What is a Stormwater Utility Fee?

- Monthly fee
  - Maintenance
  - Improvements
  - Other costs

How do you do it?

- Identify contributors
  - Impervious surface = runoff
- Create an impervious surface based billing system
Overview of Methods

• Impervious surface dataset
  – NAIP 2015 aerials
  – Supervised machine learning
• Billing data/Parcel data matching
  – Loose join script
  – Manual matching
• Goal: Combined Billing/Impervious coverage dataset

Overview of Methods

• Computers: useful tools
• Speed of computation

NAIP 2015 4-band aerial
Account – Parcel Matching

- What we have
  - Parcel-level impervious surface (with address)
  - Billing account addresses
- What we want
  - Billing account addresses with impervious surface
- Common factor: Addresses

Problem!
- 101 Oak St
- 101 Oak Street
- 101 Oak

Data Sources
Data Sources

- County Appraisal Data (CAD)
  - Palo Pinto
  - Parker
  - ~ 11000 polygons
  - Unique ID Style
  - Addresses
  - Tax information
  - Owner name

- Utility Records
  - ~ 6500 rows
  - Unique ID style
  - Addresses
  - Util. rates
  - Owner name

Loose join

**Objective**

- \( D_1 \) and \( D_2 \)
- Rigid match
- \( |D_1 \cap D_2| = 2 \)
- \( |D_1 \cup D_2| = 6343 \)
- \( |D_1 \times D_2| = 95 \) out of 6343
- \( |D_2 \times D_1| = 6343 \) out of 6343
Loose join

Standardization (Making as similar as possible)
- All Caps
- Comparable address structure ("Number" - "St/av..." - "Zip")

Loose Join

String matching algorithm
- Partial flexibility: Only on street name

Loose Join Script

<table>
<thead>
<tr>
<th>Billing Acct</th>
<th>Billing Address</th>
<th>Parcel Acct</th>
<th>Parcel Address</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>02-240000-01</td>
<td>101 CLUSTER DR</td>
<td>UIN8490</td>
<td>101 CLUSTER DR</td>
<td>1.00</td>
</tr>
<tr>
<td>16-201000-01</td>
<td>2201 GARRETT MORRIS PKWY</td>
<td>UIN7109</td>
<td>2201 GARRETT MORRIS PKWY</td>
<td>0.87</td>
</tr>
<tr>
<td>17-201001-01</td>
<td>4901 SHADY VIEW CT</td>
<td>UIN2310</td>
<td>4901 SHADY VIEW CT</td>
<td>0.96</td>
</tr>
<tr>
<td>29-198000-14</td>
<td>305 TOURNAMENT LANE</td>
<td>UIN2303</td>
<td>305 TOURNAMENT LN</td>
<td>0.93</td>
</tr>
<tr>
<td>16-236000-05</td>
<td>1050 SE 24 1/2 AVE</td>
<td>UIN6600</td>
<td>1050 SE 24TH 1/2 AVE</td>
<td>0.91</td>
</tr>
<tr>
<td>17-203000-03</td>
<td>802 BELLAIRE CIRCLE</td>
<td>UIN2400</td>
<td>802 BELLAIRE CIR</td>
<td>0.89</td>
</tr>
<tr>
<td>17-204000-05</td>
<td>105 KARL KESLLE BLVD</td>
<td>UIN1602</td>
<td>105 KARL KESLLE BLVD</td>
<td>0.86</td>
</tr>
<tr>
<td>20-203000-01</td>
<td>375 HIDEAWAY ACRES</td>
<td>UIN6458</td>
<td>375 HIDEAWAY ACRES RD</td>
<td>0.87</td>
</tr>
<tr>
<td>04-198000-03</td>
<td>305 SE 10 AVE</td>
<td>UIN6600</td>
<td>305 SE 10TH AVE</td>
<td>0.86</td>
</tr>
<tr>
<td>18-446000-03</td>
<td>317 SAW HOUSTON</td>
<td>UIN6500</td>
<td>317 SAW HOUSTON AVE</td>
<td>0.85</td>
</tr>
<tr>
<td>01-121000-01</td>
<td>317 NW 4 AVE</td>
<td>UIN7102</td>
<td>317 NW 4TH AVE</td>
<td>0.83</td>
</tr>
<tr>
<td>35-515000-03</td>
<td>101 FM 2256</td>
<td>UIN7105</td>
<td>101 FM 2256</td>
<td>0.82</td>
</tr>
<tr>
<td>31-545000-03</td>
<td>314 CEDAR</td>
<td>UIN6207</td>
<td>314 CEDAR ST</td>
<td>0.77</td>
</tr>
<tr>
<td>18-446000-01</td>
<td>101 SE 17 AVE B</td>
<td>UIN6600</td>
<td>101 SE 17TH AVE</td>
<td>0.75</td>
</tr>
<tr>
<td>25-047000-02</td>
<td>974 MORTON</td>
<td>UIN2310</td>
<td>974 MORTON AVE</td>
<td>0.75</td>
</tr>
<tr>
<td>32-860000-03</td>
<td>214 SW 26 AVE B</td>
<td>UIN7105</td>
<td>214 SW 26TH AVE</td>
<td>0.75</td>
</tr>
</tbody>
</table>

Acceptable threshold >= 0.75
Quality Control

2 concerns:
○ Data quality
○ Integrity of loose join

2 approaches:
○ Inspect 6400 records and identify false positives.
○ Graphical result of “incorrect-ness”

Quality Control

Incorrectness =
1) Wrong address given by CAD to polygon
   Test: Does Parcel centroid line up with geocoded address ?

Quality Control

Incorrectness =
2) Wrong address “JOINED” automatically despite high similarity score
   • Test: Can a third party detect a significant difference between Add.1 & Add.2 that “loose join” could not detect?
Quality Control

Variability due to parcel sizes, and Esri's imperfect address locator.

Geocoded Parcel Address to Geocoded Billing Address

\[ \epsilon = \frac{3}{5178} = 0.000579 \]

Account – Parcel Matching

- 6,434 Billing Records
- 5,200 matched by "loose join" script
- 62 undefined
- 1,172 matched manually

Manual Matching

Google Street View, Yelp, Facebook, etc...

Facebook

Neat's Ark Thift Store

9/16/19
Manual Matching

Google Street View, Yelp, Facebook, etc...

Manual Matching

Google Street View, Yelp, Facebook, etc...

Impervious – Parcel Dataset
Impervious – Parcel Dataset

Equivalent Residential Unit

- 2,600 square feet = 1 ERU

ERU-Based Billing Example

<table>
<thead>
<tr>
<th>Address</th>
<th>Single Family Home</th>
<th>Wal-Mart</th>
</tr>
</thead>
<tbody>
<tr>
<td>501 Brazos Drive</td>
<td>3,757</td>
<td>1.4</td>
</tr>
<tr>
<td>601 N FM RD 1821</td>
<td>796,507</td>
<td>306.3</td>
</tr>
</tbody>
</table>
Comparison - Rate per 1 ERU

Mean non-SFR Property (13 ERU)

Fully Funded Utility

- $4.00 per ERU = 100% funded
Fully Funded Utility

SFR Rate Comparison (1 ERU)

- Georgetown: $6.00
- Temple: $6.00
- El Paso: $4.35
- Mineral Wells (Proposed): $4.00
- Abilene: $2.70
- Amarillo: $2.46
- Mineral Wells: $1.88

Fully Funded Utility

Mean non-SFR Rate Comparison (13 ERU)

- Georgetown: $78.24
- Temple: $75.00
- El Paso: $71.95
- Fort Worth: $70.39
- Mineral Wells (Proposed): $12.06
- Frisco: $39.88
- Amarillo: $38.39
- Abilene: $34.64

Non-SFR Monthly Bill Differential ($4/ERU)
Phased Implementation?

- $2.00 per ERU = 50% funded
- $3.00 per ERU = 75% funded
- $4.00 per ERU = 100% funded

Questions?

Tak Makino, CFM
mmakino@lan-inc.com
Ph. 713-921-0399

Haytham Oueidat, EIT
houeidat@lan-inc.com
Ph. 512-338-2729

8911 N. Capital of Texas Hwy, Bldg 2
Austin, TX 78759
www.lan-inc.com

Thank You