Wait Time Observations from the Maryland 2014 General Election

A report by the Schaefer Center for Public Policy
for the Maryland State Board of Elections

January 15, 2015

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Prepared for the Maryland State Board of Elections

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EXECUTIVE SUMMARY

During the 2014 regular session of the Maryland General Assembly, language was included in the general fund appropriation for the Maryland State Board of Elections that required the state and local boards of elections to take action to ensure that voters were able to complete the entire voting process within 30 minutes and to collect additional data on wait times for voters at select Early Voting centers and Election Day polling places. Further, the Maryland General Assembly requested that the State Board of Elections submit a report that (1) describes and summarizes the data collection methods used; (2) analyzes the additional data collected; and (3) includes plans for reducing wait times at Early Voting centers and Election Day polling places. See attached Appendix A.

Pursuant to Chapters 157 and 158 of the 2013 Laws passed by the Maryland General Assembly, the State Board of Elections commissioned a study of the maximum wait times for Maryland voters in the 2010 and 2012 primary and general elections to determine the causes for wait times of more than thirty minutes. A research team at the Schaefer Center for Public Policy at the University of Baltimore conducted these studies entitled "Waiting to Vote: Incidence, Causes and Cures for Long Lines at Maryland Polling Places." The report submitted to Maryland General Assembly during the 2014 regular session (hereinafter called The 2014 Schaefer Center Report) may be accessed on the Maryland State Board of Election website at www.elections.state.md.gov. The United States Government Accountability Office in its September 2014 report to congressional requesters entitled, "ELECTIONS: Observations on Wait Times for Voters on Election Day 2012," GAO-14-850, repeatedly cited the 2014 Schaefer Center Report.

As stated in the 2014 Schaefer Center Report, "the administration of elections in Maryland is a large, complex enterprise. No other function of government in Maryland involves the active participation of over two million citizens on a single day. Imagine if everyone with a driver's license had to renew that license on the same day or if all taxpayers had to pay their taxes in person on a single day."

For the 2014 gubernatorial general election, there were 3,701,834 registered voters in Maryland with another 296,203 individuals designated as "inactive" on the voter registration list.[1]

[1] "Inactive" means an individual to whom two election mail pieces have been sent and the mail pieces have been returned to the election official without forwarding information. An inactive voter stays on the inactive list for at least two consecutive federal general elections before their registration may be cancelled. Such an individual may vote in the election at the same precinct provided they affirm their address or by provisional ballot if their address has changed. The Maryland Court of Appeals, in *Doe v Montgomery County* (2008), found that for petition purposes, an inactive voter was to be treated the same as an "active" voter. In the 2012 presidential general election, 18,681 individuals listed as "inactive" were recorded as having cast ballots, representing 0.7% of the total voter turnout.

A total of 1,745,104 individuals endeavored to cast a ballot in the 2014 gubernatorial general election. This represented 47.14% of registered voters and 38.79% of the estimated voting age population in Maryland.

This percentage turnout of registered voters for a gubernatorial general election is the lowest percentage reported since complete data has been available and reported. The previous low was 54.26% in 1986.

On Election Day, November 4, 2014, 1,347,729 individuals were recorded as being issued a ballot access card for use in voting on the AccuVote TS direct recording electronic touchscreen voting units at the 1,603 polling place locations for the 1,986 precincts in the state of Maryland.

Another 307,646 individuals voted on the touchscreen voting units during the eight days of early voting at sixty-four (64) designated locations throughout the State. This represented 8.31% percent of total active registered voters and 17.6% of total voter turnout in the 2014 gubernatorial general election.

Another 35,064 individuals cast provisional ballots at polling place locations and early voting centers during the 2014 gubernatorial general election, representing 2.01% of total voter turnout, with 32,459 or 92.57% being counted in whole or in part.

Individuals made 68,272 requests for an absentee ballot in the 2014 gubernatorial general election with 54,665 *(80.07%)* of those absentee ballots returned to local boards of election for processing. Of the absentee ballots returned, 53,851 *(98.51%)* were accepted for counting and 811 *(1.48%)* were rejected.

Responsibility for the conduct of elections in the State is divided between the Maryland State Board of Elections and twenty-four local boards of elections. The preparation for an Election Day is a significant task for every jurisdiction but is appreciably compounded by the number of potential voters a jurisdiction must serve. The range of registered voters among Maryland jurisdictions is from 12,812 in Kent County to 640,426 in Montgomery County.[2]

Elections are administered at the local level by boards of elections and local election directors with limited staff. They recruit, train, assign and supervise over 21,000 election judges (who often work a fifteen hour day, for a modest, variable stipend) to capture and collect the votes cast by individuals in 1,986 precincts in 1,603 polling place locations throughout the State.

Based upon a review of all available data maintained by the State Board of Elections and the twenty-four local boards of elections, few voters experienced wait times in excess of thirty minutes during the 2014 gubernatorial general election.[3] Based upon reported incidents from individual precinct polling places and based upon the model constructed by the research team, it was determined that very few voters may have

[2] Registration as of November 30, 2014.

[3] It should be noted that some voters arrived at an early voting center or a precinct polling location over 30 minutes before the opening of the polls and some voters arrived more than an hour before the polling places opened.

had wait times in excess of thirty minutes at various times on the Election Day, November 4, 2014, and that during the early voting period, October 23 through 30, 2014, only some voters at only a few early voting centers experienced wait times in excess of thirty minutes.

A substantial number of variables affect wait times at precinct polling locations and early voting centers including the allocation of voting system equipment, the physical characteristics of the polling place locations, the pattern of voter arrival at the polling place, the preparedness of the voters, the length of the ballot, and the efficacy of the election judges. These variables are not constant between elections; they are not constant among the twenty-four local election jurisdictions in the State; and they are not constant among the precincts within each of the twenty-four local jurisdictions administering the election.

In the 2014 Schaefer Center Report, the factors identified by the research team during the 2012 presidential general election as most likely affecting wait times were: (1) the length of the ballot in some jurisdictions; (2) the lack of sufficient voting machines in some precincts; and (3) the physical characteristics of some precinct polling place locations. During the 2014 gubernatorial general election, ballot length and the physical characteristics of some precincts were observed as contributing factors to voter wait times although, with a reduced voter turnout at both early voting centers and at precinct polling locations, almost all voters did not experience wait times in excess of thirty minutes during the 2014 gubernatorial general election.

Also contributing to lower wait times for many voters at early voting centers in the 2014 gubernatorial general election was the increase in the number of early voting centers from forty-eight in 2012 to sixty-four in 2014. The allocation of electronic pollbooks and touchscreen voting units was able to handle the reduced voter turnout in the 2014 gubernatorial general election.

The 2016 presidential election cycle will present significant challenges to the State and local boards of elections in their effort to administer the election and manage the election process at the early voting centers and precinct polling locations. Voter turnout for the 2016 presidential general election is likely to exceed 75% of registered voters (approximately 2.8 million voters) which will again strain the resources of the local boards of elections in processing voters and increase wait times at the early voting centers and precinct polling places. During the 2016 presidential primary, voter turnout will be enhanced in Baltimore City insofar as the ballot will include, for the first time, election contests for mayor, comptroller, city council president and fourteen council districts.

The new statewide voting system will be deployed in the 2016 presidential primary and general elections requiring new election administration rules and procedures, revised and enhanced election judge training, and extensive voter education efforts. Although some voters in a majority of counties have experience with an optical scan voting system last used in 2002, nearly 1.6 million other voters (43% of total registered voters) in four jurisdictions (Allegany County, Baltimore City, Montgomery County and Prince George's County) have not previously used an optical scan voting system.

The administration of elections will also be impacted in the 2016 presidential primary election by the legislative requirement to offer "same day" voter registration to individuals who appear at an early voting center during the eight days of early voting. A qualified individual who is not registered to vote will be able

to complete a voter registration application and cast a ballot in the 2016 presidential primary election. *See Chapter 43, 2013 Laws.*

STUDY METHODOLOGY

Key findings from the 2014 Schaefer Center report were that early voting center voters experienced more severe delays than those who voted on Election Day and that delays on Election Day and in early voting appeared to be highly correlated with the average length of the ballot in the jurisdictions. It was found that many precinct polling places had wait times in excess of 30 minutes. Therefore, for this report, a data collection plan was designed to further specify the extent of these phenomena. The data collection plan was also designed to test whether data collection procedures could adequately capture some variables that would help better explain the origins of excessive wait times.

For this study, early voting centers and Election Day precinct polling places were chosen for observation from the jurisdictions which had the most severe wait problems in 2012. These were the five most populous jurisdictions in the State. Another criterion for observation was that the polling place appeared to be susceptible to problems in the future. Early voting centers were chosen, in part, because of the large volume of voters who could be expected to use those sites. Since the number of early voting centers had increased from 46 in 2012 to 64 in 2014 and the period of early voting increased by three days (from five to eight days), there was uncertainty at the beginning of the observation period about which early voting centers might experience the greatest number of voters. Observations were made at the early voting centers that handled the most voters during the early voting period, October 23 through October 30, 2014.[4]

It must be stressed that the voting locations selected to be observed were not selected at random. One factor in selecting these locations was that it was expected that they were more likely to encounter wait time problems than other locations. This research was designed not to find the average experience in the State but to find and better specify specific problems. Because of the relatively low turnout there were few actual wait line problems in the State. The data presented should be read as observations from precincts that could have been expected to have problems and not as data from representative precincts.

Twenty-one observers were recruited to make observations of polling places and of voter behavior during the voting process. Appendix A includes the form that observers were given to record their observations about the early voting centers. Appendix B includes the form that the observers were given to record their observations of the voters. The observations of the voters included five different stages of the voting process:

1. The time the voter entered the check-in line,
2. The time it took that voter to reach the check-in desk,

[4] The early voting center that handled the most voters in the 2014 gubernatorial general election early voting period was the Randallstown Community Center in Baltimore County (11,489 voters). The second most number of voters were processed by the Wayne K. Curry Center in Prince George's County (9,728 voters).

3. The time taken from the time the voter arrived at the check-in desk until the voter received a voter access card,
4. The time it took from the time the voter received the voter access card until the voter began using the touchscreen voting unit,
5. The time from the beginning of using the voting unit until the voter completed voting.

In the analyses of this data, the time spent waiting to check-in (part 2 above) was added to the time from the time taken from the time the voter reached the check-in desk and received a voter access card (part 3 above) and then added again to the time from getting a card until the voter began using the touchscreen voting unit (part 4 above) to calculate the total wait time.

The twenty-one observers visited forty-three polling place locations. Observations were made at fifteen early voting centers during the early voting period from October 23 through October 30, 2014, and at twenty-eight precinct polling places on Election Day, November 4, 2014. Appendix D lists the observers and the polling place locations at which voters were observed. While they were at these polling places, the study observers recorded that 9,213 votes were cast, 5,617 early voters and 3,596 on Election Day. Of these voters, the study observers made and recorded observations of 1,293 voters through the various stages of the voting process. For a variety of reasons, not all voters were able to be observed in all five areas of study. Appendix E presents additional data gathering forms that were used to collect other data on the length of lines at the voting locations that were observed.

In addition to the direct observation of voters at early voting centers and at precinct polling places, the data and information from the electronic pollbooks and the touchscreen voting units was again analyzed to determine the volume and pace of voting at the sixty-four early voting centers and the 1,986 precinct polling places on Election Day, November 4, 2014.

A mathematical model of the relationships between the factors contributing to wait time was developed and presented in the 2014 Schaefer Center Report on wait times in the 2012 election. That model has been updated with the observations described above and with data from the electronic pollbooks from the 2014 election.

This model can be used to ascertain the extent and duration of the wait times at the opening and at the closing of the day. Using the model the research team reached a set of conclusions about wait times in the 2014 gubernatorial general election and how those wait times compared with the wait times in the 2012 election.

Assisting in the analysis of early voting data and information were records made by local election officials at each early voting center, on each day of the early voting period, of the number of individuals in the check-in line at the time the early voting center was opened (10:00 am) and of the number of voters in the check-in line at the time the early voting center was closed each day (8:00 pm).

ANALYSIS OF THE DATA COLLECTED

GENERAL RESULTS

The 2014 Schaefer Center Report on waiting times in the 2012 general election found that "The average number of words in the ballots for those jurisdictions with more than 15% of the respondents saying they waited more than 30 minutes was 1,749 words. The average number of words for the other jurisdictions was 1,073 words. Ballot length clearly contributed to the problem of lines in 2012."

To confirm and further specify this factor, the study observers recorded 1,149 observations of the time a voter spent at a voting machine. The mean time these voters spent was 4 minutes and 45 seconds. The median time was 4 minutes and 12 seconds. That the median is so much lower than the mean indicates that the distribution of these times is not a normal distribution and that some voters spend much more time than average at the voting machine. Other times were also observed. Table One shows these results below.

Table One: Summary of All the Time Related Observations Collected

All 2014 Observations	**Time in Seconds Waiting in Line to be Checked In**	**Time in Seconds Spent at the Check-in Desk**	**Time in Seconds between Completing Check-in and Accessing the Touchscreen**	**Time in Seconds to Complete the Ballot**	**Sum of Time in Seconds from Arrival until Accessing the Touchscreen**
Mean	100.91	85.17	59.89	285.62	245.37
Median	0	73	18	252	120
Std. Deviation	329.79	48.41	120.70	143.46	372.31
Minimum	0	35	0	26	39
Range	2700	674	871	1534	3069
Maximum	2700	709	871	1560	3108
Number of Observations	1168	1056	1116	1149	1013

Consistent with the findings from 2012, observed wait times in 2014 were significantly longer during early voting than on Election Day, although all average wait times were shorter during the 2014 election than in the 2012 election.

Early Voting voters in the non-random sample observed in 2014 had an average total wait time of 5 minutes, 9 seconds and Election Day voters had an average total wait time of 2 minute and 54 seconds.

Tables Two and Three presented below show the measures of observed wait times by early voters and Election Day voters.

Table Two: Summary of All the Time Related Observations Collected at Election Day Locations

All Election Day Observations	Time in Seconds Waiting in Line to be Checked In	Time in Seconds Spent at the Check-in Desk	Time in Seconds between Completing Check-in and Accessing the Touchscreen	Time in Seconds to Complete the Ballot	Sum of Time in Seconds from Arrival until Accessing the Touchscreen
Mean	31.67	84.51	65.81	299.43	174.29
Median	0	69	11	267	106
Std. Deviation	87.66	58.91	149.53	142.52	187.13
Minimum	0	35	0	35	39
Range	780	674	871	1050	1098
Maximum	780	709	871	1085	1137
Number of Observations	614	501	536	572	479

Table Three: Summary of All the Time Related Observations Collected at Early Voting Locations

All Early Voting Observations	Time in Seconds Waiting in Line to be Checked In	Time in Seconds Spent at the Check-in Desk	Time in Seconds between Completing Check-in and Accessing the Touchscreen	Time in Seconds to Complete the Ballot	Sum of Time in Seconds from Arrival until Accessing the Touchscreen
Mean	177.64	85.77	54.42	271.94	309.14
Median	6	75	25	240	135
Std. Deviation	458.02	36.46	85.64	143.19	472.41
Minimum	0	36	0	26	56
Range	2700	350	793	1534	3052
Maximum	2700	386	793	1560	3108
Number of Observations	554	555	580	577	534

Table Four presents the observations about the time it took to complete the ballot at selected locations by County and the time it took per word on the average ballot.

Table Four: Average Time to Complete Ballot by County and by Number of Ballot Words

Time in Seconds to Complete the Ballot		*Baltimore City*	*Prince George's*	*Montgomery*	*Baltimore County*	*Howard*	*Anne Arundel*	*Carroll*
	Ballot Words	1821	1336	1058	1042	836	768	759
Election Day	Mean Time on Ballot	266.77	325.75		318.69		245.17	
	Number of Observations	169	255	0	93	0	55	0
Early Voting	Mean Time on Ballot	308.26	314.16	240.39	305.17	224.52	220.17	237.27
	Number of Observations	61	176	18	86	21	204	11
All Days	Seconds per Ballot Word	0.15	0.24	0.23	0.30	0.27	0.29	0.31

REPORTS AND POLLBOOK DATA FROM THE EARLY VOTING CENTERS

For the 2014 gubernatorial general election, local election officials were asked to report the length of lines at the opening of the day and at the end of the day for each of the Early Voting Centers in the State. Appendix E shows the report form these local officials used. Reports from the early voting centers showed that few of these had significant lines. There were lines of more than 40 people at the closing time of 8:00 pm only on the last day of early voting. On no other day was a close-of-the-day line as long as 40 people as reported by local officials. Seven early voting centers reported lines exceeding this length on the last day of early voting (October 30, 2014). They were:

- Odenton Regional Library, Anne Arundel County (82)
- Bloomsbury Community Center, Baltimore County (119)
- Randallstown Community Center, Baltimore County (156)
- Honeygo Community Center, Baltimore County (49)
- Charles County Board of Elections, Charles County (47)
- Wayne K. Curry Sports and Learning Center, Prince George's County (210)
- Upper Marlboro Community Center, Prince George's County (65)

The Wayne K. Curry Center in Prince George's County reported the most severe problem on the last day of early voting with a line of 210 people at 8:00 pm. The Randallstown Community Center in Baltimore County had the second most number of people in line (156) at the close of the last day of early voting.

An observer from the research team was at the Wayne K. Curry Center on the last day of early voting and reported significant lines. The wait at the Curry Center that evening and the lines at the Curry Center at the opening of the early voting period on the first day were the only wait times exceeding 30 minutes reported by the observer team.

Analysis of the electronic pollbook data from the early voting centers show when the last voter checked-in. A total of 603 voters out of 310,569 (0.19%) were checked-in after the official poll closing time at 8:00 pm at early voting centers in the 2014 gubernatorial general election. This compares with nearly 28,000 voters checked-in after hours during the 2012 presidential general election early voting period.

Only on the last day of the early voting period (October 30, 2014), and only at ten early voting centers, were voters checked-in more than three minutes after the 8:00 pm closing time.

Table Five (below) shows those early voting centers, the time the last ballot access card was issued, and the estimated time the last voter completed the voting process. Four of the centers were in Prince George's County, three in Baltimore County and one each in Anne Arundel County, Baltimore City and Charles County. The results from the mathematical model, informed by pollbook data, indicates that at all locations except the Randallstown Community Center (Baltimore County) and Wayne K. Curry Sports and Learning Center (Prince George's County), voting was completed voting by 8:30 pm.

Table Five: Early Voting Centers with Close-of-day Lines in the 2014 General Election

Poll#	Location	Date	Time Last ballot issued	Number of ballots issued after hours	Estimated time last voter finished on touchscreen
17EV04	Wayne K. Curry Sports and Learning Center	10/30/2014	8:57:34 PM	195	9:31:22 PM
04EV02	Randallstown Community Center	10/30/2014	8:27:25 PM	114	8:44:41 PM
04EV01	Bloomsbury Community Center	10/30/2014	8:27:34 PM	45	8:38:45 PM
17EV03	Bowie Community Center	10/30/2014	8:15:18 PM	70	8:27:25 PM
02EV01	Odenton Regional Library	10/30/2014	8:14:20 PM	50	8:24:46 PM
04EV04	Honeygo Community Center	10/30/2014	8:13:40 PM	50	8:23:21 PM
17EV01	Upper Marlboro Community Center	10/30/2014	8:10:17 PM	39	8:17:03 PM
09EV01	Charles County Elections	10/30/2014	8:06:35 PM	10	8:10:22 PM
17EV05	Southern Regional Tech and Rec Complex	10/30/2014	8:04:46 PM	17	8:07:42 PM
03EV02	League for People with Disabilities	10/30/2014	8:04:50 PM	13	8:07:19 PM

Attached to this report as Appendix G is Table Ten showing the number of early voting centers in the twenty-three counties and Baltimore City in the 2010, 2012, and 2014 general elections along with the corresponding total number of early voters, early voters per center, average voters per day, early voting as a percentage of total turnout and a percentage of voter registration. The largest number of early voters in a jurisdiction was Prince George's County in 2010 (38,540), Montgomery County in 2012 (77,939), and Baltimore County in 2014 (51,814). The range of average early voters per day among Maryland's 24 jurisdictions in the 2014 gubernatorial election was from 170 in Garrett County to 1,002 in Carroll County. Talbot County is the jurisdiction with the highest percentage of early voters with 31.7% in the 2014 gubernatorial general election.

Table Six (on the following page) depicts jurisdictions with the largest number of early voters in the 2010, 2012 and 2014 general elections, the lowest and highest total turnout of voters at an early voting center in the jurisdiction, the lowest and highest turnout in the jurisdiction on a single day and the range of voter turnout at early voting centers on the last day of early voting in each respective election year. Particularly noteworthy is the significant range of voters at individual voting centers in an election year, even within a single jurisdiction. In 2012, turnout at a single early voting center reached 4,574 voters in Montgomery County and 4,276 voters in Prince George's County.

With the number of early voting centers increased from 46 in 2012 to 64 in 2014, the capacity to handle early voters has been correspondingly increased; but, with a heavy voter turnout reasonably anticipated for the 2016 presidential general election, voters could confront wait times again in excess of thirty minutes at some early vote centers, particularly on the last day of early voting.

Table Six: Early Voting Turnout for 2010, 2012, and 2014 General Elections in Largest Jurisdictions

		Count of EV Centers	Total Early Voters	Average Early Voters per Early Voting Center	Lowest Total Turnout of an Early Voting Center	Highest Total Turnout of an Early Voting Center	Lowest Countywide Turnout on a Single Day	Highest Countywide Turnout on a Single Day (the Last Day)	Turnout Range between the Centers on the Last Day
Anne Arundel	**2010**	5	28,944	5,789	3,931	7,238	4,096	5,759	833 - 1,380
	2012	5	38,140	7,628	7,112	8,220	4,583	9,840	1,818 - 2,191
	2014	5	38,656	7,731	5,999	8,874	2,349	7,513	1,225 - 1,735
Baltimore City	**2010**	5	19,866	3,973	1,848	6,746	2,231	4,956	502 - 1,465
	2012	5	45,515	9,103	5,386	11,639	5,947	11,092	1,400 - 2,756
	2014	6	25,924	4,321	1,875	7,354	1,249	5,765	508 - 1,506
Baltimore County	**2010**	5	31,239	6,248	3,732	8,877	3,907	6,976	914 - 1,762
	2012	5	56,243	11,249	7,002	16,184	7,301	13,869	1,771 - 3,881
	2014	8	51,814	6,477	2,372	11,489	2,416	10,488	499 - 2,288
Frederick	**2010**	1	5,816	5,816	-	-	828	1,268	-
	2012	1	13,862	13,862	-	-	1,869	3,137	-
	2014	3	10,713	3,571	1,260	6,883	611	2,029	251 - 1,274
Harford	**2010**	1	11,108	11,108	-	-	1,608	2,158	-
	2012	1	16,388	16,388	-	-	2,228	4,201	-
	2014	4	17,965	4,491	2,356	9,822	751	3,863	547 - 2,061
Howard	**2010**	3	14,901	4,967	1,918	6,755	2,214	3,242	440 - 1,422
	2012	3	30,463	10,154	6,778	12,468	3,959	7,444	1,634 - 3,035
	2014	3	21,432	7,144	3,518	9,859	1,652	4,417	867 - 1,875
Montgomery	**2010**	5	26,707	5,341	3,951	6,601	3,786	6,325	1,004 - 1,474
	2012	5	77,939	15,588	13,384	18,261	10,458	19,955	3,271 - 4,574
	2014	9	35,444	3,938	1,468	5,740	2,414	7,888	358 - 1,306
Prince George's	**2010**	5	38,540	7,708	4,277	10,024	4,330	9,268	1,214 - 2,193
	2012	5	69,929	13,986	12,221	15,312	8,969	18,384	3,063 - 4,276
	2014	8	46,236	5,780	1,342	9,728	2,079	10,797	333 - 2112

MEASURING THE EFFECT OF BALLOT LENGTH

OBSERVATIONS AND REGRESSION ANALYSIS

A history of the changes in the length of ballots by jurisdiction for the 2008 to 2014 general elections is presented in Appendix F.

The effect of ballot length on the time taken at the voting unit station is demonstrated by comparing the observations taken in Anne Arundel County to those taken in Prince George's County. There were 259 observations from Anne Arundel County. The average ballot length in Anne Arundel County in 2014 was 768 words and those voters averaged 3 minutes and 45 seconds at the touchscreen voting unit. There were 431 observations from Prince George's County. The average ballot length of the English language ballots in Prince George's County was 1,336 words and those voters averaged 5 minutes and 21 seconds at the touchscreen voting unit.

Using observations from these counties and others, a series of regression analyses were conducted. These analyses indicated that for every additional 100 words on the ballot it may add an additional 16 to 26 seconds to the time the voter takes at the voting unit station.

With Baltimore City observations included in a regression equation without a constant, the regression estimate of the additional number of seconds added to the time voters took once they began to use the touchscreen was about 22 seconds for every 100 additional words on the ballot. If we consider Baltimore City to be anomalous and take those observations out of the analysis, then the estimate goes up to 26 additional seconds for every 100 extra words on the ballot.

As noted in the 2014 Schaefer Center Report on the 2012 election, bottlenecks or lines may appear at different stages in the voting process depending on the configuration and the demands on a particular precinct polling place. If the time to complete and cast the ballot is the bottleneck in the polling place, then these additional seconds add up quickly and can be the cause of wait times throughout the entire voting process.

The most common bottleneck in the 2012 general election was the time the voter spent at the touchscreen voting unit. The introduction of a new voting system to be implemented during the 2016 presidential primary and general elections will alter the voting process at the early voting centers and at the precinct polling places. Further study will be required to determine potential bottlenecks that might create lines causing wait times with the implementation of the new voting system for the 2016 primary and general elections.

ANALYSIS OF ELECTRONIC POLLBOOK AND TOUCHSCREEN DATA

A mathematical model of the relationships between the factors contributing to wait time was developed and presented in the 2014 Schaefer Center Report on wait times in the 2012 election. That model has been updated with the observations described above and with data from the electronic pollbooks used in the 2014 gubernatorial general election.

This model can be used to ascertain the extent and duration of the wait times at the opening and at the closing of the day. Using the model the research team reached a set of conclusions about wait times in the 2014 gubernatorial general election and how those wait times compared with the wait times in the 2012 election. Among the conclusions are:

1. In 2012, nearly half of early voters and 10% of Election Day voters experienced wait times of over 30 minutes. Long waits during early voting were concentrated in the six largest jurisdictions, and were exacerbated by cancellation of scheduled early voting on Monday October 29 and Tuesday October 30, 2012, due to Hurricane Sandy. On Election Day, November 6, 2012, the majority of voters waiting more than 30 minutes were in Anne Arundel County, which experienced unusually long lines due to a heavy presidential election voter turnout and to a very lengthy ballot including seven statewide ballot issues and fifteen local issues. Bottlenecks waiting for the touchscreen voting machines to become available were created at the early voting centers and precinct polling places.

2. In 2014, only six of 1,986 polling places experienced after-hours voting activity on Election Day, November 4, 2014. About 60 polling places (3.74% of total polling places) were estimated to have had small numbers of voters (average of about 30 voters) who experienced waits of more than 30 minutes during the day. These increased waits were typically due to unusual spikes in near simultaneous arrivals of voters and with a touchscreen voting machine taken out of service due to equipment failure.

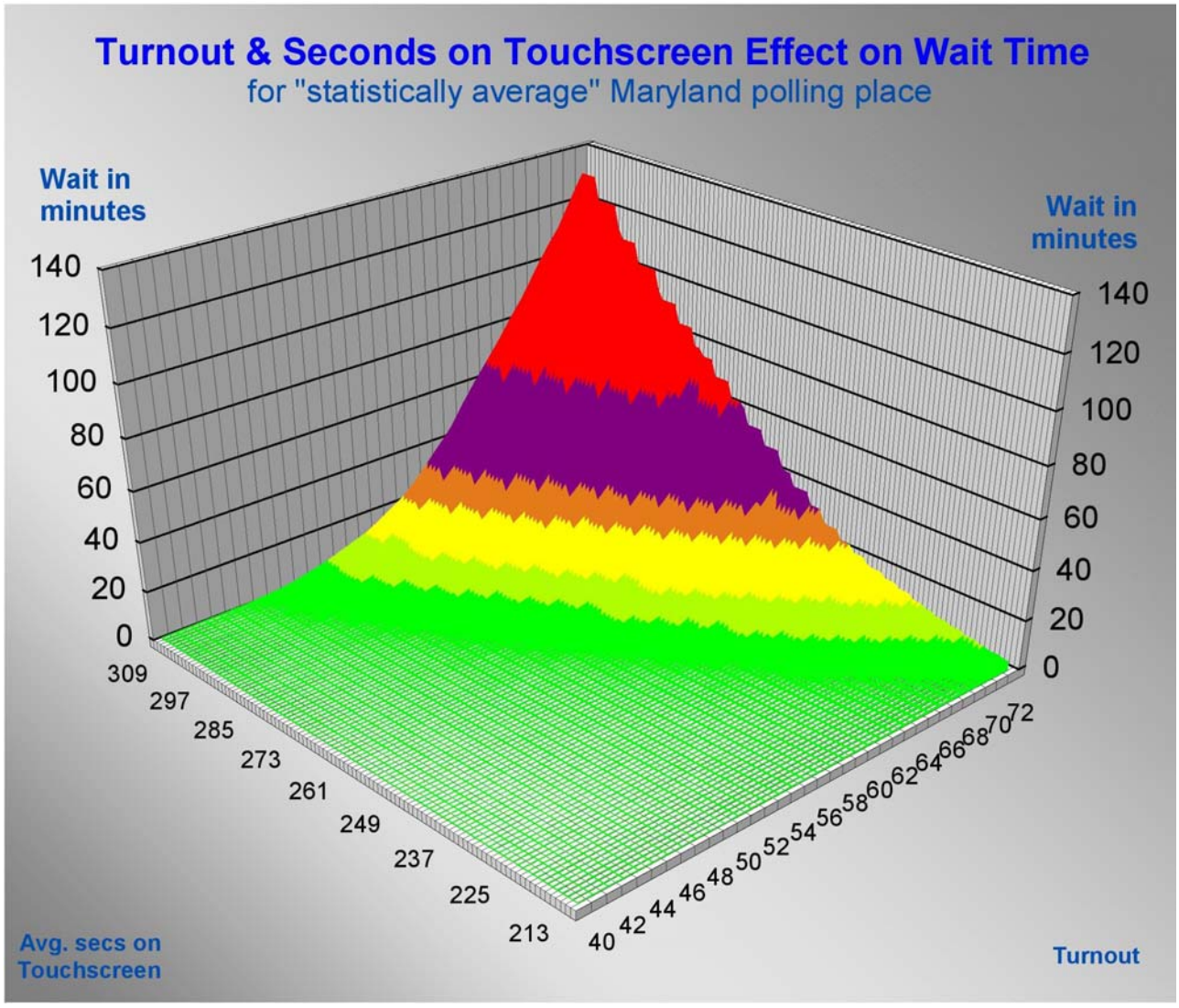
Table Seven shows the number of voters during election voting and on Election Day for the 2012 and 2014 general elections along with estimated wait times in each jurisdiction using the research team mathematical models.

Table Seven: Estimated Wait Times by Jurisdiction for the 2012 and 2014 General Elections

County	2012 Presidential General Election						2014 Gubernatorial General Election					
	Early Voting			Election Day			Early Voting			Election Day		
	Total Voted	Estimated Voters with Wait > 30 Minutes	% Waiting > 30 Minutes	Total Voted	Estimated Voters with Wait > 30 Minutes	% Waiting > 30 Minutes	Total Voted	Estimated Voters with Wait > 30 Minutes	% Waiting > 30 Minutes	Total Voted	Estimated Voters with Wait > 30 Minutes	% Waiting > 30 Minutes
Allegany	2,695		0.0%	25,423		0.0%	1,505		0.0%	18,476		0.0%
Anne Arundel	38,136	26,720	70.1%	203,416	106,077	52.1%	38,668	50	0.1%	133,104		0.0%
Baltimore City	45,510	19,601	43.1%	187,721	22,216	11.8%	25,953	13	0.1%	107,889	524	0.5%
Baltimore County	56,236	38,493	68.4%	302,292	33,657	11.1%	51,829	301	0.6%	202,933	493	0.2%
Calvert	7,039	1,713	24.3%	35,453	512	1.4%	4,753		0.0%	27,083	145	0.5%
Caroline	2,365		0.0%	10,257		0.0%	1,606		0.0%	7,395		0.0%
Carroll	10,408	1,626	15.6%	72,620		0.0%	8,017		0.0%	54,682	20	0.0%
Cecil	5,890		0.0%	34,419	1,088	3.2%	4,126		0.0%	22,032	23	0.1%
Charles	11,988	5,964	49.7%	58,693		0.0%	6,878	10	0.1%	38,989		0.0%
Dorchester	2,465		0.0%	11,878		0.0%	1,607		0.0%	8,454		0.0%
Frederick	13,862		0.0%	96,185		0.0%	10,711		0.0%	66,795	45	0.1%
Garrett	1,550		0.0%	10,662		0.0%	1,357		0.0%	7,565		0.0%
Harford	16,390	2,100	12.8%	103,062	1,755	1.7%	18,007		0.0%	70,867	320	0.5%
Howard	30,461	13,446	44.1%	111,939		0.0%	21,439		0.0%	80,519	52	0.1%
Kent	2,385		0.0%	6,840		0.0%	1,969		0.0%	5,528		0.0%
Montgomery	77,939	35,694	45.8%	329,726	2,737	0.8%	35,449		0.0%	211,662	56	0.0%
Prince George's	69,929	61,632	88.1%	284,899	37,447	13.1%	46,273	321	0.7%	162,335		0.0%
Queen Anne's	4,012		0.0%	19,332		0.0%	5,157		0.0%	13,756	50	0.4%
Saint Mary's	7,096	1,957	27.6%	37,363		0.0%	4,473		0.0%	26,987	34	0.1%
Somerset	1,655		0.0%	7,661		0.0%	1,263		0.0%	5,109	98	1.9%
Talbot	5,948		0.0%	12,845		0.0%	4,868		0.0%	9,687	82	0.8%
Washington	7,349		0.0%	51,896		0.0%	3,503		0.0%	34,015		0.0%
Wicomico	6,415	237	3.7%	32,109	1,909	5.9%	4,948		0.0%	19,868		0.0%
Worcester	2,824		0.0%	21,840		0.0%	3,441		0.0%	14,816		0.0%
Maryland	**430,547**	**209,183**	**48.6%**	**2,068,531**	**207,398**	**10.0%**	**307,800**	**695**	**0.2%**	**1,350,546**	**1,942**	**0.1%**

The mathematical model developed by the research team can be used to relate the key variables of average seconds at the Touchscreen and turnout percentage with the wait times that voters have experienced using the current system. Chart I graphically depicts this three-dimensional relationship. It shows that as seconds on the touchscreen approaches five minutes and as turnout percentage nears 70% the average wait time at a polling place will increase dramatically.

Chart I: Turnout & Seconds on Touchscreen Effect on Wait Time



OVERVIEW OF 2014 VERSUS 2012 WAIT TIMES

Lines form, and wait times increase, in a polling place whenever the number of voters arriving exceeds the throughput capacity of the polling place.

Voter turnout is the key variable determining the number of voters arriving over the timespan of a day's voting. Of course, the number of voters arriving during any given time segment is affected as well by daily turnout patterns (which are in turn influenced by the demographics of voters assigned to a polling place) as well as random variations in arrivals.

The throughput capacity of a polling place is affected by a number of factors as well, including its physical layout, the quality of polling place management, and voter familiarity with the voting system. However, the gating factors for voter throughput are most likely to be either the check-in process or the process of casting the ballot by voters.

Voter check-in in Maryland is done with an electronic pollbook operated by a check-in election judge. Check-in throughput capacity of a polling place is a function of the number of electronic pollbooks deployed and the proficiency of the check-in judges. The electronic pollbooks (as opposed to the voting machines) were the most likely bottleneck in fewer than 1% of polling places in 2014 and in about 6% of polling places in 2012. Almost all of the affected 2012 polling places were in Baltimore County, and it is estimated that about 13,000 of the 34,000 Baltimore County voters who waited more than 30 minutes on Nov 6, 2012 were due to an insufficient number of electronic pollbooks. Baltimore County increased their number of Election Day pollbooks by 34% in 2014, an average increase of one pollbook per polling place.

It should be noted that with the statewide use of a new optical scan (paper based) voting system in 2016, the electronic pollbooks will no longer have to read from, or write to, the "smart cards" that are used for ballot activation on the Touchscreen voting machines. It is estimated that the elimination of the card read/write processes will improve the overall throughput of the electronic pollbooks by 5 to 10%.

In the 2012 election, the touchscreen voting machines were much more likely than the electronic pollbooks to be the bottleneck leading to long wait times. In 2012, hourly check-ins significantly exceeded touchscreen throughput capacity at some point in the day in 579 of the 1,795 polling places (32%). This compares with less than 1% of polling places in the 2014 gubernatorial general election.

The total number of voting machines deployed was about the same in 2012 and 2014 general elections. However, the statewide average effective "load" on each touchscreen voting unit was less than half in 2014 compared with 2012, due to a 35% lower voter turnout and 25% shorter ballots on average in 2014.

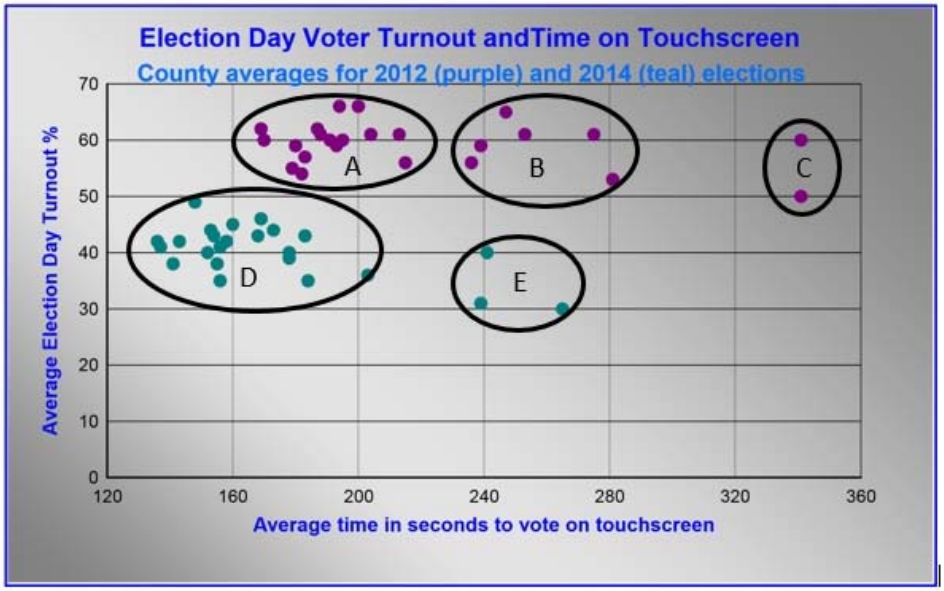
Table Eight shows average Election Day turnout (excluding early voting and absentees) and estimated "time on touchscreen" (calculated from ballot length) for the 2012 and 2014 elections for each county. It can be seen that 2014 Election Day turnout was substantially lower than 2012 turnout in all counties and averaged over 20 percentage points lower statewide. It can also be seen that estimated time on touchscreen was lower in 2014 for all counties except Charles County (which was below the State average in both elections).

Table Eight: Election Day Turnout and Estimated Average Time on the Touchscreen for the 2012 and 2014 Elections by Subdivision

	2012 County Average		2014 County Average	
County	Turnout	Seconds on TS	Turnout	Seconds on TS
Allegany	61.1%	188	44.2%	153
Anne Arundel	60.2%	341	39.6%	152
Baltimore City	50.2%	341	29.7%	265
Baltimore County	60.7%	275	40.3%	241
Calvert	61.4%	204	46.0%	169
Caroline	58.8%	193	42.3%	143
Carroll	66.3%	194	48.7%	148
Cecil	56.4%	215	36.0%	203
Charles	61.7%	169	39.7%	178
Dorchester	59.3%	180	41.2%	137
Frederick	66.2%	200	45.4%	160
Garrett	56.9%	183	39.2%	178
Harford	65.4%	247	43.7%	173
Howard	60.6%	253	41.9%	158
Kent	54.6%	179	43.1%	154
Montgomery	55.5%	236	34.6%	184
Prince George's	53.1%	281	31.2%	239
Queen Anne's	61.3%	213	42.8%	183
Saint Mary's	59.5%	195	43.1%	168
Somerset	60.0%	170	38.0%	141
Talbot	54.2%	182	41.1%	156
Washington	60.1%	191	37.8%	155
Wicomico	59.1%	239	35.4%	156
Worcester	61.9%	187	41.9%	136
Maryland	57.8%	263	37.4%	198

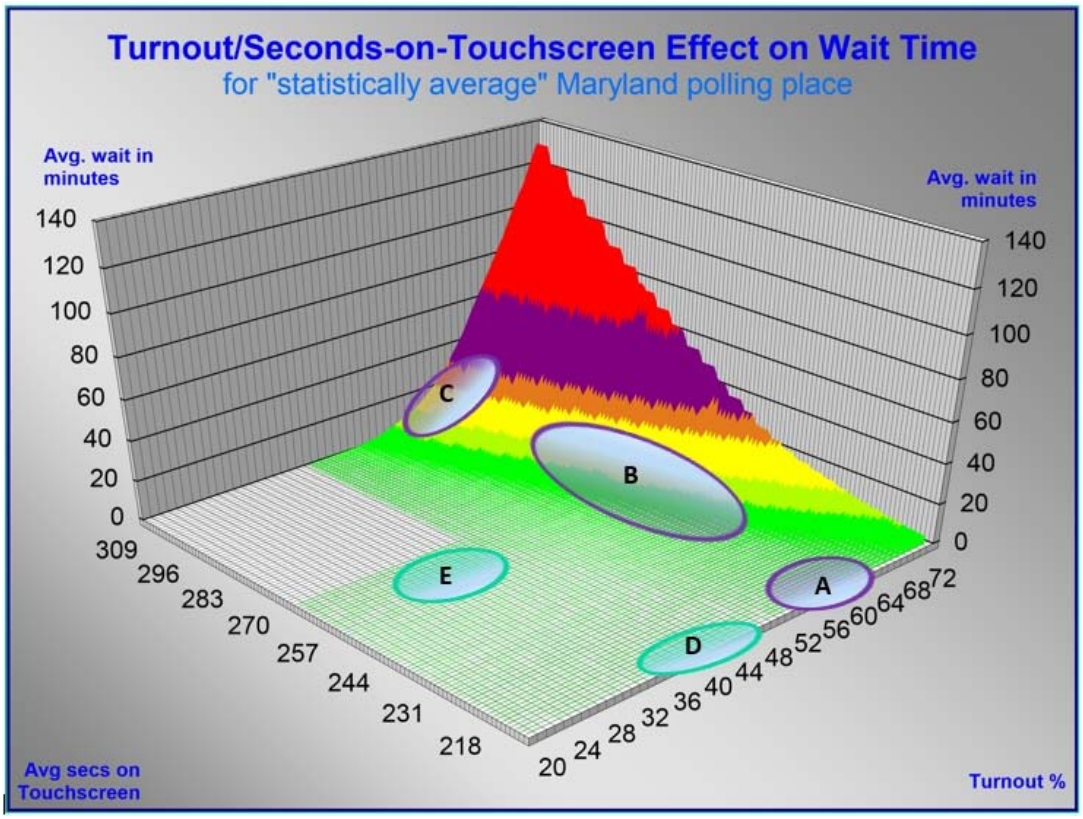
The values from the previous table (Table Eight) are also plotted on Chart II, presented below.

Chart II: Election Day Voter Turnout and Time on Touchscreen



The turnout and "time on touchscreen" ranges for county clusters A-E are transposed onto the next chart (Chart III on the following page), which shows average wait time plotted against turnout and time on touchscreen. It can be seen that though all counties experienced higher turnout in 2012, those with shorter ballots (Cluster A) had minimal wait times while those with the longest ballots (Cluster C—Anne Arundel County and Baltimore City) had longer wait times. In 2014, Election Day turnout was low enough so that even those jurisdictions with the longest ballots (Cluster E—Baltimore County, Baltimore City, and Prince George's County) experienced minimal wait times in most polling places.

Chart III: Turnout/Seconds-on-Touchscreen Effect on Wait Time



2012 Groups

A	
Allegany	Garrett
Calvert	Kent
Caroline	Queen Anne's
Carroll	Saint Mary's
Cecil	Somerset
Charles	Talbot
Dorchester	Washington
Frederick	Worcester

B
Baltimore County
Harford
Howard
Montgomery
Prince George's
Wicomico

C
Anne Arundel
Baltimore City

2014 Groups

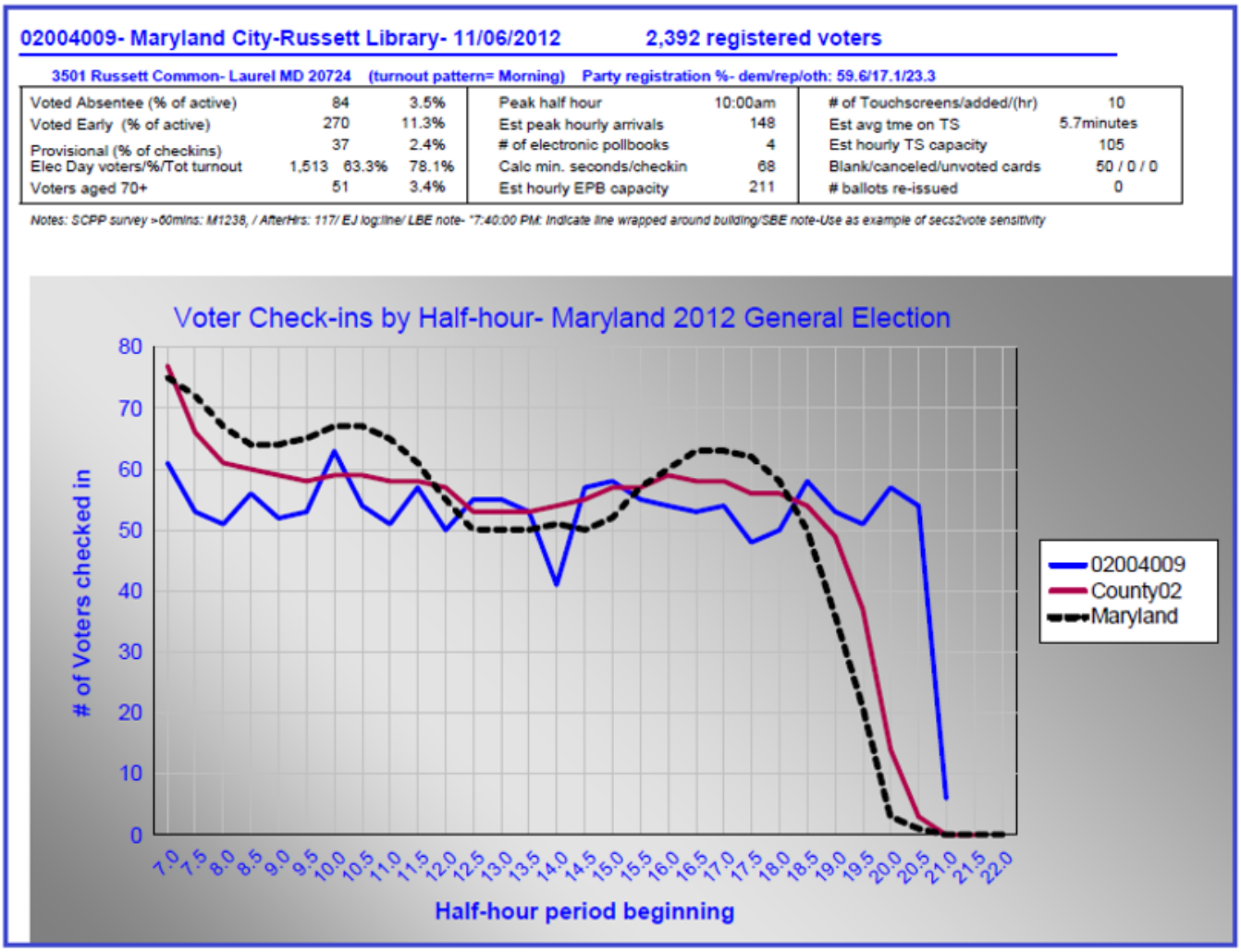
D	
Allegany	Howard
Anne Arundel	Kent
Calvert	Montgomery
Caroline	Queen Anne's
Carroll	Saint Mary's
Cecil	Somerset
Charles	Talbot
Dorchester	Washington
Frederick	Wicomico
Garrett	Worcester
Harford	

E
Baltimore City
Baltimore County
Prince George's

A SAMPLE PRECINCT COMPARISON FOR 2012 VERSUS 2014

Chart IV shown below, and the next one (Chart V), show the number of check-ins during each half-hour period at Anne Arundel County precinct 4-9 for Election Day 2012 and Election Day 2014 respectively. Although the number of registered voters (about 2,400) and the equipment deployed (four electronic pollbooks and ten touchscreen voting units) were the same for the 2012 and 2014 general elections, the wait times and line lengths at this precinct were dramatically different for the two elections.

Chart IV: Voter Check-ins by Half-Hour – Maryland 2012 General Election (Russett Library)



At the Russett Library precinct in the 2012 gubernatorial general election, there were more than 200 voters in line for most of the day, and wait times averaged about 95 minutes. The last voter was not checked in until 9:04 pm; and the last touchscreen ballot was cast at about 9:40 pm. The check-in capacity of the four electronic pollbooks (211 voters per hour) exceeded the estimated peak hourly arrivals (148 voters), so the electronic pollbooks were not the gating factor. The problem was the unusually long time (average of 5.7 minutes) that voters were taking to cast their ballots on the touchscreens due to the unusual length of the 2012 Anne Arundel County ballot.

The blue line on Charts IV and V shows the number of voters checked in at the precinct by half hour. Though the line is somewhat jagged, the hourly average is fairly constant throughout the day at about 105 voters per hour. This indicates that the number of voters checked in on the pollbooks was being deliberately restrained throughout the day so as not to overwhelm the capacity of the voting machines. Limited space to queue voters waiting for a touchscreen, as well as the limited supply of voter access cards would effectively prevent the number of check-ins from exceeding touchscreen capacity.

The dotted line in the chart above represents the statewide check-in pattern on Election Day 2012. The red line represents the average of all Anne Arundel precincts. Since the majority of precincts in the State did not have problems with excessive lines and were able to check in voters as soon as they arrived, the dotted line is likely a more accurate depiction of when voters actually arrived at the polls. Note that the Anne Arundel average (red line) is significantly flatter than the statewide pattern from 8:00 am (8.0 on chart) until 6:00 pm (18.0 on chart). This is indicative of the widespread lines and lengthy wait times at many Anne Arundel County precincts in 2012.

Chart V (on the following page) shows the state, county and precinct 4-9 patterns for voter turnout on Election Day, November 4, 2014. Except for voters arriving well before 7:00 am it likely that all voters in Maryland were checked in within 10 minutes of arriving at the precinct, and were escorted to a touchscreen within 5 minutes after being checked-in. The last ballot access card in the State was issued at 8:03 pm on November 4, 2014.

Throughout the day, at precinct 4-9 in Anne Arundel County, voters were able to begin the election process as soon as they arrived because the throughput capacity for both the electronic pollbooks (192 voters per hour) and the touchscreen voting machines (236 voters per hour) was well in excess of the maximum number of voters arriving in any hour (144 voters). Note that the average time taken to cast a ballot on the touchscreen (2.5 minutes) was less than half of the 5.7 minutes taken to cast a ballot in 2012.

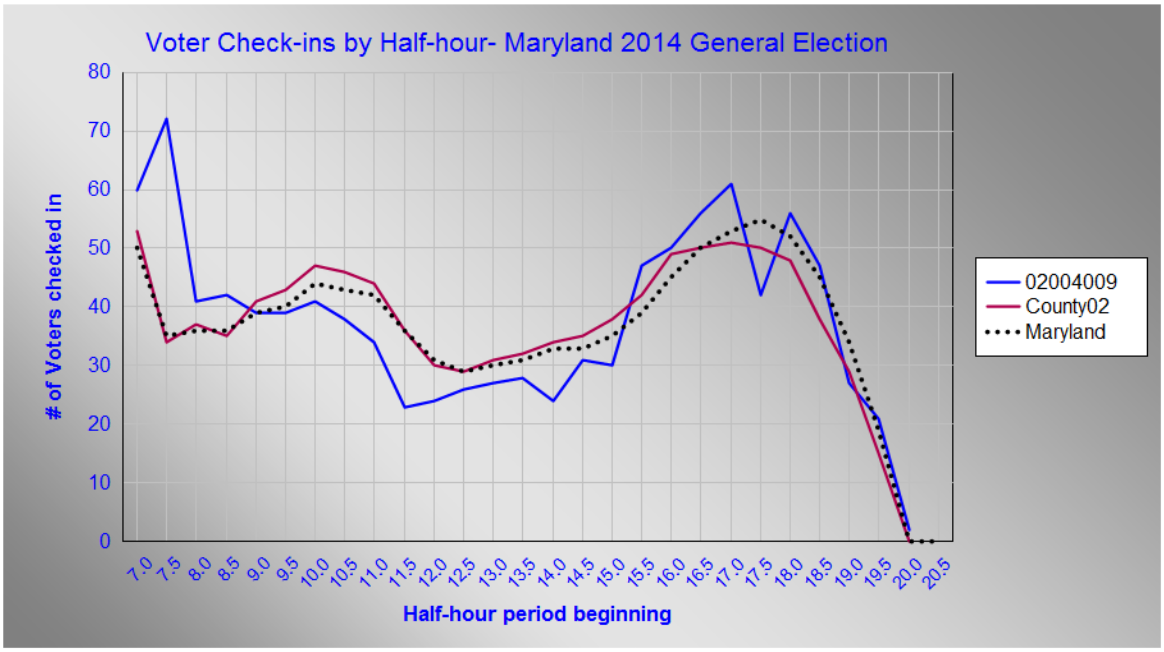
Note also that the shapes of the check-in patterns for precinct, county and state are remarkably consistent for the 2014 gubernatorial general election. This suggests that these are accurate representations of voter arrival at the polling places, not distorted by bottlenecks at either the electronic pollbooks or the touchscreen voting machines.

Chart V: Voter Check-ins by Half-Hour – Maryland 2014 General Election (Russett Library)

02004009- Maryland City at Russett Community Library- 11/04/2014 **2,431 registered voters**

3501 Russett Common- Laurel MD 20724 (turnout pattern= indeterminate) Party registration %- dem/rep/oth: 60.1/16.3/23.6

Voted Absentee (% of active)	34	1.4%	Peak half hour	7:30am	# of Touchscreens/added/(hr)	10
Voted Early (% of active)	179	7.4%	Est peak hourly arrivals	144	Est avg tme on TS	2.5 minutes
Provisional (% of checkins)	47	4.6%	# of electronic pollbooks	4	Est hourly TS capacity	236
Elec Day voters/%/Tot turnout	1,028	42.3% 51.0%	Calc min. seconds/checkin	75	Blank/canceled/unvoted cards	55 / 0 / 0
Voters aged 70+	44	4.3%	Est hourly EPB capacity	192	# ballots re-issued	1



SUGGESTIONS FOR REDUCING WAIT TIMES AT MARYLAND EARLY VOTING CENTERS AND PRECINCT VOTING PLACES

In the Schaefer Center report submitted to the Maryland General Assembly during the 2014 regular session, several suggestions for legislative or administration action were made including: (1) providing adequate numbers of machines, personnel, and suitable facilities; (2) polling place consolidation; and (3) planning for the future. In that report it was also suggested that the voting experience could be improved by recruiting and training highly qualified staff and election judges and by improving voter preparation. An extract of the 2014 Schaefer Center Report containing suggestions for reducing wait times at the Maryland polling places is attached as Appendix H to this report.

The observations made during the 2014 gubernatorial general election and the analysis of available data from the 2014 general election support and confirm the suggestions and recommendations contained in the 2014 Schaefer Center report and are restated below with consideration of the impact of the new voting system to be implemented for the 2016 presidential elections. Among the more significant suggestions in the 2014 report were (1) the creation of an "Election Infrastructure Fund" that would be available for use by the Maryland State Board of Elections and the local boards of elections to upgrade facilities and technology; (2) the availability and allocation of voting system equipment needs to be enhanced when voter turnout in a precinct on Election Day is anticipated to be 60% or 65% of currently registered voters; (3) that state and local legislative bodies be cognizant of the impact of the length of prospective ballots on the administration of elections and resulting wait times for voters at polling place locations; and (4) that the physical characteristics of an early voting site and a precinct polling place location (inside and outside the facility) is a major factor in the ability to manage the volume of individuals coming to a polling place to vote.

The introduction of a new voting system in Maryland for the 2016 presidential primary and general election will pose substantial challenges for the administration of election in managing wait times for voters. First and foremost, it can reasonably be anticipated that there will be approximately one million more voters casting ballots in the 2016 presidential general election than there were in the 2014 gubernatorial general election. Second, implementation of the new voting system will necessitate new procedures requiring enhanced election judge training and voter education as well as a review of the capacity and suitability of precinct polling locations.

The Maryland General Assembly has also mandated "same day" voter registration for individuals participating in early voting in the 2016 presidential primary currently scheduled for April 5, 2016. This entirely new process involving new technologies and procedures will complicate the administration of elections at the early voting centers and require additional resources and training. The addition of same-day voter registration to early voting has the potential to impact voter wait times, especially if voter turnout increases in competitive party primaries.

A further complicating issue is the potential for municipal jurisdictions to request the State Board of Elections to add municipal questions and elections for offices to the statewide ballot. To the extent ballot length is increased, there will be an adverse impact on the time it takes for a voter to complete the voting process.

As stated in this report, every 100 words added to a ballot length will add 16 to 24 seconds to the voting process and will impact line queuing and increase wait times for voters.

Based upon the research and analysis conducted by the Schaefer Center research team, there are numerous recommendations and suggestions that can be made to improve the time it may take to process voters at early voting centers and precinct polling places. It should be noted, however, that the most significant variable--voter turnout--is largely not controlled by the state and local boards of elections.

Presented below is a list of additional recommendations and suggestions that should improve the potential for lessening wait times experienced by voters at Maryland's early voting centers and precinct polling places. They include topics and areas such as data collection, election judge training, equipment allocation, voter education, voting location evaluation, precinct consolidation, polling place management (best practices), and the use of technology.

Recommendations and suggestions are:

(1) Evaluation and testing of voters using the new voting equipment and processes, should be conducted, including how long it will take voters to complete paper optical scan ballots of varying lengths.

(2) The recording of the number of individuals in line at the beginning and end of each early voting day at each early voting center should be continued.

(3) A recording should be made of the number of individuals in line at the beginning and end of each Election Day by the chief judges at all precinct polling locations.

(4) The Chief Judge Chapter and the Problems and Solutions Chapter of the 2016 Election Judge Training Manual should include a section on how to manage a heavy volume of voters and line formation.

(5) Local election officials should consider appropriate use of a "greeter" or "screener" election judge at anticipated heavy turnout precinct polling places. It is further recommended that these individuals be equipped with a tablet or other electronic device containing a current voter registration database to assist voters.

(6) There should be an evaluation of early voting centers and precinct polling places for their capacity to handle line flow, equipment needs and ballot stations in the implementation of the new voting system in 2016.

(7) There should be specialized election judge training for individuals responsible for implementing the new same-day registration process at early voting centers in the 2016 presidential primary election.

(8) There will be a need for substantial voter education before the 2016 presidential primary election and before the 2016 presidential general election which should include sample ballots, widespread public demonstrations of the new voting system, use of social media, websites, media events and assistance as well as outreach to schools, senior centers, colleges and universities, libraries and other public buildings and community events. It is further suggested that these public outreach efforts begin no later than the fall of 2015 and that they be intensified in the months and weeks immediately preceding the 2016 primary and general elections.

(9) The state and local boards of elections should conduct simulations of the implementation of the new voting system, rules and procedures to determine the best procedures to handle anticipated voter turnout.

(10) Local boards of elections should consider enhanced use of technology to inform voters and the general public about potential and existing lines at early voting centers and precinct polling places.

(11) Local boards of elections should consider the deployment of additional resources needed to handle the typical increase in voter turnout that occurs on the last day of early voting.

(12) Proper signage for voters at the polling places about steps in the voting process should be posted to assist in line formation and flow.

(13) Polling places with a history of significant use of provisional ballots (e.g., colleges and universities) need to have an adequate supply of ballots.

(14) There should be an ample supply of sample ballots and voting instructions at each early voting center and precinct polling places. A paper based voting system requiring a voter to mark a ballot will produce more voter error and is likely to result in a greater percentage of residual votes (or ''no votes") than other voting methods. It may also require more voter assistance by election judges to complete the voting process.

Finally, it should be noted that requesting state and local election boards and election officials to do more and more with less resources will inevitably disrupt the voting experience and increase wait times for voters. The number of Marylanders qualified and registered to vote will increase proportionately with the population growth of the State and is not expected to decrease.

If the budgets of state and local boards of education do not keep pace with voter needs and services, the consequences will be diminished capacity and resources to handle a growing number of potential voters and, in turn, a likely increase in the time a voter takes to complete the voting process at the early voting centers and precinct polling places.

APPENDICES

APPENDIX A: LEGISLATION

D38I

State Board of Elections

Budget Amendments

D38I01.01 General Administration

Add the following language to the general fund appropriation:

provided that because the State Board of Elections (SBE) has had four or more repeat audit findings in the most recent fiscal compliance audit issued by the Office of Legislative Audits (OLA), $250,000 of this agency's administrative appropriation may not be expended unless:

(1) SBE has taken corrective action with respect to all repeat audit findings from its most recent fiscal compliance audit on or before November 1, 2014; and

(2) a report is submitted to the budget committees by OLA listing each repeat audit finding along with a determination that each repeat finding was corrected. The budget committees shall have 45 days to review and comment to allow for funds to be released prior to the end of fiscal 2015.

Explanation: The Joint Audit Committee has requested that budget bill language be added for each unit of State government that has four or more repeat audit findings in its most recent fiscal compliance audit. Each such agency is to have a portion of its administrative budget withheld pending the adoption of corrective action by the agency and a determination by OLA that each finding was corrected. OLA shall submit a report to the budget committees on the status of each repeat finding.

Information Request	Author	Due Date
Status of corrective actions related to the most recent fiscal compliance audit	OLA	45 days before the release funds

Add the following language to the general fund appropriation:
Further provided that it is the intent of the General Assembly that:

(1) no Maryland voter should have to wait for more than 30 minutes to vote; and
(2) the State Board of Elections (SBE) and local boards of elections take every possible action to ensure that voters casting ballots at early voting centers and polling places on Election Day are able to complete the entire voting process, from arrival to departure, within 30 minutes.

Further provided that $25,000 of this appropriation made for the purpose of General Administration may not be expended until the State Board Elections (SBE) submits a report that describes:

(1) actions taken to keep wait times under 30 minutes in the 2014 elections;
(2) plans to keep wait times under 30 minutes in future elections that will be conducted using the new optical scan voting system; and
(3) detailed plans to implement a system, beginning with the 2016 elections, for measuring wait times at individual polling places and early voting centers and utilizing the new data to develop plans to keep wait times under 30 minutes at individual polling places and early voting centers.

The report shall be submitted by January 15, 2015, and the House Appropriations Committee, House Ways and Means Committee, Senate Budget and Taxation Committee, and Senate Education, Health, and Environmental Affairs Committee shall have 45 days to review and comment. Funds restricted pending the receipt of a report may not be transferred by budget amendment or otherwise to any other purpose and shall revert to the General Fund if the report is not submitted.

Explanation: The General Assembly is concerned about excessive wait times for voters in recent Maryland elections. According to the Survey of the Performance of American Elections (SPAE), Maryland had the third longest wait times in the country in the 2012 General Election and the sixth longest wait times in the 2008 General Election. According to the SPAE, Maryland's average wait time in the 2012 General Election was 29 minutes, and in the 2008 General Election it was 26 minutes. President Barack H. Obama created the Presidential Commission on Election Administration in calendar 2013 to make recommendations on reducing long lines at polling places, among other issues. In its report, released in January 2014, the

commission concluded that voters should not have to wait more than one half hour to vote and that election officials should be able to plan the allocation of their resources to allow nearly all voters to be processed within that time. In the report, the commission recommended that election officials measure wait times at polling places, use the information to analyze the causes of long wait times, and develop plans using that information to avoid lengthy wait times in the future. A report analyzing Maryland-specific wait time concerns submitted to the General Assembly in January 2014 in response to a requirement in Chapters 157 and 158 of 2013 included similar recommendations. This language expresses an intent, consistent with the recommendations of the Presidential Commission on Election Administration, that wait times for voters not be longer than one half hour and that SBE, in conjunction with the local boards of elections, report on efforts to reduce wait times in the 2014 elections. SBE should also plan to implement a system for the 2016 elections for measuring wait times at individual polling places and early voting centers and utilizing the new data to develop plans to keep wait times under 30 minutes in future elections conducted using the new optical scan voting system.

Information Request	**Author**	**Due Date**
Plans to reduce and measure voting wait times	SBE	January 15, 2015

Joint Chairmen's Report – Operating Budget, April 2014

D38I

APPENDIX B: FORM FOR OBSERVATIONS OF THE EARLY VOTING CENTERS

OBSERVER NAME_____ (Date:_____)

INSTRUCTIONS FOR OBSERVERS AT EARLY VOTING CENTERS

Thank you for participating as an observer at early voting centers during the 2014 gubernatorial general election. You have been authorized by the Maryland State Board of Elections (SBE) to make these observations pursuant to a requirement of the Maryland General Assembly that additional data be collected on wait times for voters. The study is being conducted in cooperation with the Schaefer Center for Public Policy at the University of Baltimore. The Center will be conducting an analysis of the data collected and preparing a report to be submitted to the Maryland General Assembly on January 15, 2015.

In conducting your observations, please follow the procedures and guidelines presented below and answer the list of questions:

1. You should introduce yourself to the Chief Judges at the early voting center as well as the local election board staff, and explain that you are conducting observations for the SBE. (You will be provided with a letter of authorization which you should take with you when you leave and reuse if assigned to observe another voting center.)
2. You should find a suitable location from which to be able to make the required observations without interfering with the work of the election judges or the flow of voters.
3. Depending upon the volume of voter turnout, it will be impossible to time the activities of each voter, therefore you should collect time samples from a random selection of every 6 to 10 voters who enter the check-in line.

At each Early Voting Center, please note the following:

1. Time of your arrival: _____
2. Time of your departure: _____
3. The length of the check-in line at your arrival: _____ (# of voters)
4. The length of the check-in line at your departure: _____ (# of voters)
5. The number of electronic poll books set up for use: _____
6. The number of touchscreen voting units set up for use by voters: _____
7. The number of election judges present: _____
8. The number of voters checked-in while you were on site: _____
   (# should be zero at 10:00am; information is available on the electronic poll books (EPBs) and can be read to you by election judges)
9. How many provisional ballot authority cards were issued during your visit? _____
   (available by observation of voters or from EPB reports accessible by election judges)
10. Other noteworthy observations about the conduct of the early voting center:

    _____
    _____
    _____
    _____

APPENDIX C: FORM OBSERVERS USED TO RECORD THEIR OBSERVATIONS OF THE VOTERS

eet for SCPP Voter Time Study **Location:** (name and address): ED and precinct

ime entered line ex: 7:00 am)	Time from line to check-in desk	Time from check-in to receiving voter access card	Time from receiving voter access card to TS voting unit	Time from start of using TS voting unit to completion of voting	NOTES
:	: :	: :	: :	: :	
:	: :	: :	: :	: :	
:	: :	: :	: :	: :	
:	: :	: :	: :	: :	
:	: :	: :	: :	: :	
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:	: :	: :	: :	: :	

APPENDIX D: STUDY OBSERVERS AND POLLING PLACES OBSERVED

Total number of volunteer observers:	21
Total number of polling place locations covered:	44 (15 early, 29 general)
Total number of voters checked in while observers were on-site:	9213 (5617 early, 3596 general)

Observers

Lois Barrance, Monica Bramlish, Sydney Callahan, Tom Feehan, Jim Gross, Angela Hamlin, Jamal Jackson, Tiffany Lewis, Elaine Martin, Dennis McGrath, Tim McGrath, Maureen Mott, Brian Nicholson, Pete Pollinger, Sarah Scholl, Peter Thomas, Kenneth Weaver, Emmanuel Welsh, Caitlin Whately, John T. Willis, Brittany Wimple

Early Voting Centers Covered (15)

Anne Arundel County (3)

EVC-2	North County Library
EVC-3	Severna Park Community Library
EVC-4	Pip Moyer Community Center

Baltimore City (2)

EVC-2	League for People with Disabilities
EVC-4	Baltimore City Public Safety Training Center

Baltimore County (3)

EVC-2	Randallstown Community Center
EVC-4	Honeygo Community Center
EVC-7	Center for MD Agriculture

Carroll County (1)

EVC-1	Westminster Senior Activities Center

Howard County (1)

EVC-3	Miller Branch Library

Montgomery County (2)

EVC-1	Mid County Community Rec Center
EVC-4	Marilyn J. Praisner Community Rec Center

Prince George's County (3)

EVC-3	Bowie Community Center
EVC-4	Wayne K. Curry Sports Center
EVC-5	Southern Regional Tech

Election Day Polling Place Locations Covered (29)

Anne Arundel County (3)

001-011	Linthicum Community Library
004-001	Maryland City Elementary School
004-009	Maryland City Russett Library

Baltimore City (10)

011-001	Chase House
011-002	Chase House
011-007	Waxter Center
012-001	1st English Lutheran Church
012-002	1st English Lutheran Church
015-018	School No. 107
024-003	Digital Harbor High School
024-005	School No. 76
027-013	School No. 339
027-038	Govans Manor
027-042	First Christian Church
027-050	Elderslie St. Andrews Methodist Church

Baltimore County (6)

002-007	Old Court Middle School
002-012	Liberty Senior Center
002-026	New Town Elementary School
009-009	Loch Raven High School
009-029	Towson University - University Union
014-001	Parkville Middle School

Prince George's County (10)

007-003	Kenilworth Elementary School
007-011	All Saints Lutheran Church
010-012	Robert DiPietro Community Center
013-005	Charles Flowers High School
017-011	Ridgecrest Elementary School
019-003	University Park Elementary School
021-001	Paint Branch Elementary School
021-006	Greenbelt Elementary School
021-007	Berwyn Heights Elementary School
021-008	Springhill Lake Elementary School

APPENDIX E: LINE LENGTH RECORD FORM USED FOR SUBMISSIONS BY ELECTION OFFICIALS

2014 General Election
Early Voting

Instructions: Record: (1) the number of voters in line when the early voting center opens each day and (2) the number of voters in line when the early voting center closes at 8 pm each day.

EV Center Number	EV Center Name	Day 1 (10/23)		Day 2 (10/24)		Day 3 (10/25)		Day 4 (10/26)		Day 5 (10/27)		Day 6 (10/28)		Day 7 (10/29)		Day 8 (10/30)	
		# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm	# in line @ 10 am	# in line @ 8 pm

APPENDIX F: CHANGES IN LENGTH OF BALLOT--2008 THROUGH 2014

Table Nine: Ballot Word Counts 2008 to 2014 General Elections

	Average Number of Words on the Ballot			
County	**General Election 2008**	**General Election 2010**	**General Election 2012**	**General Election 2014**
Allegany	569	922	1,005	751
Anne Arundel	682	1,245	2,018	768
Baltimore City	2,250	1,794	2,245	1,821
Baltimore County	1,186	1,543	1,535	1,042
Calvert	577	960	1,019	827
Caroline	553	1,040	973	748
Carroll	551	895	1,002	759
Cecil	614	1,035	1,052	1,032
Charles	532	1,016	962	882
Dorchester	566	884	970	711
Frederick	559	956	1,057	815
Garrett	643	943	1,002	944
Harford	569	857	1,364	881
Howard	569	943	1,576	836
Kent	583	972	977	797
Montgomery	770	1,095	1,312	1,058
Prince George's	1,125	1,325	1,634	1,336
Queen Anne's	630	986	1,125	841
St. Mary's	571	945	1,023	803
Somerset	568	916	968	720
Talbot	952	1,027	968	877
Washington	568	955	1,083	797
Wicomico	655	1,193	1,273	757
Worcester	566	903	985	710
Average	725	1,056	1,214	896

APPENDIX G: EARLY VOTING SUMMARY

Table Ten: Early Voting Turnout by Year and Subdivision with Number of Voting Centers

		Number of Early Voting Centers	Total Early Voters	Average Early Voters per Early Voting Center	Average Early Voters per Day	Average Early Voters per Day per Early Voting Center	Early Voting as Proportion of Total Turnout	Early Voting as Percent of Registered Voters	Registered Voters	Total General Election Turnout
Allegany	2010	1	1,026	1,026	171	171	4.6%	2.4%	42,450	22,496
	2012	1	2,695	2,695	539	539	8.9%	6.4%	42,129	30,145
	2014	1	1,504	1,504	188	188	7.2%	3.5%	42,560	20,868
Anne Arundel	2010	5	28,944	5,789	4,824	965	14.2%	8.7%	331,101	204,334
	2012	5	38,140	7,628	7,628	1,526	14.6%	10.9%	348,778	262,081
	2014	5	38,656	7,731	4,832	966	21.3%	11.1%	349,313	181,157
Baltimore City	2010	5	19,866	3,973	3,311	662	12.1%	5.4%	365,508	164,556
	2012	5	45,515	9,103	9,103	1,821	17.7%	11.6%	392,606	257,399
	2014	6	25,924	4,321	3,241	540	17.2%	6.9%	373,169	150,288
Baltimore County	2010	5	31,239	6,248	5,207	1,041	10.8%	6.3%	492,869	290,399
	2012	5	56,243	11,249	11,249	2,250	14.5%	10.9%	515,418	388,406
	2014	8	51,814	6,477	6,477	810	18.7%	9.9%	521,130	276,696
Calvert	2010	1	3,263	3,263	544	544	10.1%	5.8%	56,300	32,298
	2012	1	7,040	7,040	1,408	1,408	15.3%	12.0%	58,864	45,913
	2014	1	4,751	4,751	594	594	14.3%	7.9%	59,976	33,185
Caroline	2010	1	1,512	1,512	252	252	14.9%	8.4%	18,037	10,163
	2012	1	2,365	2,365	473	473	17.6%	13.0%	18,165	13,474
	2014	1	1,606	1,606	201	201	17.3%	8.8%	18,533	9,283
Carroll	2010	1	5,210	5,210	868	868	8.1%	5.0%	105,201	64,158
	2012	1	10,408	10,408	2,082	2,082	11.8%	9.4%	110,400	88,089
	2014	1	8,016	8,016	1,002	1,002	12.4%	7.1%	112,946	64,767
Cecil	2010	1	3,389	3,389	565	565	11.2%	5.7%	59,837	30,375
	2012	1	5,891	5,891	1,178	1,178	13.8%	9.4%	62,524	42,769
	2014	1	4,123	4,123	515	515	15.3%	6.7%	61,990	26,925
Charles	2010	1	5,127	5,127	855	855	10.8%	5.7%	89,989	47,311
	2012	1	11,987	11,987	2,397	2,397	15.8%	12.3%	97,687	75,846
	2014	2	6,880	3,440	860	430	14.4%	6.8%	100,449	47,732
Dorchester	2010	1	1,348	1,348	225	225	11.2%	6.8%	19,778	12,007
	2012	1	2,465	2,465	493	493	15.9%	12.2%	20,168	15,551
	2014	1	1,608	1,608	201	201	14.9%	7.9%	20,466	10,811
Frederick	2010	1	5,816	5,816	969	969	7.6%	4.2%	137,698	76,207
	2012	1	13,862	13,862	2,772	2,772	11.7%	9.4%	148,160	118,088
	2014	3	10,713	3,571	1,339	446	13.3%	7.1%	150,895	80,701
Garrett	2010	1	933	933	156	156	9.5%	5.1%	18,434	9,860
	2012	1	1,550	1,550	310	310	11.7%	8.3%	18,729	13,263
	2014	1	1,357	1,357	170	170	14.4%	7.0%	19,292	9,403
Harford	2010	1	11,108	11,108	1,851	1,851	11.7%	7.5%	149,053	95,133
	2012	1	16,388	16,388	3,278	3,278	12.9%	10.2%	159,971	126,876
	2014	4	17,965	4,491	2,246	561	19.6%	10.9%	164,780	91,828
Howard	2010	3	14,901	4,967	2,484	828	13.7%	8.4%	178,083	108,423
	2012	3	30,463	10,154	6,093	2,031	19.7%	16.1%	188,755	154,369
	2014	3	21,432	7,144	2,679	893	20.2%	11.0%	195,440	105,950
Kent	2010	1	1,627	1,627	271	271	19.5%	13.0%	12,482	8,337
	2012	1	2,385	2,385	477	477	23.8%	18.9%	12,594	10,024
	2014	1	1,969	1,969	246	246	25.1%	15.5%	12,724	7,843
Montgomery	2010	5	26,707	5,341	4,451	890	9.1%	4.7%	573,431	294,604
	2012	5	77,939	15,588	15,588	3,118	16.9%	12.7%	616,016	460,885
	2014	9	35,444	3,938	4,431	492	12.5%	5.6%	634,659	284,654
Prince George's	2010	5	38,540	7,708	6,423	1,285	16.5%	7.5%	517,500	233,776
	2012	5	69,929	13,986	13,986	2,797	17.8%	12.3%	568,617	392,716
	2014	8	46,236	5,780	5,780	722	20.0%	8.5%	544,677	230,665
Queen Anne's	2010	1	2,708	2,708	451	451	13.5%	9.1%	29,705	20,030
	2012	1	4,020	4,020	804	804	16.0%	12.4%	32,332	25,101
	2014	2	5,157	2,579	645	322	26.4%	15.5%	33,173	19,525
Saint Mary's	2010	1	2,872	2,872	479	479	9.0%	4.9%	59,213	32,004
	2012	1	7,096	7,096	1,419	1,419	14.7%	11.1%	63,928	48,289
	2014	1	4,471	4,471	559	559	13.6%	6.9%	64,510	32,786
Somerset	2010	1	970	970	162	162	12.3%	7.3%	13,258	7,867
	2012	1	1,655	1,655	331	331	15.8%	12.1%	13,715	10,487
	2014	1	1,263	1,263	158	158	18.6%	9.7%	12,999	6,789
Talbot	2010	1	3,659	3,659	610	610	22.2%	14.5%	25,306	16,500
	2012	1	5,948	5,948	1,190	1,190	28.9%	23.5%	25,295	20,615
	2014	1	4,869	4,869	609	609	31.8%	19.0%	25,663	15,326
Washington	2010	1	2,096	2,096	349	349	5.1%	2.5%	83,276	40,975
	2012	1	7,351	7,351	1,470	1,470	11.6%	8.4%	87,298	63,310
	2014	1	3,504	3,504	438	438	8.9%	3.9%	90,097	39,151
Wicomico	2010	1	3,971	3,971	662	662	13.2%	7.3%	54,268	30,030
	2012	1	6,415	6,415	1,283	1,283	15.0%	11.4%	56,429	42,714
	2014	1	4,945	4,945	618	618	18.9%	8.7%	56,694	26,147
Worcester	2010	1	2,769	2,769	462	462	12.8%	7.8%	35,510	21,698
	2012	1	2,823	2,823	565	565	10.2%	7.8%	36,080	27,652
	2014	1	3,439	3,439	430	430	17.8%	9.6%	35,699	19,370
Statewide	2010	46	219,601	4,774	36,600	796	11.7%	6.3%	3,468,287	1,873,541
	2012	46	430,573	9,360	86,115	1,872	15.7%	11.7%	3,694,658	2,734,062
	2014	64	307,646	4,807	38,456	601	17.2%	8.3%	3,701,654	1,791,850

APPENDIX H: SUGGESTIONS FROM THE 2014 SCHAEFER CENTER REPORT FOR REDUCING WAIT TIMES AT MARYLAND POLLING PLACES

SUGGESTIONS FOR LEGISLATIVE OR ADMINISTRATIVE ACTION

PROVIDING ADEQUATE NUMBERS OF MACHINES, PERSONNEL, AND SUITABLE FACILITIES

Local election officials have been constrained in providing services by budget pressures from the state and local governments even though there is an increasing demand for services by voters and increasing federal and state legal requirements on the administration of elections. An "Election Infrastructure Fund" that would be available for use by the Maryland State Board of Elections and the local boards of elections to upgrade facilities and technology in the ongoing effort to provide adequate service to the Maryland voter could be created. The Election Infrastructure Fund could be a revolving fund up to $50 million.

The availability and allocation of voting system equipment needs to be enhanced when voter turnout in a precinct on Election Day is anticipated to be above 60% or 65% of currently registered voters. When ballot length exceeds certain parameters these percentages may need to be modified.

The impact of the length of prospective ballots on the administration of elections and resulting wait times for voters at polling place locations should be taken into account by state and local legislative bodies and administrative agencies. Research and expert opinion agree that ballot length is a major contributing factor to wait times for voters. Limiting ballot length and allocating more resources to deal with ballot length are two strategies that should be implemented. This will require a more detailed examination of local government charter provisions.

In many elections, ballot length is a significant variable that should be taken into account. Ballot length is a key variable in a DRE system because it adds to the time that a voter can be expected to take at the bottleneck phase of the voting process. In a voting system with scanners, key constraints could be: (1) ballot length; (2) the number of privacy booths; (3) the number of undervotes or overvotes. Strategies designed to reduce ballot length should be considered, including efforts to permit or place local ballot questions on ballots in elections other than high turnout presidential elections.

Strategies to deal with the availability of acceptable voting sites should be explored. It appears that the physical characteristics of an early voting site and a polling place location (inside and outside the facility) are a major factor in the ability to manage the volume of individuals coming to a polling place to vote.

Machines, personnel, and materials should be budgeted for and allocated based on anticipated turnout in the most popular hour for that precinct, not just for its anticipated turnout for the day or for the jurisdiction. Simulation models informed by enhanced data collection might be used to guide these allocations. Allocation estimates should be made using those variables that data show may be related to key constraints or bottlenecks in the voting process.

POLLING PLACE CONSOLIDATION

Of the 1,850 Election Day precinct polling places in Maryland, about 30% are either located at the same address as another polling place or within close proximity (less than ½ mile radius) to another polling place. A number of local boards of elections (particularly Anne Arundel, Carroll, Frederick, Harford, Howard and Wicomico) have consolidated more than 100 precincts since 2006, with generally favorable results. Further consolidation might make sense in order to free up resources for adding and upgrading early vote centers.

A table summarizing the potential opportunities for local boards of elections may be found in Appendix B, with the understanding that many of these opportunities will not be practical for a variety of reasons. Another concept supported by some local election officials is the creation of "vote centers" for 'Election Day voting. These vote centers would be large facilities centrally located in a jurisdiction capable of handling multiple precincts.

PLANNING FOR THE FUTURE

Trained observers could be used during elections to gather more precise data on the factors that affect the flow of voters and the wait times. This data could then be used to improve future simulations. Election judges or other staff assigned to inform the voters of wait times and the causes of delays and to verify that voters that they are in the correct line could also be assigned to gather data about those who leave the line ("renege") and those who do not enter the line because it is too long ("balk"). This would be of assistance in gathering data on wait times (perhaps by distributing and collecting cards).

Procedures that allow electronic scanning at the check-in stations may be efficient and should be authorized. This would require a modification of Section 10-302 to permit the use of new technologies in the check-in process.

The implementation of some of these suggestions will create extra public costs. Some of that cost will be obvious to the public as polling places will be over-resourced much of the time. One way to better explain such costs could be to institute internet reporting of election budget items and also reporting the benefits of such expenditures (including, for example, the time saved by voters and increases in voter participation).

Once a new voting system has been initiated and data (including wait times) from an election using that system can be analyzed, studies could be conducted that would examine the potential effects of adjusting the size of the precincts on wait times and initiate that adjustment if it is indicated. Simulations informed by existing and new data sources could be used to make recommendations about precinct consolidation and ideal precinct size. Performing empirical tests to help estimate the time it make take voters to complete a ballot may help inform these estimates. With such data election officials would have better tools with which to design facility configurations.

SUGGESTIONS FOR IMPROVING THE VOTING EXPERIENCE

The survey conducted for this report shows that, despite the wait times, most voters have a very positive attitude about the voting experience. Suggestions for improving that experience did emerge in the course of gathering data for this report.

RECRUITING AND TRAINING HIGHLY QUALIFIED STAFF AND ELECTION JUDGES

Recruiting qualified staff to assist in election preparation and on Election Day—as well as recruiting election judges—is a challenge in many jurisdictions. Some jurisdictions allow county personnel to be compensated for working in the elections. Such policies could be implemented in other jurisdictions to assist the local board of elections.

Chief judges and other election officials should be trained to think of the voting process as a queuing system and identify the possible key constraints (bottlenecks) in the process. In recent elections, the time it takes from the casting of one ballot on a touchscreen to the casting of the next ballot by another voter has been a key constraint. Election judges should be trained to move resources, if possible, to the bottleneck in the process as it may develop on an Election Day. In 2012, this would have meant moving additional election judges to the touchscreens. In the future, it may mean putting resources around scanners so that no seconds are lost in moving people to and from the machines. In addition to this training, staff could be "cross-trained" to perform multiple jobs so that resources can be re-deployed to address bottlenecks. Cross-training is currently done by some local boards of elections.

It is possible that the new bottleneck will be at the scanners. For example, some election directors indicated that they believed many ballots would need to be rescanned. If the scanners do prove to be the bottleneck, special training and procedures should be developed to reduce the time required between one scan and another. National surveys showed Florida to be the state with the longest wait times in 2012. Florida used scanners, but some reports indicate that an increase in ballot length was a significant problem.[5]

Election judges, as well as local and state boards of elections, should inform those waiting in line about anticipated wait times. One maxim in the psychological theory surrounding queues is that "Uncertain waits seem longer than known, finite waits." The gathered data could also inform web-based dissemination of information about wait times.

Testing of election judges on the time each takes to complete critical tasks is conducted in some jurisdictions and could be extended to other jurisdictions. Queuing theory indicates this testing might be an effective

[5] American Bar Association (2013, May). "Election Delays in 2012." Retrieved from http://law.wm.edu/news/stories/2013/documents/2012_election_delays_report.authcheckdam.pdf

strategy if the training and subsequent testing is designed to ameliorate the key constraints or bottlenecks in the voting process.

IMPROVING VOTER PREPARATION

The survey of Maryland voters conducted for this study demonstrated that those voters who have reviewed sample ballots take significantly less time to vote than do those who have not. Continued or improved emphasis on getting sample ballots to voters is indicated.

Special outreach to voters whose polling place has changed or who are close to early voting centers should be made. Anecdotal evidence indicates that voters whose polling places had changed or who were unfamiliar with the difference between early voting and Election Day voting were inconvenienced and contributed to line delays.

As part of the outreach to voters, publicity about the Maryland State Board of Election's mobile friendly web based information services could be enhanced. Some local jurisdictions have also started to implement such services and collaboration between state and local services can be envisioned. Such services allow a voter to better plan for voting and to confirm that they are at the right place at the right time. Such services might be enhanced by also informing voters about historical patterns of wait times at voting locations or about the current wait times during an election period. Other measures to encourage voting in off-peak periods could be implemented such as using sample ballot mailings to help set expectations for wait times based on time of day.

IMPROVING THE VOTERS' PERCEPTIONS

To help improve the voter experience while waiting while waiting:

- Polling places should have a single line leading to the check-in table (i.e. do not have separate lines leading to each check-in judge.) This will eliminate a major cause of frustration with lines in general—the unfairness of ending up in the "slow line" through no fault of your own.

- Voters waiting in line should be given something to do—the opportunity to review a sample ballot or read literature on the state and local ballot questions would have helped voters be more prepared for the 2012 general election.

- When, as was often the case in 2012, there are backups at the voting machines but not at the pollbooks, it can be preferable to form another line at the voting machines (if the available space permits) rather than hold up check-ins waiting for the voting machines to clear. Such a strategy might require issuing more voter access cards to a precinct.

- Election judges should regularly update voters standing in line with expected wait times and explanations for delays.

Individuals assigned to the job of informing voters about the line status could also make sure people are in the right line, and explain where the bottleneck is and ask people to be ready to vote in an informed way (without creating any pressures).

At high volume precinct polling places, greeters and signs could advise voters that a seemingly long line does not necessarily mean a long wait (and specify, to the extent possible, the expected wait times). For example, a line of 150 voters waiting to vote could easily be more than 300 feet long and wrap halfway around the outside of the polling place. Seeing such a line might discourage many voters from getting in line.

If more than one scanner is deployed in a voting place, queuing theory also recommends that there be only one line feeding into all the stations and not one line for each station.

Policies on the use of cell phone and electronic devices in polling places need ongoing study as the capacity of these devices continues to evolve. The psychological theories related to queuing problems indicate that people engaged in an activity perceive their waits as shorter than do others. Perhaps the latest proposed federal regulations on cell phone use on airplane flights could be a model.

In those proposals, conversational use of phones is limited, but other uses are not. A regulation might be developed that would allow use of such devices until a certain point in the voting process when they could then be prohibited. Also, election jurisdictions around the country are considering expanded use of these technologies in the voting process.