Report To Wisconsin State Legislature

December 2, 2020

Voter Registration Numbering: State of Wisconsin

The voter registration data was downloaded from the WEC database on 8/19/2021 and contains 7,098,446 registered voters' name and assorted information.

Definition of Terms:
WEC = Wisconsin Election Commission

Voter ID: a unique data representation attached to each voter identity for the purposes of tracking that individual's address and other identifying information and election voting history. This is typically a primary key for a computer search of a database.

String: In this context, a string is any series of characters. A string can contain alpha/numeric characters, spaces or other characters on a keyboard, such as an asterisk or apostrophe.

WEC Numeric String Voter IDs

The objective of this review is to examine if WEC applies best practices for its voter data files that promote honesty, transparency and citizen confidence. Any citizen should be able to look at the voter registration files, understand them and peruse them with traditional, commonly used, inexpensive computer programs.

The voter registration information for any state uses a unique identifier for every voter. That representation is commonly the voter identification number otherwise called a voter ID.

The voter ID provided by WEC is a numeric string.

A numeric string is NOT a number.

A numeric string is a string where the only characters that are used in the string are numeric characters (the characters 0 – 9). Strings are commonly used by computers and the use of a string in this context is not an unusual choice. Strings are often indicated by surrounding them with double quotes.

This is a number: 1345

This is a string: “1345”

Best Practices

There are best practices for the implementation of numeric strings in the context of voter rolls or other similar tabular information.

WEC does not follow best practices and their voter ID numbering system is fraught with inconsistent voter ID identifier types, sequencing variances and other data in voter ID fields that are inconsistent with data best practices. Because of this lack of best practices, there is a lack of transparency using common data analysis tools.

If one chooses to use strings, there are two best practices:

1. Create a **variable width string** with no leading zeros

Examples look like this:

“9”
“10” “14” “1003” “104057”

The width (number of characters) can vary. To the left of the character string there are no zeros, spaces or other characters, visible or hidden.

They are easy for other computer programs to check. They are easy for humans to check. They make sense to both computers and humans.

2. Create a **fixed width string** and zero pad it.

Here, one determines how many instances the set is likely to contain over a reasonable period and chooses that many spaces.

For a state like Wisconsin, one might choose 100 million knowing that for the next few decades, all existing and new voter IDs would not exceed that number of zeros. The prior examples would look like this:

“000000009” “000000010” “000000014” “000001003” “022104057”

The strings are padded with zeros on the left in order to make the length of the strings consistent.

They are easy for other computer programs to check. They are easy for humans to check. They make sense to both computers and humans.

WEC Non-Best Practice Approach

Best practices exist to make data easy to understand by both common software programs and by humans. Systems that do not follow best practices produce data that is confusing for both common software programs (such as Excel) and for humans.

WEC’s approach to Voter ID’ is a variable width, multi-data type, optionally 0-padded string.

This choice “works” in that it is possible to write a program that works with strings of this type – but it makes the exported data from the WEC system confusing and increases the difficulty of auditing and data checking. If the data is more difficult to check and verify, it opens the door to unwanted activities that are difficult to detect.

WEC Voter ID strings can look like the following:

“717827990” “0717827990”

This is potentially very confusing to typical software programs that the average citizen would use to examine the data.

For example, Excel will likely interpret both Voter IDs (above) as being the same ID – making the average citizen believe that two different records are referring to the same person.

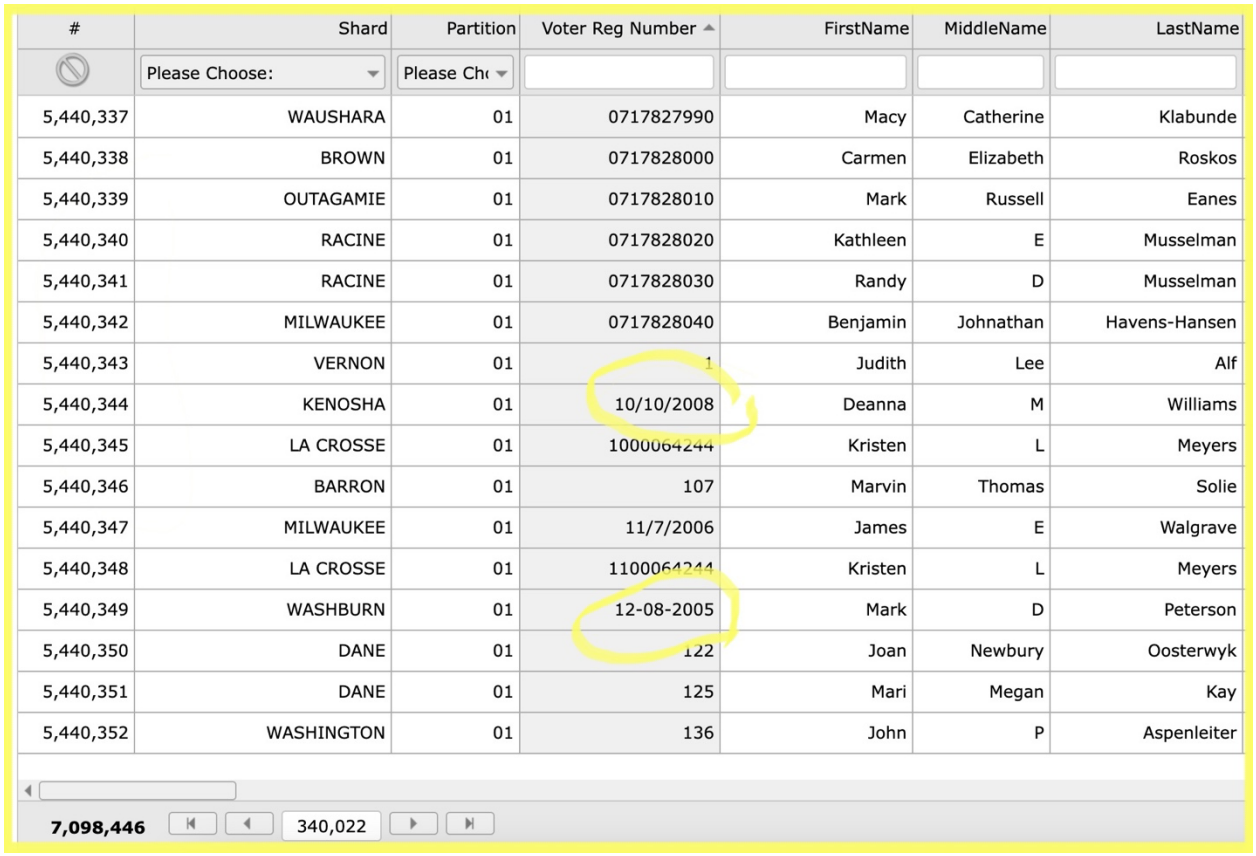
In the WEC database, this results in significant confusion.

For instance, WEC has 147,537 IDs, similar to those above, that appear to be duplicates when searched with commonly used technology. Thus, citizens cannot be assured that these 147,537 IDs are duplicates or not.

In other places the Voter ID's take on an entirely different format like: "10/10/2008" and in another it looks like this: "12-08-2005"

According to WEC, all are voter IDs.

Exhibit 1b below:



#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
5,440,337	WAUSHARA	01	0717827990	Macy	Catherine	Klabunde
5,440,338	BROWN	01	0717828000	Carmen	Elizabeth	Roskos
5,440,339	OUTAGAMIE	01	0717828010	Mark	Russell	Eanes
5,440,340	RACINE	01	0717828020	Kathleen	E	Musselman
5,440,341	RACINE	01	0717828030	Randy	D	Musselman
5,440,342	MILWAUKEE	01	0717828040	Benjamin	Johnathan	Havens-Hansen
5,440,343	VERNON	01	1	Judith	Lee	Alf
5,440,344	KENOSHA	01	10/10/2008	Deanna	M	Williams
5,440,345	LA CROSSE	01	1000064244	Kristen	L	Meyers
5,440,346	BARRON	01	107	Marvin	Thomas	Solie
5,440,347	MILWAUKEE	01	11/7/2006	James	E	Walgrave
5,440,348	LA CROSSE	01	1100064244	Kristen	L	Meyers
5,440,349	WASHBURN	01	12-08-2005	Mark	D	Peterson
5,440,350	DANE	01	122	Joan	Newbury	Oosterwyk
5,440,351	DANE	01	125	Mari	Megan	Kay
5,440,352	WASHINGTON	01	136	John	P	Aspenleiter

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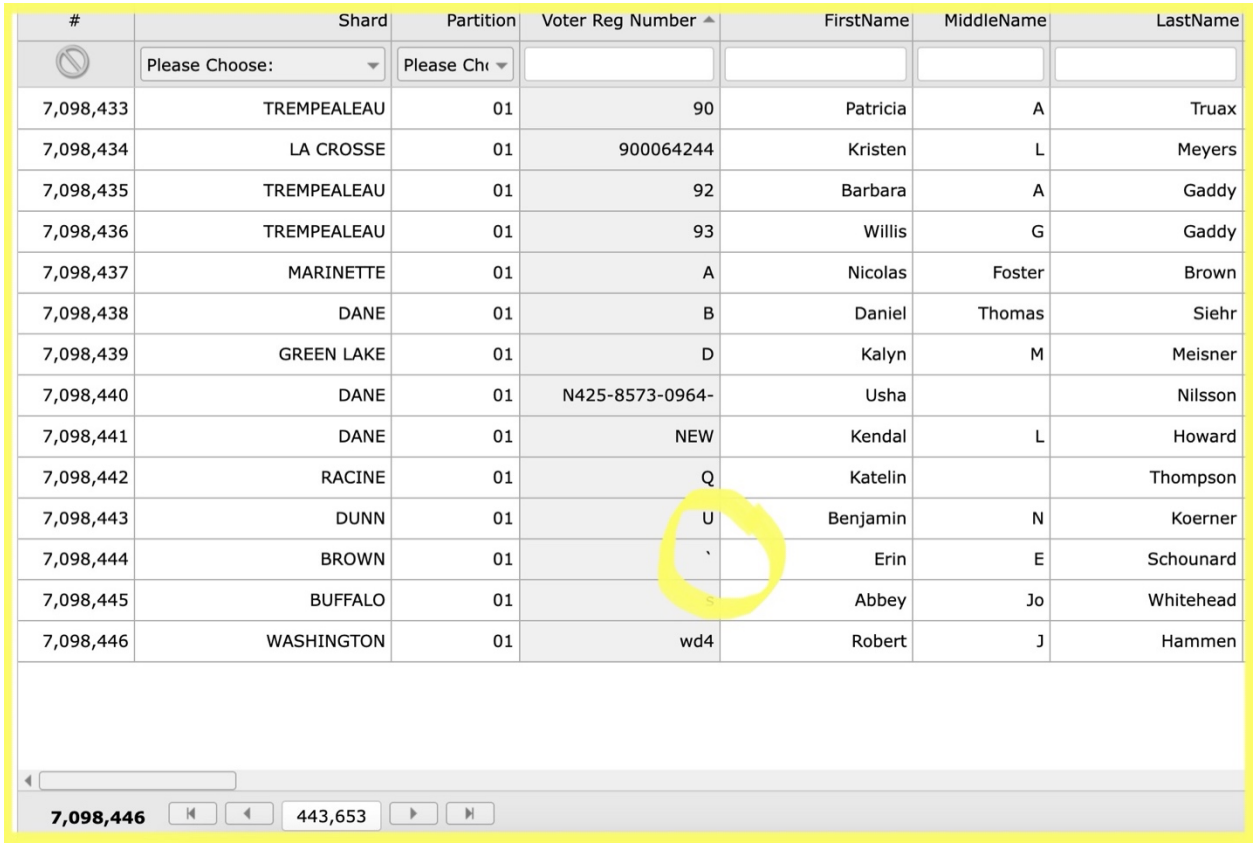
They sometimes create a voter ID with a character that is neither alpha nor numeric.

Exhibit 3b.



#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
7,098,433	TREMPEALEAU	01	90	Patricia	A	Truax
7,098,434	LA CROSSE	01	900064244	Kristen	L	Meyers
7,098,435	TREMPEALEAU	01	92	Barbara	A	Gaddy
7,098,436	TREMPEALEAU	01	93	Willis	G	Gaddy
7,098,437	MARINETTE	01	A	Nicolas	Foster	Brown
7,098,438	DANE	01	B	Daniel	Thomas	Siehr
7,098,439	GREEN LAKE	01	D	Kalyn	M	Meisner
7,098,440	DANE	01	N425-8573-0964-	Usha		Nilsson
7,098,441	DANE	01	NEW	Kendal	L	Howard
7,098,442	RACINE	01	Q	Katelin		Thompson
7,098,443	DUNN	01	U	Benjamin	N	Koerner
7,098,444	BROWN	01	`	Erin	E	Schounard
7,098,445	BUFFALO	01		Abbey	Jo	Whitehead
7,098,446	WASHINGTON	01	wd4	Robert	J	Hammen

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Look carefully, the yellow circle is NOT highlighting a speck on the reader's screen. The circle is pointing out that WEC uses an apostrophe for a voter ID number.

An apostrophe is the smallest symbol on the keyboard; it is the character between the t and s in it's. Here WEC has made an apostrophe a voter ID "number."

Data best practices exist for a reason. They make data import/export efficient. They enable computers and humans to make sense of oceans of data. They are easily auditable by humans using widely available computer software.

Most importantly, in this context best practices protect the data from unwarranted intrusion and malicious insertion of false data.

Let's take an example.

If everyone has a sequential voter ID, there is no chance anyone can insert a number between 0000123456 and 0000123457. There is no space.

However, WEC does not apply sequential numbering (strings) throughout its voter ID system.

WEC has strings where the sequencing is 1,2,3,4 increases by one digit for tens of thousands of voter IDs. Then, the sequence increases by 2 for tens of thousands of IDs. There is no apparent reason for this change. Later, the sequencing increases by 10.

Thus, there are empty slots for voter ID insertions. In the yellow circle in **Exhibit 4**, the reader will see the digits increasing by 2 as well as some insertions in that sequence.

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
3,663,985	CALUMET	01	0057870492	Daniel	A	Klotz
3,663,986	CHIPPEWA	01	0057870493	Robbyn	J	Schirmer
3,663,987	WOOD	01	0057870494	Pamela	Kay	De Boer
3,663,988	FLORENCE	01	0057870496	Robert	Allen	Fuller
3,663,989	DUNN	01	0057870498	Susan	C	Abitz
3,663,990	MILWAUKEE	01	0057870500	Kenneth	L	Ross
3,663,991	WAUKESHA	01	0057870502	MICHAEL	A	SEARS
3,663,992	WAUPACA	01	0057870504	Ruth	B	Scherwinski
3,663,993	MARATHON	01	0057870505	Theresa	E	Wetzsteon
3,663,994	WASHBURN	01	0057870506	Brian	D	Christiansen
3,663,995	WOOD	01	[illegible]	Kathleen	Ann	Ter Maat
3,663,996	WAUKESHA	01	0057870509	Brian	James	Whitney
3,663,997	OUTAGAMIE	01	0057870510	Kimberlee	K	Kane
3,663,998	SAWYER	01	0057870512	Sylvia	S	Buchanan
3,663,999	CALUMET	01	0057870513	Donald	Herbert	Goeldi
3,664,000	DUNN	01	0057870514	Gerald	Eugene	Wolf

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Exhibit 4.

Why is this important?

If voter ID numbers go from 000001230 to 000001240, to 000001250 there are 9 slots where a third party can insert 9 new IDs without easy detection in each sequence.

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName	Su
	Please Choose:	Please Ch					
5,419,745	DANE	01	0717621880	GAGE	HARRISON	MEYER	
5,419,746	KENOSHA	01	0717621890	Edvardo		Cabrera	
5,419,747	DANE	01	0717621900	Alicia		Wright	
5,419,748	KENOSHA	01	0717621910	Destiny	Marie	Caithamer	
5,419,749	DANE	01	0717621920	Eric	Harvey	Hochberg	
5,419,750	JEFFERSON	01	0717621930	Sandra	Kay	Midtlien	
5,419,751	SHAWANO	01	0717621940	Alisha	Ann	Konig	
5,419,752	SAWYER	01	0717621950	Elaine	Marie	Corbine	
5,419,753	SHAWANO	01	0717621960	Lisa	Marie	Lechterman	
5,419,754	SHAWANO	01	0717621970	Sherry	A	Kitchenmaster	
5,419,755	DANE	01	0717621980	Lindsey	Beyer	Albright	
5,419,756	ST CROIX	01	0717621990	Melissa	Mary	Jorgensen	
5,419,757	MILWAUKEE	01	0717622000	Rachel	Anneliis	Kiefer	
5,419,758	DANE	01	0717622010	Elyse	Christoff	Freiberger	
5,419,759	DANE	01	0717622020	Nicholas	J	Handrick	
5,419,760	SHAWANO	01	0717622030	Preston	L	Raasch	

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Exhibit 6, above shows the sequencing which skips 9 lines jumping by 10 for each row.

The question with WEC is: did anyone insert numbers into these sequences? The answer is YES as the **Exhibit 5**, below, yellow circle shows.

Examining **Exhibit 5**, below, one sees that the digits (strings) grow from 0515 to 0517 growing by 2 as the last thousand such numbers grew. One would be surprised to see a new number inserted as 0518 which is the case. Here an even number is inserted in a 2 digit odd number sequence.

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
3,664,001	IOWA	01	0057870515	Cheryl	Ann	Banachowski-Fuller
3,664,002	SAWYER	01	0057870517	Joyce	Marie	Mikow
3,664,003	WAUKESHA	01	0057870518	Marilyn	C	Hopper
3,664,004	WAUKESHA	01	0057870520	Margaret	L	De Witt
3,664,005	WASHINGTON	01	0057870522	Bernice	R	Gloede
3,664,006	KENOSHA	01	0057870524	Robert	C	Vennetti
3,664,007	DANE	01	0057870525	John	D	Schneider
3,664,008	DUNN	01	0057870526	[illegible]	[illegible]atthew	Raehsler
3,664,009	OUTAGAMIE	01	0057870528	[illegible]	C.	Rademacher
3,664,010	JACKSON	01	0057870530	Cassandra	Marie	Johnson
3,664,011	MARQUETTE	01	0057870532	Curt	A	Gast
3,664,012	WOOD	01	0057870533	Clara	Marie	Elsen
3,664,013	MARINETTE	01	0057870535	Carl	L	Renikow
3,664,014	BUFFALO	01	0057870536	Daniel	Lee	Noll
3,664,015	BAYFIELD	01	[illegible]	Jennifer	Ann	Tosch
3,664,016	OUTAGAMIE	01	0057870540	Tiffany	R	Ostenson

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Exhibit 5.

More interesting in Exhibit 5, one would expect to see the sequence revert back to the odd digit sequence after the insertion. That is NOT what happens. The sequence is resequenced at 0518 into an even number sequence until another insertion, where it goes back to odd.

Thus it appears that when WEC or another party inserts a new voter ID into an empty slot, all subsequent VOTER IDs resequence back to 2s or 10s.

With this approach to sequencing, it is more challenging to detect if an unauthorized party has inserted data into the sequence of records.

Merges

There are best practices for data merges and they do not appear in the WEC system.

WEC has what appear to be multiple ID schemes in the data, some are dates, some are variable width string, some are fixed width strings, some are zero-padded, some are keyboard characters.

Best practices for data merges are to map identifiers into a single consistent representation – and then use that representation on an ongoing basis.

If a data merge had followed best practices, these different ID schemes would have disappeared or they would have been segmented into one traceable such merge set.

WEC has a current voter ID system with space for over 700 million entries. There are plenty of places where WEC could find the precise number of voter IDs to assign to any type of merge. Instead, WEC has voter IDs inserted throughout its system and the different data types of date, keyboard character, digit with hidden spaces remain.

WEC not only has sequencing that is hard to follow and open to insertions, it has many different numbering sequences (strings). For instance:

Here in **Exhibit 6a,** WEC is using a sequencing of 200000246 followed by sequences with insertions, as the sequence changes from odd to even to odd.

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
5,440,369	LANGLADE	01	200	Elisabeth	A	Strobel
5,440,370	SAUK	01	200000246	Ingrid	Desiree	Wadsworth
5,440,371	WINNEBAGO	01	200007718	Kristan	A	Fischer
5,440,372	OCONTO	01	200053337	Jennifer	Lynn	Lynch
5,440,373	JEFFERSON	01	200053452	Jessica		Bailey
5,440,374	BROWN	01	200064201	Laura	Jeanne	Norton
5,440,375	WASHINGTON	01	200064232	Werner	Harland Gero...	Schwabe
5,440,376	LA CROSSE	01	200064244	Kristen	L	Meyers
5,440,377	MARATHON	01	200064246	Tricia	Ann	Knetter
5,440,378	CALUMET	01	200064257	Mariah	Lynn	Tasch
5,440,379	GREEN	01	200064288	Jacob	Allan	Rhyner
5,440,380	EAU CLAIRE	01	200064298	Brittany	C	Cloud
5,440,381	FOND DU LAC	01	200064307	Rachel	Angeline	Grutza
5,440,382	MILWAUKEE	01	200064351	Nicholas	Pearce	Steele
5,440,383	WAUKESHA	01	200064360	Morgan	A	Lang
5,440,384	KENOSHA	01	200064376	Courtney	Lynn	Bockrath

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Comparing **Exhibit 6a** with **Exhibit 6** above, looking at the left most column, one sees that the WEC sequence for WEC provided voter IDs jumps from the 700 million sequence in **Exhibit 6** to the 200000246 sequence yet both remain around the 5400000 sequence of voters.

Exhibit 7, below shows that around the same left column sequence, WEC moves to a different numbering system beginning with 575xxxxxx.

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
5,495,985	ONEIDA	01	57521913	Harvey	F	Goglin
5,495,986	ONEIDA	01	57521914	Joanna	K	Gudel
5,495,987	ONEIDA	01	57521915	Dolores	L	Gottschalk
5,495,988	ONEIDA	01	57521916	Lewis	G	Gottschalk
5,495,989	ONEIDA	01	57521917	Kelly	D	Green
5,495,990	MARATHON	01	57521918	Lee	A	Guenther
5,495,991	ONEIDA	01	57521919	Dana	L	Hammond
5,495,992	ONEIDA	01	57521920	Kari	L	Hanek
5,495,993	ONEIDA	01	57521921	Sylvia	J	Held
5,495,994	ONEIDA	01	57521922	David	L	Henrichs
5,495,995	ONEIDA	01	57521923	Laurel	J	Henrichs
5,495,996	ONEIDA	01	57521924	Carole	A	Hielke
5,495,997	ONEIDA	01	57521925	Ronald	W	Hielke
5,495,998	ONEIDA	01	57521926	Jean	M	Hilt
5,495,999	ONEIDA	01	57521927	Stephen	D	Hilt
5,496,000	ONEIDA	01	57521928	Rodney	P	Huber

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Exhibit 8 demonstrates that WEC uses another sequencing approach in the general vicinity of 5400000. This sequence begins with the 300xxxxxx then reverts to voter IDs with only two or three digits.

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
5,494,033	CLARK	01	292	Brittany	Lee	Vandeberg
5,494,034	BROWN	01	300064201	Laura	Jeanne	Norton
5,494,035	LA CROSSE	01	300064244	Kristen	L	Meyers
5,494,036	MARATHON	01	300064246	Tricia	Ann	Knetter
5,494,037	GREEN	01	300064288	Jacob	Allen	Rhyner
5,494,038	EAU CLAIRE	01	300064298	Brittany	C	Cloud
5,494,039	WINNEBAGO	01	300064351	Nicholas	P	Steele
5,494,040	WAUKESHA	01	300064360	Morgan	A	Lang
5,494,041	KENOSHA	01	300064376	Courtney	Lynn	Bockrath
5,494,042	TAYLOR	01	300064461	Evelin		Correia
5,494,043	MILWAUKEE	01	300130661	Albertina		Dimartino
5,494,044	WAUPACA	01	300294945	Ellen	Sue	Chowning
5,494,045	ROCK	01	300432055	Shane	Lee	Niedzwecki
5,494,046	KENOSHA	01	31	Dawn	Marie	Zabroski
5,494,047	WASHINGTON	01	316	Lawrence	N	Thomas
5,494,048	WASHINGTON	01	317	Jody	L	Strupp

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Exhibit 8.

WEC does not appear to use generally accepted best practices for its voter ID system. The voter ID is the most important identifier in the entire system because it is unique to every voter, past or present, active or inactive.

The key question one must ask is whether individuals can insert voter ID numbers into the WEC voter registration system without going through its inherent number assigning program. The answer would appear to be yes as the data shows.

Let's revisit **Exhibit 1b**.

Like other states, Wisconsin assigns voter ID numbers by a machine, a computer. There is some mechanism for a central agency to assign a voter identification number to a person and it should generally be an identifier that is incremented as each new voter is registered.

Can individuals enter the WEC system and apply arbitrary identifiers to a voter? As Exhibit 1b below demonstrates, humans can and do enter arbitrary strings:

#	Shard	Partition	Voter Reg Number	FirstName	MiddleName	LastName
	Please Choose:	Please Ch				
5,440,337	WAUSHARA	01	0717827990	Macy	Catherine	Klabunde
5,440,338	BROWN	01	0717828000	Carmen	Elizabeth	Roskos
5,440,339	OUTAGAMIE	01	0717828010	Mark	Russell	Eanes
5,440,340	RACINE	01	0717828020	Kathleen	E	Musselman
5,440,341	RACINE	01	0717828030	Randy	D	Musselman
5,440,342	MILWAUKEE	01	0717828040	Benjamin	Johnathan	Havens-Hansen
5,440,343	VERNON	01	1	Judith	Lee	Alf
5,440,344	KENOSHA	01	10/10/2008	Deanna	M	Williams
5,440,345	LA CROSSE	01	1000064244	Kristen	L	Meyers
5,440,346	BARRON	01	107	Marvin	Thomas	Solie
5,440,347	MILWAUKEE	01	11/7/2006	James	E	Walgrave
5,440,348	LA CROSSE	01	1100064244	Kristen	L	Meyers
5,440,349	WASHBURN	01	12-08-2005	Mark	D	Peterson
5,440,350	DANE	01	122	Joan	Newbury	Oosterwyk
5,440,351	DANE	01	125	Mari	Megan	Kay
5,440,352	WASHINGTON	01	136	John	P	Aspenleiter

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A human entered the system and inserted the “apostrophe” for a voter registration number.

There is no question the WEC system is open to human intervention and from the inconsistent naming conventions seen throughout the WEC system and highlighted in **Exhibit 1b**, there appears to be neither proper security nor control.

If citizens are not able to reasonably deal with the voter rolls either by reviewing them manually or with commonly available computer programs, there will continue to be a lack of trust in the voting institution.

The danger in Wisconsin is significant that a bad actor can access the WEC system and can take advantage of the egregious poor data practices to influence an election outcome.