# MESA COUNTY, COLORADO, VOTING SYSTEMS

# Forensic Analysis of Data and Processes

Prepared by

Jeffrey O'Donnell - Database and Systems Analyst

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#### EXECUTIVE SUMMARY

This report documents data and process anomalies found during a forensic analysis of the drive image of Mesa County, Colorado's Dominion Election Management Server. These anomalies cast significant doubt as to whether Mesa County's 2020 General Election was run in a fair and legal manner.

This analysis was performed using the backup forensic image of the Election Management Server (EMS), which was saved before Dominion Voting Systems (DVS) re-imaged the County's server.

The facts presented lead to the conclusions that:

- 1) The true vote count in Mesa County, Colorado cannot be accurately calculated for the 2020 General Election. As such, the county's vote should be decertified.
- 2) Persons unknown performed actions that caused the loss of important data obscuring the source of over 5,500 ballots.
- 3) Processes and Practices used by the DVS Election Management software are not conducive to the running of a fair and accurate election. As such, this software should not be used for managing elections until such time as the documented security flaws are demonstrably fixed.

Evidence supporting these findings is documented in this report.

## INTRODUCTION

Use of computerized Election Management Systems is now nearly universal across counties in the United States. While the use of these systems decreases the manpower costs as well as the time taken to produce election results, it also reduces the transparency of the election process. It has been argued that the right to free and fair elections is the most important right we have as Americans, as it can be used to defend against abuses of all other rights. When votes cast by humans are counted by machines, it is a fundamental necessity that the operations and processes of those machines are transparent, auditable, and 100% accurate.

Numerous Federal and State laws exist to attempt to safeguard our elections. Title 52 USC §20701 provides for much of the Federal guidance in this area, requiring that Voting systems:

- a) Comply with established 2002 Federal Election Commission Standards (CRS 1-5-601.5)
- b) Preserve "any election records" for at least 22 months after an election (CRS 1-7-802)

52 USC §20701 also prescribes penalties for destroying, removing, or delaying delivery of election records. (Section 1-13-111)

The statute makes it clear that the "every officer of election" is responsible for maintaining the election records and integrity. As such, it would be irresponsible for an election officer to trust the compliance to any part of this Federal statute to an outside vendor, as it opens them up to criminal prosecution should the statute be violated by that vendor. Mesa County, Colorado, uses software and hardware provided by Dominion Voting Systems (DVS), and for the 2020 General Election, specifically "D-Suite 5.11". The primary computer server, which contains the raw vote information used to produce official reports, makes use of Microsoft SQL Server 2016 databases running on the Microsoft Windows 2016 Server operating system. The forensic image used for the analysis, which was created on May 23, 2021, has been validated as authentic by numerous autonomous groups.

#### **DEFINITION OF TERMS**

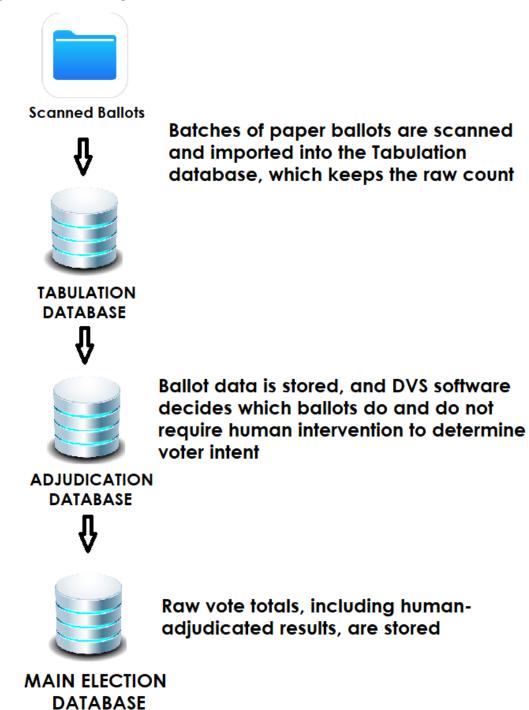
"Batch": Mesa County collects paper ballots in stacks of up to 100 and runs them through the tabulator, which is the hardware that digitally scans the image, Each of these stacks of ballots is called a "batch".

"Adjudication": This term means the process of determining the intent of a voter. DVS software inspects the digital image of each ballot, and checks for ovals which are properly filled in. If the software has 100% confidence in the votes marked, then the adjudication process is deemed complete.

"Manual Adjudication": Should the software not be able to determine the voter intent for any race, the ballot in question is referred to manual adjudication, a process in which ballot can be examined by humans, who together determine the voter intent and make any required changes to the ballot based upon their examination.

#### **DATABASE TOPOGRAPHY**

The DVS Election Management System was set up in Mesa County using the following databases and vote data flow structure:



#### **RESULTS OF ANALYSIS**

### **1**. Data Integrity Violation, leading to uncertain results

Our analysis shows that the process of converting a ballot cast by voters into a digital data record is obfuscated during at least one part of the counting process.

To demonstrate this issue, we must give the timeline of events beginning October 19<sup>th</sup>, 2020, when Mesa County began processing ballots.

On October 19th, 85 "batches", consisting of 8,256 ballots, were scanned into the system. 799 of these were referred to manual adjudication (9.7%). These batches were serially numbered from 1 to 85 in the database.

On October 20<sup>th</sup>, 116 additional batches, consisting of 11,359 ballots, were processed. 1,128 of these ballots were referred to manual adjudication (9.9%).

On October 21<sup>st</sup>, vote data and database alteration occurred. 66 Batches, consisting of 6,298 ballots, were processed up until 2:14 PM, local time. 239 of these ballots were referred to manual adjudication (3.7%). At this time, the system shows that the following occurred:

- 1. New Adjudication and Tabulation databases were created. Below shows the names and dates of the original and new databases.
- Commands were executed to copy vote data from the "old" adjudication and tabulation databases to the new ones. However, batches 2 through 59, which were among the 85 processed on October 19<sup>th</sup>, were excluded from the synchronization.

3. All of the batches copied to the "new" databases were run through the DVS adjudication step once again. Although this is a digital process which should have resulted in the same rate of manual adjudication referrals, only 965 of the 20,346 ballots in the re-run batches, 4.7%, were referred to manual adjudication this time.

The 5,567 votes which were contained in batches 2 through 59 (the specific IDs of which will be included in reference section A), were left untouched in the main election database, meaning that they are part of the officially reported election totals for the county.

This aberration in the processing of ballots is important because of how the DVS system keeps track of individual ballots. One ballot contains numerous votes, as it contains choices for many election races. In the Adjudication Database, individual ballots are stored along with the file location of their scanned image. Only the batch and vote information are sent to the Main Election Database, meaning that should it ever be desired to track a vote back to its individual ballot, that search has to go back through a table in the Adjudication database. Because information about batches 2-59 was not copied to the operating Adjudication database, this linkage would be impossible. Manual adjudication events for any of these ballots will likewise be unavailable.

There is also no way of determining if the 25,913 ballots processed before the database switch contain the same information as the 25,913 ballots processed afterwards.

The low manual adjudication rate on October 21<sup>st</sup> is also a significant finding. Although we do not have access to the scanning hardware and its software, it appears that the settings were changed on the 21<sup>st</sup>,

which would account for the lower manual adjudication rate. However, all ballots scanned after the database switch were manually adjudicated at a rate of more than 11 percent. Thus, the lower manual adjudication rate on that one day of processing is unexplained.

If the reasons behind these findings cannot be adequately explained, then the county's election results are indeterminate and must be decertified. We cannot determine, due to the purging of database logs, the exact process by which this vote alteration was performed, or the entity who performed it. However, in our opinion, the knowledge necessary to perform these actions would not generally exist in County Election personnel, unless they were being guided by someone with significant knowledge of the system.

The net effect is that over 5% of the County's total reported vote is suspicious and cannot be validated.

## 2. Intentional purging of Log Files

In examining the drive image, we found that nearly every critical file used to save logs of events which occur in the server have been set to a very low size (typically 10 megabytes), meaning that only the last few days of events are stored. This is not the default behavior of the operating system or database server. This left us, and anyone else who wanted to effectively audit the actions taken during the election period, unable to view any of these events.

The logs which are regularly purged are:

a. Standard Windows Event logs, including the System, Application, and Services log, which would show all applications run and errors encountered.

- b. Networking logs, which would show connection to the server from other computers.
- c. Windows Defender anti-virus and anti-malware logs, which would show malware intrusion into the server. Of note, an analysis of the deleted files on the system show that Windows Defender logs were often manually deleted.
- d. Microsoft SQL Server logs, which would show database activity and the processed which caused that activity.

All of these logs should be considered under the category "all election records", as the DVS Election Management System is running on the Windows operating system, uses the SQL Server database application to store and manipulate election data, and uses Windows Defender as its only mitigation against malware intrusion. In our opinion, the planned purging of this log information is a breach of the Federal 22 month data retention laws.

# 3. Evidence of Connection to both local Intranet and External Internet

DVS claims that its Election Servers are "air gapped", and incapable of being remotely accessed. We found direct evidence that the Mesa County server is connected to other computers in a local intranet. For instance, the fact that the server retrieves information from an external system to retrieve the ballot data indicates that there is a connection. If this intranet is connected via a router, then that router could provide access to the internet or other networks locally.

The following facts should be investigated:

a. A network card is active on the server

- b. Microsoft SQL Server is configured to "listen" on the interface, meaning that someone with access and credentials could do any database alteration they desired.
- c. Microsoft Report Server reports which exist on the server, which match the formatting and style of the official reports on Mesa County's websites, require an internet connection to be run. Specifically, they attempt to connect with Microsoft's Azure services, and produce an error if they are unable.

It is important to recognize that system intrusions can occur just as easily from other local computers as they can from systems on the internet. Many virus and malware applications are designed to "hop" from system to system via any local network to which they are connected.

## 4. Lack of Software Updates

Microsoft Windows Server and Microsoft SQL Server are regularly updated to address the latest virus and malware exploits. The server used in Mesa County had not had a Windows Update since June 10th, 2019. In the time between June 10<sup>th</sup>, 2019 and October 19<sup>th</sup>, 2020, there were dozens of critical updates addressing hundreds of issues which could cause everything from data exposure to remote software execution to complete loss of data.

This shows, in our opinion, a disregard for the integrity of the data on the Election Management Server.

## **5. Existence of SQL Server Management Studio**

Microsoft SQL Server can be managed at a very low level by a tool called "SQL Server Management Studio" (SSMS). We found that not only is this tool, which can be used by anyone with access to the server

to change or delete any election data, installed on the server, DVS user manuals actually instruct election personnel to utilize it to perform certain database tasks. The existence of this tool on the server opens up the system to accidental and intentional data changes which would leave no trail whatsoever.

## 6. Lack of Referential Integrity in DVS Database Tables

Most modern database designs include a concept called "referential integrity". For example, if you have one table of data that has information about a person, and another table that has information about colleges, you might have a field in the person's table that can contain an id, or pointer, to the college he went to. Referentially integrity in this case would mean that if John Smith's record had a pointer to the University of Pittsburgh, the system should give an error should you try to remove the item "University of Pittsburgh" from the colleges table. It would not allow you to do this action because something else "refers" to the college.

The DVS Election Management System data structures have no such integrity built into them. This is why batch records in the one database could be deleted without any consequence to records that point to that batch in another database. This lack of referential integrity means that vote information could easily be added or removed from one part of the database without any warnings or errors occurring in other parts of the database.

#### CONCLUSIONS

- As we have found evidence that a large number of ballots have had their source placed in serious question, none of the election results from Mesa County can be considered trustworthy, and the 2020 General Election in that county should be decertified.
- 2. A hand audit of all physical ballots in Mesa County, and their corresponding envelopes, should be performed. This audit should focus first on the ballots reportedly contained in the 58 missing batches.
- 3. The hard-drive data from any county using DVS to manage their elections should forensically preserved and examined to determine if evidence of data alteration exists.
- 4. Because of the serious security concerns outlined, DVS should not be used to manage future elections until the issues outlined above are explained and remedied.

#### **REFERENCE A – MESA COUNTY BATCHES**

This lists all batches of ballots processed before the database switch described above, along with the reprocessing time. The batches which were reprocessed after the database switch are highlighted in Yellow. The batches which were *not* reprocessed after the database switch are highlighted in Red. All times are local to Mesa County, Colorado.

Batch ID	Initial Processing	2nd Processing	Tabulator	Votes
4001	10/19/20 12:07 PM	10/21/20 2:20 PM	Tabulator 10 - Batch 4001	100
4002	10/19/20 12:07 PM		Tabulator 10 - Batch 4002	42
4003	10/19/20 12:07 PM		Tabulator 10 - Batch 4003	100
4004	10/19/20 12:07 PM		Tabulator 10 - Batch 4004	100
4005	10/19/20 12:07 PM		Tabulator 10 - Batch 4005	100
4006	10/19/20 12:08 PM		Tabulator 10 - Batch 4006	100
4007	10/19/20 12:08 PM		Tabulator 10 - Batch 4007	100
4008	10/19/20 12:08 PM		Tabulator 10 - Batch 4008	99
4009	10/19/20 12:08 PM		Tabulator 10 - Batch 4009	100
4010	10/19/20 12:08 PM		Tabulator 10 - Batch 4010	100
2001	10/19/20 12:23 PM		Tabulator 4 - Batch 2001	98
2002	10/19/20 12:30 PM		Tabulator 4 - Batch 2002	100
2003	10/19/20 12:32 PM		Tabulator 4 - Batch 2003	100
2004	10/19/20 12:36 PM		Tabulator 4 - Batch 2004	100
2005	10/19/20 12:43 PM		Tabulator 4 - Batch 2005	100
2006	10/19/20 1:50 PM		Tabulator 4 - Batch 2006	100
2007	10/19/20 1:54 PM		Tabulator 4 - Batch 2007	100
2008	10/19/20 1:58 PM		Tabulator 4 - Batch 2008	100
2009	10/19/20 2:03 PM		Tabulator 4 - Batch 2009	100
2010	10/19/20 2:06 PM		Tabulator 4 - Batch 2010	100
2011	10/19/20 2:10 PM		Tabulator 4 - Batch 2011	99
2012	10/19/20 2:14 PM		Tabulator 4 - Batch 2012	100
2013	10/19/20 2:18 PM		Tabulator 4 - Batch 2013	100
2014	10/19/20 2:22 PM		Tabulator 4 - Batch 2014	100
2015	10/19/20 2:26 PM		Tabulator 4 - Batch 2015	100
2016	10/19/20 2:30 PM		Tabulator 4 - Batch 2016	100
2017	10/19/20 2:34 PM		Tabulator 4 - Batch 2017	100
2018	10/19/20 2:36 PM		Tabulator 4 - Batch 2018	33
2019	10/19/20 2:40 PM		Tabulator 4 - Batch 2019	100
2020	10/19/20 2:44 PM		Tabulator 4 - Batch 2020	100
2021	10/19/20 2:48 PM		Tabulator 4 - Batch 2021	99
2022	10/19/20 2:51 PM		Tabulator 4 - Batch 2022	100

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2023	10/19/20 2:57 PM		Tabulator 4 - Batch 2023	99
2024	10/19/20 2:59 PM		Tabulator 4 - Batch 2024	100
4011	10/19/20 3:05 PM		Tabulator 10 - Batch 4011	100
2025	10/19/20 3:06 PM		Tabulator 4 - Batch 2025	100
4012	10/19/20 3:09 PM		Tabulator 10 - Batch 4012	100
2026	10/19/20 3:10 PM		Tabulator 4 - Batch 2026	99
4013	10/19/20 3:12 PM		Tabulator 10 - Batch 4013	100
2027	10/19/20 3:15 PM		Tabulator 4 - Batch 2027	100
4014	10/19/20 3:16 PM		Tabulator 10 - Batch 4014	100
2028	10/19/20 3:17 PM		Tabulator 4 - Batch 2028	100
2029	10/19/20 3:19 PM		Tabulator 4 - Batch 2029	25
2030	10/19/20 3:22 PM		Tabulator 4 - Batch 2030	100
4015	10/19/20 3:24 PM		Tabulator 10 - Batch 4015	99
2031	10/19/20 3:29 PM		Tabulator 4 - Batch 2031	100
4016	10/19/20 3:30 PM		Tabulator 10 - Batch 4016	100
2032	10/19/20 3:34 PM		Tabulator 4 - Batch 2032	99
4017	10/19/20 3:34 PM		Tabulator 10 - Batch 4017	100
4018	10/19/20 3:40 PM		Tabulator 10 - Batch 4018	100
4019	10/19/20 3:44 PM		Tabulator 10 - Batch 4019	100
4020	10/19/20 3:48 PM		Tabulator 10 - Batch 4020	99
2033	10/19/20 4:00 PM		Tabulator 4 - Batch 2033	100
4021	10/19/20 4:00 PM		Tabulator 10 - Batch 4021	99
2034	10/19/20 4:03 PM		Tabulator 4 - Batch 2034	100
4022	10/19/20 4:03 PM		Tabulator 10 - Batch 4022	100
4023	10/19/20 4:05 PM		Tabulator 10 - Batch 4023	78
2035	10/19/20 4:09 PM		Tabulator 4 - Batch 2035	100
4024	10/19/20 4:09 PM		Tabulator 10 - Batch 4024	100
4025	10/19/20 4:12 PM	10/21/20 2:20 PM		99
2036	10/19/20 4:13 PM	10/21/20 2:20 PM	Tabulator 4 - Batch 2036	100
4026	10/19/20 4:15 PM		Tabulator 10 - Batch 4026	100
2037	10/19/20 4:16 PM	10/21/20 2:20 PM	Tabulator 4 - Batch 2037	99
4027	10/19/20 4:19 PM	10/21/20 2:20 PM	Tabulator 10 - Batch 4027	100
4028	10/19/20 4:22 PM	10/21/20 2:20 PM	Tabulator 10 - Batch 4028	100
2038	10/19/20 4:24 PM	10/21/20 2:20 PM	Tabulator 4 - Batch 2038	100
2039	10/19/20 4:28 PM	10/21/20 2:20 PM	Tabulator 4 - Batch 2039	100
2040	10/19/20 4:32 PM	10/21/20 2:21 PM	Tabulator 4 - Batch 2040	100
2041	10/19/20 4:35 PM	10/21/20 2:21 PM	Tabulator 4 - Batch 2041	100
4029	10/19/20 4:37 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4029	100
2042	10/19/20 4:41 PM	10/21/20 2:21 PM	Tabulator 4 - Batch 2042	99
4030	10/19/20 4:41 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4030	99
2043	10/19/20 4:46 PM	10/21/20 2:21 PM	Tabulator 4 - Batch 2043	100
4031	10/19/20 4:49 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4031	97

4032	10/19/20 4:53 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4032	99
		10/21/20 2.21 1101		22
4033	10/19/20 4:55 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4033	100
2044	10/19/20 4:57 PM	10/21/20 2:21 PM	Tabulator 4 - Batch 2044	100
4034	10/19/20 4:58 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4034	100
2045	10/19/20 5:00 PM	10/21/20 2:21 PM	Tabulator 4 - Batch 2045	99
4035	10/19/20 5:03 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4035	100
4036	10/19/20 5:06 PM	10/21/20 2:21 PM	Tabulator 10 - Batch 4036	100
2046	10/19/20 5:16 PM	10/21/20 2:22 PM	Tabulator 4 - Batch 2046	99
2047	10/19/20 5:18 PM	10/21/20 2:22 PM	Tabulator 4 - Batch 2047	100
4037	10/19/20 5:18 PM	10/21/20 2:22 PM	Tabulator 10 - Batch 4037	100
2048	10/19/20 5:22 PM	10/21/20 2:22 PM	Tabulator 4 - Batch 2048	99
2049	10/20/20 10:05 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2049	100
2050	10/20/20 10:07 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2050	100
2051	10/20/20 10:10 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2051	99
2052	10/20/20 10:13 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2052	100
2053	10/20/20 10:17 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2053	100
2054	10/20/20 10:29 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2054	100
2055	10/20/20 10:32 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2055	100
2056	10/20/20 10:40 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2056	100
2057	10/20/20 10:43 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2057	100
2058	10/20/20 10:50 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2058	99
2059	10/20/20 10:53 AM	10/21/20 2:22 PM	Tabulator 4 - Batch 2059	100
2060	10/20/20 10:56 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2060	100
2061	10/20/20 10:59 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2061	100
2062	10/20/20 11:02 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2062	98
2063	10/20/20 11:05 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2063	100
2064	10/20/20 11:08 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2064	100
2065	10/20/20 11:11 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2065	100
2066	10/20/20 11:16 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2066	100
2067	10/20/20 11:19 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2067	100
2068	10/20/20 11:22 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2068	100
2069	10/20/20 11:26 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2069	99
2070	10/20/20 11:30 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2070	94
2071	10/20/20 11:33 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2071	100
2072	10/20/20 11:38 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2072	100
2073	10/20/20 11:43 AM	10/21/20 2:23 PM	Tabulator 4 - Batch 2073	100
4038	10/20/20 11:43 AM	10/21/20 2:24 PM	Tabulator 10 - Batch 4038	99
4039	10/20/20 11:48 AM	10/21/20 2:24 PM	Tabulator 10 - Batch 4039	100
4040	10/20/20 11:50 AM	10/21/20 2:24 PM	Tabulator 10 - Batch 4040	99
2074	10/20/20 11:52 AM	10/21/20 2:24 PM	Tabulator 4 - Batch 2074	99
4041	10/20/20 11:55 AM	10/21/20 2:24 PM	Tabulator 10 - Batch 4041	100
2075	10/20/20 11:56 AM	10/21/20 2:24 PM	Tabulator 4 - Batch 2075	99

4042	10/20/20 11:58 AM	10/21/20 2.24 014	Tabulator 10 - Batch 4042	100
	10/20/20 11.00/10	10/21/20 2:24 PM		100
4043	10/20/20 12:02 PM	10/21/20 2:24 PM	Tabulator 10 - Batch 4043	100
4044	10/20/20 12:05 PM	10/21/20 2:24 PM	Tabulator 10 - Batch 4044	100
2076	10/20/20 12:07 PM	10/21/20 2:24 PM	Tabulator 4 - Batch 2076	100
2077	10/20/20 12:13 PM	10/21/20 2:24 PM	Tabulator 4 - Batch 2077	100
4045	10/20/20 12:13 PM	10/21/20 2:24 PM	Tabulator 10 - Batch 4045	100
2078	10/20/20 12:16 PM	10/21/20 2:24 PM	Tabulator 4 - Batch 2078	99
4046	10/20/20 12:16 PM	10/21/20 2:24 PM	Tabulator 10 - Batch 4046	100
2079	10/20/20 12:19 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2079	99
4047	10/20/20 12:19 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4047	99
2080	10/20/20 12:22 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2080	99
4048	10/20/20 12:22 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4048	100
2081	10/20/20 12:25 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2081	100
4049	10/20/20 12:30 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4049	100
2082	10/20/20 1:08 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2082	100
4050	10/20/20 1:11 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4050	100
2083	10/20/20 1:14 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2083	100
4051	10/20/20 1:14 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4051	100
2084	10/20/20 1:16 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2084	100
4052	10/20/20 1:18 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4052	100
2085	10/20/20 1:20 PM	10/21/20 2:25 PM	Tabulator 4 - Batch 2085	100
4053	10/20/20 1:21 PM	10/21/20 2:25 PM	Tabulator 10 - Batch 4053	100
2086	10/20/20 1:22 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2086	100
4054	10/20/20 1:27 PM	10/21/20 2:26 PM	Tabulator 10 - Batch 4054	100
4055	10/20/20 1:31 PM	10/21/20 2:26 PM	Tabulator 10 - Batch 4055	100
2087	10/20/20 1:33 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2087	98
2088	10/20/20 1:37 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2088	100
4056	10/20/20 1:47 PM	10/21/20 2:26 PM	Tabulator 10 - Batch 4056	97
2089	10/20/20 1:53 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2089	100
2090	10/20/20 1:58 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2090	99
4057	10/20/20 2:02 PM	10/21/20 2:26 PM	Tabulator 10 - Batch 4057	96
2091	10/20/20 2:04 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2091	100
2092	10/20/20 2:07 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2092	100
4058	10/20/20 2:07 PM	10/21/20 2:26 PM	Tabulator 10 - Batch 4058	97
2093	10/20/20 2:10 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2093	100
2094	10/20/20 2:14 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2094	100
2095	10/20/20 2:19 PM	10/21/20 2:26 PM	Tabulator 4 - Batch 2095	97
2096	10/20/20 2:23 PM	10/21/20 2:27 PM	Tabulator 4 - Batch 2096	99
3001	10/20/20 2:26 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3001	100
3002	10/20/20 2:29 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3002	100
2097	10/20/20 2:31 PM	10/21/20 2:27 PM	Tabulator 4 - Batch 2097	100
3003	10/20/20 2:32 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3003	100

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3004	10/20/20 2:36 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3004	98
2098	10/20/20 2:38 PM	10/21/20 2:27 PM	Tabulator 4 - Batch 2098	100
3005	10/20/20 2:39 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3005	98
2099	10/20/20 2:42 PM	10/21/20 2:27 PM	Tabulator 4 - Batch 2099	99
3006	10/20/20 2:43 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3006	100
2100	10/20/20 2:46 PM	10/21/20 2:27 PM	Tabulator 4 - Batch 2100	100
3007	10/20/20 2:47 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3007	100
2101	10/20/20 2:49 PM	10/21/20 2:27 PM	Tabulator 4 - Batch 2101	100
3008	10/20/20 2:51 PM	10/21/20 2:27 PM	Tabulator 7 - Batch 3008	100
2102	10/20/20 2:57 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2102	97
3009	10/20/20 2:57 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3009	95
2103	10/20/20 3:00 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2103	99
3010	10/20/20 3:01 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3010	99
2104	10/20/20 3:04 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2104	99
3011	10/20/20 3:04 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3011	98
2105	10/20/20 3:07 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2105	100
3012	10/20/20 3:07 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3012	100
3013	10/20/20 3:10 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3013	98
2106	10/20/20 3:12 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2106	95
3014	10/20/20 3:13 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3014	100
2107	10/20/20 3:21 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2107	95
3015	10/20/20 3:23 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3015	94
2108	10/20/20 3:25 PM	10/21/20 2:28 PM	Tabulator 4 - Batch 2108	100
3016	10/20/20 3:25 PM	10/21/20 2:28 PM	Tabulator 7 - Batch 3016	100
3017	10/20/20 3:29 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3017	100
2109	10/20/20 3:30 PM	10/21/20 2:29 PM	Tabulator 4 - Batch 2109	94
3018	10/20/20 3:35 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3018	97
3019	10/20/20 3:59 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3019	95
1001	10/20/20 4:02 PM	10/21/20 2:29 PM	Tabulator 2 - Batch 1001	75
3020	10/20/20 4:03 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3020	99
3021	10/20/20 4:06 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3021	99
3022	10/20/20 4:10 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3022	99
3023	10/20/20 4:13 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3023	100
3024	10/20/20 4:22 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3024	99
2110	10/20/20 4:24 PM	10/21/20 2:29 PM	Tabulator 4 - Batch 2110	98
3025	10/20/20 4:26 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3025	100
2111	10/20/20 4:28 PM	10/21/20 2:29 PM	Tabulator 4 - Batch 2111	100
3026	10/20/20 4:29 PM	10/21/20 2:29 PM	Tabulator 7 - Batch 3026	100
3027	10/20/20 4:34 PM	10/21/20 2:30 PM	Tabulator 7 - Batch 3027	100
3028	10/20/20 4:38 PM	10/21/20 2:30 PM	Tabulator 7 - Batch 3028	100
1002	10/20/20 4:46 PM	10/21/20 2:30 PM	Tabulator 2 - Batch 1002	21
1003	10/20/20 4:56 PM	10/21/20 2:30 PM	Tabulator 2 - Batch 1003	75

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1004	10/20/20 4:57 PM	10/21/20 2:30 PM	Tabulator 2 - Batch 1004	80
2112	10/21/20 9:05 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2112	99
2113	10/21/20 9:07 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2113	95
2114	10/21/20 9:10 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2114	98
2115	10/21/20 9:14 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2115	96
2116	10/21/20 9:18 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2116	99
2117	10/21/20 9:20 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2117	100
2118	10/21/20 9:22 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2118	100
2119	10/21/20 9:28 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2119	100
2120	10/21/20 9:33 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2120	100
2121	10/21/20 9:36 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2121	100
2122	10/21/20 9:39 AM	10/21/20 2:30 PM	Tabulator 4 - Batch 2122	100
2123	10/21/20 9:42 AM	10/21/20 2:31 PM	Tabulator 4 - Batch 2123	100
1005	10/21/20 9:50 AM	10/21/20 2:31 PM	Tabulator 2 - Batch 1005	68
1006	10/21/20 9:54 AM	10/21/20 2:31 PM	Tabulator 2 - Batch 1006	37
1007	10/21/20 9:56 AM	10/21/20 2:31 PM	Tabulator 2 - Batch 1007	76
1008	10/21/20 10:14 AM	10/21/20 2:31 PM	Tabulator 2 - Batch 1008	14
4059	10/21/20 10:16 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4059	100
4060	10/21/20 10:25 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4060	100
4061	10/21/20 10:28 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4061	100
4062	10/21/20 10:32 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4062	98
4063	10/21/20 10:34 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4063	100
4064	10/21/20 10:37 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4064	100
4065	10/21/20 10:40 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4065	100
4066	10/21/20 10:43 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4066	100
4067	10/21/20 10:47 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4067	99
4068	10/21/20 10:51 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4068	100
4069	10/21/20 10:56 AM	10/21/20 2:31 PM	Tabulator 10 - Batch 4069	100
4070	10/21/20 10:59 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4070	100
4071	10/21/20 11:02 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4071	99
4072	10/21/20 11:05 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4072	100
4073	10/21/20 11:21 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4073	100
4074	10/21/20 11:27 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4074	100
4075	10/21/20 11:35 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4075	97
4076	10/21/20 11:38 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4076	100
4077	10/21/20 11:41 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4077	100
4078	10/21/20 11:46 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4078	100
4079	10/21/20 11:49 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4079	100
4080	10/21/20 11:53 AM	10/21/20 2:32 PM	Tabulator 10 - Batch 4080	100
4081	10/21/20 12:00 PM	10/21/20 2:32 PM	Tabulator 10 - Batch 4081	101
4082	10/21/20 12:02 PM	10/21/20 2:32 PM	Tabulator 10 - Batch 4082	100
4083	10/21/20 12:05 PM	10/21/20 2:32 PM	Tabulator 10 - Batch 4083	100

4084	10/21/20 12:08 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4084	100
4085	10/21/20 12:12 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4085	100
4086	10/21/20 12:15 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4086	98
4087	10/21/20 12:50 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4087	98
4088	10/21/20 12:53 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4088	95
4089	10/21/20 12:55 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4089	97
4090	10/21/20 12:58 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4090	98
4091	10/21/20 1:03 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4091	95
4092	10/21/20 1:08 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4092	98
4093	10/21/20 1:10 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4093	98
4094	10/21/20 1:13 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4094	95
4095	10/21/20 1:16 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4095	97
4096	10/21/20 1:19 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4096	96
4097	10/21/20 1:23 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4097	95
4098	10/21/20 1:28 PM	10/21/20 2:33 PM	Tabulator 10 - Batch 4098	100
4099	10/21/20 1:29 PM	10/21/20 2:34 PM	Tabulator 10 - Batch 4099	63
4100	10/21/20 1:34 PM	10/21/20 2:34 PM	Tabulator 10 - Batch 4100	100
3029	10/21/20 1:50 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3029	100
3030	10/21/20 1:53 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3030	100
3031	10/21/20 1:57 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3031	100
3032	10/21/20 2:00 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3032	100
3033	10/21/20 2:05 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3033	100
3034	10/21/20 2:08 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3034	100
3035	10/21/20 2:11 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3035	100
3036	10/21/20 2:14 PM	10/21/20 2:34 PM	Tabulator 7 - Batch 3036	99

#### **REFERENCE B – DATABASES AND TABLES**

In order to assist other researchers, who may wish to examine these findings or perform additional analysis, here are the most important databases and tables which were used in this analysis.

#### Main Election Database:

[2020 Mesa County General-2020-09-05-00-10-20]

#### Primary Tables:

ResultContainer: (Batch level raw vote data) ResultSplitter: (Vote Data by Polling Location ChoiceResult: (Raw aggregated vote data) Choice: (All Candidates/Choices) Contest: (All contests in Election) Tabulator: (All defined tabulators)

#### **Stored Procedures:**

*GetContestResults*: Displays current results of any or all contests *GetContestStatistics*: Displays stats for any or all contests, including undervotes and overvotes

#### **Adjudication Databases**

[AdjudicableBallotStore\_2020\_Mesa\_County\_General\_2020-10-21\_14:18:51] (before copy) [AdjudicableBallotStore\_2020\_Mesa\_County\_General\_2020-10-01\_12:18:50] (after copy)

#### **Primary Tables:**

Batch: Raw batch information SerializedAdjudicableBallots: Contains one data record for each ballot received. BallotStatusEvents: Every ballot with adjudication status. New records for same ballot whenever any change occurs in the status of the ballot

## **REFERENCE C – LEAD INVESTIGATOR**

#### Jeffrey O'Donnell – Database and Systems Analyst

Mr. O'Donnell has over 40 years of experience in Software and Database design. His experience includes work with Rockwell International, Westinghouse Nuclear, Mellon Bank, and the Penn State Applied Research Lab. He also has extensive experience in analyzing and predicting trends in large data sets. He now runs his own software publishing and consulting firm.