2020_112351.txt	57d1795db8be71d516e29350e347fb3a
EV33-1377-10-21-2020_111843.txt	56c3b5a11651c68735164c578eade4e1
EV33-1377-10-22-2020_111714.txt	03551f170bf758efc90c013d0fe2e467
EV33-1377-10-23-2020_112614.txt	dbfdd369ac148723540c83f614cca454
EV33-1377-10-26-2020_111318.txt	0b68adff779f59c70a530000bf989aca
EV33-1377-10-27-2020_111413.txt	a6fc7377bf6c6fe6653f539c5970a6f7
EV33-1377-10-28-2020_111331.txt	43758b9290f90d0305d5ed84aa10becb
EV33-1377-10-29-2020_111300.txt	410b30b06f2ca73022f27173fe114038
EV33-1377-10-30-2020_111804.txt	5cb44e5ea214f40227e04345d4355ff7
EV33-1377-11-02-2020_111214.txt	5d15bb8686a022f53400550cfe010a07

6.6.3.3 RECOMMENDATION

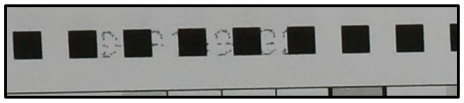
Legislation should be considered that requires that the various election related systems to properly integrate in order to give accurate and consistent counts between the mail-in ballots cast, mail-in ballots received, mail-in ballots accepted, mail-in ballots rejected, and be able to reconcile these details with who voted in the final voted file.

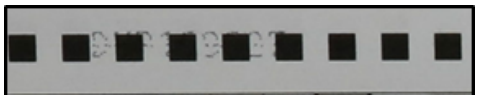
6.6.4 DUPLICATED BALLOTS INCORRECT & MISSING SERIAL NUMBERS

Ballots Impacted ~500

Damaged Ballots sent to duplication must have a serial number that can be matched to the duplicate (replacement ballot). Many damaged ballots sent to duplication do not have a serial number, and multiple duplicated ballots have incorrect serial numbers that do not match the original ballots. The County must "record an identical serial number on both the original and duplicate ballot (including spoiled duplicates) – this ties the ballots together and creates a paper trail as required by statute, A.R.S. § 16-621(A)"

In addition, there are hundreds of damaged ballots with unreadable serial numbers like these examples below:

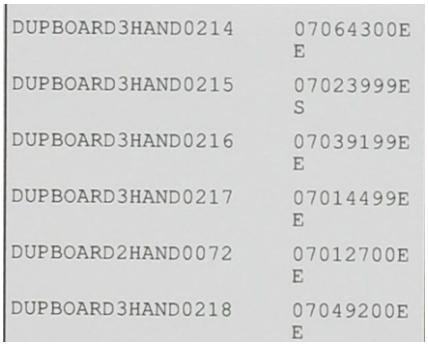




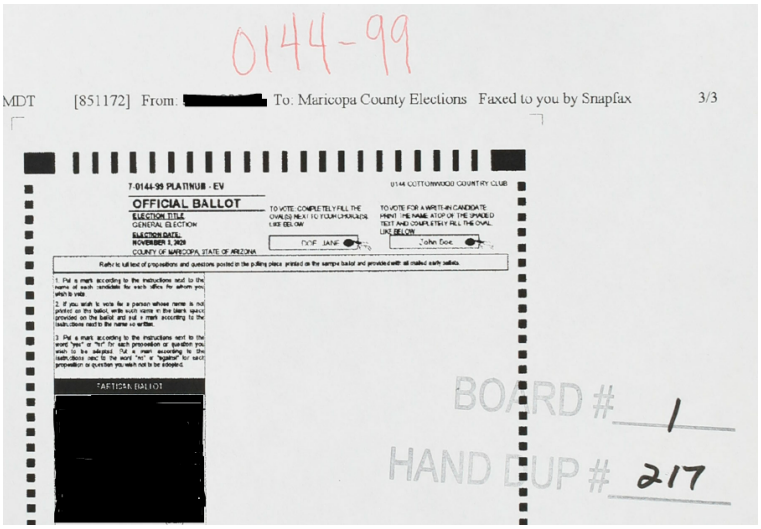
Of those original ballots that had a readable serial number, several of them had incorrect serial numbers. In some cases, as shown in the example below, the audit team was able to identify the original ballot and the duplicate ballot based on a series of precinct, ballot type and presidential selection. The five ballots in the table below had incorrect serial numbers on the duplicate ballot.

Duplicate Ballot Serial Number	Precinct	Ballot Type	Presidential Selection	Original Damaged Ballot Serial Number
DUPBOARD3HAND0214	643	0	Biden	Board 1 Hand Dup 214
DUPBOARD3HAND0215	239	99	Trump	Board 1 Hand Dup 215

DUPBOARD3HAND0216	391	99	Biden	Board 1 Hand Dup 216
DUPBOARD3HAND0217	144	99	Biden	Board 1 Hand Dup 217
DUPBOARD3HAND0218	492	0	Biden	Board 1 Hand Dup 218



Segment Trailer Sheet showing precinct and ballot type



UOCAVA Ballot Image showing precinct, ballot type

6.6.4.1 REFERENCES

- State of Arizona – 2019 Elections Procedures Manual[25]
- A.R.S. § 16-621 – Proceedings at the counting center[26]

6.6.4.2 RECOMMENDATION

Legislation should be considered that requires regular audits of elections within a year of the election. Among the mandatory items required to perform in the audit should be a review of the duplicate ballot process.

6.6.5 MAIL-IN BALLOT RECEIVED WITHOUT RECORD OF BEING SENT

Ballots Impacted 397

Ballots show as returned in the EV33 Early Voting Returns File for a voter who voted by mail but there is no matching record in the EV32 Early Voting Sent File showing that a ballot was ever sent. This most likely means that there was a clerical error in the EV32 Early Voting Sent Files and ballots that were sent out legitimately were not recorded, however there is a potential this could indicate a fraudulent ballot received.

NOTE: At an earlier hearing it was stated that there were 74,243 entries in EV33 Early Voting Returns Files without a corresponding entry in the EV32 Early Voting Sent Files. This was brought up in the context of justification for performing canvassing to further validate the reasoning for this discrepancy. While this discrepancy is accurate, it was unintentionally misleading. All but 397 of those entries were Early Voting in-person votes which also generate an EV33 entry in addition to mail-in ballots.

6.6.5.1 REFERENCES

- A.R.S. 16-542 – Request for ballot[27]
- A.R.S. 16-246 – Early Balloting[28]

6.6.5.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
EV33-1377-10-09-2020_101111.txt	f1daa7089f7300237f6b4ff779661cf9
EV33-1377-10-12-2020_113210.txt	72e4e6c102e3539b4dd15b4454357b69
EV33-1377-10-13-2020_111553.txt	9b14841281c031533322b50aabb86a24
EV33-1377-10-14-2020_112757.txt	1b7537d7d9b927dbf4e462ed5ee8f97c
EV33-1377-10-15-2020_121331.txt	dec7d08dde4970c26e32b8c844f4a9ab
EV33-1377-10-16-2020_113522.txt	f0a632c3fd9b5f177d48504dc119be31
EV33-1377-10-19-2020_111708.txt	db80b692a9188add0844a8974e227287
EV33-1377-10-20-2020_112351.txt	57d1795db8be71d516e29350e347fb3a
EV33-1377-10-21-2020_111843.txt	56c3b5a11651c68735164c578eade4e1
EV33-1377-10-22-2020_111714.txt	03551f170bf758efc90c013d0fe2e467
EV33-1377-10-23-2020_112614.txt	dbfdd369ac148723540c83f614cca454

[25] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[26] https://www.azleg.gov/ars/16/00621.htm
[27] https://www.azleg.gov/ars/16/00168.htm
[28] https://www.azleg.gov/ars/16/00246.htm

File Name	MD5 Hash
EV33-1377-10-26-2020_111318.txt	0b68adff779f59c70a530000bf989aca
EV33-1377-10-27-2020_111413.txt	a6fc7377bf6c6fe6653f539c5970a6f7
EV33-1377-10-28-2020_111331.txt	43758b9290f90d0305d5ed84aa10becb
EV33-1377-10-29-2020_111300.txt	410b30b06f2ca73022f27173fe114038
EV33-1377-10-30-2020_111804.txt	5cb44e5ea214f40227e04345d4355ff7
EV33-1377-11-02-2020_111214.txt	5d15bb8686a022f53400550cfe010a07
EV32-1377-09-18-2020_075112.txt	ab22e9ba4ad54af1b7a47f8381d506c7
EV32-1377-09-30-2020_111728.txt	2e4df9ccf2e5e64fd7e164628ff7667a
EV32-1377-10-01-2020_113125.txt	92538fe838c7c872957d155a98290874
EV32-1377-10-02-2020_125658.txt	be7d44838daa2aa758a0adb1dfe88acd
EV32-1377-10-05-2020_112338.txt	31a356a1a1826639759fc66afb812498
EV32-1377-10-06-2020_114600.txt	cb70c4468ebd51142003e46e3e1257c4
EV32-1377-10-07-2020_111951.txt	185d423606927ba15f827e19329c02aa
EV32-1377-10-08-2020_111639.txt	4f82598b6fab071300e92b8f56407451
EV32-1377-10-09-2020_112718.txt	bdf22cce7eca5eeb0b52dbb9f87a54b6
EV32-1377-10-12-2020_113153.txt	67a7ab52ab0850127528b18667eaf5c6
EV32-1377-10-13-2020_111535.txt	81af1c0b010368d0e11cc68e8a21f2e6
EV32-1377-10-14-2020_112738.txt	e88cce6a8a27b5bf755765f516710c48
EV32-1377-10-15-2020_121305.txt	2f12b801d981afc0e4e114bdfbf4241c
EV32-1377-10-16-2020_113410.txt	46a251f88fdd1d2e2352ac1dc61fffa9
Maricopa_EV32-1377-10-19-2020_111633-2020-10-20T14 53 30Z.txt	9cd6e80c07e1f33129cf98302930abb6
Maricopa_EV32-1377-10-20-2020_112309-2020-10-21T15 13 12Z.txt	e3cc25b520b5710090f4dfff2d7fce7f
Maricopa_EV32-1377-10-21-2020_111759-2020-10-22T15 08 54Z.txt	e786fec02788d0b7c4392ca5b1cd284e
Maricopa_EV32-1377-10-22-2020_111639-2020-10-23T15 03 40Z.txt	86ea315f6bce7c0c902027b5373f6e2c
Maricopa_EV32-1377-10-23-2020_112532-2020-10-26T15 00 59Z.txt	ca42553da16ea38cf2b72f29b81a990f

6.6.5.3 RECOMMENDATION

It is recommended that the Attorney General inquire of Maricopa County as to the reason for this discrepancy, and if a sufficient explanation is not received an investigation be opened to investigate this further.

6.6.6 VOTERS WITH INCOMPLETE NAMES

Ballots Impacted 393

A.R.S. 16-152 requires that the form used for the registration of electors shall contain the registrant's given name, middle name, if any, and surname.

The 11/07/2020 VM34 contains voters recorded with incomplete names.

Examples of incomplete names include:

- Voters with only a last name
- Voters with only an initial for their last name
- Voters with an initial for their first name and last name
- Voters with no last name

- Voters with only an initial for their first name

The VM55 Final Voted file has 393 voters with incomplete names.

NOTE: It is possible to have a legal name that is just an initial, or to not have a surname. However, this is extremely rare, and the list should be reviewed to determine its accuracy.

Description	Number of voters
Last name only	15
Last name is an initial only	9
No last name	45
First name is an initial only	324
Total	**393**

The 2019 Elections Procedure Manual addresses failure to provide name. "If the State Form, Federal Form, FPCA, or FWAB does not contain the registrant's name, residence address or location, DOB, or signature (or assisting person's signature), but the County Recorder has the address, telephone number, or email address to contact the registrant to request the incomplete information, the registrant should be entered into the voter registration database in a "suspense" status until the incomplete information or a new voter registration form is received. A.R.S. § 16-134(B); A.R.S. § 16-121.01(A)." (pgs. 18-19)

If the registrant does not provide the missing, incomplete, or illegible information by 7:00 p.m. on the date of the next regular general election, the registration form is invalid and the registrant's status may be changed from "suspense" to "not registered," with the reason code "pending expired" (or functional equivalent). The registrant would need to submit a new voter registration application to be eligible to vote in future elections. (pg. 19)

6.6.6.1 REFERENCES

- A.R.S. 16-152 – Registration Form[29]
- State of Arizona - 2019 Elections Procedure Manual[30]

6.6.6.2 DATA FILES UTILIZED

File Name	**MD5 Hash**
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.6.6.3 RECOMMENDATION

Legislation should be considered that requires the voter registration entries be a direct match with any acceptable form of government identification, and that the voter rolls be regularly maintained and validated to contain complete legal names.

[29] https://www.azleg.gov/ars/16/00152.htm
[30] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf

6.6.7 Deceased Voters

Ballots Impacted 282

The Final Voted File, or VM55, was cross-checked against a commercially available data source provided by Melissa[31] called Personator, and it was found that 282 individuals who were flagged as deceased prior to October 5, 2020, voted in the election.

Personator is a best-in-class identity and address validation tool. It confirms that an individual is associated with an address, indicates prior and current addresses, tracks when and where the individual moves, tracks date-of-birth and date-of-death. To accomplish this, it utilized both private and government data sources such as the US Postal Service's National Change of Address (NCOA) service, and the Social Security Administration's Master Death List.

NOTE: It is recommended that the Attorney General further investigate this finding to confirm the validity of this finding, and if applicable, determine who cast the vote on behalf of the deceased individual.

6.6.7.1 Data Files Utilized

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.6.7.2 Recommendation

Legislation should be considered to require the voter rolls to periodically be compared against the Social Security's Master Death List, or other commercially available tools that gives access to this information. Failure to do this regularly should come with financial penalties to the County.

6.6.8 Audit UOCAVA Count Does Not Match the EAC Count

Ballots Impacted 226

The Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) requires all counties in the United States to report data related to the ability of civilian, military, and overseas citizens to register to vote and successfully cast a ballot. Analysis of the data submitted by Maricopa to the US Election Commission shows discrepancies in the number of ballots reported by the County to the EAC and the number of ballots observed during the audit. The audit team found 226 more electronically submitted UOCAVA ballots than the County reported to the EAC. Any UOCAVA ballots returned by mail were not identified as UOCAVA. Therefore, the audit team used the County mail numbers reported to the EAC. A Public Records Request for UOCAVA data was submitted to the Arizona Secretary of State but as of this date, no records have been provided in response to that request.

EAVS 2020 vs Audit Counts

UOCAVA Type	EAVS 2020	Audit Count	Discrepancy
Electronically	8,988	9,214	-226
Mail	1,420	Comingled	Unknown
Total	10,408	-	-

[31] https://www.melissa.com

While many people believe that UOCAVA is a law that primarily enables active-duty military men and women to vote, it is used more often by non-military voters. See below table of the total number of Civilian vs Military voters who were UOCAVA eligible in Maricopa County based on the November 07, 2020, VM34 Monthly Voter Rolls.

Military Returned Ballots	Military % of UOCAVA	Civilian Ballots Returned	Civilian % of UOCAVA
4,359	35%	7,934	65%

The law allows military voters who are out of their home county to vote electronically. However, non-military voters (civilians) who are not out of the country are not eligible to vote electronically. According to Maricopa County's UOCAVA Map website, more than 140 civilians – who were not UOCAVA eligible due to being in the United States--were permitted to vote via UOCAVA in the 2020 General Election.

The Uniformed and Overseas Citizens Absentee Voting Act defines eligibility as:

- A member of a uniformed service on active duty who, by reason of such active duty, is absentee from the place of residence where the member is otherwise qualified to vote;
- A member of the merchant marines who, by reason of service in the merchant marine, is absent from the place of residence where the member is otherwise qualified to vote; or
- A spouse or dependent of a member referred to above who, by reason of the active duty or service of the member, is absent from the place of residence where the spouse or dependent is otherwise qualified to vote.
- An absent uniformed services voter who, by reason of active duty or service is absent from the United States on the date of the election involved;
- A person who resides outside the United States and is qualified to vote in the last place in which the person was domiciled before leaving the United States; or
- A person who resides outside the United States and (but for such residence) would be qualified to vote in the last place in which the person was domiciled before leaving the United States

Maricopa County shows that there are 12,293 eligible UOCAVA voters based on the November 7, 2020, VM34 Monthly Voter Rolls. Of these UOCAVA ballots transmitted, 85% or 10,408 were reported as returned. Historically, approximately 68% of UOCAVA voters return their ballot.

It should be noted that the 2020 General Election occurred in the midst of a global pandemic. The US State Department went to extraordinary lengths to repatriate all US citizens who wanted to return to the US during the pandemic. Despite that, the number of civilian UOCAVA voters in Maricopa County nearly doubled. In 2016 Maricopa County reported 4,916 civilian UOCAVA voters requested ballots. In 2020, that number grew to 8,043 civilian UOCAVA voters who requested ballots.

REFERENCES

- State of Arizona – 2019 Elections Procedures Manual[32]
- Maricopa County UOCAVA Map Website[33]
- US Election Commission 2020 Survey Results[34]

[32] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[33] https://recorder.maricopa.gov/uocavamap/
[34] https://www.eac.gov/research-and-data/studies-and-reports

- US Election Commission 2016 Survey Results[35]

6.6.8.1 Data Files Utilized

File Name	MD5 Hash
11-03-2020-0 Canvass COMPLETE NOV2020	ce62cc061b6bb56b4fd40aa4866adb16
Maricopa County-VM34 Voter Registration Nov 7, 2020	d7bfc018296832836d2bd8de440cba53

6.6.8.2 Recommendation

Legislators should consider auditing the UOCAVA voting system to confirm if any changes are required to ensure the integrity of the vote.

6.6.9 Late Registered Voters with Counted Votes

Ballots Impacted 198

Individuals who registered to vote after the October 15th deadline were allowed to cast a vote and these votes were counted. The Final Voted File, or the VM55, is the official record of who cast a vote for a given election. This file does not contain the Date of Registration for individuals who voted in the election, but it does include each person's Voter ID which can be cross referenced against the Full Voter File, or VM34, to get the registration date value.

It would be expected that either the October or the November VM34 file would contain all of the registered voters that voted in on the November 2020 General Election, but this was not the case. It took 12 different VM34 files ranging from April 9, 2017, to December 4th, 2020, to find all of the Voter IDs found in the Final Voted VM55 File for the 2020 General Election.

When utilizing multiple Full Voter Files that span multiple years it can get complicated to determine which data for a given Voter ID should be utilized when that Voter ID is found in more than one file. For the purpose of our analysis for this and other findings we assumed that the November 7, 2020, VM34 file would be the most accurate since it was right after the election, and the only VM34 officially provided by Maricopa County as part of a subpoena.

As a result, we loaded the data from VM34 files for every month from January 2017 through December 2020 into a database. First, we loaded the December 4, 2020, VM34 file. We then subsequently loaded the VM34 files from the oldest to the newest, with each subsequent VM34 file replacing the stored data for any Voter ID that had existed in a prior load and finishing with the November 7, 2020, file. This ensured that we always had the most current data for a given Voter ID, and the latest data from the last time a given Voter ID showed up in a VM34 file would always be utilized.

This composite VM34 file was then matched up with the VM55 file to provide additional details for all voters within the Final Voted VM55 file.

In all, it required data from the following VM34 files to match all the data:

VM34 File Date	# Of Matched Voters
12/4/2020	605
11/7/2020	2,089,465
9/5/2020	1
8/8/2020	1

[35] https://www.eac.gov/sites/default/files/eac_assets/1/6/2016_EAVS_Comprehensive_Report.pdf

7/3/2020	1
6/6/2020	1
12/6/2019	2
10/5/2019	3
4/5/2019	1
2/2/2019	1
5/6/2017	1
4/9/2017	1

When building this file in this manner there were 198 voters registered after October 15th who voted in the election and had their vote counted, according to the Final Voted File.

NOTE: Individuals who register according to the Uniformed and Overseas Citizens Absentee Voting Act (UOCAVA) were not included in this list as the rules for UOCAVA allow registration up to 7:00pm on election day.

NOTE: Publicly, we had stated that there were 3,981 individuals who had registered after October 15th and voted. This was based on a wrong assumption by one of our data analysts who concluded that the only way the Official Canvass could match the Final Voted VM55 file was if those voters flagged as "Q", or uncounted provisional ballots, were in fact counted in the Official Canvass. While the discrepancy between the Official Canvass and the VM55 numbers are very similar to that number, assumptions should not have been made as to the reasoning for that.

6.6.9.1 REFERENCES

- A.R.S. § 16-152 – Registration Form[36]
- A.R.S. § 16-120 – Eligibility to vote[37]
- A.R.S. § 16-101 – Qualifications of registrant[38]

6.6.9.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
Maricopa County-VM34 Voter Registration Oct 2, 2020	99a4440ae9bab7f0de96d7656b4e739d
Maricopa County-VM34 Voter Registration Nov 7, 2020	d7bfc018296832836d2bd8de440cba53
Maricopa County-VM34 Voter Registration Dec 4, 2020	255f69007b253c7f2737b050c439f269

6.6.9.1 RECOMMENDATION

Legislation should be considered that would require applications developed and utilized for voter rolls or voting to be developed to rigorous standards that ensure the confidentiality and integrity of the systems. This would prevent the entry of invalid data. Specifically, its recommended that the Open Web Application Security Project (OWASP) Application Security Verification Standard (ASVS) Level 3 be applied to all applications associated with voter rolls or voting and that it be required that this be fully validation no less than once every two years.

[36] https://www.azleg.gov/ars/16/00152.htm
[37] https://www.azleg.gov/ars/16/00120.htm
[38] https://www.azleg.gov/ars/16/00101.htm

6.6.10 Date of Registration Changes to Earlier Date

Ballots Impacted 194

Dates of Registration in the Full Voter File, also known as a VM34, are periodically changing, including changing to earlier dates. Dates of Registration are significant because they can determine if someone is eligible to vote in an election, or if they're not eligible. Based on communications with the Maricopa County Recorder's Office, Dates of Registration should never change except for fixing the occasional mistake.

A review of the November 07 VM34 file and subsequent VM34 files for the remainder of 2020 and into 2021 show 891 dates of registration changes that would have made someone eligible to vote in the November 2020 General Election when their date of registration shown on the November 7th file would have prohibited it. Out of these 891 dates of registration, 194 had their votes counted in the 2020 General Election despite still having an ineligible date of registration on the November 7th VM34.

----- Forwarded Message -----
From: voterinfo - RISCX <voterinfo@risc.maricopa.gov>
To: [redacted]
Sent: Friday, September 3, 2021, 04:51:57 PM MST
Subject: RE: Customer Website Comments - Voter Information

Hello [redacted]

Thank you for your questions.

Are there any circumstances in which someone's registration date can change?

Generally, a voter's date of registration does not change outside of correcting a mistake. The date of registration is the date where the voter first registered to vote in in the county, while any updates to a voter's registration is tracked separately.

The only time a voter may have two dates of registration is if their registration has previously been cancelled and the voter registers again. The original record could be cancelled for a variety of reasons, including death of the voter, voter request, or the voter has moved outside Maricopa County. Only the latest voter registration record is considered valid and a voter cannot use their cancelled record.

Does it always reflect the original registration in Maricopa County or can someone transfer a registration from another county?

The date of registration will always reflect the original date of registration in the county where the voter lives. Voter rolls are maintained at the county level, so counties only keep records of the voters in their jurisdiction. For example, Maricopa County can process and access records for our 2.6 million voters, but we do not keep records of Pima County voters.

If a voter moves to another county or state, that voter will have to reregister in their new location. We cannot transfer a voter registration between counties or states.

6.6.10.1 REFERENCES

- A.R.S. § 16-152 – Registration Form[39]
- A.R.S. § 16-120 – Eligibility to vote[40]
- A.R.S. § 16-101 – Qualifications of registrant[41]

6.6.10.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
Maricopa County-VM34 Voter Registration Oct 2, 2020	99a4440ae9bab7f0de96d7656b4e739d
Maricopa County-VM34 Voter Registration Nov 7, 2020	d7bfc018296832836d2bd8de440cba53
Maricopa County-VM34 Voter Registration Dec 4, 2020	255f69007b253c7f2737b050c439f269

6.6.10.3 RECOMMENDATION

Legislation should be considered that would require applications developed and utilized for voter rolls or voting to be developed to rigorous standards that ensure the confidentiality and integrity of the systems. Specifically, its recommended that the Open Web Application Security Project (OWASP) Application Security Verification Standard (ASVS) Level 3 be applied to all applications associated with voter rolls or voting and that it be required that this be fully validated no less than once every two years.

6.6.11 DUPLICATE VOTER IDS

Ballots Impacted 186

Individuals were found within the voter rolls that had the same first name, last name, shared an address at one point in the past, and their birth years were within 10 years; suggesting they're the same person, but multiple Voter IDs. In all 186 cases both VoterIDs voted in the 2020 General Election.

NOTE: All Voter ID's associated with this finding can be found in Appendix X. This finding is not any clear indication of wrongdoing, and if wrongdoing occurred it may or may not have been the result of the individual whose Voter ID is listed in this report. It is recommended that the Attorney General follow-up further and determine if any additional action is needed.

6.6.11.1 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
Maricopa County-VM34 Voter Registration Nov 7, 2020	d7bfc018296832836d2bd8de440cba53

6.6.11.2 RECOMMENDATION

Legislation should be considered that requires the periodic review of the voter rolls for duplicate entries by the same name and year of birth. Legislation should also be considered that would require voter registration to validate that no

[39] https://www.azleg.gov/ars/16/00152.htm
[40] https://www.azleg.gov/ars/16/00120.htm
[41] https://www.azleg.gov/ars/16/00101.htm

other registered voter on the rolls registered with the same valid identification. This would prevent both accidental and purposeful multiple registrations.

6.6.12 MULTIPLE VOTERS LINKED BY AFFSEQ

Ballots Impacted 101

Each voter registration form has a unique, preprinted number on it much like a serial number on paper currency. This number is called an affidavit sequence number or AFFSEQ. It is preprinted, usually in the upper right-hand corner of every registration document. Each unique AFFSEQ number represents the specific registration document it is preprinted on.

Below is an example of an actual AFFSEQ number preprinted on a voter registration document. This specific AFFSEQ number 130026977, should only ever be associated with the voter and voter ID that filled out and signed this registration form this number was printed on.

The County uses AFFSEQ numbers and their corresponding registration documents to record any changes or updates to an individual voter's registration record. Every time a voter fills out a registration document, whether it be to register for the first time or to update their registration information with an address change, party change or signature update, the AFFSEQ number preprinted on their form is recorded in their voter record along with the date the form was signed by the registrant. A digital image of each registration document is created. The image is titled with the AFFSEQ number of the document it represents. The AFFSEQ identifier number is unique to each transaction, unique to the voter, and should never be repeated. As with paper currency, if more than one bill is found with the same serial number, then the bills are examined to determine which bill is the original and which is the duplicate.

Comparing the VM55 Final Voted file to the Maricopa County monthly VM34 files across time, between January 6, 2018-June 6, 2021, resulted in 5,711 instances where an affidavit sequence number was shared by multiple voters. It was confirmed with the County that AFFSEQ numbers are unique to the voter and should never be repeated.

On Aug 30, 2021, at 11:52 AM, voterinfo - RISCX <voterinfo@risc.maricopa.gov> wrote:

Good morning [redacted]. The AFFSEQs refers to Affidavit sequence. Each transaction by a voter will result in an affidavit. The affidavit could be a modification to your registration such as address change, party change or an updated signature as an example. An affidavit identifier is also applied to the affidavit envelope, or a provisional ballot used during an election. These identifiers are unique to each transition and never repeated.

Thank you for your questions.

Respectfully,
ILENE HABER
Communications Manager

OFFICE OF MARICOPA COUNTY RECORDER
111 S. 3RD Ave, Ste. 103, Phoenix, AZ 85003
(602) 506-2543 Email: voterinfo@risc.maricopa.gov

Of the 5,711 instances of AFFSEQ numbers shared by multiple 2020 General Election voters, at least one vote was cast.

- In 101 of these instances, BOTH voter IDs linked by AFFSEQ voted in 2020 General Election.

160,223 AFFSEQ images were provided which is an extremely small percentage of the total AFFSEQ images that are recorded over time.

Upon examining hundreds of these AFFSEQ registration document images of voters sharing the same AFFSEQ number, it was found that:

- The same person is being assigned more than one voter ID number.
- Voter identities and their voter ID are being assumed by other individuals with different names, addresses, identifying information and even of the opposite gender

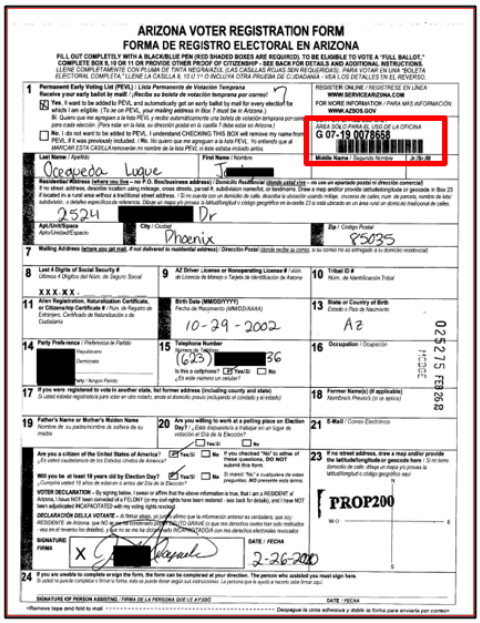
The registration document images of all shared AFFSEQ numbers need to be examined to determine which associated voter is the original and which voter is the duplicate.

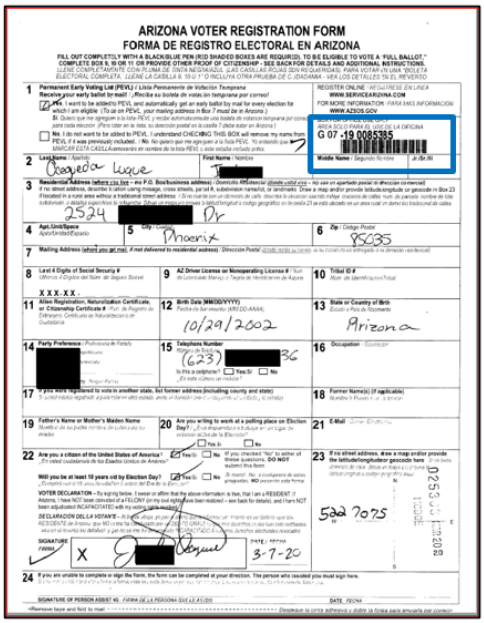
Three samples of the types of issues we found in the 5,711 instances are documented below.

Same Person with Two Different Voter ID's Linked by AFFSEQ-Both Voter IDs Voted in GE2020:

In this sample instance, the same person, with her name misspelled in the voter registration database, shares an AFFSEQ with herself and also has two voter IDs. In the images below you can that the same person filled out two registration forms 10 days apart, she was given a unique voter ID in each instance even though both forms were filled out with the same name, address, birth date and phone number. A vote was cast by mail-in ballot for both voter IDs.

VOTER ID	Name	Address	DOB Year	Date of Registration	VM 34 File Name	Initial AFFSEQ	Initial Change Effective Date	Linked AFFSEQ	VM55 BALTYPE
5227057	JOCELYN OCEGUEDLUQUE	2524 N 58TH DR PHOENIX AZ 85035	2002	2/26/2020	4/3/2020	190078668	2/26/2020	190085385	R
5227075	JOCELYN OCEGUEDALUQUE	2524 N 58TH DR PHOENIX AZ 85035	2002	2/28/2020	4/3/2020	190085385	3/7/2020	190085385	R





Same Person with the Secondary Voter ID Given a Different Name and Address-Both Voter IDs Voted GE2020:

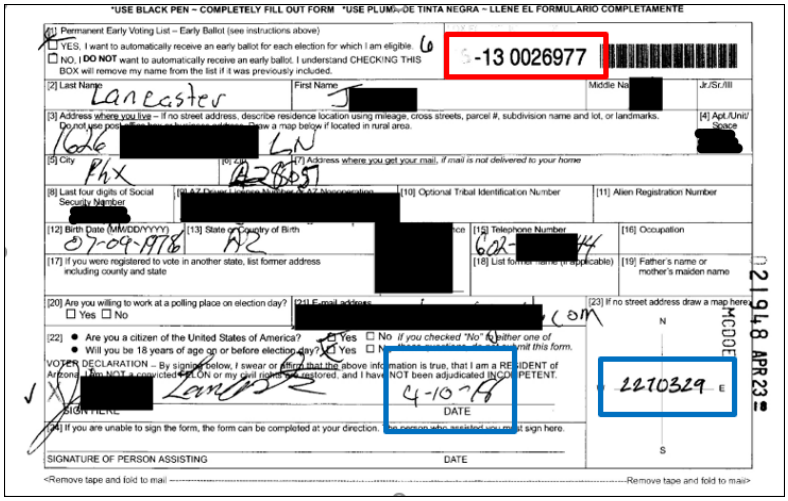
The first image below shows the voter information for two voters that share the same AFFSEQ number, 130026977. County records show that in the 1/6/2018 VM34 file that J Taylor, voter ID 2270329 shared the same AFFSEQ number with J Lancaster, voter ID 4502290. These two voters have different names, addresses, and birth years. They both voted in the 2020 General Election.

In the registration image below, you can see that J Lancaster filled out a registration form on 4/10/2018. The preprinted AFFSEQ number on the form was 130026977. J Lancaster lists his birthyear as 1978 on this form. It is listed as 1975 in his voter record. He included his driver's license number as identifying information. On this form in the lower right-hand corner, a county employee wrote the voter ID number 2270329, identifying the connection with that voter ID. In row 1 of the voter record below, you see that voter ID number 2270329 belongs to J Taylor, not J Lancaster. The County employee identified that J Lancaster was connected with J Taylor in some way. The date the County employee stamped this form is April 23, 2018. Both voter IDs were used to vote in the 2020 General Election.

In row 2 you can see that J Lancaster has a voter ID number of 4502290. Jason's address in the VM34 record is in Phoenix. This corresponds with his voter registration form below.

VOTER ID	Name	Address	Birth Year	Date of Registration	VM34 File Date	Initial AFFSEQ	Initial Change Effective Date	Linked AFFSEQ	VM55 BALTYPE

2270329	J[redacted] TAYLOR	1231 [redacted] AVE GILBERT AZ 85234	1978	1/6/2002	1/6/2018	203902330	8/21/2015	130026977	R
4502290	J[redacted] LANCASTER	1626 [redacted] LN PHOENIX AZ 85015	1975	8/4/2016	1/6/2018	204457621	8/4/2016	130026977	R



Male Voter with Two Voter ID Linked by AFFSEQ to a Female who Assumes His Voter ID-Both Voter IDs Voted GE2020:

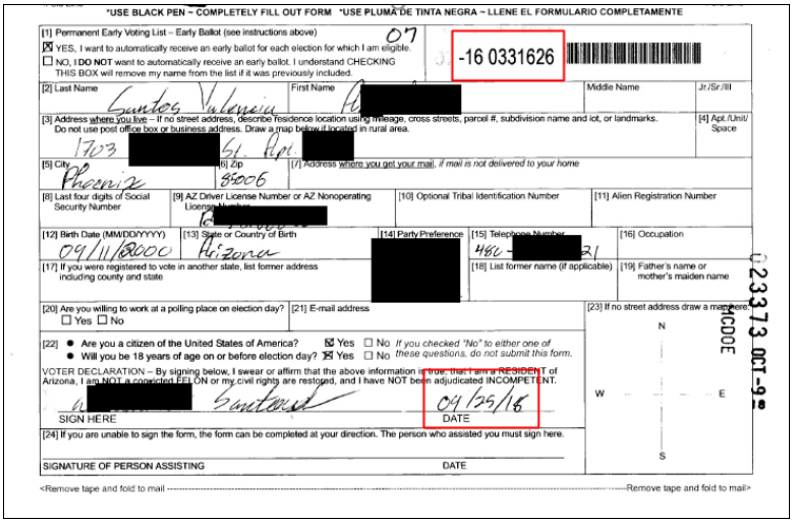
Just as no two voters should share an AFFSEQ number, no two voters should share a voter ID number. The County confirmed that voter IDs are generated automatically and that they are never reused. It was found that not only are two voters sharing an AFFSEQ number, but they are also sharing a voter ID number.

A Santos Valencia registered to vote on 9/25/2018. The AFFSEQ on his registration form is 160331626. He was given voter ID number of 4944179. In row 1 below you can see that his voter ID number is now associated with K Star, a female, at a different address in Phoenix. This unknown person who is using Mr. Santos Valencia's original voter ID voted in the 2020 General Election using a mail in ballot. Mr. Santos Valencia voted in person on election day.

A Santos Valencia filled out a registration form again on 9/22/2020. He was given voter ID number 5403530. Abraham voted in 2020 General Election in person at the polls. We do not have an image of this voter registration as it was not in the limited AFFSEQ images supplied to us by the County.

VOTER ID	Name	Address	Birth Year	Date of Registration	VM34 File Date	Initial AFFSEQ	Initial Change Effective Date	Linked AFFSEQ	VM55 BALTYPE

4944179	K[redacted] STAR	1714 [redacted] AVE PHOENIX AZ 85016	2000	9/25/2018	12/9/2018	160331626	9/25/2018	207187818	R
5403530	A[redacted] SANTOS VALENCIA	5242 [redacted] AVE B PHOENIX AZ 85013	2000	9/22/2020	10/2/2020	206931207	9/22/2020	207187818	P



*USE BLACK PEN ~ COMPLETELY FILL OUT FORM *USE PLUMA DE TINTA NEGRA ~ LLENE EL FORMULARIO COMPLETAMENTE

[1] Permanent Early Voting List – Early Ballot (see instructions above) 07
☒ YES, I want to automatically receive an early ballot for each election for which I am eligible.
☐ NO, I DO NOT want to automatically receive an early ballot. I understand CHECKING THIS BOX will remove my name from the list if it was previously included.
-16 0331626

[2] Last Name: Santos Valencia | First Name: A[redacted] | Middle Name | Jr./Sr./III

[3] Address where you live – If no street address, describe residence location using mileage, cross streets, parcel #, subdivision name and lot, or landmarks. Do not use post office box or business address. Draw a map below if located in rural area.: 1703 [redacted] St Apt [redacted] | [4] Apt./Unit/Space

[5] City: Phoenix | [6] Zip: 85006 | [7] Address where you get your mail, if mail is not delivered to your home

[8] Last four digits of Social Security Number | [9] AZ Driver License Number or AZ Nonoperating License: [redacted] | [10] Optional Tribal Identification Number | [11] Alien Registration Number

[12] Birth Date (MM/DD/YYYY): 09/11/2000 | [13] State or Country of Birth: Arizona | [14] Party Preference | [15] Telephone Number: 480-[redacted]21 | [16] Occupation

[17] If you were registered to vote in another state, list former address including county and state: [redacted] | [18] List former name (if applicable) | [19] Father's name or mother's maiden name

[20] Are you willing to work at a polling place on election day? ☐ Yes ☐ No | [21] E-mail address | [23] If no street address draw a map here: N W E S

[22] ● Are you a citizen of the United States of America? ☒ Yes ☐ No
● Will you be 18 years of age on or before election day? ☒ Yes ☐ No
If you checked "No" to either one of these questions, do not submit this form.

VOTER DECLARATION – By signing below, I swear or affirm that the above information is true, that I am a RESIDENT of Arizona, I am NOT a convicted FELON or my civil rights are restored, and I have NOT been adjudicated INCOMPETENT.

[redacted] Santos SIGN HERE | 09/25/16 DATE

[24] If you are unable to sign the form, the form can be completed at your direction. The person who assisted you must sign here.

SIGNATURE OF PERSON ASSISTING | DATE

<Remove tape and fold to mail ---------- Remove tape and fold to mail>

MCDOE 23373 OCT-9

6.6.12.1 REFERENCES

- State of Arizona – 2019 Elections Procedures Manual[42]

6.6.12.2 DATA FILES UTILIZED

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654
VM34_20170107_113131.txt	fb675c6b6ad9757759a1e686ce87a17f
VM34_20170204_104417.txt	02a1003bf8ddc1a0cc547032c73505db
VM34_20170305_102136.txt	708ea30d01595f1552892a13e1c11eeb
VM34_20170409_044850.txt	9b25f73a824589bd70e20fe02cb1f703
VM34_20170506_094005.txt	d8bbaacbaffba5321ac4b22d7aaebf5e
VM34_20170604_014543.txt	ecb6f6760b313b135c6a9ba7e4d6369a

[42] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf

File Name	MD5 Hash
VM34_20170708_091800.txt	76c897e712aba76072dff3fb68e8d29c
VM34_20170805_111659.txt	ad9f1e228123d67c9774d5c4de3a4442
VM34_20170903_031323.txt	05cfd1aa1f82392f99c65e394d526470
VM34_20171008_021223.txt	6e199b2b3fc9a98c78d4c3ee76727720
VM34_20171103_103144.txt	c7890363fbaf1de622af2f589d0a48d4
VM34_20171203_070930.txt	b796c93976f7d89cd53d09a26406fcaf
VM34_20180106_024335.txt	74823063c6c04beb0ae2ba94789992b8
VM34_20180203_063848.txt	6b55c00202aa4edb39bb47bac27e7545
VM34_20180302_095453.txt	8c6e9e7edaaff58b2b4635c3ad56369c
VM34_20180406_081509.txt	fc3f8d71d9cdfebc10aeaf7fb5c4290b
VM34_20180504_093125.txt	fa683fa02fd0d9bfcbc52a106af6873e
VM34_20180602_102915.txt	c99fd11d76648af61948842161d1d197
VM34_20180707_024237.txt	b6141774c149ea2f7695e230d5f78eb9
VM34_20180803_115351.txt	351a3107ef1a7e5a907c1137393216ee
VM34_20180907_091404.txt	62e7d11db59dbb5be078b7a3374125be
VM34_20181005_112120.txt	1b07988566c762821d625a0477269d3c
VM34_20181102_105026.txt	cb73855d70509a13a52beedde18666a3
VM34_20181209_032523.txt	9838a26c37f016d0e87adb43a9501707
VM34_20190106_084008.txt	6f4be0c41404d12bb0f6ff69d8f27a28
VM34_20190202_063949.txt	cc8a7b9b1cf66a9b8fce0905df71af74
VM34_20190302_090830.txt	15ec5c127b37ec91c1c14708e7a9421d
VM34_20190405_074946.txt	fb6ecbf069154cbb8149d4af8348c6c4
VM34_20190503_080954.txt	b130edae7a4ae04afcf8e459c085fc2d
VM34_20190608_035533.txt	301287923fc8327b259c286712f0b38c
VM34_20190705_102047.txt	b89551ec6616a148a0a6eb0d9a9eb9a4
VM34_20190802_093213.txt	b2517193b03f9820c3588789890cd505
VM34_20190906_115511.txt	7fe4f70c92e995a87cd67c69feac348a
VM34_20191005_075436.txt	30cd819a5b53759ebd9b35fcf4f2f515
VM34_20191206_062132.txt	4d7d56540c50bcb9efd53882f65dafa9
VM34ALL_20201107_003451.txt	d7bfc018296832836d2bd8de440cba53
VM34_20200103_062658.txt	ea5eb36acb1f3a20204fc860578755bc
VM34_20200208_124009.txt	cb840187d01b8d26f4a192a29de0729a
VM34_20200306_114048.txt	92b41e30958182e994ff86b5600c9002
VM34_20200403_113114.txt	5460b45b91f6709ee118e2385020b102
VM34_20200502_014453.txt	c44bf7968e9bf4fde446f5c43da584ef
VM34_20200606_001100.txt	1d8b12eea610b5b55f07d9fad1d8af80
VM34_20200703_213734.txt	47afb6e874c859a08c4105f912981330
VM34_20200808_004341.txt	8cb279714659f945f154129ea757f677
VM34_20200905_001156.txt	11ec4b2896389484429edbabb5a717bd
VM34_20201002_235246.txt	99a4440ae9bab7f0de96d7656b4e739d

File Name	MD5 Hash
VM34_20201204_214820.txt	255f69007b253c7f2737b050c439f269
VM34_20210101_194641.txt	55e2e5308c1c818ab64e58b2952d63cc
VM34_20210205_184914.txt	3c1a1c1a8400464de6a4730d4e50f6c3
VM34_20210305_191848.txt	af6f78181173c9e7cad7e5f17029dd20
VM34_20210402_214448.txt	2fa8f197af888c6e0604ac9ca849aa1b
VM34_20210507_194658.txt	3a7e950b1d9e0d657a4a45e0b22506a5
VM34_20210604_190336.txt	30f1fe36c5ad4eac2a7ca5508663b9bf

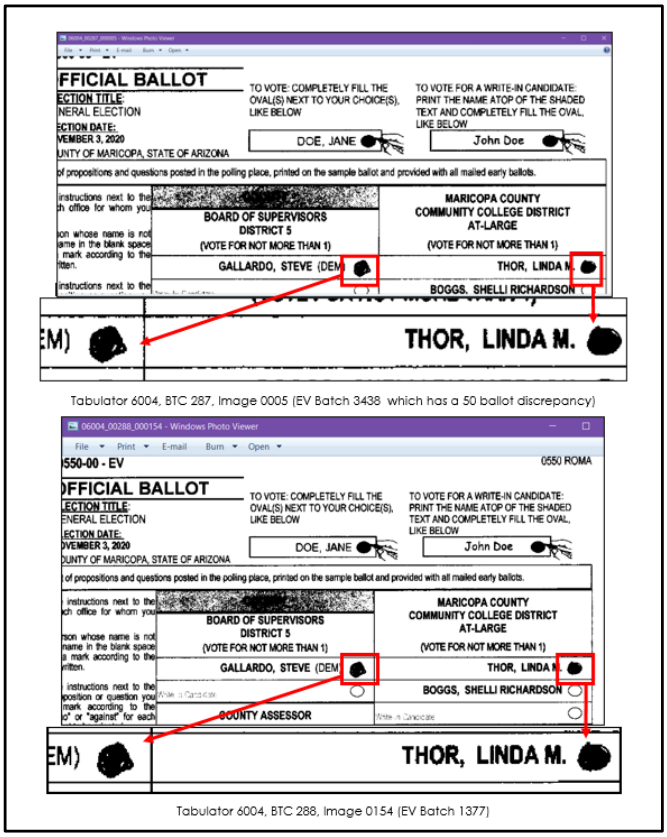
6.6.12.3 RECOMMENDATION

Legislation should be considered that would require applications developed and utilized for voter rolls or voting to be developed to rigorous standards that ensure the confidentiality and integrity of the systems. Specifically, its recommended that the Open Web Application Security Project (OWASP) Application Security Verification Standard (ASVS) Level 3 be applied to all applications associated with voter rolls or voting and that it be required that this be fully validation no less than once every two years.

6.6.13 DOUBLE SCANNED & COUNTED BALLOTS

Ballots Impacted 50

While examining batch discrepancies between the hand count and the Maricopa County Cast Vote Record (CVR) totals, we discovered that the county double counted ballots. We continue to review the Dominion images to identify the total number of double counted ballots. EVC4/10-26 thru 10-28/3385 which has a 50-ballot discrepancy is presented as an example below. The image shows one of 50 ballots that were tabulated twice giving each associated voter – two votes.



6.6.13.1 Data Files Utilized

File Name	MD5 Hash
Maricopa County Transfer Manifests	N/A
Maricopa County Daily Ballot Summary	N/A
Maricopa County 2020 General Election Cast Vote Record	c31a2f34714b7582cb17e907be3152e0

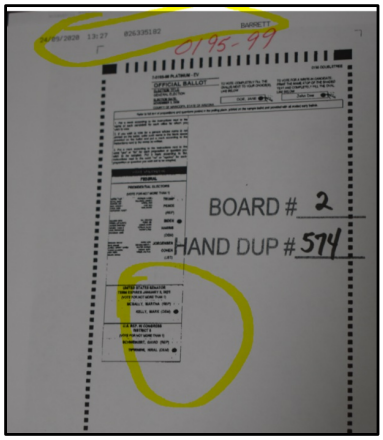
6.6.13.2 Recommendation

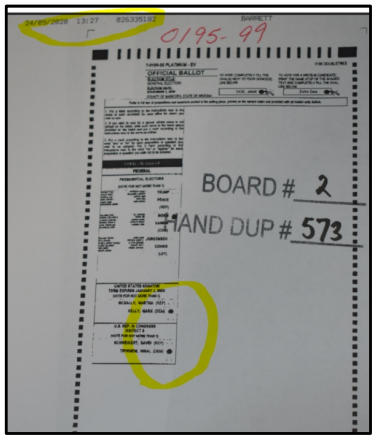
Maricopa County officials should audit the tabulation process daily to ensure no batches are scanned and tabulated multiple times.

6.6.14 UOCAVA Electronic Ballots Double Counted

Ballots Impacted 6

During our hand count, we identified multiple UOCAVA ballots that had been printed and duplicated more than once (e.g., Double Votes). Below is one example of one double printed UOCAVA ballot that was assigned two different serial numbers and submitted for duplication. This would result in two votes being counted for this one voter.





6.6.14.1 References

- EAC - 2018 UOCAVA Data Set [43]

6.6.14.2 Recommendation

Legislation should be considered which would require that systems utilized for UOCAVA would keep track of and help prevent the double-printing of ballots.

6.6.15 Duplicate Ballots Reuse Serial Numbers

Ballots Impacted 6

Duplicate Ballots were found reusing serial numbers. Without unique serial numbers its near impossible to match an original ballot (DSD) with its duplicated ballot (DUP).

Below is an example of a serial number used multiple times:

BOX ID	TYPE	SERIAL NO.
EVH1/11-11/DUP 175044	DUP	DUP294104
Original Damaged Ballots SD 8	DSD	DUP294104

[43] https://www.eac.gov/research-and-data/datasets-codebooks-and-surveys

Commented [DL3]: @Heather – If you're going to claim 6 then we need 6 examples here. We should probably have Pallet / Box / Image Name at least unless you have another way to reference them.

Commented [DL4]: Heather, do we have this number yet? This is supposed to be done.

Original Large Print Sent to Duplication 2	DSD	DUP294104
DSD RANDOM SAMPLE REVIEW 2	DSD	DUP171329
EVH1/11-07/DUP9582	DUP	DUP171329
Original Damaged Ballots SD 8	DSD	DUP171329

6.6.15.1 REFERENCES

- State of Arizona – 2019 Elections Procedures Manual[44]
- A.R.S. § 16-621 – Proceedings at the counting center[45]

6.6.15.2 RECOMMENDATION

Legislation should be considered that would explicitly require each damaged ballot to have a unique serial number in order to match it up with its original.

[44] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[45] https://www.azleg.gov/ars/16/00621.htm

6.7 Informational Findings

6.7.1 Audit Interference

Ballots Impacted N/A

Runbeck Election Services is a privately owned company that provided election services including the printing of all mail ballots for Maricopa County in the 2020 General Election. Prior to the start of the audit, members of the audit team conducted research into the paper, ink, toner and format of the official ballots. As part of that research, the audit team contacted Runbeck CEO, Jeff Ellington, to ask several general questions about the ballots used in the 2020 General Election. Initially, Jeff Ellington agreed to a call but then asked for the questions in writing. As requested, the audit team sent Mr. Ellington 5 general questions via email. Mr. Ellington responded to that email and said that Maricopa County instructed him that vendors, even private companies, should not speak with auditors. Maricopa County refused to provide the information about the ballot paper and ballot printing and then interfered with the auditor's communication with Runbeck, a private company that does business with hundreds of other jurisdictions and entities.

6.7.1.1 Recommendation

Legislators should consider legislation that would prohibit interference with legislative investigations under a criminal penalty.

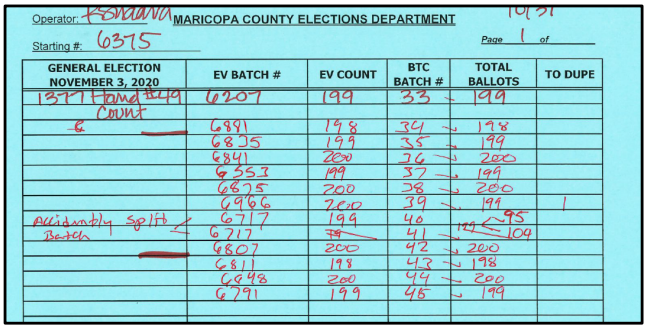
6.7.2 Batch Discrepancies

Ballots Impacted N/A

A comparison of our hand count totals to the CVR totals has revealed numerous discrepancies. We are in the process of comparing the Dominion images of ballots to determine the cause of the discrepancy. Below are two examples of discrepancies.

7	EVC1/10-31/6841 ✓		6841, 6835, 6553, 6875, 6966, 6717, 6807

Above: Maricopa County Ballot Transfer Manifest showing EV batches in the box.



Operator: [illegible] MARICOPA COUNTY ELECTIONS DEPARTMENT 10/31

Starting #: 6375 Page 1 of

GENERAL ELECTION NOVEMBER 3, 2020	EV BATCH #	EV COUNT	BTC BATCH #	TOTAL BALLOTS	TO DUPE
1377 Hand Count	6207	199	33 →	199	
-6	6891	198	34 →	198	
	6835	199	35 →	199	
	6841	200	36 →	200	
	6553	199	37 →	199	
	6875	200	38 →	200	
	6966	200	39 →	199	1
Additionally split Batch	6717	199	40	95	
	6717	78	41 →	104	
	6807	200	42 →	200	
	6811	198	43 →	198	
	6648	200	44 →	200	
	6791	199	45 →	199	

Above: Maricopa County Daily Ballot Summary for 10-31-2020 Tabulator C1. Note that BTC Batch 40 has 95 ballots and BTC Batch 41 has 104 ballots which combine to make up EV Batch 6717 which should have 199 total ballots.

tabulatorbatchid	tabulatorid	batchid	file	ballots
06001_00033	06001	00033	566	199
06001_00034	06001	00034	577	199
06001_00035	06001	00035	595	198
06001_00036	06001	00036	608	200
06001_00037	06001	00037	789	200
06001_00038	06001	00038	791	191
06001_00039	06001	00039	795	200
06001_00040	06001	00040	801	200
06001_00041	06001	00041	782	199
06001_00042	06001	00042	786	199
06001_00043	06001	00043	792	199
06001_00044	06001	00044	796	199

The CVR summary, pictured above, shows that BTC Batch 40 had 200 ballots tabulated and BTC Batch 41 had 199 ballots tabulated. These numbers do not match the Blue Sheet totals. Pallet 7 Box EVC1/10-31/6841 has only 1396 ballots but the CVR shows 1500 ballots. This results in a discrepancy of -104 ballots.

6.7.2.1 Data Files Utilized

File Name	MD5 Hash
Maricopa County Transfer Manifests	N/A
Maricopa County Daily Ballot Summary	N/A
Maricopa County 2020 General Election Cast Vote Record	c31a2f34714b7582cb17e907be3152e0

6.7.2.2 Recommendation

Maricopa County officials conduct daily audits and quality control measure to reduce errors and prevent duplicate tabulations that result in the nullification of legal voters' votes.

6.7.3 Commingled Damaged and Original Ballots

Ballots Impacted N/A

The 2019 Election Procedure Manual requires that all original damaged ballots sent to duplication be placed in an envelope or container labeled "Ballots that have been duplicated." The County delivered boxes of ballots that were commingled and incorrectly identified. Batches identified on the manifest as original ballots were, in fact, machine duplicated ballots. The auditors could not rely on the County's description of ballot boxes or batches identified on the manifest. Hours of careful examination were required to unravel the inaccurate documents provided to ensure that votes were not counted twice.

As an example, in Box EVH1/11-07/MC17349, the manifest shows that there are 14 batches of original ballots. When the auditors opened the boxes to count the ballots, they observed 7 batches of original ballots, 8 batches of duplicate ballots and one batch missing from the manifest. Batches of duplicate ballots in boxes of original undamaged ballots is a difficult issue to unravel. During the hand count, we also identified several instances of damaged ballots in boxes with original ballots. We are unable to determine if the damaged ballots had been duplicated and tabulated as duplicates.

The Election Procedures Manual makes it clear that damaged ballots sent to duplication must be separated and the County did not consistently adhere to this rule.

The Arizona Secretary of State claims that duplicate ballots and the original damaged ballots sent to duplication are to be segregated. In case No. CV2020-015285, Roopali Desai represented Arizona Secretary of State Katie Hobbs and said:

> *THE COURT: And those are segregated? I'm – those-- they don't get put in the pile where we're not going to be able to find them anymore, right? We know where those are?*
>
> *MS. DESAI: Duplicated ballots are -- those are --the original as well as the duplicated ballots are, by statute, segregated and preserved.*

6.7.3.1 REFERENCES

- Arizona Supreme Court Case – CV2020-015285[46]
- State of Arizona – 2019 Elections Procedures Manual[47]

6.7.3.2 RECOMMENDATION

All duplicated ballots should be separated and properly identified as duplicates. All original damaged ballots sent to duplication should be separated and properly identified in compliance with the EPM.

6.7.4 EARLY VOTES NOT ACCOUNTED FOR IN EV33

Ballots Impacted N/A

The EV33 Early Voting Return Files do not contain entries for 255,326 Early Voters which are recorded in the VM55 Final Voted File. Individuals that vote as part of Early Voting, either by mail or in person, should have an EV33 entry related to their casting of a vote containing details as to when and how that vote was cast. Without an EV33 these details are unavailable, and it could make some types of audits impossible.

Ballot Type	Number of Voters
B – Early Vote - In-Person	41,335
R – Early Vote - Mail-In	213,990

6.7.4.1 REFERENCES

- A.R.S. § 16-558.01 – Mailing of Ballots[48]
- A.R.S. § 16-246 – Early Balloting[49]
- A.R.S. § 16-542 – Request for ballot[50]

[46] https://www.supremecourt.gov/DocketPDF/20/20-809/163521/20201211121632424_12-11-20%20Appendix%20Ward%20v%20Jackson.pdf
[47] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[48] https://www.azleg.gov/ars/16/00558-01.htm
[49] https://www.azleg.gov/ars/16/00246.htm
[50] https://www.azleg.gov/ars/16/00542.htm

6.7.4.2 DATA FILES UTILIZED

File Name	MD5 Hash
EV33-1377-10-09-2020_101111.txt	f1daa7089f7300237f6b4ff779661cf9
EV33-1377-10-12-2020_113210.txt	72e4e6c102e3539b4dd15b4454357b69
EV33-1377-10-13-2020_111553.txt	9b14841281c031533322b50aabb86a24
EV33-1377-10-14-2020_112757.txt	1b7537d7d9b927dbf4e462ed5ee8f97c
EV33-1377-10-15-2020_121331.txt	dec7d08dde4970c26e32b8c844f4a9ab
EV33-1377-10-16-2020_113522.txt	f0a632c3fd9b5f177d48504dc119be31
EV33-1377-10-19-2020_111708.txt	db80b692a9188add0844a8974e227287
EV33-1377-10-20-2020_112351.txt	57d1795db8be71d516e29350e347fb3a
EV33-1377-10-21-2020_111843.txt	56c3b5a11651c68735164c578eade4e1
EV33-1377-10-22-2020_111714.txt	03551f170bf758efc90c013d0fe2e467
EV33-1377-10-23-2020_112614.txt	dbfdd369ac148723540c83f614cca454
EV33-1377-10-26-2020_111318.txt	0b68adff779f59c70a530000bf989aca
EV33-1377-10-27-2020_111413.txt	a6fc7377bf6c6fe6653f539c5970a6f7
EV33-1377-10-28-2020_111331.txt	43758b9290f90d0305d5ed84aa10becb
EV33-1377-10-29-2020_111300.txt	410b30b06f2ca73022f27173fe114038
EV33-1377-10-30-2020_111804.txt	5cb44e5ea214f40227e04345d4355ff7
EV33-1377-11-02-2020_111214.txt	5d15bb8686a022f53400550cfe010a07

6.7.4.3 RECOMMENDATION

Legislation should be considered that requires that the various election related systems to properly integrate to give accurate and consistent counts between the mail-in ballots cast, mail-in ballots received, mail-in ballots accepted, mail-in ballots rejected, and be able to reconcile these details with who voted in the final voted file.

6.7.5 HIGH BLEED-THROUGH RATES ON BALLOTS

Ballots Impacted N/A

A large number of the ballots from in-person voting, primarily on Election Day (ED), experienced bleed-through where the marks from one-side of the ballot were clearly visible on the other side of the ballot. This does not happen when the manufacturer recommended paper is utilized under normal circumstances. Failure to utilize the manufacturers recommended materials can have unexpected results in equipment that could include jams, misreading, or other problems. This problem is further enhanced if the ballot in question was also printed on a mis calibrated printer. When this happens it's possible that the ovals from one side of the ballot, could get close enough to potentially impact the choices or lack of choice on the other side of the ballot. In its worst-case scenario this could cause a contest to be voted that had not been voted, a vote could be cancelled, or it could cause an overvote situation. No images that were reviewed met these conditions.

NOTE: A manual analysis of the Election Management System (EMS) Server and a review of how the Dominion Software interpreted several thousand ballots; it was not immediately evident that this impacted the interpretation of the ballots. All immediate indications were that the Dominion tabulators read the marks almost exclusively within the oval of the ballot.

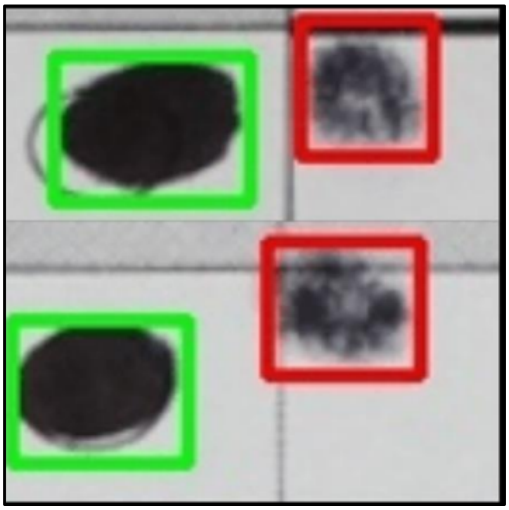


Figure 1 - Green is around the actual vote. The red boxes show the bleed through from the other side.

NOTE: This finding is rated informational because there were no examples found which would have changed a vote. It is theoretically possible that instances exist that were not reviewed, or this could have an impact on future elections.

6.7.5.1 References

- Dominion Printing & Finishing Specifications[51]

6.7.5.2 Recommendation

Legislation should be considered that would require that the election equipment be properly maintained, including, but not limited to ensuring that ballot printers are in the proper calibration.

6.7.5.3 Instances

The Kinematic Artifact processing is still working through the ballots, but examples related to this issue can be found within the attached report. At this time, this particular issue appears to be systemic to any non-Runbeck printed ballots.

6.7.6 Improper Paper Utilized

Ballots Impacted N/A

A large number of the ballots from in-person voting, utilized paper that is not recommended by the manufacturer of the tabulators for use in the systems. This can result in higher jam rates, more bleed through, and could potentially impact the readability of the ballots by the scanners. At this time 10 different papers have been found. Several of these paper

[51] https://www.sos.state.co.us/pubs/elections/VotingSystems/DVS-DemocracySuite511/documentation/SD-IC-PrintingSpecification-5-11-CO.pdf

stocks include paper with the weight from 20lb to 30lbs; when the generally accepted best practice for voting is to utilize ballot stock of 80lbs or higher. Since this type of paper is generally not tested within the equipment, nor part of the Logic and Accuracy testing, the effects of utilizing it is unclear.

The large number of papers utilized during this election and the lack of official reporting about what paper stocks were utilized made it difficult to identify any potential counterfeit ballots. Standardization on these details would more greatly facilitate future audits.

6.7.6.1 REFERENCES

- Dominion Printing & Finishing Specifications[52]

6.7.6.2 RECOMMENDATION

Legislation should be considered that would require that paper stocks utilized on election day should conform to manufacturer recommendations to ensure that the paper that has been tested in the device is what is actually utilized to cast votes.

Legislation should also be considered that mandates the standardization of paper utilized for the election including requiring that the ballot stock amounts utilized be fully accounted for and tracked, and that this information be made publicly available.

6.7.6.3 INSTANCES

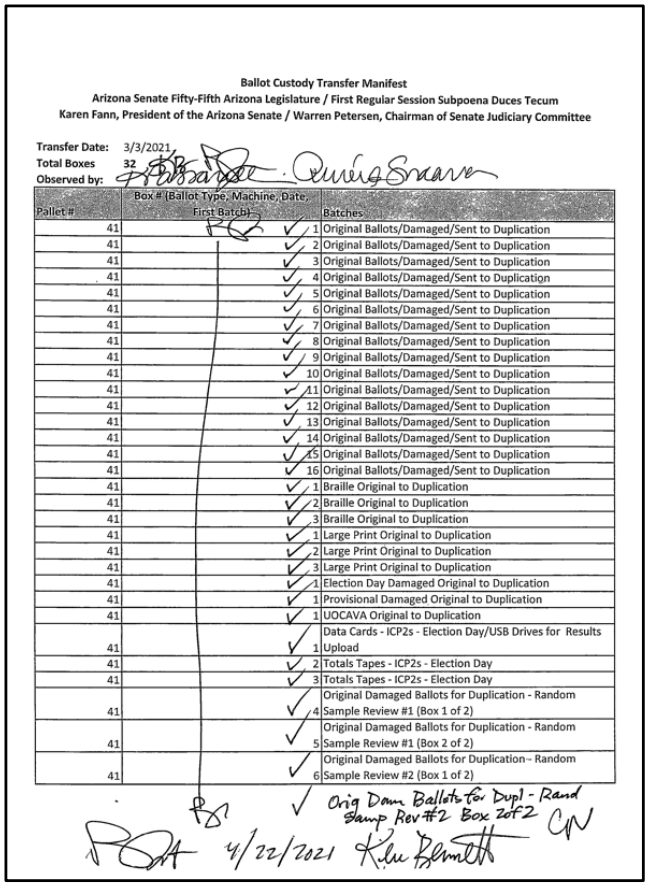
The Kinematic Artifact processing is still working through the ballots, but examples related to this issue can be found within the attached report. At this time, this particular issue appears to be systemic to any non-Runbeck printed ballots.

6.7.7 INACCURATE IDENTIFICATION OF UOCAVA BALLOTS

Ballots Impacted N/A

Maricopa County identified only one box on the manifest as having UOCAVA Original Ballots sent to duplication. The audit team examined all other boxes of ballots and identified 6 other boxes that were inaccurately labeled. All UOCAVA ballots identified by the County were 8 ½" X 11" copies of electronically submitted voted ballots. UOCAVA ballots were found in boxed labeled Braille Ballots and boxes labeled the generic Original Ballots/Damaged/Sent to Duplication. This inaccurate labeling of UOCAVA boxes gave the impression that there were far fewer UOCAVA ballots than were actually counted.

[52] https://www.sos.state.co.us/pubs/elections/VotingSystems/DVS-DemocracySuite511/documentation/SD-IC-PrintingSpecification-5-11-CO.pdf



Ballot Custody Transfer Manifest
Arizona Senate Fifty-Fifth Arizona Legislature / First Regular Session Subpoena Duces Tecum
Karen Fann, President of the Arizona Senate / Warren Petersen, Chairman of Senate Judiciary Committee

Transfer Date: 3/3/2021
Total Boxes 32
Observed by:

Pallet #	Box # (Ballot Type, Machine, Date, First Batch)		Batches
41		✓ 1	Original Ballots/Damaged/Sent to Duplication
41		✓ 2	Original Ballots/Damaged/Sent to Duplication
41		✓ 3	Original Ballots/Damaged/Sent to Duplication
41		✓ 4	Original Ballots/Damaged/Sent to Duplication
41		✓ 5	Original Ballots/Damaged/Sent to Duplication
41		✓ 6	Original Ballots/Damaged/Sent to Duplication
41		✓ 7	Original Ballots/Damaged/Sent to Duplication
41		✓ 8	Original Ballots/Damaged/Sent to Duplication
41		✓ 9	Original Ballots/Damaged/Sent to Duplication
41		✓ 10	Original Ballots/Damaged/Sent to Duplication
41		✓ 11	Original Ballots/Damaged/Sent to Duplication
41		✓ 12	Original Ballots/Damaged/Sent to Duplication
41		✓ 13	Original Ballots/Damaged/Sent to Duplication
41		✓ 14	Original Ballots/Damaged/Sent to Duplication
41		✓ 15	Original Ballots/Damaged/Sent to Duplication
41		✓ 16	Original Ballots/Damaged/Sent to Duplication
41		✓ 1	Braille Original to Duplication
41		✓ 2	Braille Original to Duplication
41		✓ 3	Braille Original to Duplication
41		✓ 1	Large Print Original to Duplication
41		✓ 2	Large Print Original to Duplication
41		✓ 3	Large Print Original to Duplication
41		✓ 1	Election Day Damaged Original to Duplication
41		✓ 1	Provisional Damaged Original to Duplication
41		✓ 1	UOCAVA Original to Duplication
41		✓ 1	Data Cards - ICP2s - Election Day/USB Drives for Results Upload
41		✓ 2	Totals Tapes - ICP2s - Election Day
41		✓ 3	Totals Tapes - ICP2s - Election Day
41		✓ 4	Original Damaged Ballots for Duplication - Random Sample Review #1 (Box 1 of 2)
41		✓ 5	Original Damaged Ballots for Duplication - Random Sample Review #1 (Box 2 of 2)
41		✓ 6	Original Damaged Ballots for Duplication - Random Sample Review #2 (Box 1 of 2)

✓ Orig Dam Ballots for Dupl - Rand Samp Rev #2 Box 2 of 2

4/22/2021

6.7.7.1 RECOMMENDATION

Efforts to audit the UOCAVA voting process have been stalled due to the County's failure to turn over the records of the digital systems used to receive and print the UOCAVA electronic ballots. Maricopa County should also provide official reporting on UOCAVA voting in the county.

6.7.8 MISSING SUBPOENA ITEMS

Ballots Impacted N/A

The original subpoena dated January 13, 2021, required Maricopa County to provide "Access to all original, paper ballots (including but not limited to early ballots, Election Day Ballots and Provisional Ballots)." Maricopa County officials failed to comply with this portion of the subpoena. The auditors did not receive the following original ballots:

- Rejected Provisional Ballots
- Uncured Mail Ballots
- Ballots returned to the County as undeliverable

To complete this portion of the audit, we need to review each of these sets of original paper ballots. In addition to the paper ballots, we need all related documentation from the County regarding reasons for rejected provisional and records of attempts to cure mail ballots. 12,112 Maricopa County provisional ballots were rejected in the 2020 General Election.

6.7.8.1 Recommendation

Maricopa County should comply with the Senate Subpoena.

6.7.9 No Record of Voters in Commercial Database

Ballots Impacted N/A

All voters within the Final Voted File, or VM55, was cross-checked against a commercially available data source provided by Melissa[53] called Personator and 86,391 individuals were found with no record in the database for either their name, or anyone with the same last name at the address in the VM55 file. It is expected that a number of these individuals are in fact real people with a limited public record and commercial presence; but it is unclear how large that number is. It is highly recommended that this list be further validated with canvassing to determine what percentage of these voters represent current and valid voters.

Personator is a best-in-class identity and address validation tool. It confirms that an individual is associated with an address, indicates prior and current addresses, tracks when and where the individual moves, tracks date-of-birth and date-of-death. To accomplish this, it utilized both private and government data sources such as the US Postal Service's National Change of Address (NCOA) service, and the Social Security Administration's Master Death List.

6.7.9.1 Data Files Utilized

File Name	MD5 Hash
Maricopa County-VM55 Final Voted Nov2020 PBRQ	43070bc7afdf40a37cd45092e9733654

6.7.9.2 Recommendation

Legislation should be considered that requires a periodic review and maintaining of the voter rolls to be sure it represents current Arizona residents.

6.7.10 Out of Calibration Ballot Printers

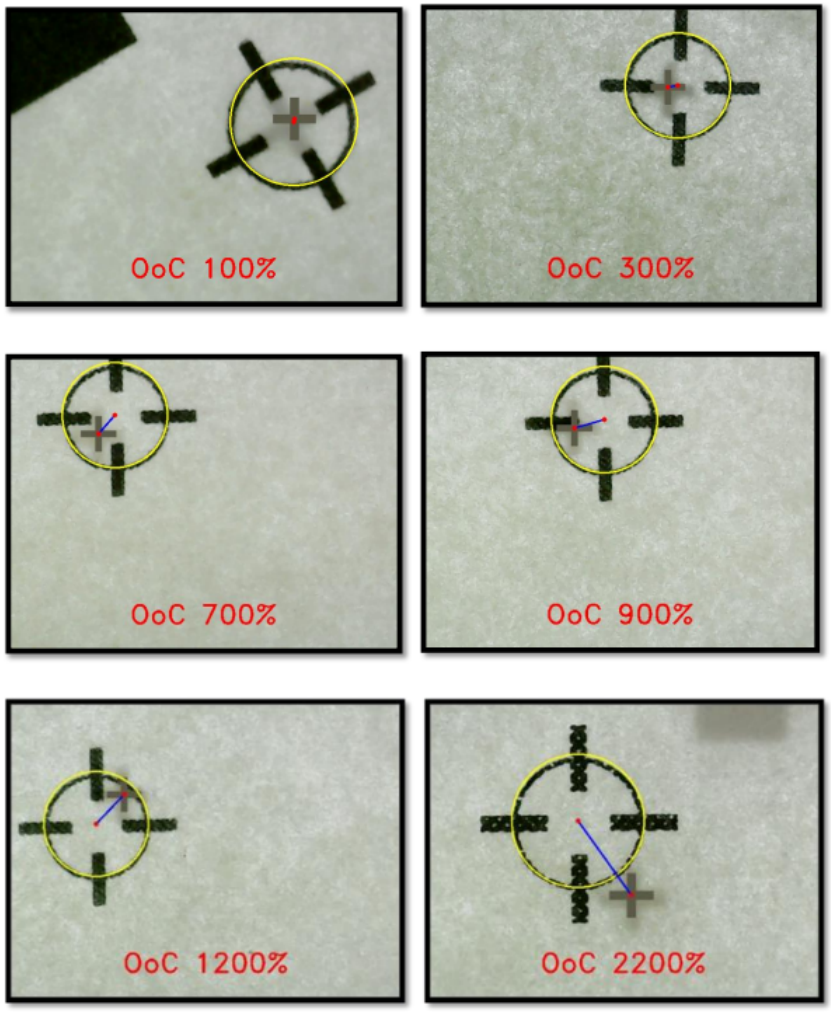
Ballots Impacted N/A

A large number of ballots appear to have been printed on printers not properly calibrated. This means that the front-page of the ballot is not consistently aligned with the back page of the ballot. The way this alignment presented appeared to be unique for each vote center printer. This is contrary to manufacturer guidelines and recommendations and could result in inconstant reading of votes across all the different tabulators, which may bring equal protection under law considerations. In its best case, it would have absolutely no impact on the tabulation of votes. In its worst

[53] https://www.melissa.com

case this could result in overvotes, undervotes, cancelled votes, or votes sent to adjudication. The likelihood of these scenarios increases if the ballots also had bleed through, which was highly prevalent for the in-person ballots.

NOTE: A manual analysis of the Election Management System (EMS) Server and a review of how the Dominion Software interpreted several thousand ballots; it was not immediately evident that this impacted the interpretation of the ballots. However, with over 200,000 ballot images not readable no clear conclusion can be made from this analysis.



6.7.10.1 REFERENCES

- Dominion Printing & Finishing Specifications[54]

6.7.10.2 RECOMMENDATION

Legislation should be considered that would require that the election equipment be properly maintained, including, but not limited to ensuring that ballot printers are properly calibrated.

6.7.10.3 INSTANCES

The Kinematic Artifact processing is still working through the ballots, but examples related to this issue can be found within the attached report. At this time, this particular issue appears to be systemic to any non-Runbeck printed ballots.

6.7.11 REAL-TIME PROVISIONAL BALLOTS

Ballots Impacted N/A

The Arizona Secretary of State Elections Procedures Manual identifies circumstances that require the issuance of a Provisional Ballot. If a voter appears in the e-pollbook or signature roster as having received an early ballot by mail, but the voter wants to vote in person on Election Day, that voter must be issued a Provisional Ballot. However, Maricopa County reported 58,550 voters who had received mail ballots but were issued standard ballots on Election Day. The County identifies these as "real-time Provisional Ballots." There is no mention of real-time provisional in the AZ Elections Procedures Manual. In fact, the EPM specifically addresses this circumstance and is clear that such voters must be issued a Provisional ballot.

This could have allowed people to cast more than one vote based on the timing of the scan of ID or the scan of the ballot envelope. Potential overrides should be further investigated but data related to system overrides was not provided by the County. There appears to be no statutory authority for Maricopa County to deviate from the EPM and issue standard ballots to voters who had already received a mail ballot.

This was reported as a note at the bottom of page 12,329 of the November General Election Canvass Final -below:

> **Note:** There were 58550 Early Ballot recepients that had not RETURNED their Early Ballot and consequently were issued a standard ballot on Election Day. These were processed as real-time Provisional Ballots.

A.R.S. § 16-579(F). Issuing a Provisional Ballot

1. *Circumstances Requiring Issuance of a Provisional Ballot:*
   Voter Received an Early Ballot
   A voter must be allowed to vote a provisional ballot if the voter appears on the signature roster or e-pollbook as having received an early ballot-by-mail, but either:

[54] https://www.sos.state.co.us/pubs/elections/VotingSystems/DVS-DemocracySuite511/documentation/SD-IC-PrintingSpecification-5-11-CO.pdf

(1) affirms that they have not voted and will not vote the ballot-by-mail; or

(2) surrenders the ballot-by-mail to the inspector on Election Day. A.R.S. § 16-579(B)

Voters who appear at a voting location with a ballot-by-mail that has not been voted, along with the affidavit envelope, may use a privacy booth at the voting location to mark the ballot-by-mail. In this circumstance, the voter does not sign in and the voter must place the voted ballot-by-mail in its affidavit envelope, sign the affidavit envelope, and place the envelope in the early ballot drop-off container at the voting location.

6.7.11.1 REFERENCES

- State of Arizona – 2019 Elections Procedures Manual[55]
- A.R.S § 16-579 – Procedure for obtaining ballot by elector[56]

6.7.11.2 DATA FILES UTILIZED

File Name	MD5 Hash
11-03-2020-0 Canvass COMPLETE NOV2020	ce62cc061b6bb56b4fd40aa4866adb16

6.7.11.3 RECOMMENDATION

Maricopa County should explain this deviation from the Elections Procedures Manual and should provide data regarding the overrides of the mail ballot envelope scan process.

6.7.12 VOTER REGISTRATION SYSTEM AUDIT ACCESS

Ballots Impacted N/A

One of the most important components of the audit was the analysis of the voter registration system and records of authorized or unauthorized access to that system. Our audit team has been denied the access required to complete this portion of the audit. In the Senate's subpoena dated January 12, 2021, Maricopa County was ordered to provide the auditors access to, or control of all equipment used in connection with the administration of the 2020 election. In a second subpoena, dated July 26, 2021, the County was ordered to provide all reports, finding and other documents concerning the voter registration breach. The response from the County claims that they are not aware of a breach.

> **1. "All reports, findings and other documents concerning any breach of the voter registration server, the Maricopa County Recorder's Office systems, or any other aspect of the Maricopa County elections systems at any time within six months of the November 3, 2020 general election"**
>
> The Board of Supervisors is not aware of any "breach", as stated above, occurring during this time period, or any other time period relevant to the November 3, 2020 election. The Board of Supervisors is aware of an incident in November 2020 wherein an individual programmatically accessed the County Recorder's website and gathered publicly available information for a short period of time. The Recorder's website is in no way connected to the air-gapped tabulation system in the secure room where ballots are counted. To the extent you are requesting records related to this incident, you recently made a public records request to both the Maricopa County Recorder and the Board of Supervisors requesting similar information. As always, the Board of Supervisors will comply with your public records request promptly consistent with Arizona law. We hereby request that you accept our response to your public records request in lieu of production pursuant to this subpoena.

[55] https://azsos.gov/sites/default/files/2019_ELECTIONS_PROCEDURES_MANUAL_APPROVED.pdf
[56] https://www.azleg.gov/ars/16/00579.htm

Claiming that this breach was nothing more than unauthorized access to public data has not been supported with evidence. According to a Forbes article published December 4th, 2020, Maricopa County confirmed voter data had been stolen and that a federal investigation was under way. Further, the statement that, "the Recorder's website is in no way connected" shows a failure to understand the vulnerabilities associated with unauthorized access and failure to secure the voter registration database. CISA considers voter registration systems to be critical infrastructure and thus requires states and counties to implement the highest levels of security. The only way to ensure that there is one vote for every legally registered voter is careful control of the voter registration database.

6.7.12.1 References

- Maricopa County Letter to Arizona Senate[57]
- Cybersecurity and Infrastructure Agency (CISA)[58]

6.7.12.2 Recommendation

Legislation should be considered that would require applications developed and utilized for voter rolls or voting to be developed to rigorous standards that ensure the confidentiality and integrity of the systems. Specifically, its recommended that the Open Web Application Security Project (OWASP) Application Security Verification Standard (ASVS) Level 3 be applied to all applications associated with voter rolls or voting and that it be required that this be fully validation no less than once every two years.

6.7.13 Questionable Ballots

Ballots Impacted N/A

Analysis of the paper ballots has discovered ballots which exhibit characteristics that are anomalous and do not match known legitimate ballots. This includes color ballots that are missing Machine Identification Codes (MIC), as well as ballots that are demonstrating consistent printing irregularities that suggest they were not printed with the standard ballot PDF generated from the Dominion Election Management System (EMS). These irregularities may have logical explanations, but these explanations are not immediately evident.

NOTE: The questionable ballots have been reviewed to determine if they favor one presidential candidate over another presidential candidate. No discernable pattern could be determined at this time, but analysis is ongoing. This highly suggests that these are not counterfeit but do require some sort of explanation.

6.7.14 References

- Maricopa County Election Facts and Myths[59]
- Runbeck Printing Website[60]
- HP PageWide WebPress T HD Specification[61]

[57] https://www.maricopa.gov/DocumentCenter/View/70435/Final-Signed-Letter-to-Senators
[58] https://www.cisa.gov/election-security
[59] https://recorder.maricopa.gov/justthefacts/
[60] https://runbeck.net/election-solutions/election-printing-mailing/
[61] https://www.hp.com/us-en/commercial-industrial-printing/pagewide/t250-hd-web-presses.html

6.7.15 Recommendation

Legislators should consider passing laws standardizing the papers and printing process utilized for printing ballots and requiring documentation to be kept of all papers utilized. This will facilitate determining if a ballot is in fact genuine and remove any areas for confusion.

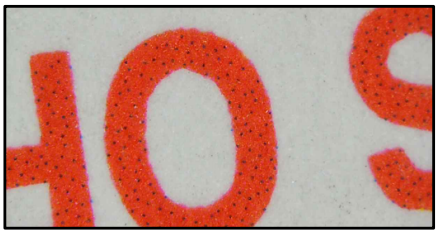
6.7.15.1 Instances

6.7.15.1.1 Color Ballots Missing Machine Identification Code (MIC)

Ballots were identified that were printed in color but did not include Machine Identification Codes (MIC) printed on them like is typical of the standard Runbeck printed mail-in ballot. MIC codes are small yellow dots that are only visible at 200x magnification. They were introduced in the mid-1980's as an anti-counterfeiting measure and include both a timestamp and a unique identifier encoded in the yellow dots. MIC codes are included in almost all color printers in the United States. In-person voting utilized Ballot on Demand (BOD) printers that appeared to always print in black-and-white. At this time over 100 questionable ballots without MIC codes have been identified and an automated process is being written to find more.

In addition to lacking MIC codes these questionable ballots appeared to have been printed on different printer technologies. As a result, the ballots exhibited both color and texture differences.

Below are two sample images. The one on the left is a microscope image of a Runbeck printed mail-in ballot. The one on the right is a microscope image of a questionable color ballot. These show that different printing technologies were utilized.



According to the Runbeck website, they use thermal inkjet technology on a large commercial HP T Series Inkjet Web Press.

Pictured below:

Maricopa County's Election Facts and Myth Buster website has the following statement, "While there are no watermarks programmed on Maricopa County ballots or on the paper, about 9% of the printers used at Vote Centers during the 2020 General Election have a standard feature, which adds microscopic yellow dots to everything printed on that machine. Those dots do not impact tabulation."

Tens of thousands of Election Day ballots were examined and did not observe any printed with the microscopic yellow dots that were observed the Runbeck printed ballots. These findings contradict the County's claim about the Vote Center printers. We have made numerous requests for the County to share details of the printers used in the 2020 General Election, but the requests have been ignored.

6.7.15.1.2 Non-Dominion PDF Printed Ballots

Over 15,000 ballots have been found that were printed from an unidentified printing source other than the PDF for the official election ballots for Maricopa County 2020 General Election found on the Election Management Server machine.

One of the easiest characteristics that can be seen in the enlarged areas is the printing resolution. If a straight line is smooth and straight when enlarged or if that line has an irregular pattern to it. See the two photos below:

Figure 1 - Non-Uniform Dividing Lines of anomalous ballots.

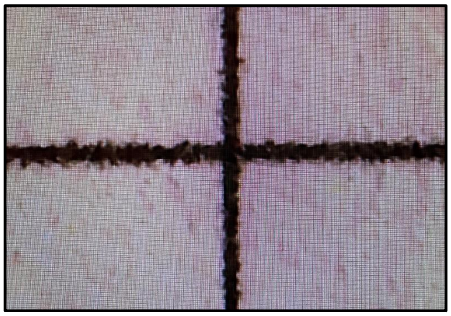


Figure 2 – Well-Formed Straight Dividing Lines of normal ballots.

Many groups of Election Day (ED) and Early Voting (EV) ballots that show this type of evidence of not being printed from the "official ballot" PDF based on the line quality, areas of shading, and other printing patterns. They are different than cleanly printed Election Day ballots from other areas and also different from the printed mail-in ballots, both of which typically have the well-formed lines.

Further, a subset of these printing anomalies was found in several places throughout the EV ballots, but many more in the ED ballots. This subset can be identified by anomalies in the printed lines, such as the breaks in the printed ovals corresponding to a candidate. The lines in these ballots are broken in exactly the same place on the oval, even for different precincts ballots.

a. A few representatives are shown below. In this image, there is an acetate overlay with markings pointing to the anomalous breaks in the lines. The same acetate overlay with the same markings is placed in the examples below to show the identical nature in all of these. This is strong evidence that these were not printed from the "Official Ballot" PDF provided for that ballot type.

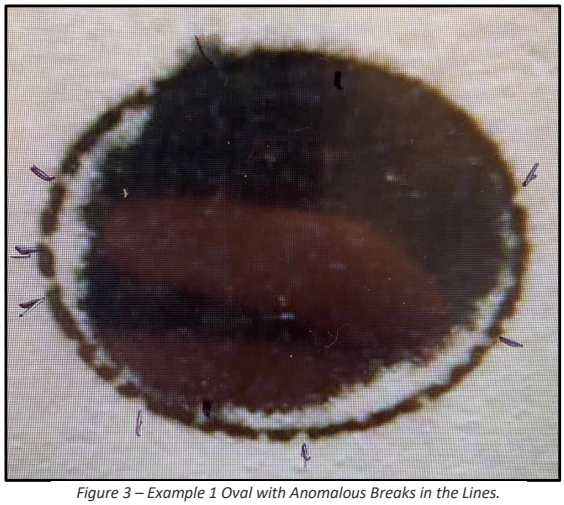


Figure 3 – Example 1 Oval with Anomalous Breaks in the Lines. Anomalous breaks are marked with a pen.

Figure 4 – Example 2 Oval with Anomalous Breaks in the Lines. Anomalous breaks are marked with a pen.

For reference, this is an oval from the PDF for the “Official Ballot” that was provided:

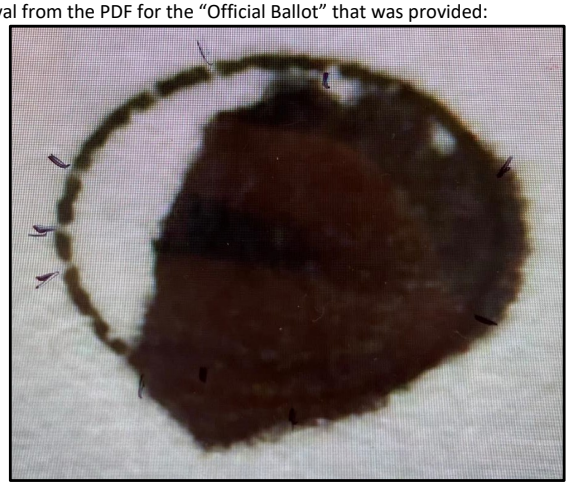


Figure 5 – Example 3 Oval with Anomalous Breaks in the Lines. Anomalous breaks are marked with a pen.

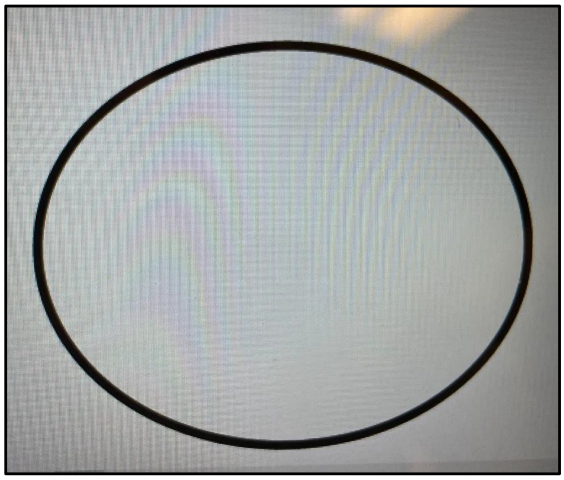


Figure 6 – Example of Oval from the Official Ballot PDF

At this point in the review, over 15,000 ballots with this printing defect. Based on the identical nature of the anomalies, this subset of ballots originated from the same source at some point.

In some cases, the entire box submitted (or nearly all but a few ballots) contained the same printing defects. A few of these examples from election day (ED) ballots are:

Pallet	Box	**Polling Location**
42	ED/12-08/10574	Holiday Park School
42	ED/12-08/11405	Burton Barr Central Library
42	ED/12-08/12299	Camel Back Inn
42	ED/12-08/12897	Conflicting information; either all Brophy College Prep OR Brophy College Prep AND some from Arrowhead Mall
42	ED/12-08/13694	Cartwright Annex
42	ED/12-08/14044	Conflicting information; either all Buckeye City Hall OR Buckeye City Hall AND some from Charles Harris School
42	ED/12-08/14286	Conflicting information; either all Hi Way Baptist Church OR Hi Way Baptist Church AND some from Young Town Clubhouse
42	ED/12-08/15685	Correlates to only the number of ballots attributed to Annex and Chandler Commons
42	ED/12-09/15570 BAG#2	TG Barr School and Pendegast Community Center
42	ED/12-09/15645	Scottsdale Plaza
42	ED/12-8/15673	Canyon Trails
43	ED/12-09/12430	(Not Listed)
44	ED/12-09/10215	Scottsdale Worship Center
45	ED/12-08/11458	Betania Presbyterian Church
45	ED/12-08/15707	Turf Paradise
45	ED/12-08/15642	(Not Listed)
25	EVC2/10-20/149	N/A
25	EVC2/10-20/1413	N/A
25	EVC2/10-20/204	N/A

When the contents of the box were examined, there are approximately 1290 ballots in the box. However approximately 550 of these contain the printing anomaly and 840 of these do not contain that anomaly. Each of these types are grouped together and consecutive.

There are examples of non-random (grouped together) early voting ballots that contain this same printing anomaly.

For example, Pallet 25 – Box 149 – There is a series of over 150 ballots in a row that contain this same printing anomaly. These could have come from a polling center that was allowing early voting. The manner in which the EV was received was random including mail in ballots and was not traceable to a specific location.

Pallet 25 – Box 1413 – The first 410 ballots in the box contained this printing anomaly.

Pallet 25 – Box 204 – has approximately 1200 ballots in total, within those 1200 are just under 150 ballots interspersed throughout that contain the noted printing anomaly.

7 VOTING MACHINE FINDINGS

The following section outlines all findings related to the voting machines including the analysis and discoveries during the Voting Machine phases of the work.

7.1 Voting Machine Scoring

Cyber Ninjas utilizes a risk ranking system based on the guidelines outlined by NIST publication 800-30, "Guide for Conducting Risk Assessments – Information Security". A severity is assigned to a finding based on a combination of the likelihood the finding could impact the election, or the ability to audit the election and the impact it could have on the election results.

	Impact			
Likelihood	**Low**	**Medium**	**High**	**Critical**
Critical	Medium	High	High	Critical
High	Medium	Medium	High	High
Medium	Low	Medium	Medium	High
Low	Low	Low	Medium	Medium

Table 2: Election Risk Matrix.

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Both the likelihood and the impact of the finding are rated independently on a scale from "Low" to "Critical". These ratings are then combined utilizing the risk matrix represented in Table 2 to determine the associated severity for the issue.

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7.2 Digital Analysis Summary

In addition to the observations and recommendations found below it is imperative to note the impact that the lack of compliance with the Arizona Senate Subpoena had on this digital audit. Because the Maricopa County Board of Supervisors did not comply, it made a complete assessment of the digital voting systems impossible. Analysis of those items that were produced, however, clearly demonstrated that the Maricopa County voting systems did not follow CISA or industry standard cyber security best practices.

First Maricopa County personnel did not control the administrative iButton credentials necessary to configure and validate the ICP2 tabulators. Second, Maricopa County did not properly assign and manage the usernames and passwords necessary to restrict access to the voting systems. The user accounts were not attributable to an individual, rather they were shared throughout the staff. Furthermore, the same password was utilized by multiple accounts and was never changed since the installation of the Dominion software. That same password was used by both administrative and user accounts. If a user had access to user level account, that user had all the knowledge necessary to perform administrative functions with elevated access. Third, the windows security and activity logs were not preserved for the required 22 months following the election, thus significantly hampering the analysis of authorized activity. It did appear that the Dominion software specific logs were preserved, but those logs do did not provide the same level of detail or data that the Windows operating system logs did for security events, remote login events or other user activity. Fourth, there was a clear lapse in the hardware configuration monitoring and baseline in the Maricopa County voting systems as evidenced by the presence of an unauthorized second bootable hard drive in the Adjudication 2 workstation.

7.3 Findings Summary Table

#	Finding Name	Likelihood	Impact	Severity
7.4.1	Election Management System Database Purged	High	High	High
7.4.2	Election Files Deleted	High	High	High
7.4.3	Corrupt Ballot Images	High	High	High
7.5.1	Missing Ballot Images	Medium	High	Medium
7.5.2	Failure to Follow Basic Cyber Security Practices	Medium	High	Medium
7.5.3	Subpoenaed Equipment Not Provided	Medium	High	Medium
7.5.4	Anonymous Logins	Medium	Medium	Medium
7.5.5	Dual Boot System Discovered	Medium	Medium	Medium
7.5.6	EMS Operating System Logs Not Preserved	Low	High	Medium
7.6.1	Election Data Found from Other States	Low	Medium	Low

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Deleted: 8.3.2

Deleted: 8.3.3

Deleted: 8.4.1

Deleted: 8.4.2

Deleted: 8.4.3

Deleted: 8.4.4

Deleted: 8.4.5

Deleted: 8.4.6

Deleted: 8.5.1

7.4 High

7.4.1 Election Management System Database Purged

Likelihood: High **Impact:** High

The Election Management System (EMS) database which holds all details associated with the 2020 General Election was purged and all the election results were cleared by a Results Tally and Reporting Admin on February 2 at 5:14 pm; the evening before the Pro V & V audit was scheduled to officially start. This means that these results were not available for Pro V & V or SLI to perform any type of audit, nor were they available for Cyber Ninjas to review. The next day Pro V & V then proceeded to add new tabulators for their audit, and they imported results into these tabulators further clearing remnants of the database. It is worth noting that the Dominion software fully supports creating a full copy of an existing election project; and if a cleared database was required for Pro V & V to perform their audit, they could have first duplicated the existing Election Project. This action may have been in violation of the Senate's subpoena.

NOTE: While the log file clearly indicates that the results and images were also purged as part of the process, the majority of the images did appear to be reloaded back to the system at some point. There were images missing and a number of corrupt images as can be seen in the other findings.

NOTE: On August 26th the Maricopa County Board of Supervisors was requested to explain the reasoning for this activity but has chosen not to respond.

```
SELECT userRelatedInfo, executedCommand, operationTimestamp  FROM [20201103 General-2020-09-21-11-26-56].[dbo].[UserLog]
 WHERE operationTimestamp < '2021-02-02' AND operationTimestamp > '2021-02-01'
```

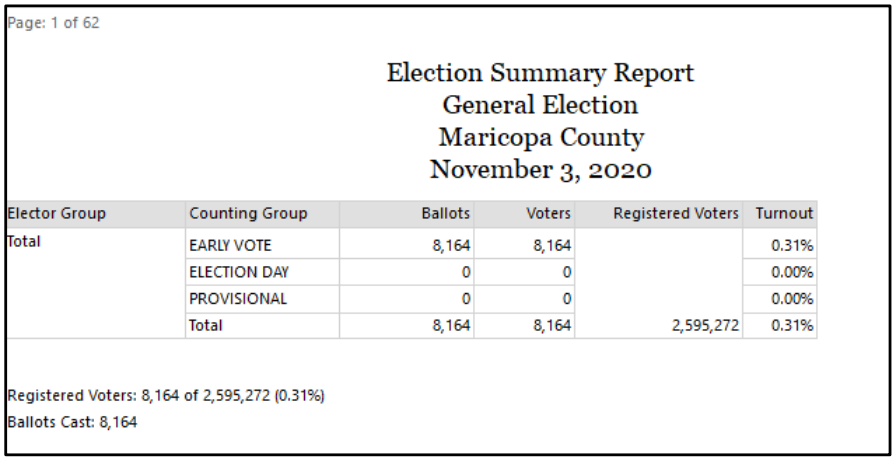
sults | Messages

userRelat...	executedCommand	operationTimestamp
RTRAdmin	PurgeResultsCommand (execution duration: 76478ms):All result files from database were deleted.	2021-02-01 17:16:27.810
RTRAdmin	User initiates the OnPurgeResults activity	2021-02-01 17:14:47.363
RTRAdmin	User initiates the Result Files activity	2021-02-01 17:14:21.567
RTRAdmin	User initiates the Election Summary Report activity	2021-02-01 17:21:55.173
RTRAdmin	Project 20201103 General opened	2021-02-01 17:14:21.550
RTRAdmin	User initiates generation of password.	2021-02-01 17:15:01.160
RTRAdmin	PurgeResultsCommand (execution duration: 288779ms):The result files database, result files and images from NAS were deleted. Purging of results has finished successfully.	2021-02-01 17:20:00.097

Figure 2 - UserLog shows that RTRAdmin Successfully Purged the 20201103 Election Database and Files.

Tabulator Nu...	Name	Location	Type	Counting Group	Log File	Closed	Images Loaded	Load
157189	Audit 7	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
3002	HiPro 2 Early ...	MCTEC	Imagecast Ce...	EARLY VOTE	☐	☐	☐	1
157192	Audit 10	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157191	Audit 9	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157193	Audit 11	Maricopa	ICE/ICP 2	EARLY VOTE	☑	☑	☑	1
157185	Audit 3	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157186	Audit 4	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157195	Audit 13	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
6004	Canon 4 Early...	MCTEC	Imagecast Ce...	EARLY VOTE	☐	☐	☐	1
157190	Audit 8	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157184	Audit 2	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157187	Audit 5	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157188	Audit 6	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157194	Audit 12	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
157183	Audit 1	Maricopa	ICE/ICP 2	EARLY VOTE	☐	☑	☑	1
3001	HiPro 1 Early ...	MCTEC	Imagecast Ce...	EARLY VOTE	☐	☐	☐	3

Figure 3 - Tabulator List is full of "audit" tabulators which are the only ones with results.



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Election Summary Report
General Election
Maricopa County
November 3, 2020

Elector Group	Counting Group	Ballots	Voters	Registered Voters	Turnout
Total	EARLY VOTE	8,164	8,164		0.31%
	ELECTION DAY	0	0		0.00%
	PROVISIONAL	0	0		0.00%
	Total	8,164	8,164	2,595,272	0.31%

Registered Voters: 8,164 of 2,595,272 (0.31%)
Ballots Cast: 8,164

Figure 4 - Results for the 2020 General Election only show 8,164 votes from the Pro V & V audit.

7.4.1.1 Data Files Utilized

File Name	MD5 Hash
AZAud-E-089-1 _EMS PRIMARY\AZAud-E-089-1 _EMS PRIMARY	95a6f531c4969dda8f5703858e33d414

7.4.1.2 RECOMMENDATION

Legislation should be considered that could more greatly facilitate audits to be performed and require the counties to cooperate with the audits when they occur. Specifically, the county should be required to provide all the details needed to have a fully functional Election Management System where results can be reviewed.

7.4.2 ELECTION FILES DELETED

Likelihood: High **Impact:** High

According to the Master File Table (MFT) of the drives, a large number of files on the Election Management System (EMS) Server and HiPro Scanner machines were deleted including ballot images, election related databases, result files, and log files. These files would have aided in our review and analysis of the election systems as part of the audit. The deletion of these files significantly slowed down much of the analysis of these machines.

7.4.2.1.1 Deletion Activity on the EMS C:\ Drive

The EMS server that was produced contained six hard drives. Two of those hard drives were configured in a mirrored configuration and contained the operating system and install programs. This mirrored drive was assigned the drive letter "C" and was the boot drive for the EMS. Between 10/28/20 08:52:36AM and 11/05/20 05:58:58PM 865 directories and 85,673 election related files (scanned ballots, .dvd files, slog.txt files, etc.) were deleted from the EMS C:\ drive. A full listing is provided in the file named Files and Directories Deleted from the EMS C Drive.txt.

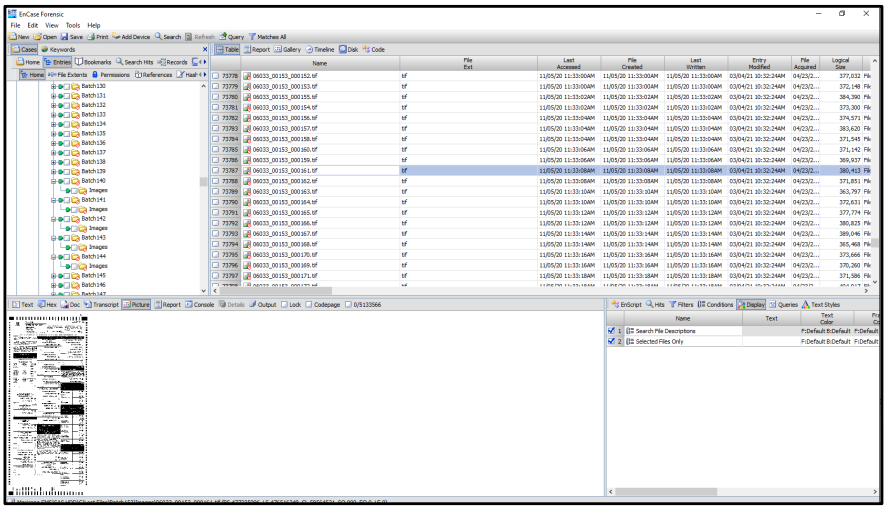


Figure 5-Example of Election Related File Deletion from EMS C:\ Drive

7.4.2.1.2 Deletion Activity on the EMS D:\ Drive

The other four (4) hard drives were configured in a 0+1 hardware raid configuration that contained a single 2.1 Terabyte partition. For the purposes of this examination this raid was manually reconstructed and mounted as a single 2.1 TB drive. This mounted image was then imaged using the FTK Imager software package. The resulting forensic image was then utilized for analysis. This drive contained the dominion election data, election definitions, the election databases, the NAS directory and the scanned ballot images. Between 11/01/20 10:37:41AM and 03/16/21 10:17:06AM 9,571 directories and 1,064,746 election related files were deleted from the D drive. These deleted files include scanned ballot images, ICX results, context.spx files, choice.spx files, .dvd files from the tabulators, and other election related files. A full listing of the deletions is provided in the file Files and Directories Deleted from the EMS D Drive.txt.

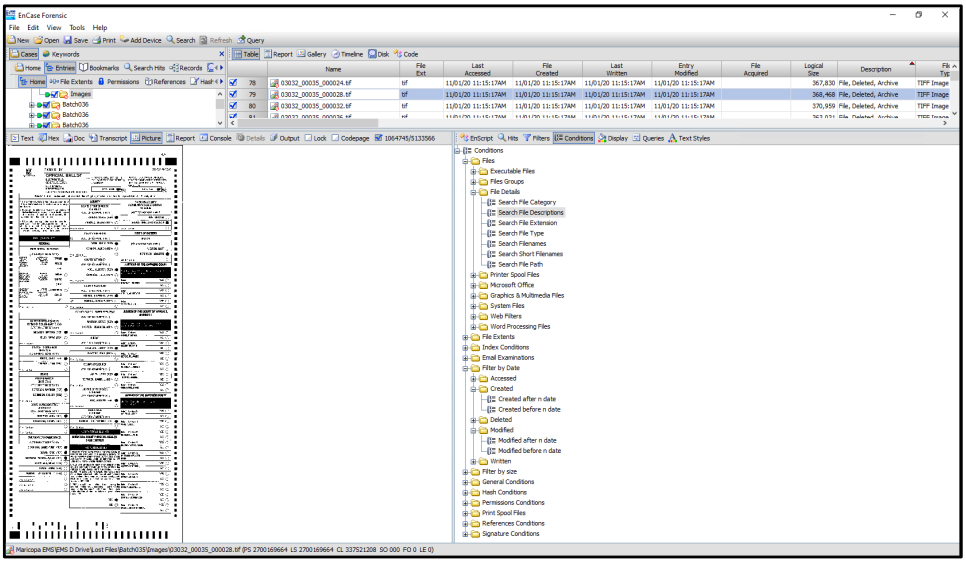


Figure 6-Trump Ballot Image Created and Deleted on 1 Nov 2020 from D:\ Drive

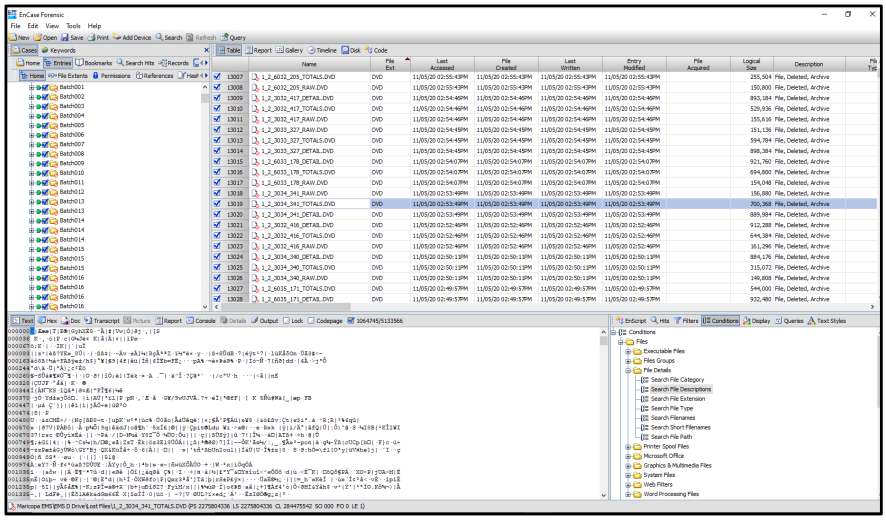


Figure 7-Deleted Election Results Files on 5 November 2020 from D:\ Drive

7.4.2.1.1 Deleted Directories and Files from HiPro 1

HiPro 1 Deleted Files and Folders – 304 Directories and 59,387 files containing election data were deleted from the HiPro scanner number 3 (CyFIR evidence number AZAUD-C-096) by an individual using the account hipradmin01. These files were deleted on 3 March 2021 between 03/03/21 12:53:34PM and 03/03/21 01:37:49PM.

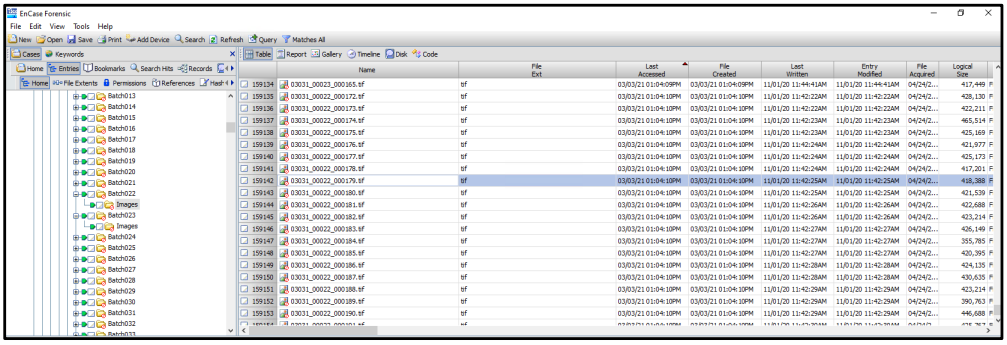


Figure 8-Deleted Election Related Files from HiPro 1

7.4.2.1.2 Deleted Directories and Files from HiPro 3

HiPro 3 Deleted Files and Folders – 1,016 Directories and 196,463 files containing election data were deleted from the HiPro scanner number 3 (CyFIR evidence number AZAUD-C-099) by an individual using the account hipradmin03. These files were deleted on 3 March 2021 between 03/03/21 01:26:32PM and 03/03/21 01:37:49PM.

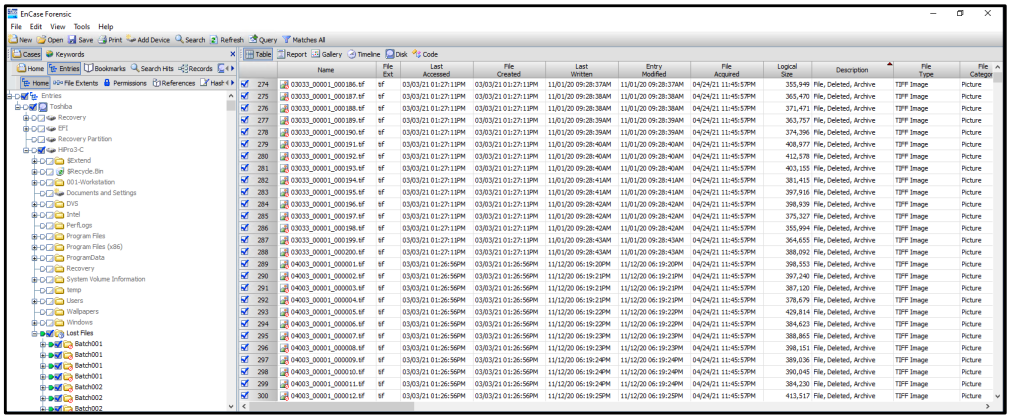


Figure 9-Deleted Election Related Files from HiPro3

7.4.2.1.3 Deleted Directories and Files from HiPro 4

HiPro 4 Deleted Files and Folders – 981 Directories and 191,295 files containing election data were deleted from the HiPro scanner number 4 (CyFIR evidence number AZAUD-C-098) by and individual using the hiproadmin04 account. These files were deleted on 3 March 2021 between 03/03/21 02:32:47PM and 03/03/21 02:44:32PM.

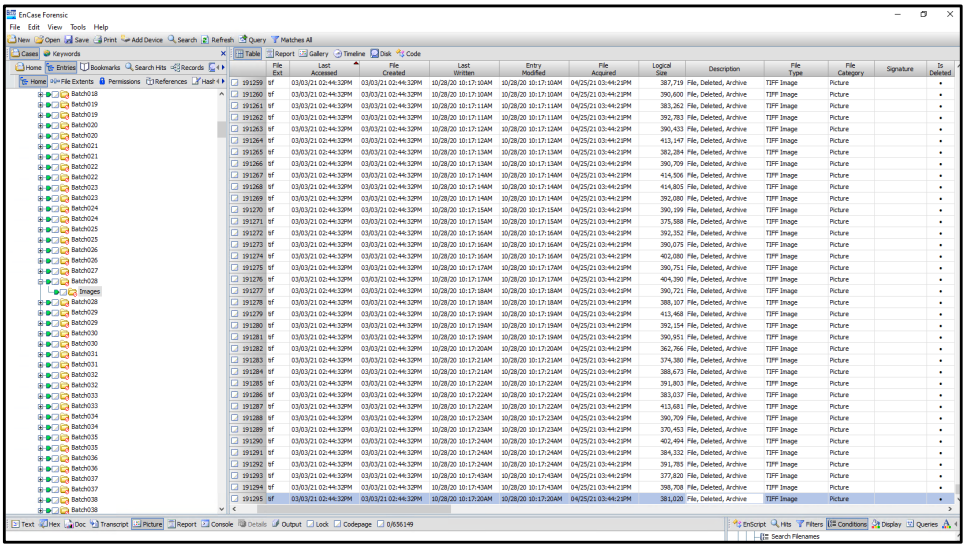


Figure 10-Deleted Election Related Files on HiPro4

7.4.3 Corrupt Ballot Images

Likelihood: High **Impact:** High

The audit has discovered 263,139 ballot images on the election system that are corrupt and unreadable TIFF format images. It is unclear what events could have resulted in this number of images being corrupted. The corruption of the ballot images in the election system only occurs for ballots that were scanned on or after November 1, 2020. No corruption of ballot images occurred in the 1,347,240 ballots processed on the same nine high-speed scanners prior to November 1, 2020. The image corruption is incongruous with the performance of those same nine high-speed scanner systems during the entire election prior to November 1, 2020. For each of the eight high-speed scanners used for ballots scanned starting on November 1, approximately half of the TIFF images are corrupted. The corruption prevents the audit team from confirming the efficacy of the vote totals and the correlation to the paper ballots stored in the various batches.

TIFF image batches were corrupted in some way and not entirely readable for the purposes of the audit. This means that it was impossible to confirm that the electronically recorded votes corresponded to the corrupted TIFF ballot images. In this scenario it is possible that manipulation of the electronic vote totals occurred in the instances where the TIFF images are corrupted. These corrupt TIFF images are not in the folder structure where finally adjudicated ballots are held. Instead, the corrupted adjudicated ballots for "Early Vote Spare 2" are located amongst what appear to be test batch ballot images.

NOTE: Because these images are critical, a new copy of these images was requested from Maricopa County, but a response was not given.

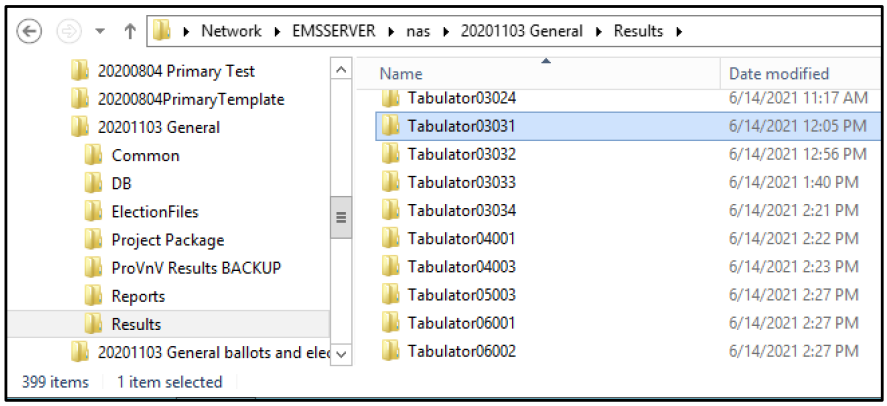


Figure 11 - Early Vote Spare 2 Misallocated and Corrupted Ballots.

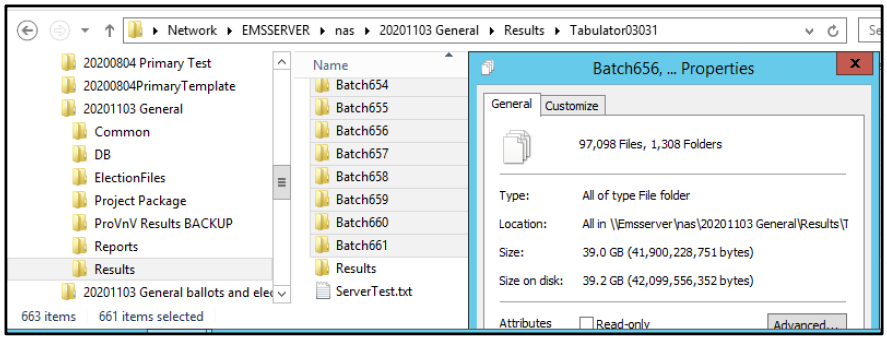


Figure 12 - HiPro 1 Early Vote Spare 2 Showing 97,098 Ballot Tiff Images, Showing the High Volume on these Devices.

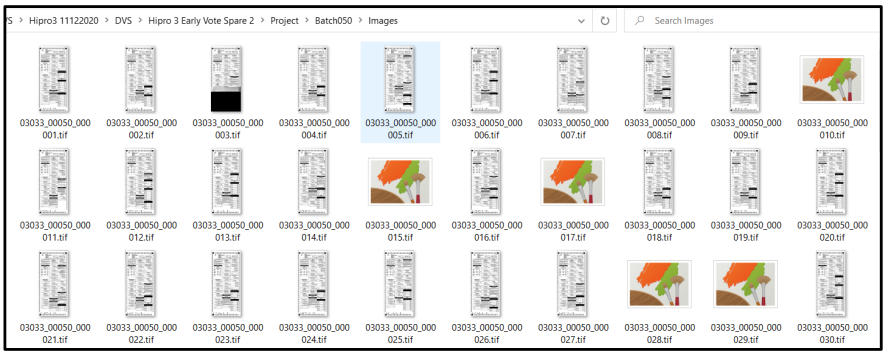


Figure 13 - Example folder showing corrupt TIFF images. The corrupt images either will not display a pre-view at all, or the ballot will be partially blacked out.

In addition, the very same nine (9) high speed tabulators processed more than 1.3 million votes from October 20, 2020, to October 31, 2020 without corrupting any TIFF ballot images. It is anomalous that these high-speed scanners had no errors for the eleven-day period prior to November 1, 2020, but had issues starting on November 1.

NOTE: The top level of the EMS folder structure containing all of the scanner's zip files with the unadjudicated ballots (except the aforementioned missing ballots) are present. The corrupted ballots by file name do appear in these zip files, but none of the ballots in this folder structure are adjudicated.

7.4.3.1 Data Files Utilized

File Name	MD5 Hash
AZAud-E-089-1 _EMS PRIMARY\AZAud-E-089-1 _EMS PRIMARY	95a6f531c4969dda8f5703858e33d414

7.4.3.2 Reproduction Steps

In order to locate and find the corrupt ballots, the Unix "find" command can be employed in conjunction with the "file," "grep," and "wc" (word count) command to determine if the ballot image is indeed a valid TIFF image format file.

For example, here is the command line:

```
find ./Network/EMSSERVER/nas/20201103\ General/Results -exec file {} \; | grep
-i TIFF | wc -l
```

7.4.3.3 Recommendation

Legislation should be considered that will make ballot images an artifact from an election that is publicly published for increased transparency and accountability in the election process.

7.5 Medium

7.5.1 Missing Ballot Images

Likelihood: Medium **Impact:** High

The total number of ballot images that exist within the body of computer forensics material provided for the audit is substantially less than the official vote totals and the total number of paper ballots audited. 21,273 ballot images are entirely missing from the forensics images of the election equipment. This means that there are electronic votes recorded, but no actual ballot images that correspond to the votes. This makes it impossible to fully validate the results or confirm that the Election Management System (EMS) was not tampered with.

The results from the high-speed scanners from 11/1 to 11/13 are not found in the folder named, “20201103 General ballots and election files and adjudicated tabulators.” We find the bulk of them in “20201103 General\Results” folder. The first 15-20 (depending on the specific high-speed scanner) of these batches do not have ballot images. The total number of missing ballot images is 21,273.

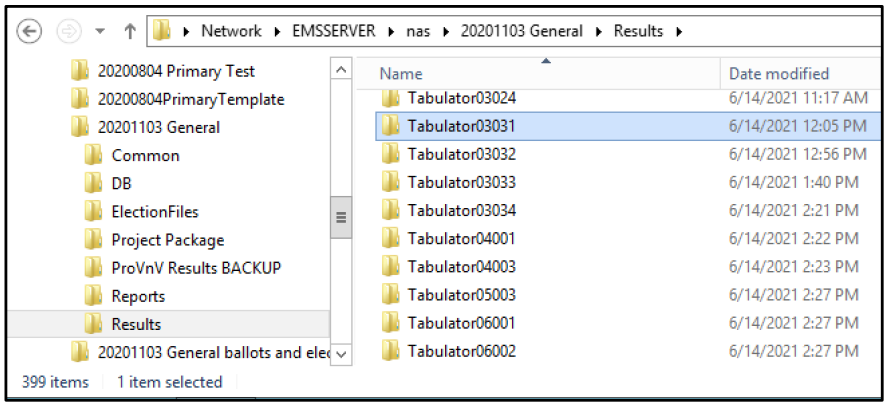


Figure 14 - The tabulator results are found in two different folders, "20201103 General Ballots and election files and adjudicated tabulators" and "20201103 General".

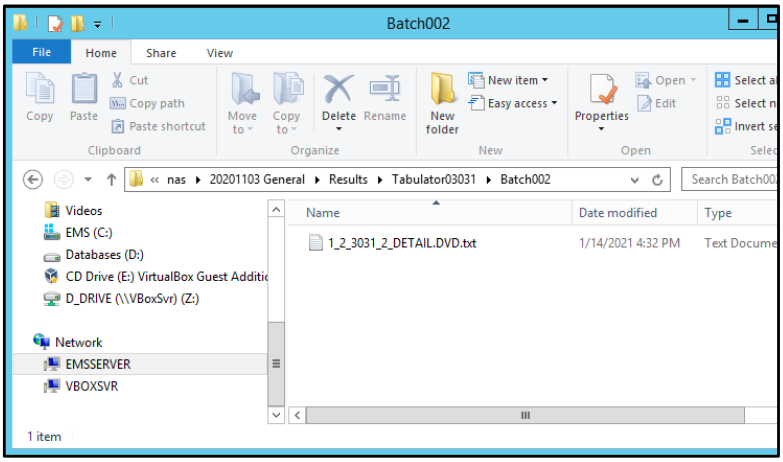


Figure 15 - The tabulator folder that should have images within it does not have any images. In total 21,273 images were missing.

7.5.1.1 Data Files Utilized

File Name	MD5 Hash
AZAud-E-089-1 _EMS PRIMARY\AZAud-E-089-1 _EMS PRIMARY	95a6f531c4969dda8f5703858e33d414

7.5.1.2 Reproduction Steps

In order to find the number of ballot images, first it is necessary to query the EMS database for the election project name Project 20201103 General and select the vote total for the entire election using the following MS SQL command. This query is executed using the Microsoft SQL Server Management Studio v17.1 that was found to be installed on the EMS.

Windows Domain and Logon: EMSServer\emsadmin

Database Name: 20211103 General-2020-09-21-11-26-56

SELECT [Id], [TabulatorId], [BatchId], [Status], [BallotNumber], [LoadOrder], [BallotData], [AdjudicationSessionData]

FROM [AdjudicableBallotStore_20201103_General_2020-10-20_08:39:45].[dbo].[SerializedAdjudicableBallots]

In order to count the total number of ballot images, the Unix “find” command can be employed in conjunction with the “grep” and the “wc” (word count) command to determine if the ballot image is indeed a valid TIFF image format file.

For example, here is the command line:

```
find ./Network/EMSSERVER/nas/20201103\ General/Results -exec file {} \; | grep
-i TIFF | wc -l
find ./Network/EMSSERVER/n
nas/20201103\ General\ ballots\ and\ election\ files\ and\ adjudicated\ tabulat
ors -exec file {} \; grep -i TIFF | wc -l
```

Add these totals together and this is the total number of TIFF images on the EMS for the election.

Then take the total number of ballots from the EMS from and subtract the total from the above commands.

7.5.1.3 RECOMMENDATION

Legislation should be considered that will make ballot images an artifact from an election that is publicly published for increased transparency and accountability in the election process.

7.5.2 FAILURE TO FOLLOW BASIC CYBER SECURITY PRACTICES

Likelihood: Medium **Impact:** High

The Department of Homeland Security's Cybersecurity & Infrastructure Security Agency (CISA) has published a series of cybersecurity best practices and guidelines. In addition to general guidelines, CISA has also published specific best practices for securing election systems that is available for all counties to access at no cost. In the most recent version of the document CISA broke this guidance into specific categories for ease of utilization. As part of these findings, this report will address the following CISA recommendations and address the lack of Maricopa County compliance with the recommendations; Software and Patch Management, Log Management, Credential Management, and Establish a Baseline for Host and Network Activity.

7.5.2.1 INSTANCES

7.5.2.1.1 Software and Patch Management

CISA outlines the necessity for software and patch management within election systems. Specifically, CISA states "Failure to deploy patches in a timely manner can make an organization a target of opportunity, even for less sophisticated actors, increasing the risk of compromise." It is clear that there was no established program to patch the operating system or even update the antivirus definitions. Neither the operating system nor the antivirus had been patched or updated since August 2019 (the date of the installation of the Democracy Suite). The county released a statement that they were prohibited from updating the operating system, that had they done so it would have invalidated the certification issued by the Voter Assistance Commission (VAC) for the Dominion software. This statement is contradicted by the County's own actions following the installation of the Dominion software. Contrary to the claims that updating items on the election systems would invalidate the certification of the election system by the EAC, forensic analysis revealed that after the installation of the Dominion software in August 2019, 4 EXE packages were created, 45 EXE packages were updated and/or modified, 377 Dynamic Link Libraries (DLL) were created, and 1053 Dynamic Link Libraries were modified on the EMS server. If updating the operating system with patches and updating the antivirus definition file would have invalidated the voting certification, then the county had already invalidated the certification prior to the general election of 2020. Neither security audit contracted by Maricopa County noted these findings in their report.

7.5.2.1.2 Log Management

The Cybersecurity and Infrastructure Agency (CISA) recommends that organizations should set up centralized log management systems that 1) forward logs from local hosts to a centralized log management server, correlate logs from both network and host security devices, and review both centralized and local log management policies to maximize efficiency and retain historical data. Analysis of the systems revealed that none of these recommendations were being followed on the Maricopa County election systems. In fact, in a later paragraph this report details how the windows security logs for the EMS server were in fact intentionally deleted such that the logs no longer covered the time period for the 2020 General Election. Neither security audit contracted by Maricopa County noted this finding in their report.

7.5.2.1.3 Credential Management

The Cybersecurity and Infrastructure Agency (CISA) states that Managing passwords and using strong passwords are important steps in preventing unauthorized access to databases, applications, and other election infrastructure assets. CISA further recommends that usernames be assigned to a specific person, not be shared and be changed every 90 days. CISA actually recommends that multifactor authentication be enabled for election systems. Key to the username and password concept is to be able to uniquely identify a user, assure authorized access by a given users, and to be able to hold that individual accountable for the actions performed by that assigned account. In the case of the Maricopa County election systems, none of these guidelines were followed. Neither security audit contracted by Maricopa County noted this finding in their report.

Maricopa County Failed to Ensure Unique Username Allocation to Individuals

Generic username accounts were created as part of the Dominion Software installation on 8/06/2019. These accounts were not assigned to a specific individual but appear to have been shared accounts based on function, not individual accountability. Neither security audit contracted by Maricopa County noted this finding in their report.

Maricopa County Failed to Create Unique Passwords for Each Account

Unique passwords were not created for each account. Just to be clear, the same password was used for all the accounts (if there was in fact a password for the account). This action violates every principle of password management guideline as published in every cyber security framework that currently exists. Below are the list of accounts and the corresponding password. Note the last 4 characters of the password has been masked for security reasons, but all 4 of those characters are the same for all accounts. Furthermore, these passwords had not been changed since the Dominion software suite had been installed (presumably by Dominion employees) in August of 2019. The recommendation from CISA and most cybersecurity frameworks recommend that passwords, especially for administrative accounts, should be changed every 90 days. Neither security audit contracted by Maricopa County noted this finding in their report.

Account Name	Password
AdjSys	Arizona****
DVSAdministrator	Arizona****
DVSGuest	no password is set
Adjadmin01	Arizona****
Adjadmin02	Arizona****
Adjadmin03	Arizona****
Adjadmin04	Arizona****
Adjadmin05	Arizona****

Account Name	Password
Adjuser03	Arizona****
Adjuser04	Arizona****
Adjuser05	Arizona****
Adjuser06	Arizona****
Adjuser07	Arizona****
Adjuser08	Arizona****
Adjuser09	Arizona****
Adjuser10	Arizona****

Account Name	Password
Adjadmin06	Arizona****
Adjadmin07	Arizona****
Adjadmin08	Arizona****
Adjadmin09	Arizona****
Adjadmin10	Arizona****
Adjadmin11	Arizona****
Adjadmin12	Arizona****
Adjadmin13	Arizona****
Adjadmin14	Arizona****
Adjadmin15	Arizona****
Adjadmin16	Arizona****
Adjadmin17	Arizona****
Adjadmin18	Arizona****
Adjadmin19	Arizona****
Adjadmin20	Arizona****
Adjuser01	Arizona****
Adjuser02	Arizona****
Hiproadmin01	Arizona****
Hiproadmin02	Arizona****
Hiproadmin03	Arizona****
Hiproadmin04	Arizona****
Iccadmin01	Arizona****

Account Name	Password
Adjuser11	Arizona****
Adjuser12	Arizona****
Adjuser13	Arizona****
Adjuser14	Arizona****
Adjuser15	Arizona****
Adjuser16	Arizona****
Adjuser17	Arizona****
Adjuser18	Arizona****
Adjuser19	Arizona****
Adjuser20	Arizona****
Emsadmin01	Arizona****
Emsadmin02	Arizona****
Emsadmin03	Arizona****
Emsadmin04	Arizona****
Emsadmin	Arizona****
Emsepsuser	Arizona****
Emsuser01	Arizona****
Iccadmin02	Arizona****
Iccadmin03	Arizona****
Iccadmin04	Arizona****
Iccadmin05	Arizona****
Iccadmin06	Arizona****

Note: These passwords were subsequently used in conjunction with accessing virtual machines that were created from copies of the forensic images and were proven to be legitimate passwords. Neither security audit contracted by Maricopa County noted this finding in their report.

7.5.2.1.4 Lack of Baseline for Host and Network Activity

The analysis of the computing systems that comprised the Maricopa County voting system (to the extent produced) did not find any whitelisting, monitoring, baselining, or network programs that could have been used to establish a baseline for host and network activity. CISA recommends that counties leverage software and monitoring functions to establish and enforce a software and a network baseline of approved programs, communications protocols, and communications devices for voting systems. This baseline should be monitored and integrated into an alerting and response capability to ensure that no unauthorized programs are executed on the endpoints in the network and there are no unauthorized devices communicating on the network. Neither security audit contracted by Maricopa County noted this discrepancy or finding in their report.

7.5.3 SUBPOENAED EQUIPMENT NOT PROVIDED

Likelihood: Medium **Impact:** High

SLI Compliance report page 11 states that the Maricopa County produced 6 EMS computers. Further analysis indicated that there were 4 EMS workstations and 2 EMS servers. Maricopa County only produced 1 EMS server and 4 EMS workstations despite the Arizona Senate subpoena requesting ALL EMS servers and systems utilized in the 2020 General Election. This failure to comply with the Arizona Senate's subpoena has impacted the ability to perform a complete audit of the digital network and devices. For example, if malware was resident on the missing EMS or that machine was utilized in any manner to manipulate the results of the election; this would not be able to be determined from our analysis.

7.5.3.1 INSTANCES

7.5.3.1.1 Network Related Data

The Arizona Senate Subpoena to the Maricopa County Board of Supervisors included the production of network routers, router configuration files and managed switches used in the 2020 General Election. In subsequent conversations with county officials and county attorneys between 4/22/21 and 4/30/21 these officials agreed to provide virtual access to the systems and to provide archived Splunk data beginning 60 days prior to the election and ending 90 days following the election. Ultimately Maricopa County refused to provide any data citing that the production of the router data would compromise ongoing law enforcement operations and the personally identifying information (PII) of Maricopa County residents. This assertion conflicts with other public statements, both in the media and in legal documents, that the voting systems were never connected to the internet. If that was the case, the analysis of the data from the router and Splunk would have been over in a matter of hours. The public statement that the production of this data would compromise PII of Maricopa residents also is contrary to the technical capabilities of the router function. The data contained in a router would not contain any packet level data that would contain any PII concerning Maricopa County residents.

7.5.3.1.1 Poll Worker Laptops

Despite the presence of at least one poll worker laptop at each voting center and despite the fact that the subpoena covered all systems involved in the 2020 General Election, Maricopa County refused to produce a single laptop. It is unknown, due to the lack of this production, whether there was unauthorized access, malware present or internet access to these systems.

7.5.3.1.1 ImageCast Precinct (ICP) Administrator Credentials and Hardware Tokens

Maricopa County utilized the Dominion ImageCast Precinct 2 (ICP2) tabulator during the General 2020 election. These tabulators are normally configured with cellular wireless connections, Wi-Fi access and multiple wired LAN connections. The ICP2 actually requires two forms of authentication to configure, check and/or access the device, a numerical password and an iButton token. Maricopa County produced iButton credentials for Poll Workers to open and close polls on the ICP2's but did not produce any credentials to access the higher level administrative or configuration settings for the tabulators. This prevented the verification of the ICP2 settings to include the cellular wireless settings, the local area network settings, the wide area network settings and access to the administrative configuration reporting functions. During the course of the examination, we were able to recover the higher-level admin's numerical password from the EMS SQL Database. We also attempted to create administrative level iButton credentials utilizing the EMS system forensic images mounted in a Virtual Machine (VM) environment. The VM of the EMS system was fully functional and was used to produce poll worker iButton credentials, however, the EMS did not have the ability to create the administrative ICP2 credential.

The EMS, as produced to the auditors, only had the Poll Worker role programmed into EMS. The Poll Worker role did not have the necessary privileges and functionality to create an administrative iButton credential. In their response to the Arizona Senate request for the administrative ICP2 iButton credentials, the Maricopa County officials indicated that they did not possess these credentials and only the contracted Dominion employees have access to these credentials. Dominion has refused to comply with the production request. Given the inability to create administrative tokens with the EMS and the statement by Maricopa County concerning the ownership of the administrative iButtons, Maricopa County is unable to validate tabulator configurations and independently validate the voting system prior to an election. Additionally, since Maricopa County do not control the administrative iButtons, it is our finding that Maricopa County is unable to independently configure, validate the voting systems prior to an election, or satisfactorily freeze the configuration of the systems for the required time periods during an election. If only the vendor controls the administrative iButtons, Maricopa County has no way of checking the configuration of the tabulators.

7.5.3.1.1 ImageCast X and Other Devices

Based on the videos of the Maricopa County Tabulation and Election Center (MCTEC) there are a significant quantity of systems that were used in the voting process for the 2020 General Election that were not produced as a result of the subpoena. Not a single system contained in the figures below were produced by Maricopa County in response to the Arizona Senate subpoena.

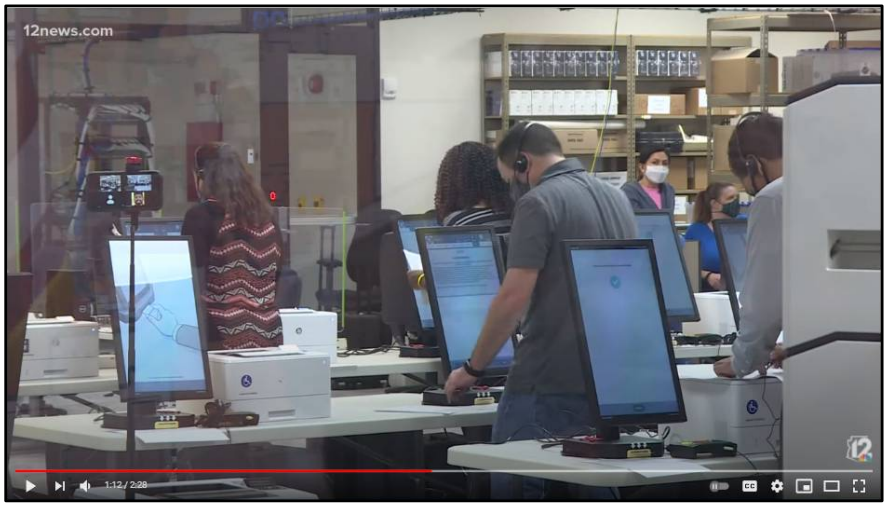


Figure 16-Video Taken on 8 November 2020 of Maricopa County ICX Systems

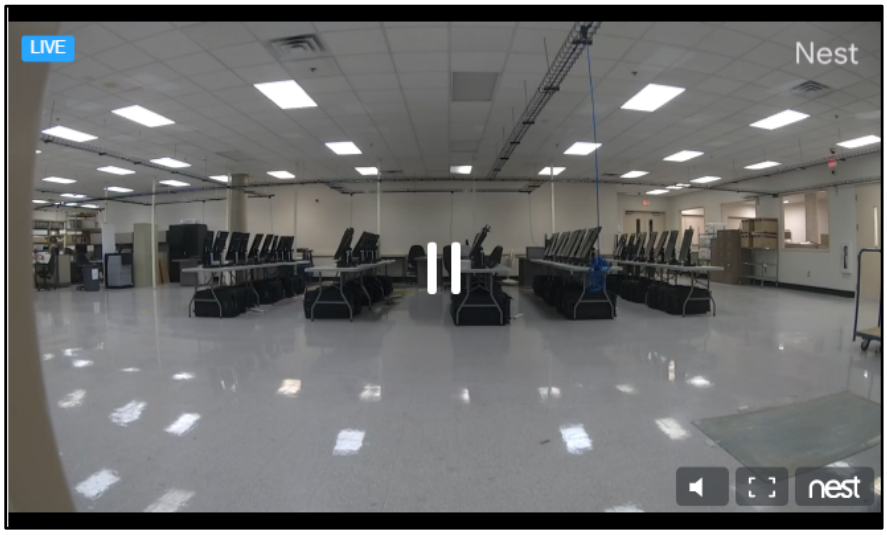


Figure 17-Video Capture Taken from Maricopa County Live Stream

7.5.3.1.2 Other Devices Connected to the Election Network

Examination of the network configurations for the produced systems determined that the programmed gateway for all the systems was 192.168.100.1. This normally refers to the network router used to route network traffic external to the 192.168.100.x subnet. This device could also have been a managed switch. In either case, the device was not produced. The DNS cache has an entry for MCTEC06.ems.net with an IP address of 192.168.100.150, indicating that this system had been communicated with the EMS server and was probably used for printing. Given the naming convention of the device, MCTEC06.ems.net, MCTEC is the acronym for the Maricopa County Tabulation and Election Center. This device has not been produced by Maricopa County. Therefore, there are additional network components that the county has not acknowledged and that directly contradict public statements made by the county that the election system did not have any routers and was completely isolated from the internet.

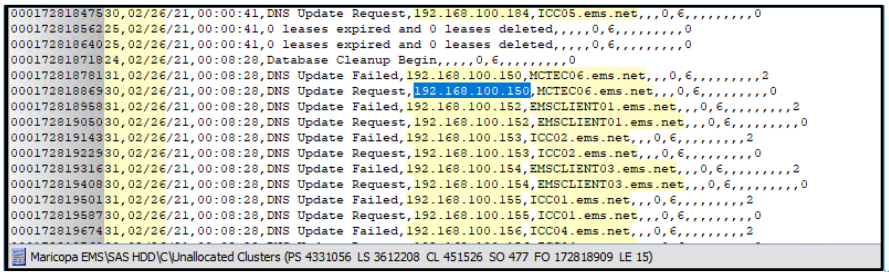


Figure 18-DNS Update Table Recovered from the Maricopa County EMS.

Commented [DL5]: DNS shows as failed, we need to explain this.

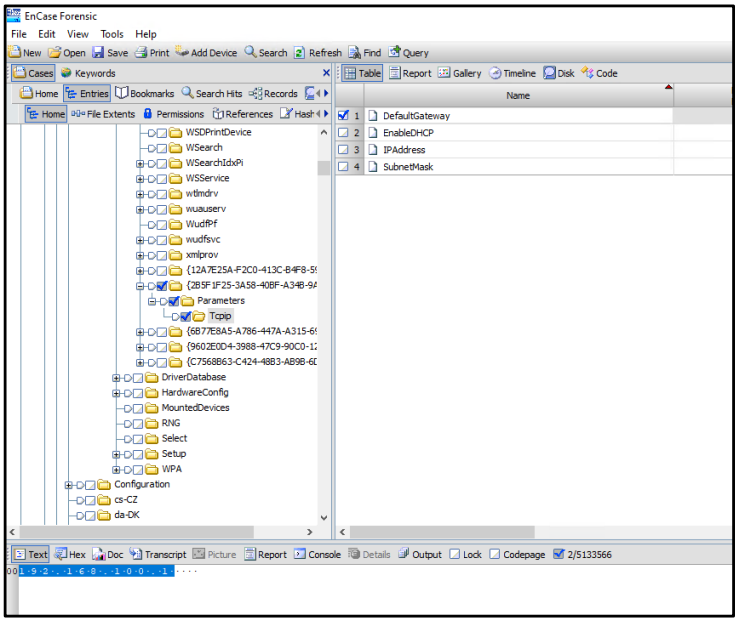


Figure 19-Default Gateway Settings

7.5.4 Anonymous Logins

Likelihood: Medium **Impact:** Medium

There are common functions in Microsoft Windows that will record an anonymous login activity into the windows security logs. These logins, however, exhibit known recording sequences within the logs that allow analysts to determine the origination of the requesting function and determine the legitimacy of the logged action. An example of this behavior is the windows response to a request to access a Windows Server Message Block (SMB) share, also known as a network drive. When a user requests a connection to network drive, that initial connection request is logged as an anonymous user. The log entry also records the requestor's host name and the requestor's IP address. That anonymous request is then immediately followed up with another logged entry that authenticates the user's actual username and password in order to grant access. Below is a screen shot of this normal windows activity. Notice that the workstation name, source network IP and source port fields of this log entry contains valid data. This log entry is immediately (within one second) followed by the successful authentication of the username that is authenticating to the network drive for access permissions. That subsequent user authentication is also logged.

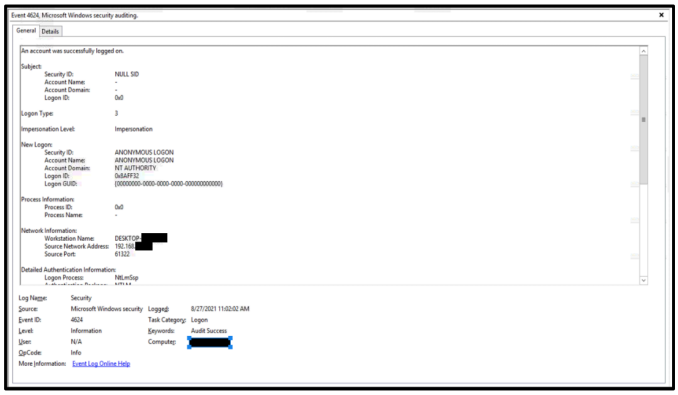


Figure 20-Normal Anonymous Request to SMB Share

While the Windows security logs from the Maricopa County EMS server only are present from 2/5/21 to 4/12/21, there are a significant number of atypical remote, anonymous logins contained in the Windows security logs. Below is an example of the atypical anonymous logons. Note that this is a remote login (login type 3). Note that the Workstation Name, Source Network Address and Source Port log elements are not populated, and that root/system level access is granted. It is normal for logins from the local system (login type 1, 2, 5 and 7) to not populate these data fields, but the fact that it is a network remote login (login type 3), and the fields are not populated is highly irregular and indicates that this is not a normal anonymous login type activity. A search of the event logs from other Windows 2012 R2 servers did not reveal a single logon type 3 or type 10 anonymous log entry that did not record these log data elements.

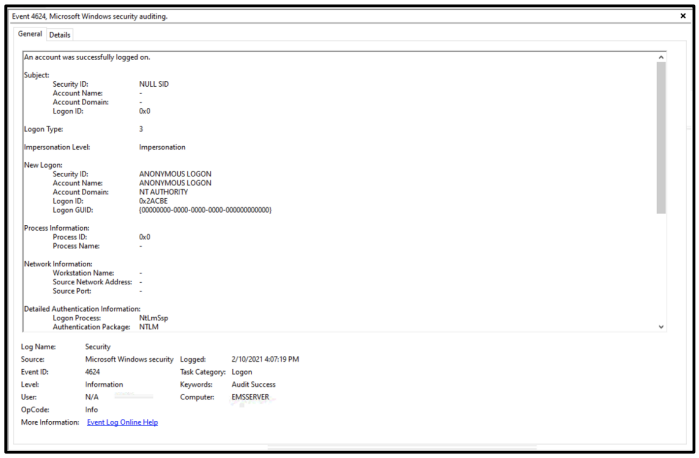


Figure 21-Atypical Remote Anonymous Access to EMS Server

Given Maricopa County' failure to produce the subpoenaed network data, it is impossible to determine the origin of these successful atypical remote anonymous logons. The fact that there effectively was no user account and password controls resulting in shared user accounts and passwords, coupled with the lack of network data, makes it impossible to determine if these accesses were legitimate or unauthorized without the network data.

7.5.5 Dual Boot System Discovered

Likelihood: Medium **Impact:** Medium

Analysis of the system labeled Adjudication 2 (CyFIR evidence designation AZAud-E-087) revealed that this system contained two bootable hard drives. These two hard drives were subsequently labeled One of the AZAud-E-087-1 and AZAud-E-087-2. Neither security audit contracted by the Maricopa County noted this finding in their report.

7.5.5.1 Analysis of AZAud-E-087-1 determined the following:

Computer Name: DESKTOP-7S841F6

Network Configuration: DHCP Enabled

NIC Configurations: The system contained configurations for two network interfaces

ActiveDNSProbeContent Entry: 131.107.255.255

WLanSVC\Parameters\EapolKeyIPAddress\LocalAddress: 192.168.137.1

Configured to communicate with an SMTP server address of 10.100.10.105 in the Dominion Voting Systems NLog.config file. Note: the nslog.config files on this system also contained clear text passwords, one of which was the password for the emsdbadmin account.

Commented [DL6]: Indicate how this might show that things go to the internet.

7.5.5.2 Analysis of AZAud-E-087-2 determined the following:

Computer Name: ADJCLIENT02

Network Configuration: The system contained configurations for three network interfaces.

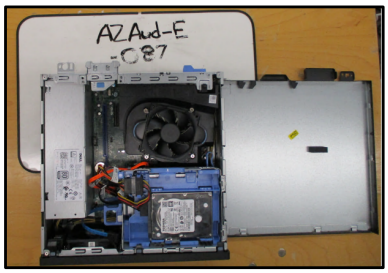
- NIC1: DHCP Enabled
- NIC2: DCHP Enabled. Cached IP address of 192.168.100.158. DHCP Server:192.168.100.10.
- NIC3: Does not contain registry configuration entries.

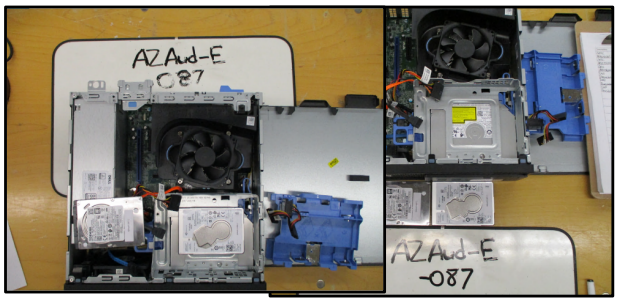
ActiveDNSProbeContent Entry: 131.107.255.255

WLanSVC\Parameters\EapolKeyIPAddress\LocalAddress: 192.168.137.1

The discovery of a system with a dual boot configuration is a significant finding. First, it clearly demonstrates that there was a failure in the hardware configuration management of the Maricopa County election systems. Second, two bootable hard drives within the same system, under certain circumstances would create a situation where one operating system could act as a "jump box" where one system could access the internet and the other system would be restricted to an isolated network. This is commonly called a dual homed access and could have provided an access route into the voting system network. Given the lack of compliance and the failure by Maricopa County to produce the router data, historical Splunk data and NetFlow data per the Arizona Senate Subpoena prevents the full analysis of the impact of this dual boot computer. Neither of the two audits performed by Maricopa County detected or reported this additional, bootable hard drive on the Adjudication 2 system.

Commented [DL7]: Need to make it clear that that connection to the internet would be the most likely reason why this type of configuration would be chosen.





7.5.6 EMS Operating System Logs Not Preserved

Likelihood: Low **Impact:** High

The Windows event logs that were present on the EMS Server that was produced by Maricopa County contain Windows security event logs (security.evtx). This file records the Windows operating security events for the EMS server including all user accesses, whether those accesses are from the local system itself or from accessing the system remotely. This log file was restricted by a policy set by Maricopa County to a file size of 20,480KB (20MB). The logging activity was set to automatically overwrite the existing log entries if the security file exceeded this size. The overwrite action would write a new log entry and delete the oldest entry in the log file. In the case of the security.evtx file on the EMS server, the earliest retained log entry was dated 2/5/2021 10:37:49 AM (the last day of the Pro V & V audit) and the latest entry was dated 4/12/2021 4:53:16 PM. The logs were not preserved and did not cover the dates for the general election (3 November 2020). An examination of the EMS and other systems involved in the 2020 General Election did not discover any enabled external log aggregation functionality nor were historical logs beyond those that were contained on the operating systems provided to the digital examination team. The security access logs were not preserved and were overwritten, which appears to be a violation of ARS XX.

Commented [DL8]: Timeline of deletions.

Commented [DL9]: Insert sentence that outlines timeline of court ruling.

Commented [DL10]: Get ARS value.

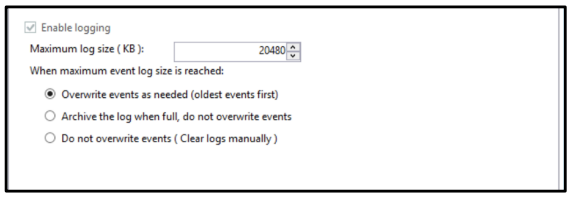


Figure 22-Policy Settings EMS Security.evtx

7.5.6.1.1 User Log Deletions on 2/11/2021

A user leveraging the emsadmin account remotely logged into the EMS server at 2/11/2021 9:08:27 AM via terminal services and began executing a script at 2/11/2021 9:09:04 AM that checked accounts for blank passwords. The event logs record this connection as originating from a system with the IPV6 address of fe80::ec82:cdfd%1998664174, which is a local network IPV6 address. Between 2/11/2021 8:09:04 AM and 2/12/2021 7:12:55 AM this user ran this check 462 times. Each time the check was performed a new line was added to the security log, which had the effect of deleting the oldest entry in the log file due to the previously mentioned log size limitation setting. 462 older log entries were deleted via this method.

7.5.6.1.2 User Log Deletions on 3/03/2021

A user utilizing the emsadmin account remotely logged into the EMS server at 3/3/2021 11:12:31 AM and began executing a script at 3/3/2021 11:13:44 AM that checked accounts for blank passwords. The event logs record this connection as originating from a system with the IPV6 address of fe80::ec82:cdfd, which is a valid IPV6 local network address. Between 3/3/2021 11:12:31 AM and 3/5/2021 7:58:04 AM this user ran the script 37,686 times. Each time the check was performed a new line was added to the security log, which had the additional effect of deleting the oldest entry in the log file due to the previously mentioned log size limitation setting. 37,468 older log entries were deleted via this method.

This was x days after a judge stated that the subpoena needed to be complied with.

Commented [DL11]: What percentage of the log max size is this?

Commented [DL12]: Replace.

Figure 23-3 Identified but Unnamed Individuals at the keyboard at 3/3/2021 at 11:06AM

7.5.6.1.3 User Log Deletions on 4/12/2021

A user utilizing the emsadmin account began executing a script at 4/12/2021 1:39:38 PM to check accounts for blank passwords. Between 4/12/2021 12:39:38 PM and 4/12/2021 12:45:13 PM this user ran this check 330 times. Each time the check was performed a new line was added to the security log, which had the additional effect of deleting the oldest entry in the log file due to the afore mentioned log size limitation setting. 330 older log entries were deleted via this method.

Figure 24- County Employee at the EMS Keyboard on 4/12/2021 at 12:39PM the time of the last blank password check was run.

7.6 Low

7.6.1 Election Data found From Other States

Likelihood: Low **Impact:** Medium

The Maricopa County Adjudication 2 system had two bootable hard drives. The drive identified as AZAud-E-087-1 contains a directory c:\NAS. Inside of that directory are subdirectories that appear to contain data from other jurisdictions and what appears to be demonstration data. Specifically, these directories are named Common, WA Cert General 2018 vA, WA Cert Primary 2018 vA, SC Cert Cookie General, Write-in Only, Special Election with Fusion and General with Variable SP. It would be a logical assumption that WA=Washington and SC=South Carolina. There is no known need for this external data to be located on a Maricopa County adjudication system. Neither of the two audits performed by Maricopa County reported this finding.

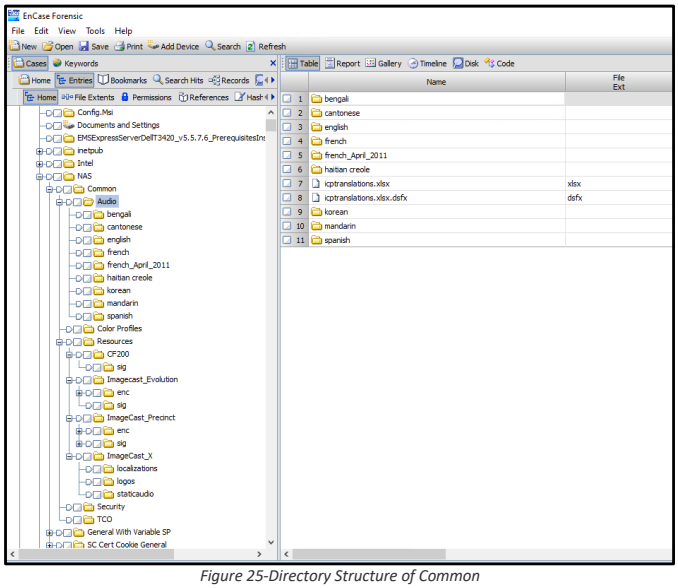


Figure 25-Directory Structure of Common

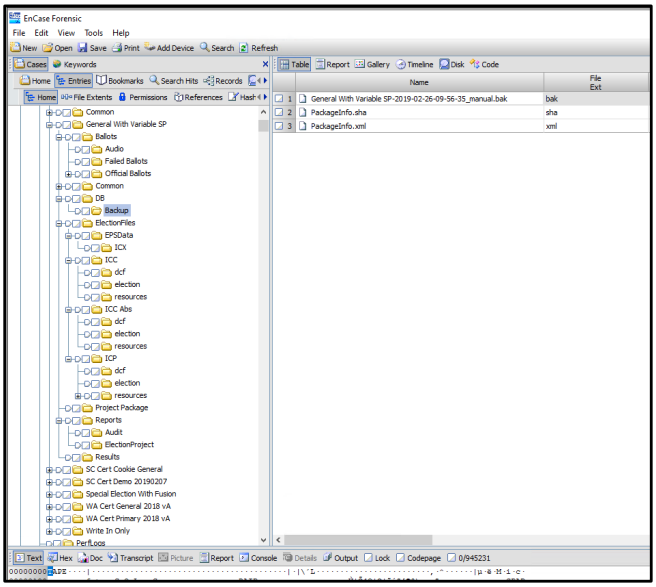


Figure 26-General with Variable SP Directory

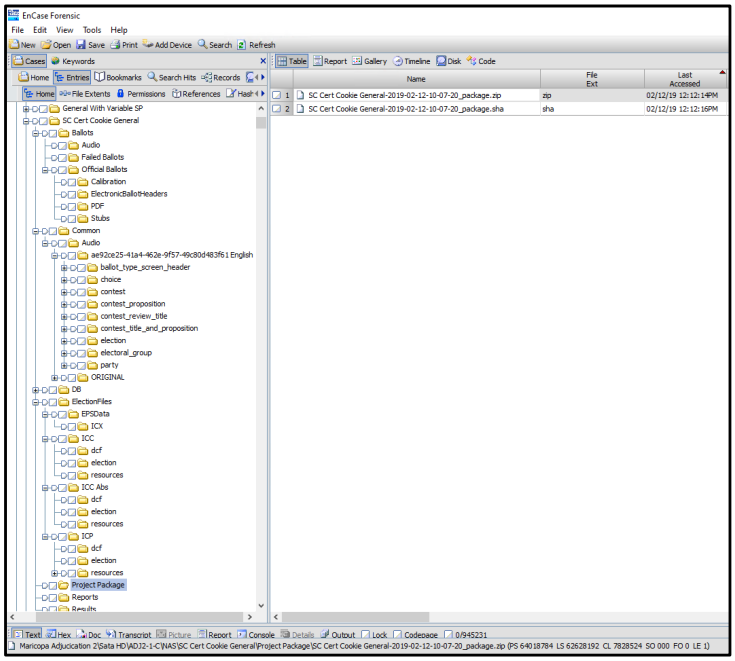


Figure 27-SC Cert Cookie General Directory Structure

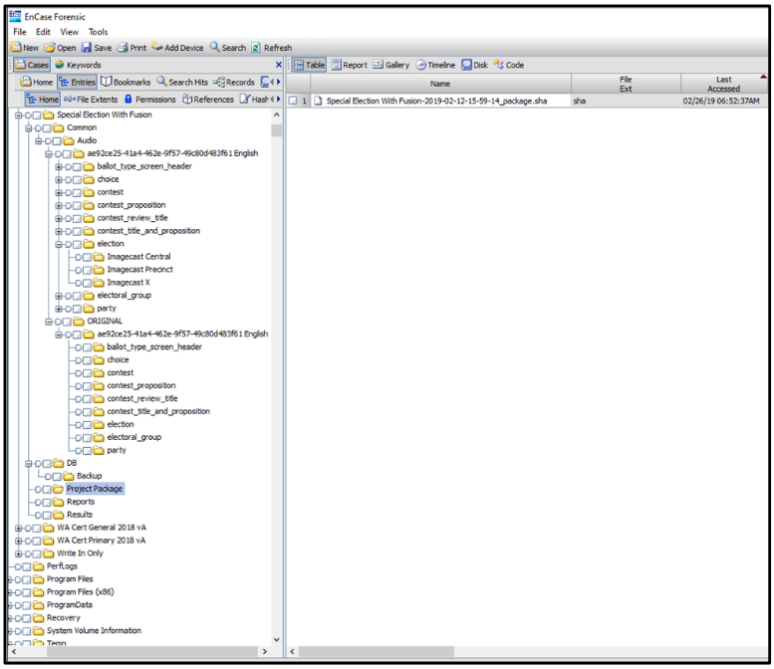


Figure 29-Special Election with Fusion Directory

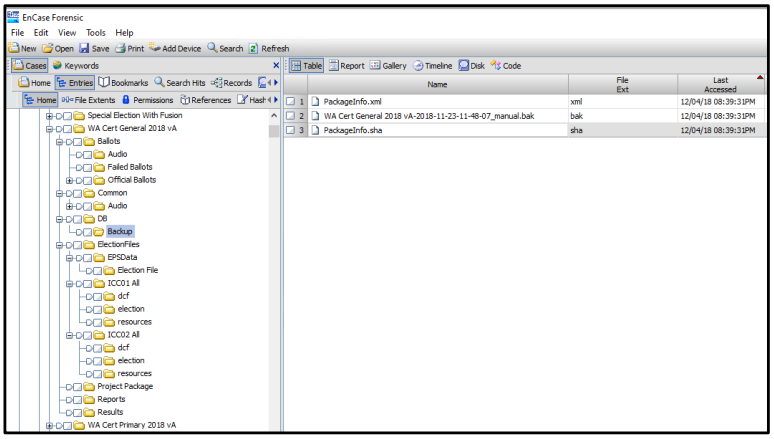


Figure 28 - WA Cert General 2018 vA Directory

8 About Cyber Ninjas

Commented [DL13]: Expand to include entire team.

Cyber Ninjas is an application security consulting company specializing in ethical hacking, training, and security program development. Our staff represents over 10 years of experience in a variety of areas including application support, development, product management, and application security. This experience across all areas of the software development life cycle gives us a unique perspective on how to build security into your existing processes. We can help you build a software security program, expand the capabilities of your existing staff, or simply perform a security assessment of your software or your company. With everything we do, our goal is to build the knowledge within your organization. We strongly believe that "Security comes with knowledge."; and that it is our job as Cyber Ninjas to train and teach through every engagement to build up capabilities within your organization.