Close Enough for Government [to] Work

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University of California, Berkeley

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Verified Voting
Palo Alto, California

[Election Leak] [CNN: DC hack]

Things to keep in mind

The difference between theory and practice is smaller in theory than it is in practice. (Various)

The purpose of elections is to convince the losers that they lost. (D. Wallach)

The purpose of election audits is to convince rational people that the losers lost. (PBS)

Saguache County, Colorado crimes

Grand jury has its hands full with Saguache election case, by Troy Hooper

A disputed election in south-central Colorado is now in the hands of a grand jury that is reviewing allegations that the clerk and other officials committed crimes when they tallied the votes.

. . .

Officials in Saguache County stand accused of more than 30 misdemeanors.

THE COLORADO INDEPENDENT, 25 MARCH 2011,

http://coloradoindependent.com/80819/grand-jury-has-its-hands-full-with-saguache-election-case

Waukesha County, WI: Oops!

Wisconsin Election Surprise: David Prosser Gains 7,500 Votes After 'Human Error' In Waukesha County, by Amanda Terkel

There were 3,456 missing votes for Democratic-backed challenger JoAnne Kloppenburg and 11,059 for incumbent GOP-backed Justice David Prosser. Kloppenburg has previously been beating Prosser by just 200 votes of the roughly 1.5 million cast statewide.

"The spreadsheet . . . inadvertently was not saved."

HUFFINGTON POST, 7 APRIL 2011,

`http://www.huffingtonpost.com/2011/04/07/david-prosser-wisconsin-supreme-court_n_846431.html`

Vote-flipping in North Carolina

NC GOP leader: Touchscreen voting machines have programming flaw, by Michael Biesecker

The chairman of the N.C. Republican Party alleged Thursday that a programming flaw with touchscreen voting machines used for early voting in 36 counties is causing votes intended for GOP candidates to be counted for Democrats.

News Observer, 28 October 2010, http://www.newsobserver.com/2010/10/28/766257/nc-republican-party-chair-touchscreen.html#ixzz13gTJCCvp

Humboldt County CA, 2008

Serious Error in Diebold Voting Software Caused Lost Ballots in California County, by Kim Zetter

Election officials in a small county in California discovered by chance last week that the tabulation software they used to tally votes in this year's general election dropped 197 paper ballots from the totals at one precinct. The system's audit log also appears to have deleted any sign that the ballots had ever been recorded.

WIRED NEWS, 8 DECEMBER 2008, `http://blog.wired.com/27bstroke6/2008/12/unique-election.html`

California Elections Code §15360

[T]he official conducting the election shall conduct a public manual tally of the ballots tabulated by those devices, including absent voters' ballots, cast in 1 percent of the precincts chosen at random by the elections official . . .

The official conducting the election shall include a report on the results of the 1 percent manual tally in the certification of the official canvass of the vote. This report shall identify any discrepancies between the machine count and the manual tally and a description of how each of these discrepancies was resolved . . .

What should audits do?

Pro forma audits

Most audit laws have no clear goal: "count and stop," or "count and explain discrepancies."

Compliance vs. materiality audits

Compliance: Were proper procedures followed? (e.g., secure chain of custody?)

Materiality: Did any errors that occurred despite compliance matter?

Effective materiality audit

Correct the outcome if it is wrong.

Can require counting the entire audit trail by hand.

California AB 2023 (Saldaña, sponsored by SoS Bowen)

(b)(3) “Risk-limiting audit” means a manual tally employing a statistical method that ensures a large, predetermined minimum chance of requiring a full manual tally whenever a full manual tally would show an electoral outcome that differs from the outcome reported by the vote tabulating device for the audited contest. A risk-limiting audit shall begin with a hand tally of the votes in one or more audit units and shall continue to hand tally votes in additional audit units until there is strong statistical evidence that the electoral outcome is correct. In the event that counting additional audit units does not provide strong statistical evidence that the electoral outcome is correct, the audit shall continue until there has been a full manual tally to determine the correct electoral outcome of the audited contest.

Unanimous bipartisan support in both houses.
11 counties committed to pilots; 20 interested.

Verified Voting helped draft AB 2023 and endorsed it.

Big Ideas

Strongly Software-Independent Voting System

A voting system is strongly software-independent if an undetected error or change to its software cannot produce an undetected change in the outcome, and we can find the correct outcome without re-running the election.

Risk-limiting Audit

Large, known chance of a full hand count if the outcome is wrong, thereby correcting the outcome.

Risk is maximum chance of failing to correct an apparent outcome that is wrong, no matter what caused the outcome to be wrong.

New (Big?) Idea

Resilient Canvass Framework

Known minimum chance that the overall system (human, hardware, software, procedures) gives the correct election outcome.

Combine a strongly software-independent voting system with a compliance audit and a risk-limiting audit.

Risk-Limiting Audits in California

Marin County (February 2008; November 2008, 2009)

Orange County (March 2011)

Yolo County (November 2008, 2009)

Santa Cruz County (November 2008)

Monterey County (next week!)

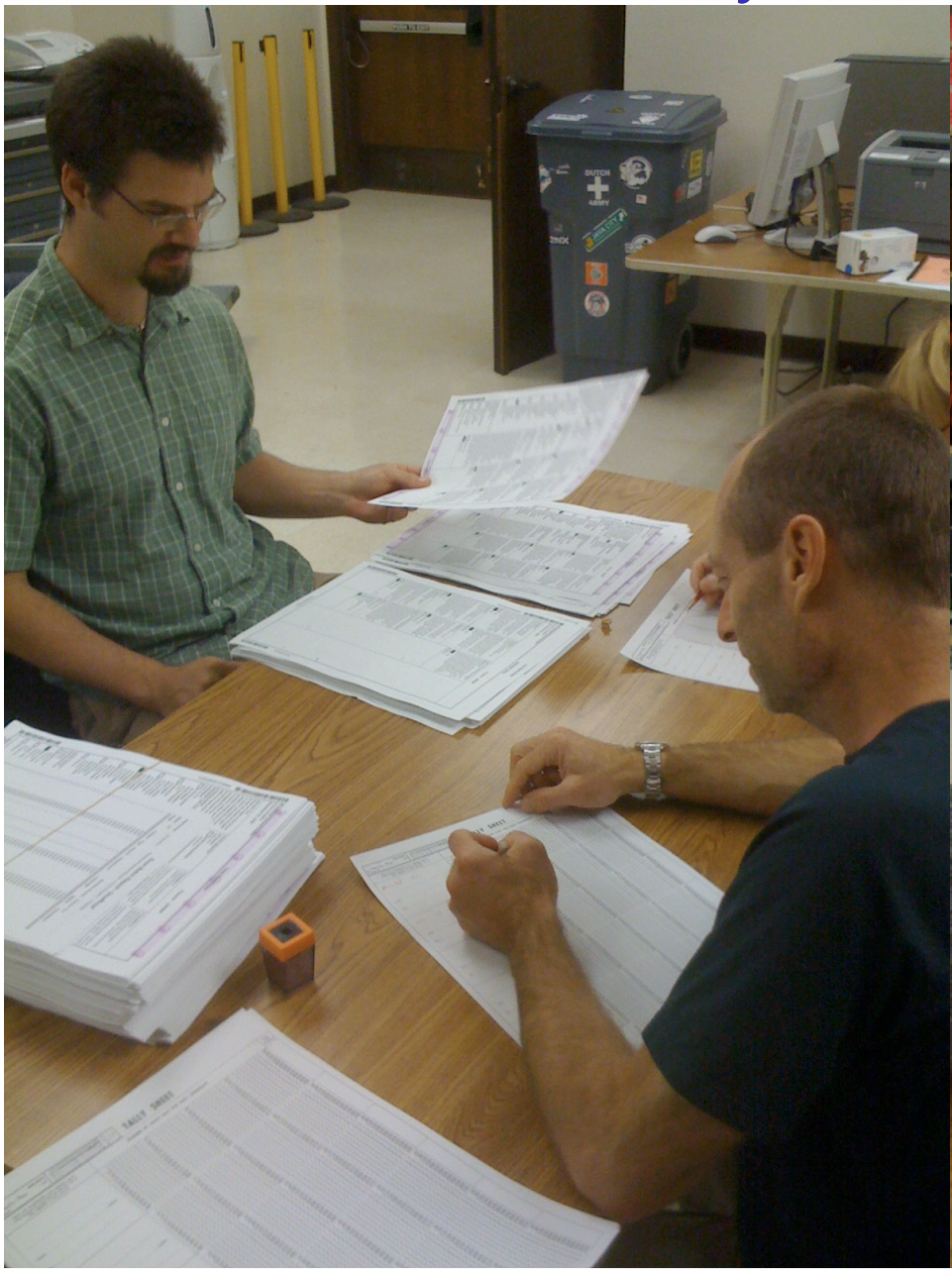
Measures requiring super-majority, simple measures, multi-candidate contests, vote-for-*n* contests.

Contest sizes ranged from about 200 ballots to 121,000 ballots.

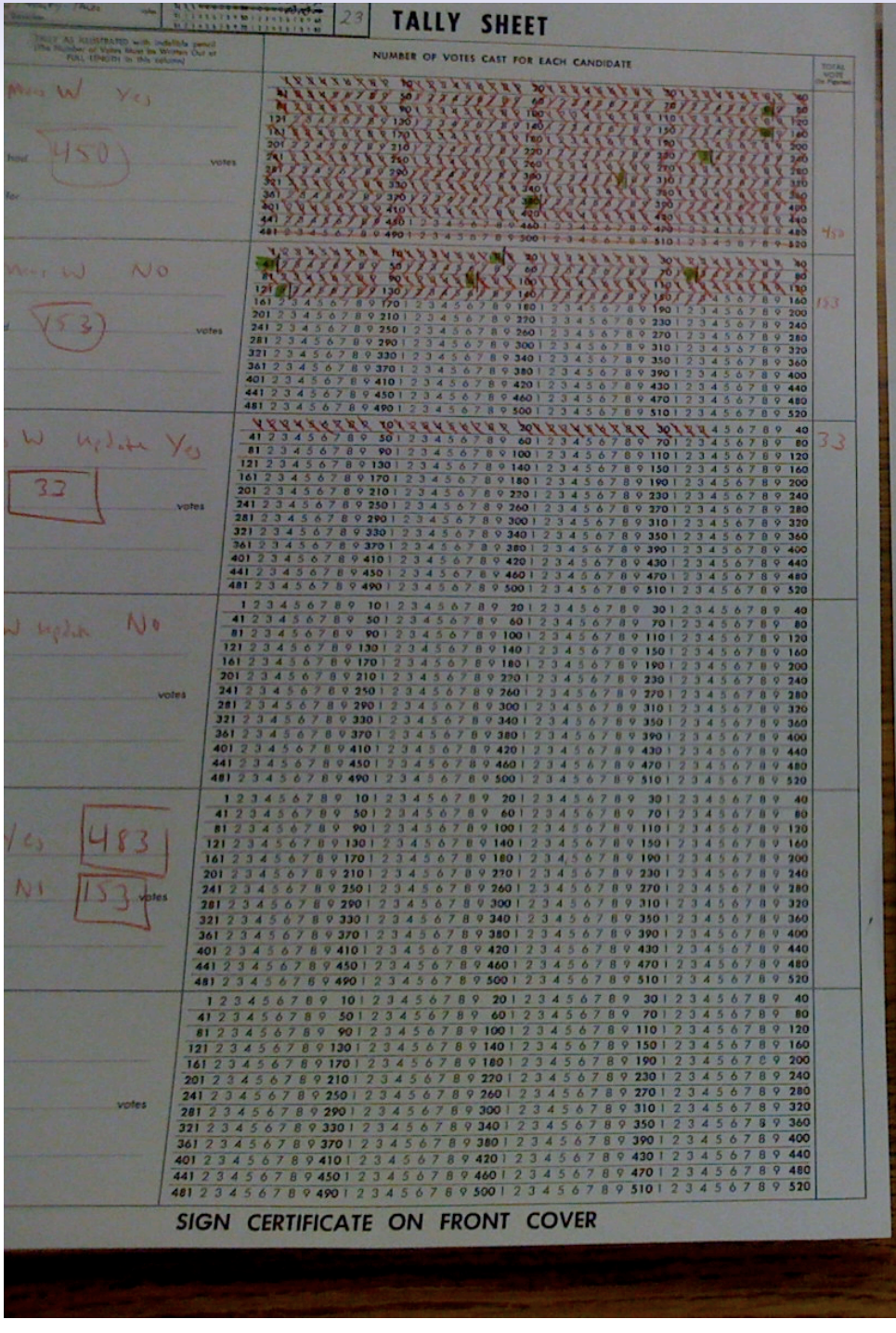
Counting burden ranged from 32 ballots to 7,000 ballots.

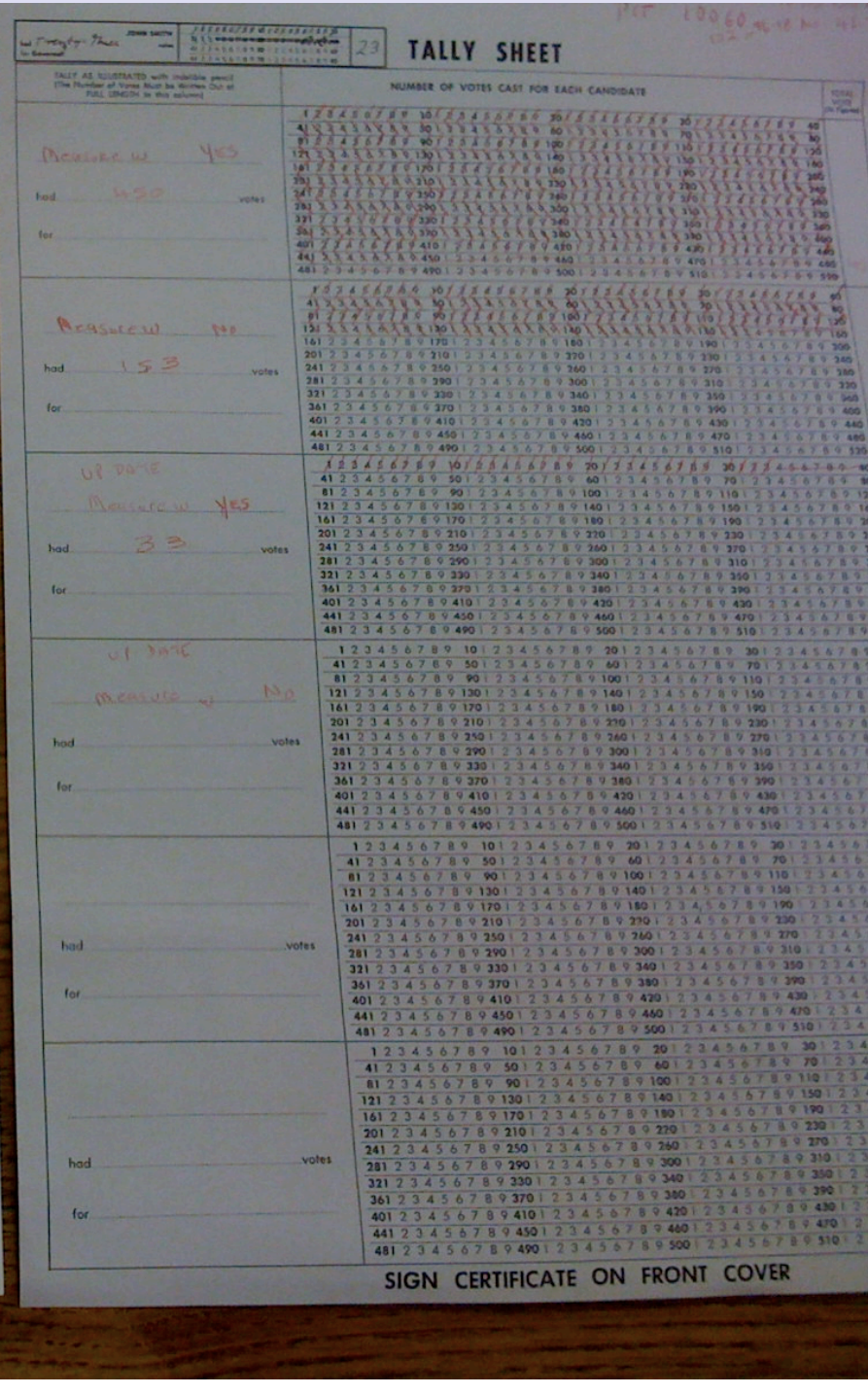
Cost per audited ballot ranged from nil to about $0.55.

2008 Yolo County, CA Measure W Audit



Voted Ballots
Hefty


TALLY SHEET
NUMBER OF VOTES CAST FOR EACH CANDIDATE
Measure W Yes
had 450 votes
for
Measure W No
had 153 votes
for
Measure W Update Yes
had 33 votes
for
Measure W Update No
had votes
for
Yes 483
No 153 votes
had votes
for
had votes
for
SIGN CERTIFICATE ON FRONT COVER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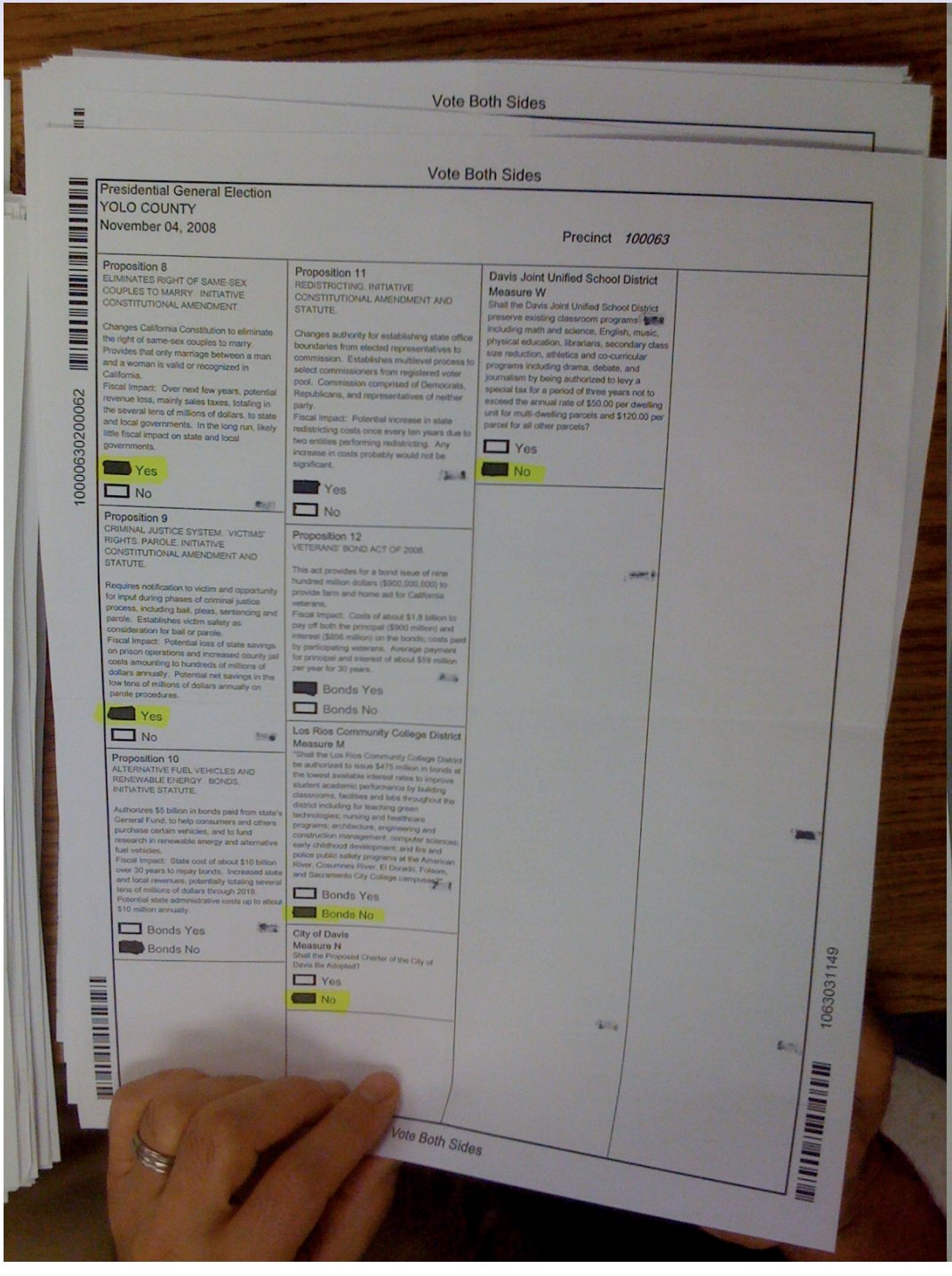
Vote Both Sides
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Presidential General Election
YOLO COUNTY
November 04, 2008
Precinct 100063
Proposition 8
ELIMINATES RIGHT OF SAME-SEX COUPLES TO MARRY. INITIATIVE CONSTITUTIONAL AMENDMENT
Changes California Constitution to eliminate the right of same-sex couples to marry. Provides that only marriage between a man and a woman is valid or recognized in California.
Fiscal Impact: Over next few years, potential revenue loss, mainly sales taxes, totaling in the several tens of millions of dollars, to state and local governments. In the long run, likely little fiscal impact on state and local governments.
Yes
No
Proposition 9
CRIMINAL JUSTICE SYSTEM. VICTIMS' RIGHTS. PAROLE. INITIATIVE CONSTITUTIONAL AMENDMENT AND STATUTE.
Requires notification to victim and opportunity for input during phases of criminal justice process, including bail, pleas, sentencing and parole. Establishes victim safety as consideration for bail or parole.
Fiscal Impact: Potential loss of state savings on prison operations and increased county jail costs amounting to hundreds of millions of dollars annually. Potential net savings in the low tens of millions of dollars annually on parole procedures.
Yes
No
Proposition 10
ALTERNATIVE FUEL VEHICLES AND RENEWABLE ENERGY. BONDS. INITIATIVE STATUTE.
Authorizes $5 billion in bonds paid from state's General Fund, to help consumers and others purchase certain vehicles, and to fund research in renewable energy and alternative fuel vehicles.
Fiscal Impact: State cost of about $10 billion over 30 years to repay bonds. Increased state and local revenues, potentially totaling several tens of millions of dollars through 2019. Potential state administrative costs up to about $10 million annually.
Bonds Yes
Bonds No
Proposition 11
REDISTRICTING. INITIATIVE CONSTITUTIONAL AMENDMENT AND STATUTE.
Changes authority for establishing state office boundaries from elected representatives to commission. Establishes multilevel process to select commissioners from registered voter pool. Commission comprised of Democrats, Republicans, and representatives of neither party.
Fiscal Impact: Potential increase in state redistricting costs once every ten years due to two entities performing redistricting. Any increase in costs probably would not be significant.
Yes
No
Proposition 12
VETERANS' BOND ACT OF 2008.
This act provides for a bond issue of nine hundred million dollars ($900,000,000) to provide farm and home aid for California veterans.
Fiscal Impact: Costs of about $1.8 billion to pay off both the principal ($900 million) and interest ($856 million) on the bonds; costs paid by participating veterans. Average payment for principal and interest of about $59 million per year for 30 years.
Bonds Yes
Bonds No
Los Rios Community College District
Measure M
"Shall the Los Rios Community College District be authorized to issue $475 million in bonds at the lowest available interest rates to improve student academic performance by building classrooms, facilities and labs throughout the district including for teaching green technologies; nursing and healthcare programs; architecture, engineering and construction management; computer sciences; early childhood development; and fire and police public safety programs at the American River, Cosumnes River, El Dorado, Folsom, and Sacramento City College campuses?"
Bonds Yes
Bonds No
City of Davis
Measure N
Shall the Proposed Charter of the City of Davis Be Adopted?
Yes
No
Davis Joint Unified School District
Measure W
Shall the Davis Joint Unified School District preserve existing classroom programs including math and science, English, music, physical education, librarians, secondary class size reduction, athletics and co-curricular programs including drama, debate, and journalism by being authorized to levy a special tax for a period of three years not to exceed the annual rate of $50.00 per dwelling unit for multi-dwelling parcels and $120.00 per parcel for all other parcels?
Yes
No
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1063031149
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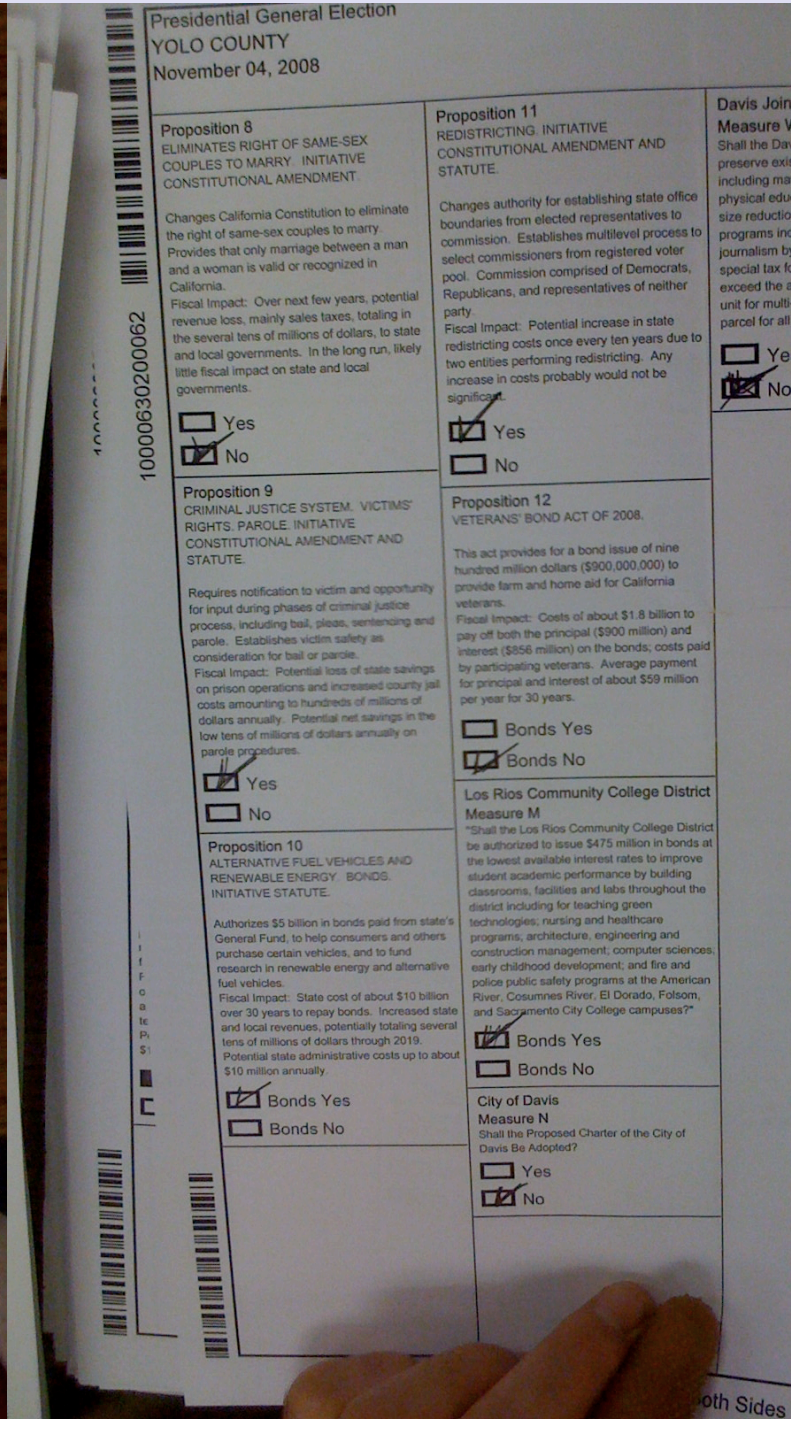
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Bonds No
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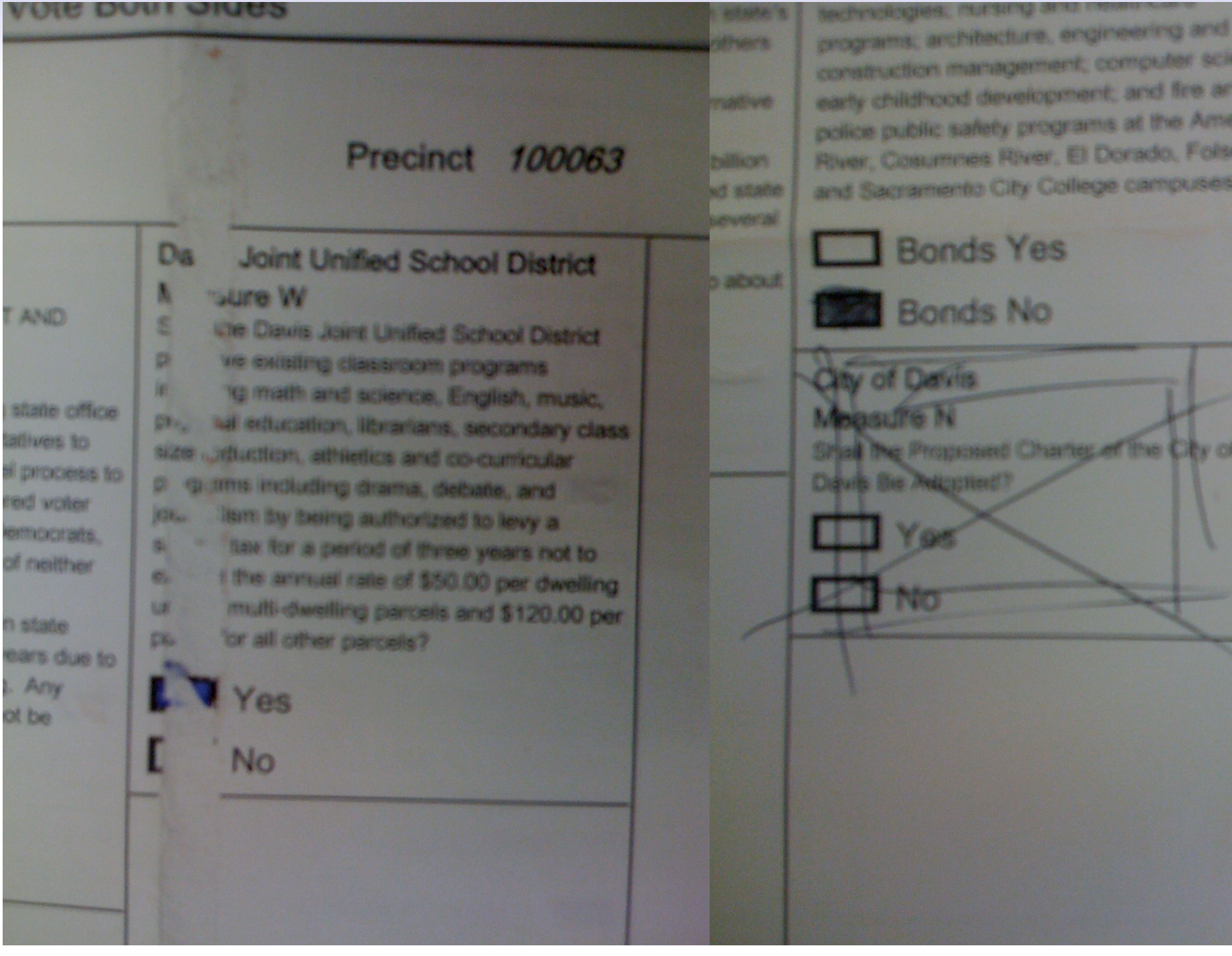
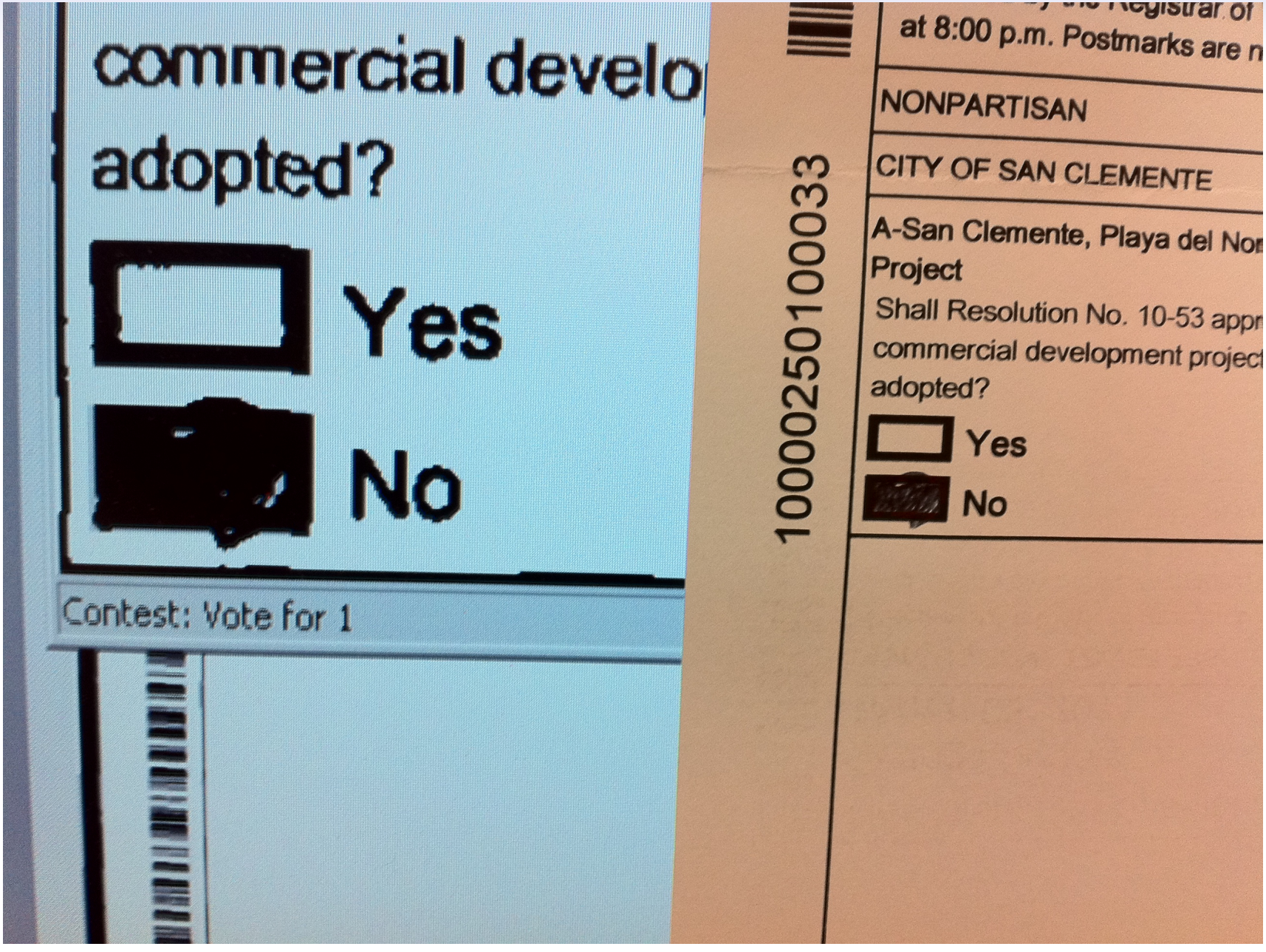
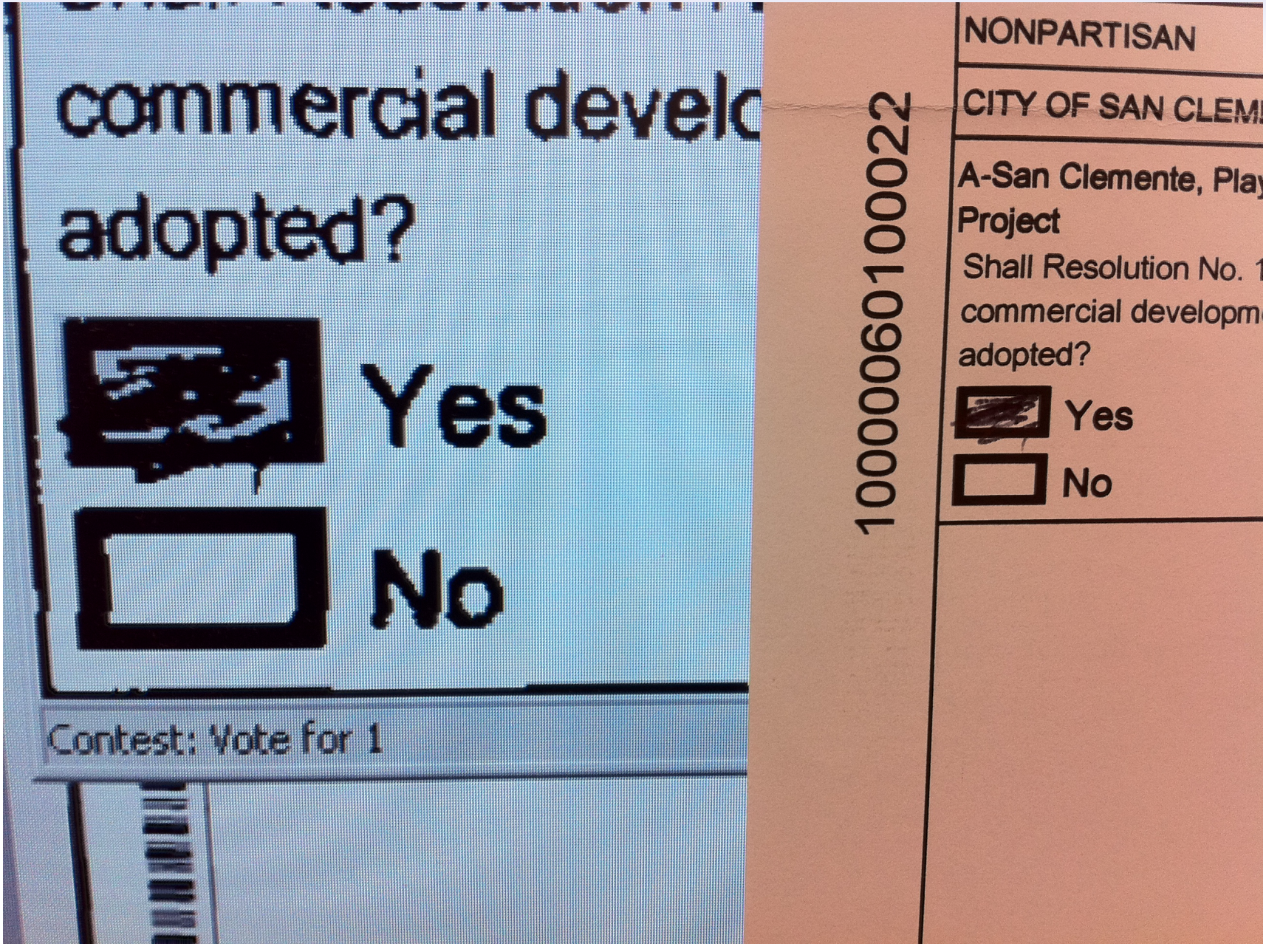

Vote Both Sides
Precinct 100063
Joint Unified School District
Yes
No
Bonds Yes
Bonds No
City of Davis
Yes
No

2011 Orange County, first audit under AB 2023

TAMPER
HART
IENTE SPECIAL MUNICIPAL ELECTION
March 8, 2010

Notice
OPEN DOOR SLOWLY


commercial develo
adopted?
Yes
No
Contest: Vote for 1
at 8:00 p.m. Postmarks are n
NONPARTISAN
CITY OF SAN CLEMENTE
A-San Clemente, Playa del No
Project
Shall Resolution No. 10-53 appr
commercial development project
adopted?
Yes
No
10000250100033


commercial develo
adopted?
Yes
No
Contest: Vote for 1
10000060100022
NONPARTISAN
CITY OF SAN CLEM
A-San Clemente, Play
Project
Shall Resolution No. 1
commercial developm
adopted?
Yes
No

Batch size matters

100 bags of 100 jelly beans, various flavors.
What fraction are coconut?

Compare pulling a bag at random to stirring all the beans together in a big pot and sampling 100 beans.

Vote-tabulation errors are like coconut jelly beans.
Less information in checking bags of beans—or batches of ballots—than in checking the same number drawn individually from the "pot."

Yolo County Measure P, November 2009: For 10% risk limit, initial sample 6 batches, 1,437 ballots (11.33%).

Could have gotten 10% risk limit by checking 6 individual ballots (less than 0.05%).

Orange County Statutory Audit

Votes in one precinct counted by hand. No errors found.

Chance the 1% audit would find no errors even if the outcome is wrong could be over 88%.

The error rate in the sample says little about the error rate in the whole contest because the batch is large:
One bag might have no coconut jelly beans, even though the rest have many.

Orange County Audits: Costs

Statutory Audit: $257.68

Scales as the size of the contest: a contest twice as large would cost about twice as much to audit.

AB 2023 risk-limiting audit (10% risk): $483.79 (not including my time or airfare)

Would have cost essentially the same for any contest with the same percentage margin, no matter how large the contest.

Only have to taste a teaspoon of soup to tell if the soup is too salty, no matter how big the pot–if it's stirred well.

Advantages of ballot-level RLA

Like sampling jelly beans from a big pot, instead of sampling bags of jelly beans.

- cheap (if technology supports it–working with vendors)
- fast and observable
- easy computations
- easy to explain

Tested in Yolo and Orange; next week in Monterey.

Expect to audit multi-jurisdictional contest in 2012.

Hope to have ballot-level audits in at least 5 California jurisdictions in 2012.

Secret sauce: have to associate individual CVRs with ballots.

Role of Verified Voting

- Promotes good ideas; defends against bad ones
- Becoming the definitive clearinghouse for state and national audit-related information, including law, pending legislation, and best practices
- Helps draft state and federal legislation (including AB 2023)
- Endorses good legislation and procedures that improve reliability and transparency (including AB 2023 and risk-limiting audits.
- Has provided volunteers to observe and help with pilot audits.
- Has helped me travel to conferences to develop, refine, and promote effective, efficient election audits (to secretaries of state, elections officials, election integrity advocates, computer scientists, voting equipment vendors, . . .).