CUYAHOGA COUNTY BOARD OF ELECTIONS

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Post-Election Audit Summary

September 13, 2011 Primary Election (Broadview Heights Mayor)

On October 11, 2011 we conducted a Risk-Limiting Post-Election Audit for the September Primary Election. A total of 4,189 ballots were cast in the Broadview Heights Mayoral race between four (4) candidates.

Our Risk-Limiting Audit was based upon the Kaplan-Markov method as explained by Phillip B. Stark and Mark Lindeman. Auditing best practices recommend we split up the total ballots cast by precinct into multiple batch types. Our first precinct batch consisted of the Absentee ballot category. Our second precinct batch was made up of the ballots cast in the Election Day, Provisional, Post-Election Day and Post-Absentee categories.

A master spreadsheet was created with statistical formulas to determine the number of batches that must be audited in order to reach a 90% confidence level. This confidence level means the audit has at least a 90% probability of leading to a full recount if the apparent outcome is incorrect. Based on this data, the required numbers of batches to audit is fifteen (15).

We used a "Probability Proportional to Error Bound with Replacement" selection method utilizing four (4) containers each filled with ten (10) slips of paper labeled 0-9. One slip of paper was randomly pulled from each container creating a four digit number ranging from 0 through 9,999. Ranges of four digit numbers were assigned to specific batches based upon their error bound - i.e. the greater the possibility of a miscount within a batch, the more numbers assigned, and the more likely it is to be selected.

In the past we had filled a hopper filled with a significant number of ping pong balls. However, this created a rounding problem during the selection of batches due to finite amount of balls. For example, a ball that statistically should be assigned 3.5 ping pong balls was actually assigned 3 balls. Picking one digit from separate containers allows us to quickly and easily pick a batch while also significantly reducing the amount of rounding. In this audit the largest difference between the theoretical number of assigned batches to actual number of assigned batches was 0.0000856969. This will also escalate well for possible future countywide audits.

The result of the random digit batch assignment process was twelve (12) unique batches. Three batches were selected multiple times. The list of the audited batches is below:

> Broadview Heights 1-A - Absentee
> Broadview Heights 1-B - Absentee
> Broadview Heights 1-C - Absentee
> Broadview Heights 2-A - Absentee
> Broadview Heights 2-C - Absentee
> Broadview Heights 2-D - Absentee
> Broadview Heights 4-A - Absentee
> Broadview Heights 4-C - Absentee
> Broadview Heights 4-D - Absentee
> Broadview Heights 3-C - Election Day, Provisional, Post Absentee and Post Election Day
> Broadview Heights 4-A - Election Day, Provisional, Post Absentee and Post Election Day
> Broadview Heights 4-C - Election Day, Provisional, Post Absentee and Post Election Day

In conclusion, a total of 2,527 ballots were audited during the Post Election Audit for the September 13, 2011 Primary Election, which amounted to a total cost of $582.30 or $0.14 per ballot in the audited contest. All results match the Official Certification giving a 100% accuracy rate for the election.

Historical Post-Election Audit Data

Audit History				
Election Audit	Total Ballots Audited	Errors	Accuracy rate	Accuracy Percentage
NOV08GEN	67,577	43	0.000636311	99.94%
MAR08PRI	30,814	44	0.001427922	99.86%
MAY09PRI	4,866	1	0.000205508	99.98%
SEP09PRI	2,408	2	0.000830565	99.92%
NOV09GEN	39,308	6	0.000152641	99.99%
MAY10PRI	686	0	0	100%
NOV10GEN	21,990	7	0.000318327	99.97%
FEB11SPC	612	0	0	100%
MAY11PRI	958	0	0	100%
AUG11SPC	1,080	0	0	100%
SEP11PRI	2,527	0	0	100%
TOTALS	172,826	103	0.000595975	99.95%

ACCURACY RATE