

Data Reliability and Quality Assurance : A Case Study



Data Reliability: A Case Study in
Torrance

Data Reliability Testing: A Case Study of the Audit of Residential Rubbish Billing

Biennial Forum of Government Auditors ,
San Jose, May 2006
Presented by Saboohi A. Currim
Audit Manager
City of Torrance

- ***Application of data reliability standards to an actual study conducted by the City of Torrance Audit Division.***

Objectives

- To determine if some residents of the City are receiving rubbish collection services from the City's Public Works Department without paying for these services.

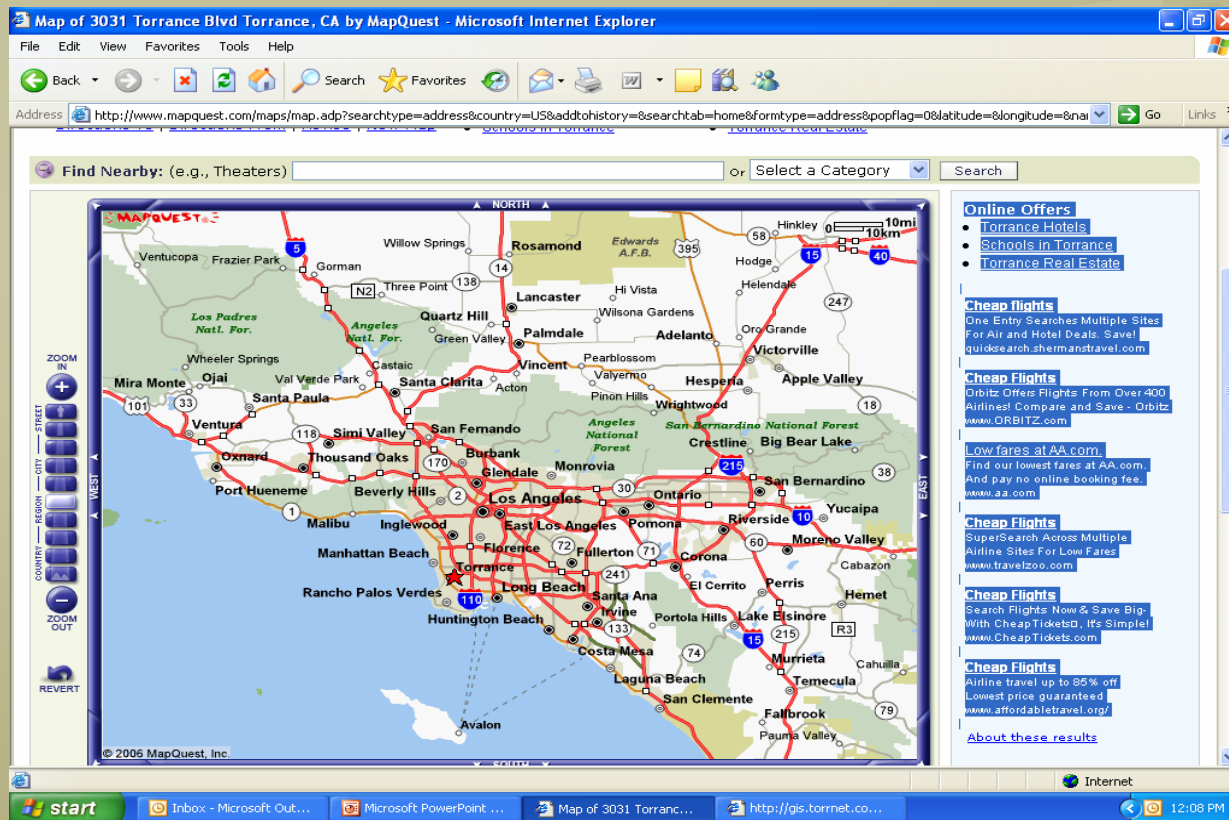
Procedures

- Identifying the complete universe of residential rubbish billing account addresses in Torrance
- Determining which addresses were not paying for rubbish billing services
- Collecting evidence that these addresses were not paying for and yet receiving services

Background on Torrance

■ Population : 146,204

Size: 21.2 square miles.



Data Reliability: A Case Study in
Torrance

Characteristics Required of Data Sources Utilized

- Complete: contains all of the data elements & records needed for the engagement.
- Accurate: consistently reflects the data entered at the source

Data Sources Available to the City

- Rubbish Billing Systems
- Trash Collection Route System
- Water & Sewer Billing Systems
- City Maps on Geographic Information System based on County Assessor's parcel data

Assessment of Reliability

Data Source I

- Rubbish Billing System: This system lacks completeness as not all addresses in the City are serviced by the City's trash collection services. However the data in the rubbish billing file was determined to be accurate as the City sends out bills every 2 months and follows up on unpaid or undelivered bills.



Lists of Torrance Rubbish Service Accounts from TMWD

Microsoft Excel - tor_rubbish_customers

File Edit View Insert Format Tools Data Window Help

Type a question for help

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Reply with Changes... End Review...

A18 RUBY VILLANUEVA

	A	B	C	D	E	F	G	H
1	Name	CustNbr	ServiceLocationStreet	ServiceLocationNbr	RubbishLas	A/Rbalance	Address	
2	HIGSON DAVID	8000468	CRENSHAW BL	2347	20050215	0	2347 CRENSHAW BL	
3	LEONARA HELMESLEY	8000607	San Miquel Blvd	2122	20050207	0	2122 San Miquel Blvd	
4	DOLORES WRIGHT	8000633	Westwood Blvd	2025	20050207	131.09	2025 Westwood Blvd	
5	SCOTT OLDS	8000634	Westwood Blvd	2023	20050207	0	2023 Westwood Blvd	
6	PATRICIA POOLE	8000636	Westwood Blvd	2019	20050207	0	2019 Westwood Blvd	
7	KEN JEWEL	8000805	San Miquel Blvd	1810-12	20050208	0	1810-12 San Miquel Blvd	
8	HARVEY SHIEH	8000811	San Miquel Blvd	1746-B	20050208	164.36	1746-B San Miquel Blvd	
9	CHARLES HONG	8000816	San Miquel Blvd	1746-A	20050208	0	1746-A San Miquel Blvd	
10	ALEX CHOI	8000854	las canchas way	1732	20050208	0	1732 las canchas way	
11	LARA IBRAHIM	8000858	las canchas way	1736	20050208	122.15	1736 las canchas way	
12	NICOLE POOLE	8000859	las canchas way	1740	20050208	0	1740 las canchas way	
13	MIKE SHAPIRO	8000875	las canchas way	1744	20050208	0	1744 las canchas way	
14	JOYCE REYES	8000877	las canchas way	1748-50	20050208	0	1748-50 las canchas way	
15	TERI VANOS	8000879	las canchas way	1752	20050208	0	1752 las canchas way	
16	JIL WELDIN	8000892	las canchas way	1808	20050208	0	1808 las canchas way	
17	SUZANNE BITTNER	8000900	las canchas way	1814	20050208	0	1814 las canchas way	
18	RUBY VILLANUEVA	8000910	San Miquel Blvd	1813-15	20050208	0	1813-15 San Miquel Blvd	
19	JERRY MASUDA	8000913	las canchas way	1820	20050208	0	1820 las canchas way	
20	KATHY SCALA	8000917	las canchas way	1824	20050208	0	1824 las canchas way	
21	JEANNIE LEW	8000919	las canchas way	1828	20050208	0	1828 las canchas way	
22	COLLEEN MARKERT	8000920	las canchas way	1904	20050208	0	1904 las canchas way	
23	DONNA LEARNED	8000926	las canchas way	1908	20050208	0	1908 las canchas way	
24	ALICE TORRALBA	8000931	las canchas way	1912	20050208	0	1912 las canchas way	
25	KERRY KEHOE	8000938	las canchas way	1920	20050208	0	1920 las canchas way	
26	MAY RAMOS	8000942	las canchas way	1924	20050208	64.33	1924 las canchas way	
27	ELLA SANDBERG	8000943	las canchas way	1928	20050208	-0.62	1928 las canchas way	
28	TOM ARIMA	8000950	220TH ST	1918	20050208	0	1918 220TH ST	
29	NAT DULANEY	8000956	las canchas way	2008	20050208	0	2008 las canchas way	
30	LEILA RASHID	8000957	San Miquel Blvd	2005	20050208	0	2005 San Miquel Blvd	
31	VINA GUICHARD	8000958	San Miquel Blvd	2009	20050208	0	2009 San Miquel Blvd	
32	OLIVIA TRAN	8000960	San Miquel Blvd	2013-15	20050208	0	2013-15 San Miquel Blvd	
33	PAT VELASCO	8000965	las canchas way	2016-1/2-2018	20050208	-80.31	2016-1/2-2018 las canchas way	

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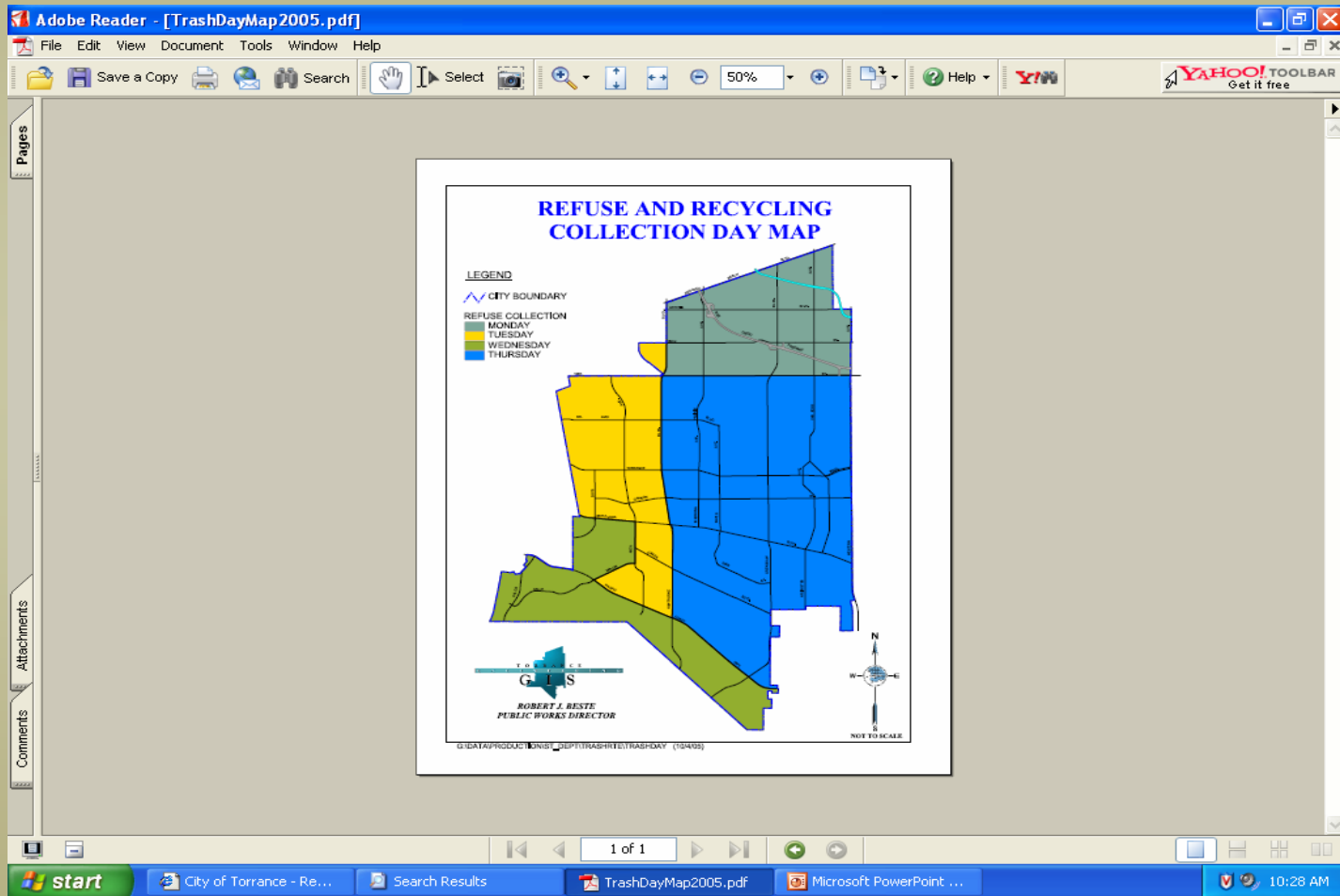
Assessment of Reliability

Data Source II

- Trash Route System: This system lacks completeness as the system does not define which addresses the rubbish is collected from. Just quadrants are specified in the route map. It also lacks accuracy as no address /account level information is provided on the route sheet.



Trash Route system does not list completely or accurately all addresses that receive rubbish collection services.



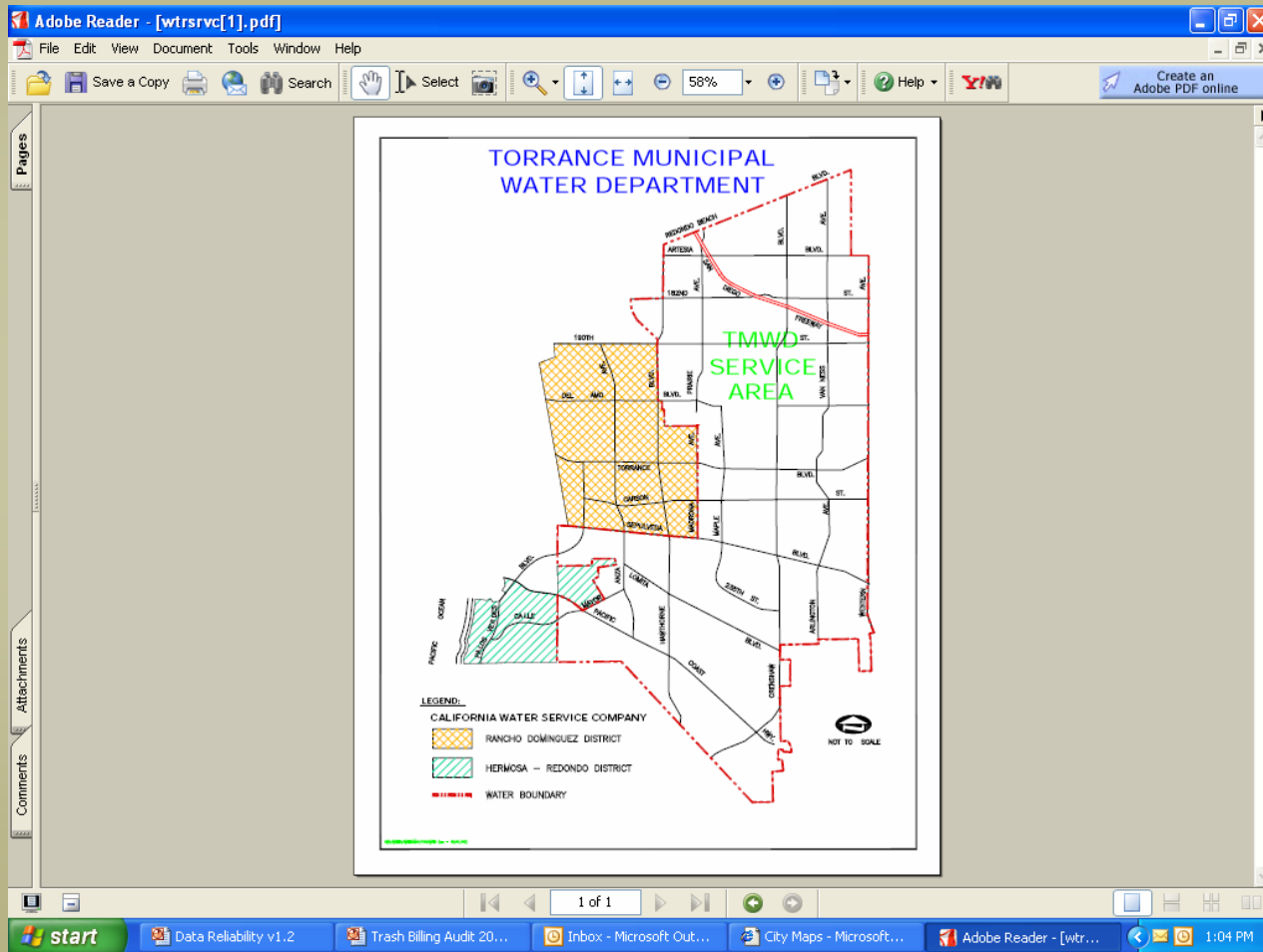
Assessment of Reliability

Data Source III

- Water Billing Systems: These systems are not complete as the City is served by 2 separate water utilities with different billing systems. Each system is not complete in listing all service addresses in Torrance.
- The 2 billing systems also do not segregate commercial versus, residential customers so it is not possible to generate a list of SFR receiving water service.
- *Note: All Names & addresses have been altered to protect confidential customer billing information*



Service areas for TMWD and Calwater Districts



TMWD Water, Trash & Sewer Billing Report

Microsoft Excel - Torrance water Billing 2002 V1.2

File Edit View Insert Format Tools Data Window Help

Type a question for help

Reply with Changes... End Review...

C906 5075 CAMINO DE LAS ESTRELLAS

	A	B	C	H	I	L	M	N	O	P	Q
1	Cust Nbr	Customer Name	Service Location	Water Chg	ccf Usage	Sewer Chg	Trash Connect Date	Trash Close Date	Trash Chg	Extra Container Chg	
898	8027497	HIGSON DAVID	5075 CAMINO DE LAS ESTRELLAS	\$ 1,489.94	848	\$ 208.43	0	0	\$ -	\$ -	
899	8029898	LEONARA HELMESLEY	500 VIA LOS LAGOS	\$ 1,489.93	848	\$ -	0	0	\$ -	\$ -	
900	8024962	DOLORES WRIGHT	6121 HAWTHORNE BLVD	\$ 1,488.19	847	\$ 209.23	0	0	\$ -	\$ -	
901	8000556	SCOTT OLDS	8921 290TH ST	\$ 1,486.41	846	\$ 209.13	0	0	\$ -	\$ -	
902	8036715	PATRICIA POOLE	5075 CAMINO DE LAS ESTRELLAS	\$ 1,479.40	842	\$ 205.90	19711214	0	\$ 171.57	\$ -	
903	8029526	KEN JEWEL	500 VIA LOS LAGOS	\$ 1,477.64	841	\$ 206.62	0	0	\$ -	\$ -	
904	8024868	HARVEY SHIEH	6121 HAWTHORNE BLVD	\$ 1,475.87	840	\$ 207.14	0	0	\$ -	\$ -	
905	8005538	CHARLES HONG	8921 290TH ST	\$ 1,472.36	838	\$ 206.48	0	0	\$ -	\$ -	
906	8011954	ALEX CHOI	5075 CAMINO DE LAS ESTRELLAS	\$ 1,472.37	838	\$ 206.85	0	0	\$ -	\$ -	
907	8031226	LARA IBRAHIM	500 VIA LOS LAGOS	\$ 1,468.85	836	\$ 205.73	0	0	\$ -	\$ -	
908	8032733	NICOLE POOLE	6121 HAWTHORNE BLVD	\$ 1,467.10	835	\$ -	0	0	\$ -	\$ -	
909	8029873	MIKE SHAPIRO	8921 290TH ST	\$ 1,465.34	834	\$ 206.85	0	0	\$ -	\$ -	
910	8015772	JOYCE REYES	5075 CAMINO DE LAS ESTRELLAS	\$ 1,461.82	832	\$ 205.11	0	0	\$ -	\$ -	
911	8012214	TERI VANOS	500 VIA LOS LAGOS	\$ 1,460.07	831	\$ 205.31	0	0	\$ -	\$ -	
912	8007722	JIL WELDIN	6121 HAWTHORNE BLVD	\$ 1,458.31	830	\$ 204.13	0	0	\$ -	\$ -	
913	8018607	SUZANNE BITTNER	8921 290TH ST	\$ 1,458.32	830	\$ 204.61	0	0	\$ -	\$ -	
914	8031241	RUBY VILLANUEVA	5075 CAMINO DE LAS ESTRELLAS	\$ 1,458.32	830	\$ 204.07	0	0	\$ -	\$ -	
915	8032941	JERRY MASUDA	500 VIA LOS LAGOS	\$ 1,458.31	830	\$ 204.24	0	0	\$ -	\$ -	
916	8001689	KATHY SCALA	6121 HAWTHORNE BLVD	\$ 1,456.57	829	\$ 204.52	0	0	\$ -	\$ -	
917	8019893	JEANNIE LEW	8921 290TH ST	\$ 1,453.04	827	\$ 204.32	0	0	\$ -	\$ -	
918	8009011	COLLEEN MARKERT	5075 CAMINO DE LAS ESTRELLAS	\$ 1,449.53	825	\$ 203.73	0	0	\$ -	\$ -	
919	8010993	DONNA LEARNED	500 VIA LOS LAGOS	\$ 1,447.77	824	\$ 203.51	0	0	\$ -	\$ -	
920	8000164	ALICE TORRALBA	6121 HAWTHORNE BLVD	\$ 1,446.01	823	\$ 203.07	0	0	\$ -	\$ -	
921	8013950	KERRY KEHOE	8921 290TH ST	\$ 1,446.01	823	\$ 202.20	0	0	\$ -	\$ -	
922	8031825	MAY RAMOS	5075 CAMINO DE LAS ESTRELLAS	\$ 1,446.01	823	\$ 202.55	0	0	\$ -	\$ -	
923	8035020	ELLA SANDBERG	500 VIA LOS LAGOS	\$ 1,442.51	821	\$ 202.48	0	0	\$ -	\$ -	
924	8025655	TOM ARIMA	6121 HAWTHORNE BLVD	\$ 1,440.74	820	\$ 202.04	0	0	\$ -	\$ -	
925	8012546	NAT DULANEY	8921 290TH ST	\$ 1,426.69	812	\$ -	0	0	\$ -	\$ -	
926	8035018	LEILA RASHID	5075 CAMINO DE LAS ESTRELLAS	\$ 1,426.67	812	\$ 200.30	0	0	\$ -	\$ -	
927	8012364	VINA GUICHARD	500 VIA LOS LAGOS	\$ 1,424.93	811	\$ 199.71	0	0	\$ -	\$ -	

Sheet1 / Sheet2 / Sheet3 /

Ready

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CW Water, Sewer Billing Report

Microsoft Excel - City of Torrance Cal water data

File Edit View Insert Format Tools Data Window Help

Type a question for help

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M10

	A	B	C	D	F	G	H	I	J	M	N
1	Service Address	Customer Name	CWS Acct Num	On Date	Active mths	AVG	Water	Sewer	Tax		
2	5075 CAMINO DE LAS ESTRELLAS	HIGSON DAVID	08-51-40-0050-3	01/05/1999	12	140	\$3,681.07	\$409.92	\$220.89		
3	500 VIA LOS LAGOS	LEONARA HELMESLEY	08-51-40-0075-1	01/05/1999	12	12	\$684.58	\$35.04	\$0.00		
4	6121 HAWTHORNE BLVD	DOLORES WRIGHT	08-51-40-0100-2	01/05/1999	12	12	\$335.19	\$35.04	\$20.12		
5	8921 290TH ST	SCOTT OLDS	08-51-40-0125-1	01/05/1999	12	20	\$931.14	\$58.56	\$55.87		
6	5075 CAMINO DE LAS ESTRELLAS	PATRICIA POOLE	08-51-40-0150-1	01/05/1999	12	12	\$676.58	\$35.04	\$0.00		
7	500 VIA LOS LAGOS	KEN JEWEL	08-51-40-0175-3	01/05/1999	12	38	\$707.47	\$111.24	\$42.53		
8	6121 HAWTHORNE BLVD	HARVEY SHIEH	08-51-40-0200-4	01/05/1999	11	31	\$972.39	\$81.96	\$58.37		
9	8921 290TH ST	CHARLES HONG	08-51-40-0225-3	01/05/1999	12	18	\$999.74	\$52.68	\$60.01		
10	5075 CAMINO DE LAS ESTRELLAS	ALEX CHOI	08-51-40-0250-1	01/05/1999	12	12	\$490.75	\$35.04	\$29.46		
11	500 VIA LOS LAGOS	LARA IBRAHIM	08-51-40-0275-5	01/05/1999	12	86	\$1,921.78	\$251.76	\$115.33		
12	6121 HAWTHORNE BLVD	NICOLE POOLE	08-51-40-0300-3	01/05/1999	12	18	\$638.99	\$52.68	\$38.35		
13	8921 290TH ST	MIKE SHAPIRO	08-51-40-0325-5	01/05/1999	12	31	\$1,065.48	\$90.72	\$63.93		
14	5075 CAMINO DE LAS ESTRELLAS	JOYCE REYES	08-51-40-0330-4	01/05/1999	12	34	\$925.46	\$99.48	\$55.55		
15	500 VIA LOS LAGOS	TERI VANOS	08-51-40-0350-1	01/05/1999	12	0	\$369.56	\$0.00	\$0.00		
16	6121 HAWTHORNE BLVD	JIL WELDIN	08-51-40-0375-1	01/05/1999	5	33	\$433.36	\$40.25	\$26.01		
17	8921 290TH ST	SUZANNE BITTNER	08-51-40-0375-2	06/04/1999	7	0	\$521.66	\$0.00	\$31.33		
18	5075 CAMINO DE LAS ESTRELLAS	RUBY VILLANUEVA	08-51-40-0400-2	01/05/1999	12	25	\$553.73	\$73.20	\$33.23		
19	500 VIA LOS LAGOS	JERRY MASUDA	08-51-40-0425-2	01/05/1999	12	23	\$804.34	\$67.32	\$48.28		
20	6121 HAWTHORNE BLVD	KATHY SCALA	08-51-40-0450-6	01/05/1999	12	13	\$555.74	\$38.04	\$33.36		
21	8921 290TH ST	JEANNIE LEW	08-51-40-0475-2	01/05/1999	12	23	\$831.25	\$67.32	\$49.90		
22	5075 CAMINO DE LAS ESTRELLAS	COLLEEN MARKERT	08-51-40-0500-3	01/05/1999	12	26	\$962.34	\$76.08	\$57.77		
23	500 VIA LOS LAGOS	DONNA LEARNED	08-51-40-0525-3	01/05/1999	12	21	\$975.77	\$61.44	\$58.57		
24	6121 HAWTHORNE BLVD	ALICE TORRALBA	08-51-40-0600-3	01/05/1999	12	37	\$982.26	\$108.24	\$58.96		
25	8921 290TH ST	KERRY KEHOE	08-51-40-0625-5	01/05/1999	11	13	\$655.40	\$35.04	\$39.41		
26	5075 CAMINO DE LAS ESTRELLAS	MAY RAMOS	08-51-40-0650-3	01/05/1999	12	18	\$627.05	\$52.68	\$37.64		
27	500 VIA LOS LAGOS	ELLA SANDBERG	08-51-40-0675-1	01/05/1999	12	36	\$1,121.23	\$105.36	\$0.00		
28	6121 HAWTHORNE BLVD	TOM ARIMA	08-51-40-0680-3	01/05/1999	12	29	\$829.84	\$84.84	\$49.81		
29	8921 290TH ST	NAT DULANEY	08-51-40-0700-1	01/05/1999	12	321	\$6,632.32	\$939.84	\$397.96		
30	5075 CAMINO DE LAS ESTRELLAS	LEILA RASHID	08-51-40-0725-4	01/05/1999	12	170	\$4,239.92	\$497.76	\$254.41		
31	500 VIA LOS LAGOS	VINA GUICHARD	08-51-40-0750-2	01/05/1999	12	11	\$289.02	\$32.16	\$17.36		
32	6121 HAWTHORNE BLVD	OLIVIA TRAN	08-51-40-0775-6	01/05/1999	12	18	\$419.38	\$52.68	\$25.17		

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Assessment of Reliability

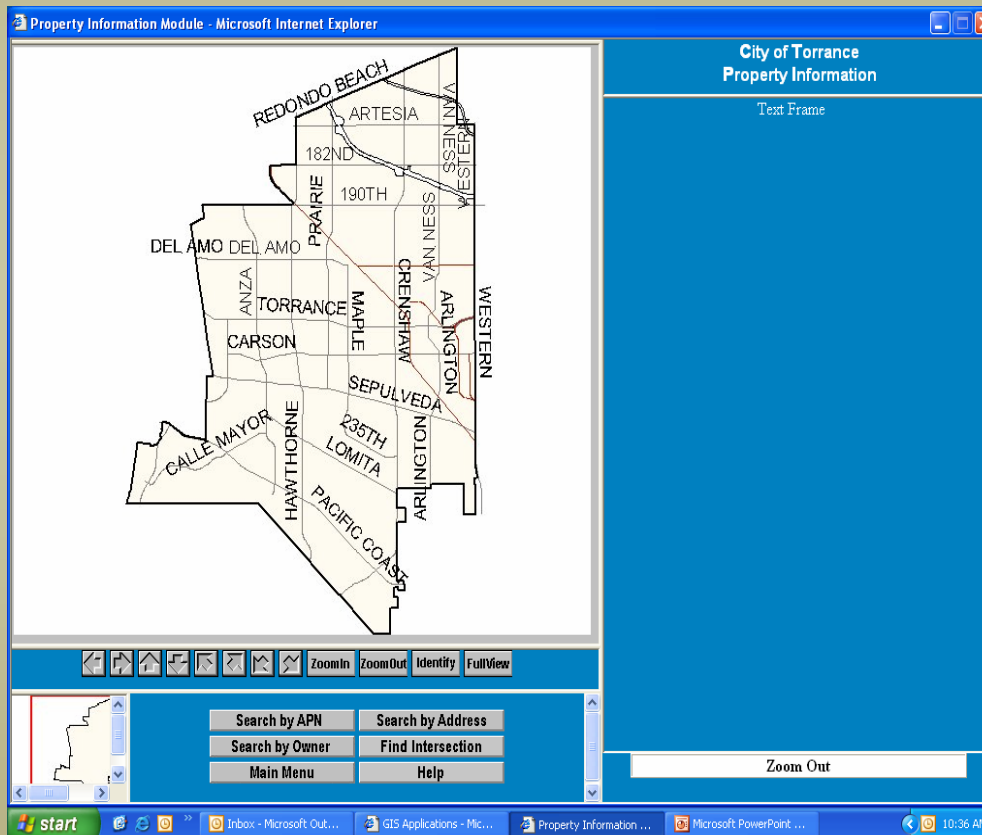
Data Source IV

- City GIS maps are complete listing of all parcels in the City, but lack the data element of whether they are receiving city trash collection services or not.
- All parcels were not classified accurately as to type of zoning code (SFR or Single Family Residential vs. Multi Family Residential).
- All parcels did not accurately translate into valid street addresses.



City of Torrance GIS System

This was the City's proprietary system that we used to map the Assessor's Data



Test of Data Sources

- **Audit Challenge:** To combine all these data sources in a way that we can obtain one data source that has all the data elements that we need and the assurance that all residential service addresses have been identified



Test of Completeness

- Used the City's GIS system with data from LA County Assessor's Office to generate a complete list of properties classified as R1 or residential single family homes in the City & compared it to the addresses on the rubbish billing records
- Generated exception report from comparing these 2 lists.

Identified 2,200 Target Parcels for Comparison with GIS maps

Microsoft Excel - Parcels Not Registered 42505

Type a question for help

MS Sans Serif 10

Reply with Changes... End Review...

D14 BITTNER MCDONOUGH

	B	C	D	H	I	J	K	L	M	N
	HOUSE_	STREET_NAME	OWNER	NO_OF _UNIT	is Registered	Searched for in Rubbish Customers				
1	2023	556th	BITTNER MCDONOUGH	1	FALSE	TRUE				
2	3321	166TH ST	OLDS KEHOE	1	FALSE	TRUE				
3	2924	556th ST	RAMOS VILLANUEVA	4	FALSE	TRUE				
4	2925	556th ST	SANDBERG REYES	4	FALSE	TRUE				
5	2914	557th ST	BITTNER MCDONOUGH	4	FALSE	TRUE				
6	2915	557th ST	OLDS KEHOE	4	FALSE	TRUE				
7	3536	557th ST	RAMOS VILLANUEVA	3	FALSE	TRUE				
8	3542	557th ST	SANDBERG REYES	3	FALSE	TRUE				
9	3548	557th ST	BITTNER MCDONOUGH	3	FALSE	TRUE				
10	3554	557th ST	OLDS KEHOE	3	FALSE	TRUE				
11	3560	557th ST	RAMOS VILLANUEVA	3	FALSE	TRUE				
12	2203	169TH PL	SANDBERG REYES	1	FALSE	TRUE				
13	3414	558th ST	BITTNER MCDONOUGH	4	FALSE	TRUE				
14	3420	558th ST	OLDS KEHOE	4	FALSE	TRUE				
15	3424	558th ST	RAMOS VILLANUEVA	4	FALSE	TRUE				
16	3430	558th ST	SANDBERG REYES	4	FALSE	TRUE				
17	3434	558th ST	BITTNER MCDONOUGH	4	FALSE	TRUE				
18	3537	558th ST	OLDS KEHOE	5	FALSE	TRUE				
19	3541	558th ST	RAMOS VILLANUEVA	5	FALSE	TRUE				
20	3542	558th ST	SANDBERG REYES	4	FALSE	TRUE				
21	3548	558th ST	BITTNER MCDONOUGH	4	FALSE	TRUE				
22	3554	558th ST	OLDS KEHOE	4	FALSE	TRUE				
23	3507	558th ST	RAMOS VILLANUEVA	4	FALSE	TRUE				
24	3960	558th ST	SANDBERG REYES	1	FALSE	TRUE				
25	3601	172ND ST	BITTNER MCDONOUGH	3	FALSE	TRUE				
26	4111	173RD ST	OLDS KEHOE	1	FALSE	TRUE				
27	2827	175TH ST	RAMOS VILLANUEVA	1	FALSE	TRUE				
28	2604	176TH ST	SANDBERG REYES	1	FALSE	TRUE				
29	4015	176TH ST	RAMOS VILLANUEVA	1	FALSE	TRUE				
30	2018	177TH ST	SANDBERG REYES	1	FALSE	TRUE				
31										

Ready

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Inbox - Microsoft Out... Data Reliability v1.2 Trash Billing Audit 20... Microsoft Excel - Parc...

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Test of Accuracy

- Used the City's GIS visual mapping system to identify the physical location of missing parcels.



COT GIS Mapping System

Identifying Addresses w/o Accounts

The screenshot displays the City of Torrance Property Information Module in Microsoft Internet Explorer. The main window shows a map of property parcels with a red dot indicating a specific location. The parcel is labeled with the APN 7516-017-017. The map includes street names: BARBARA, GLENN, LAURETTE, REDBEAM, JACQUES, LINDA, and PALOS VERDES. The information panel on the right provides the following details:

City of Torrance Property	
APN	7516-017-017
Situs Address	2190 REDBEAM AVE
Situs City	TORRANCE
Situs Zip Code	90501
Legal Description	TRACT 1877
Owner Name	GIML, REE, DIAN
Owner Address	2190 REDBEAM AVE
Owner City/State	TORRANCE CA
Owner Zip Code	90501
Census Tract	6507
Zoning	SFR
IRIS Land Use	R1
Zoning Overlay	HILLS
General Plan Designation	R-LO

The interface also includes a search bar with options: Search by APN, Search by Address, Search by Owner, Find Intersection, Main Menu, and Help. A zoom control is visible at the bottom right of the map area.

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Findings from Unmatched Data

- The assessor's data on GIS was not completely accurate as to the reality of property development on the ground.
- Many parcels listed as RI were actually substandard lots such as easements & rights of way .
- Some parcels had been converted into multifamily units.
- Many parcels could not be located on street maps indicating that some properties had been merged into one address.

Follow Up Procedures to Verify Findings

- On site visits to each location clearly identified as an existing single family residence, receiving rubbish service and evidence of no bills.



Audit Intern “Overseeing” Fieldwork



Data Reliability: A Case Study in
Torrance

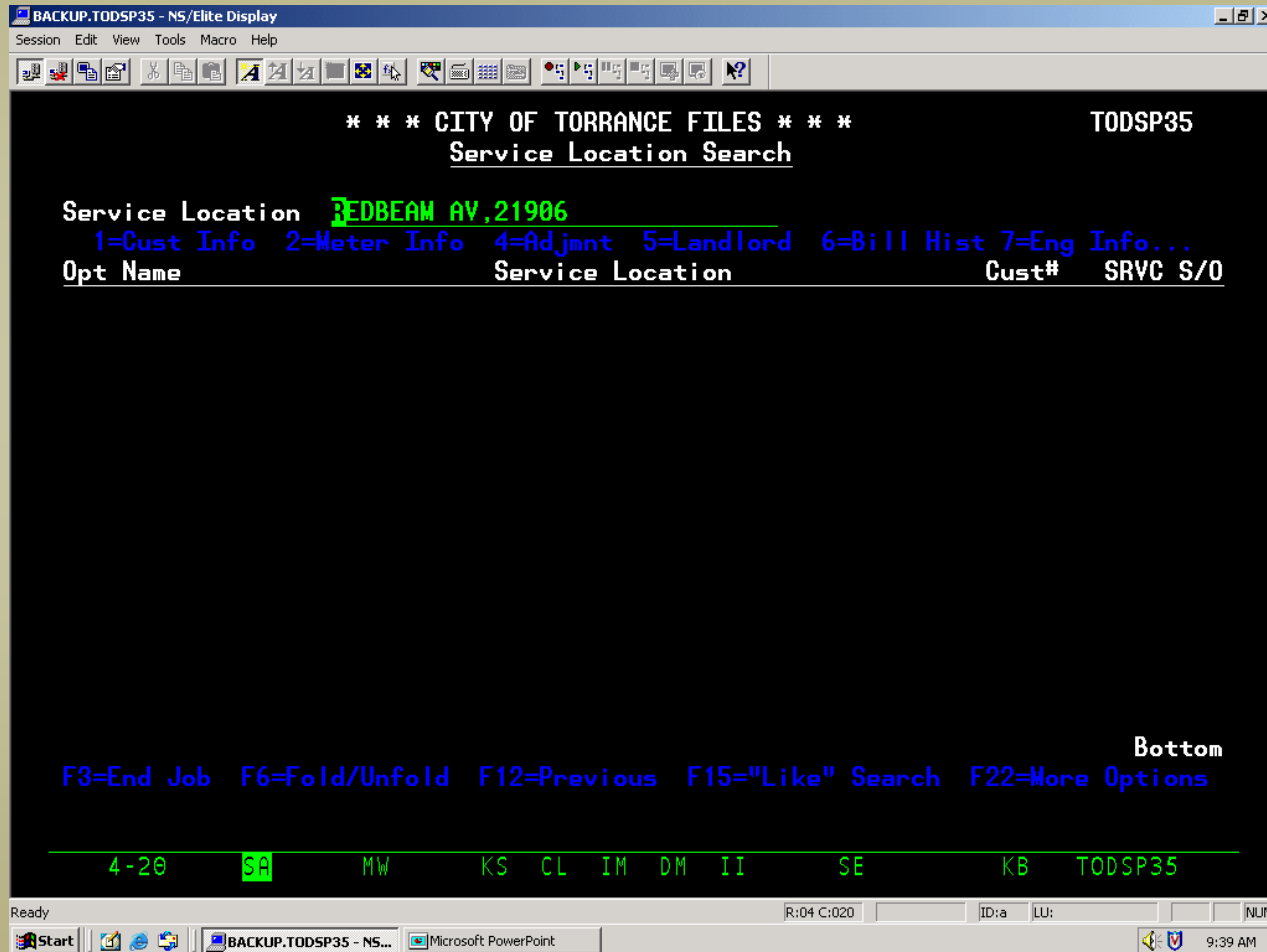
Sample Tuesday Route

21906 Redbeam Ave



Rubbish Bin ID# V0238677

Verified Address has no account on rubbish billing system



Main Findings

FIELD INSPECTIONS:

- Identified 179 target parcels for field inspection over four daily routes
- Confirmed 109 parcels with evident rubbish bin (s) - (60% of targets)
- Photographed rubbish containers from the street to document service
- Notated rubbish and/or recycling bin numbers for inventory

LIKELY REVENUE STREAM:

2006 and thereafter: $109 \times \$37.88 \text{ bimonthly rate} \times 6 = \$24,775 \text{ per year}$

Conclusions

- Using data from a variety of sources can be helpful but ultimately all information has to be verified either visually or by reference to another source document.
- Most data sources have significant weaknesses and it is important to understand how this information was collected so that alternative methods are used to compensate for the shortcomings of the data.

