

# How Can I Make Sense of Demand Data?

for Hydraulic Models and Everyone Else

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**PNWS-AWWA 2023 Section Conference**  
**Kennewick, WA**

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MAY 3 2023, 11:30am



# — Agenda

- Defining demand
- Demand data
- Distributing demand
- Development and demand

1

# Defining demand

**What is demand anyway?**

# — What is demand?

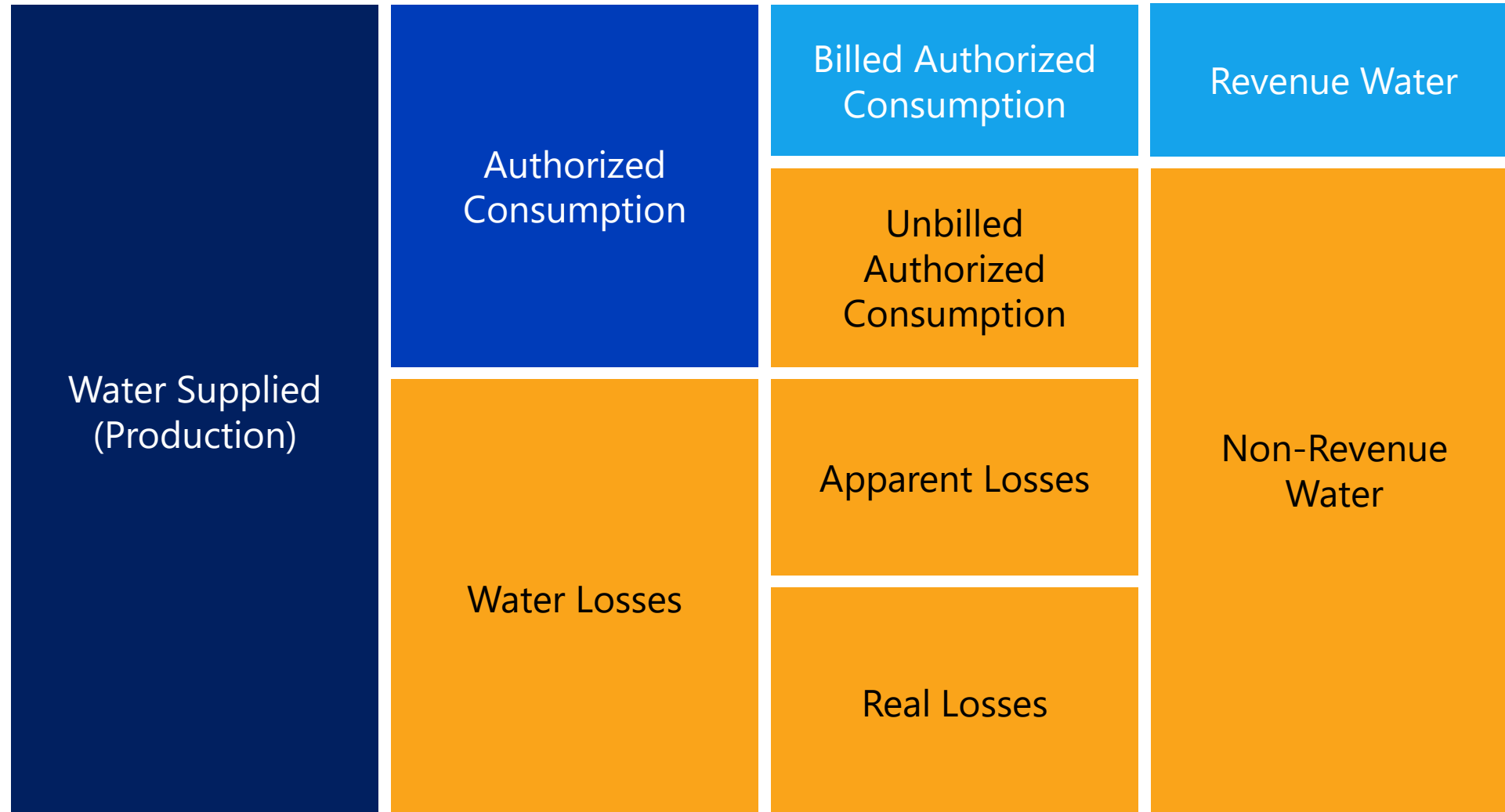


Demand is the quantity of water required by consumers at a given point in time.

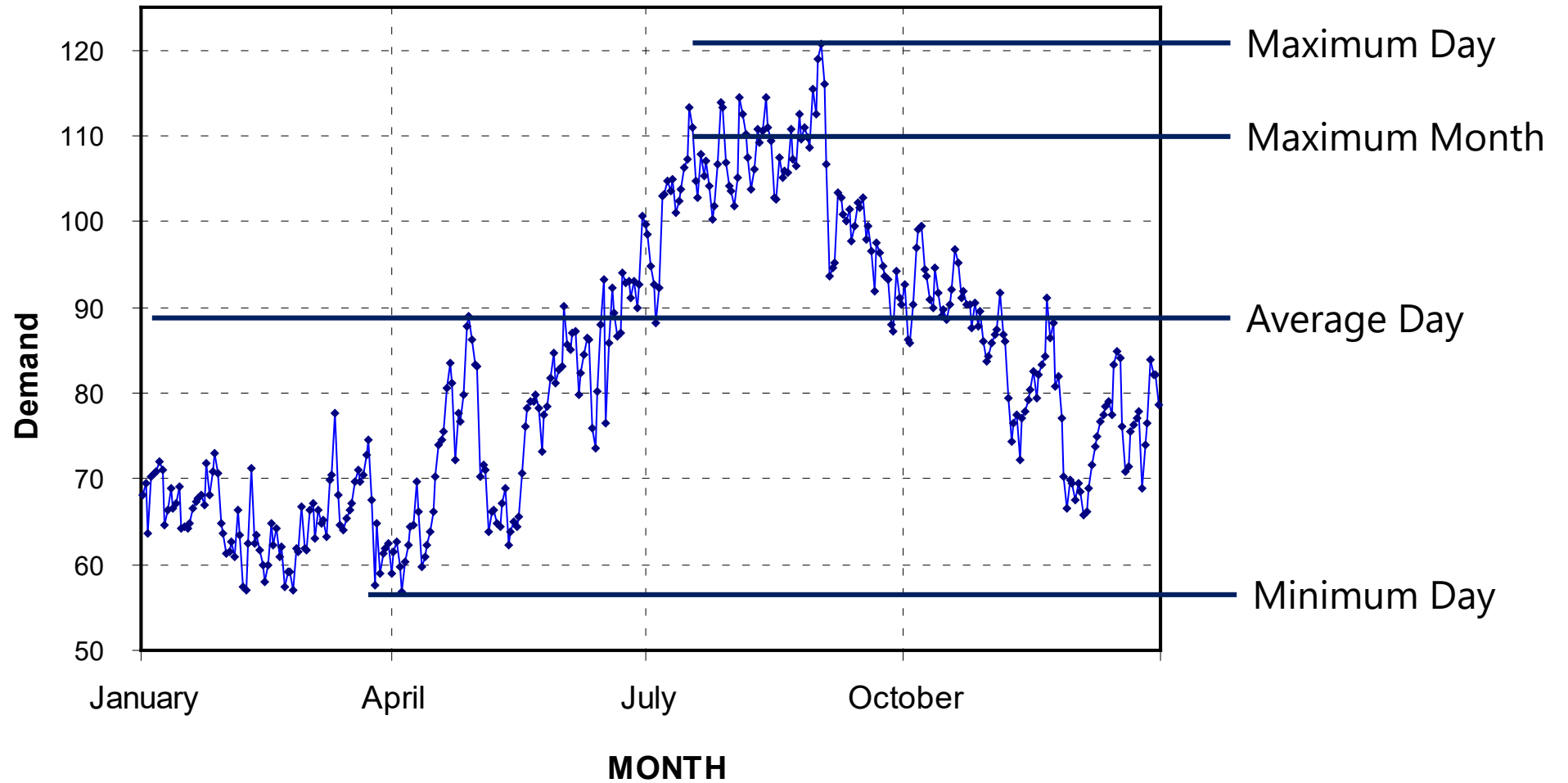
Demand can also refer to the sum of all individual demands in a system, which is typically represented by a demand curve or graph.

- AWWA, Water System  
Operations reference book

# AWWA water loss matrix

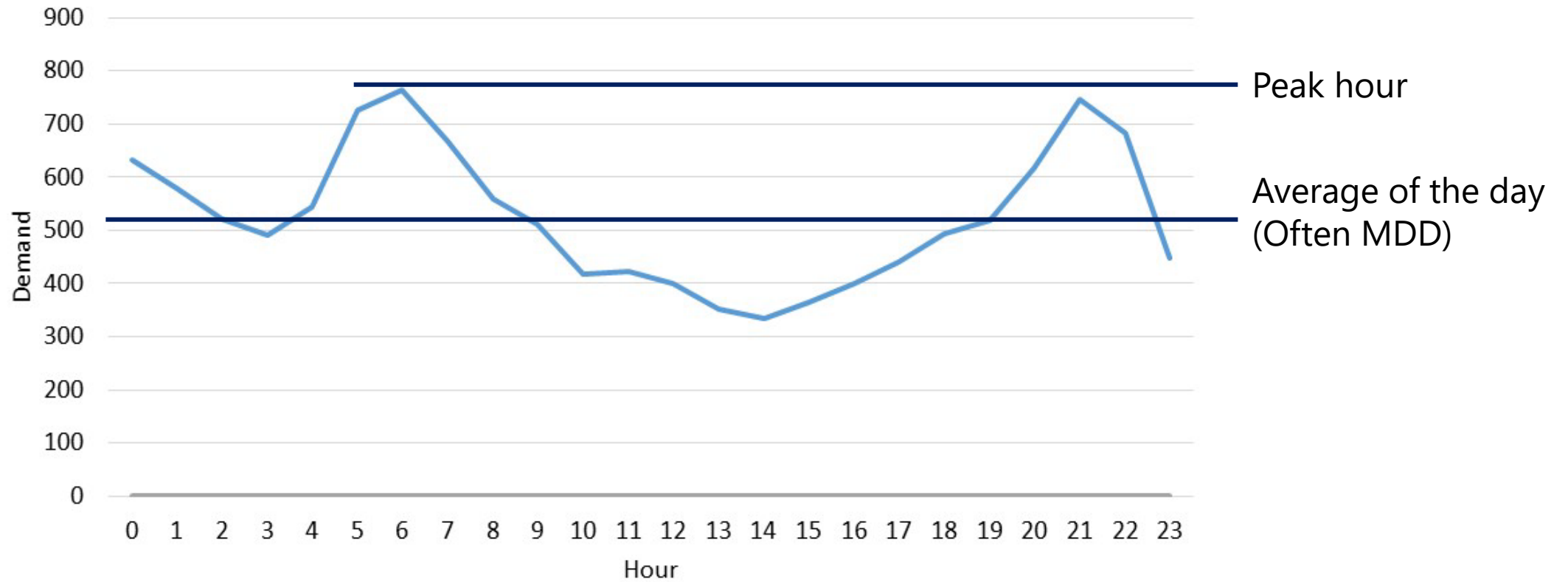


# Seasonal demand variability



**There are hydrologic wet/dry year impacts too**

# Daily demand variability



# 2

## Demand data

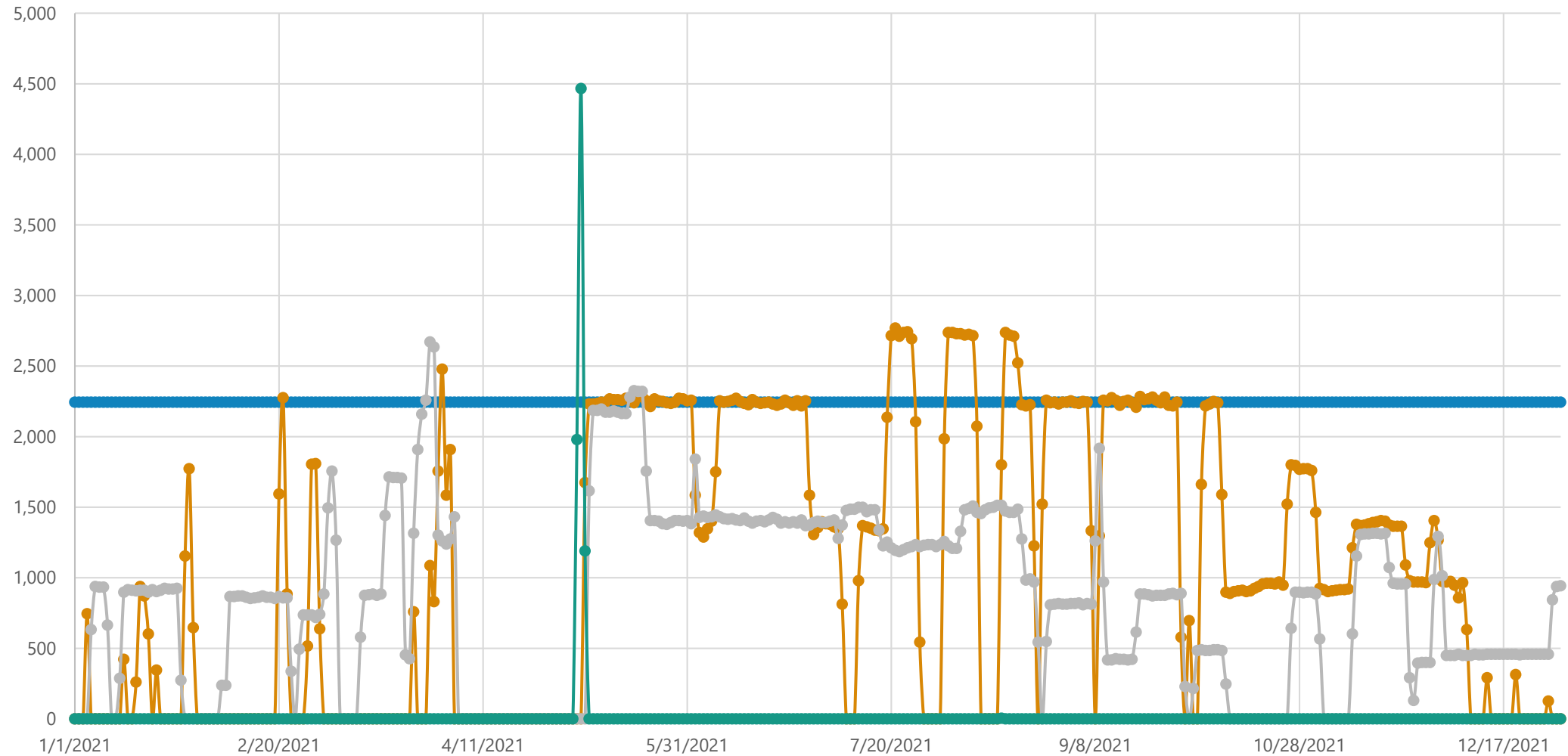
**Where do I get demand data from?**



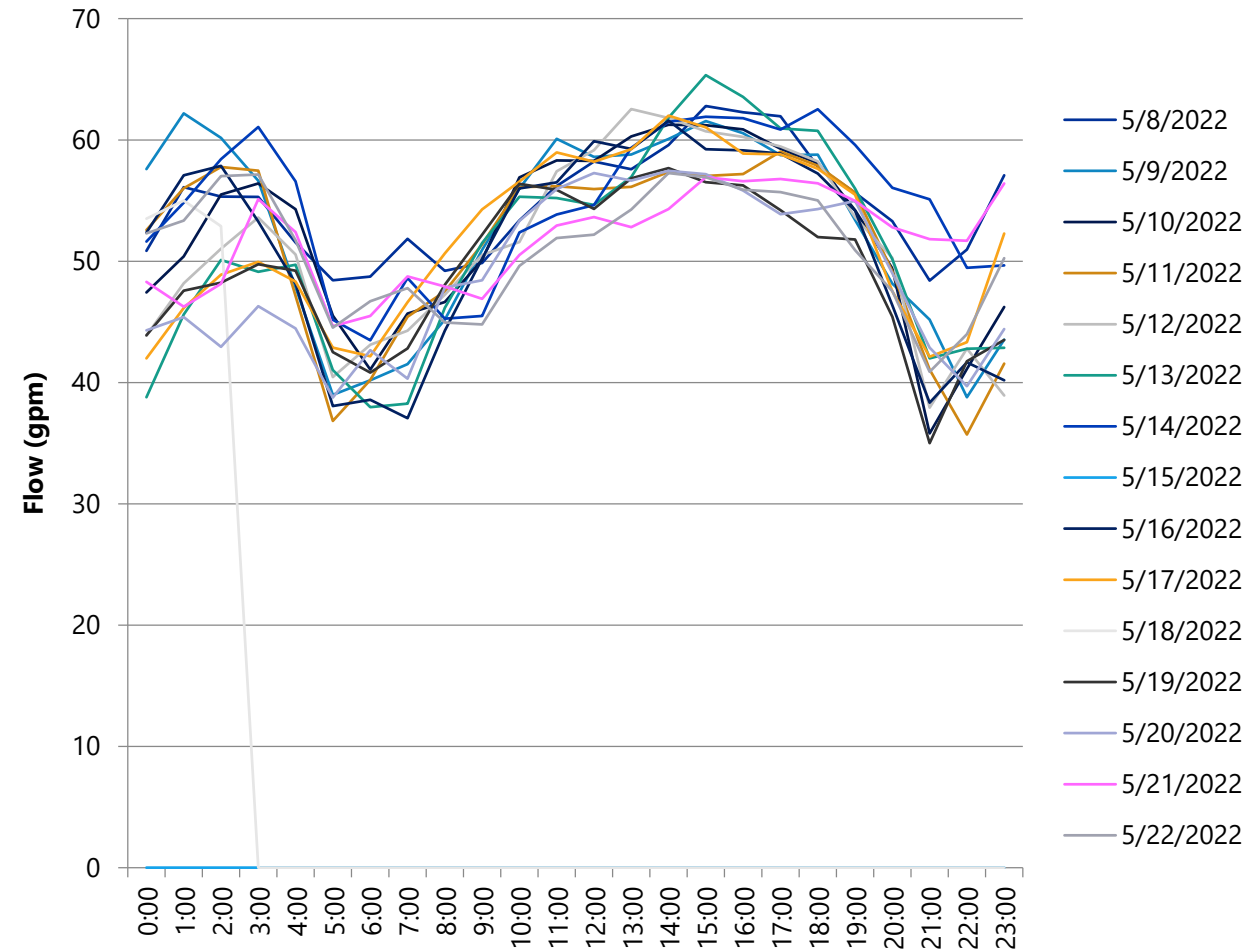
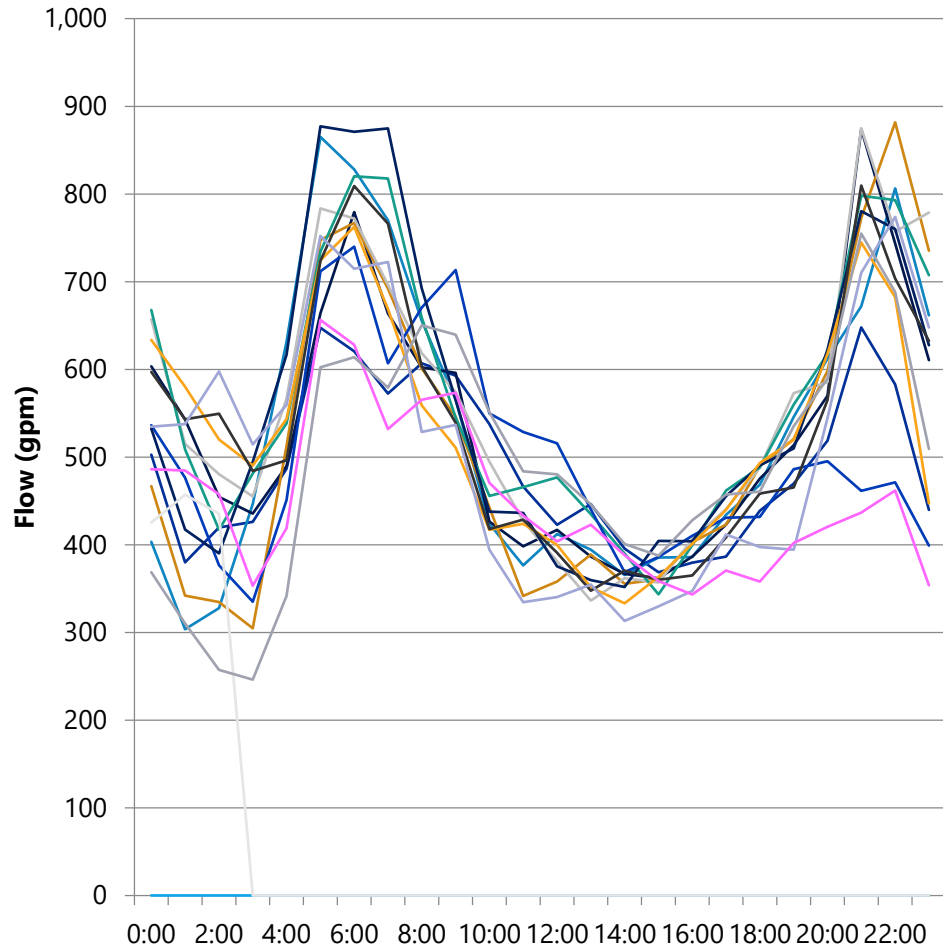
# Sources of demand data

- Production meters (at WTP, wells, imported connections)
- Flow meters in the system (including DMAs)
- Service connection meters
  - » Traditional (monthly or bi-monthly read)
  - » Advanced metering infrastructure (AMI)

# Production data and hydraulic modeling



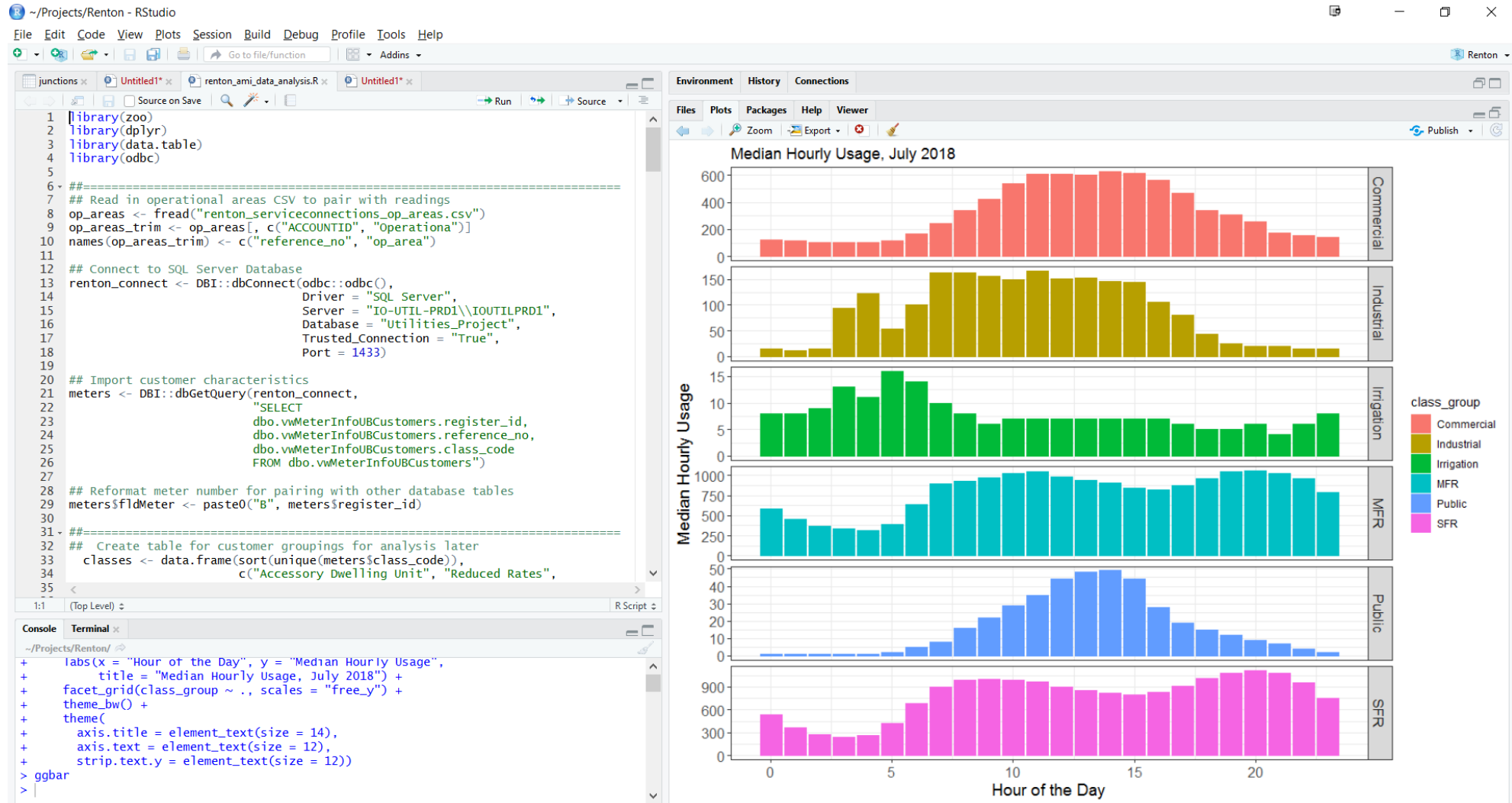
# In-system flow meters and hydraulic modeling



# Billing data and hydraulic modeling

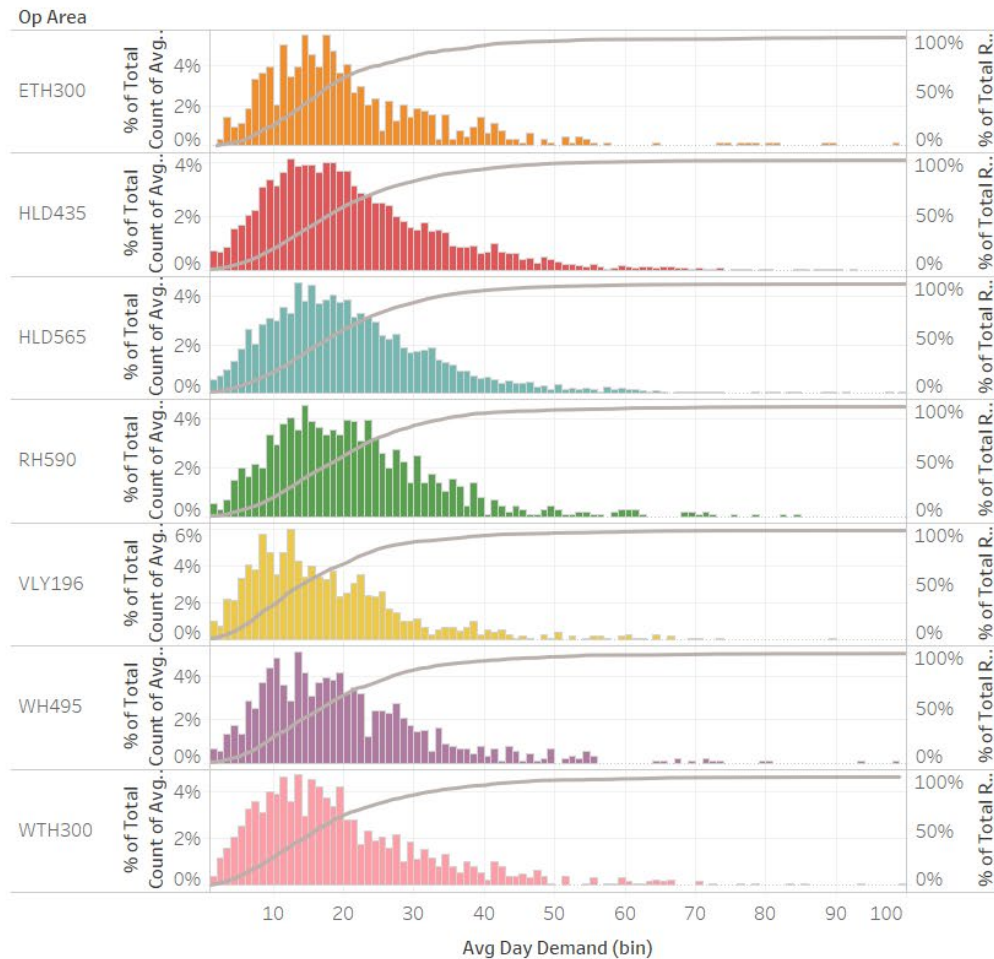
1	APN	BillCodeDesc	JanFeb2021	Total2021	Jan2021	Feb2021	Mar2021	Apr2021	May2021	Jun2021	Jul2021	Aug2021	Sept2021	Oct2021	Nov2021	Dec2021	2021 Total (ccf)	LU_Code
26390	383042051	Water - Domestic	11	65	6	5	6	5	6	5	6	5	6	5	5	5	65	Low Density Residential
26391	383053001	Water - Domestic	19	149	12	7	8	8	10	12	11	14	21	24	12	10	149	Low Density Residential
26392	383062011	Water - Domestic	5	34	3	2	3	3	2	3	3	3	3	4	3	2	34	Low Density Residential
26393	383063012	Water - Domestic	16	99	8	8	8	8	8	10	8	9	8	8	9	7	99	Low Density Residential
26394	383071014	Water - Domestic	16	103	8	8	9	8	7	8	7	8	16	7	9	8	103	Low Density Residential
26395	383071016	Water - Domestic	27	127	10	17	15	15	13	12	9	5	6	6	7	12	127	Low Density Residential
26396	383071024	Water - Domestic	33	151	20	13	9	8	26	6	5	5	15	11	19	14	151	Low Density Residential
26397	380150006	Water - Domestic	4	48	2	2	2	3	3	5	2	2	3	3	8	13	48	Low Density Residential
26398	380181012	Water - Domestic	20	168	13	7	14	16	15	16	18	0	30	13	9	17	168	Medium Density Residential
26399	380183012	Water - Domestic	20	280	12	8	8	16	29	33	34	36	42	30	12	20	280	Medium Density Residential
26400	380184006	Water - Domestic	23	212	12	11	8	19	20	24	26	27	23	20	13	9	212	Medium Density Residential
26401	380191001	Water - Domestic	15	208	8	7	11	10	14	19	20	28	36	22	19	14	208	Medium Density Residential
26402	380191006	Water - Domestic	25	157	12	13	13	13	14	14	13	17	15	11	11	11	157	Medium Density Residential
26403	380191019	Water - Domestic	13	151	6	7	6	11	11	16	18	17	18	12	15	14	151	Medium Density Residential
26404	380193003	Water - Domestic	20	162	10	10	7	12	14	19	18	19	18	14	11	10	162	Medium Density Residential
26405	380193005	Water - Domestic	17	205	9	8	12	16	21	24	24	23	24	17	16	11	205	Medium Density Residential
26406	380194003	Water - Domestic	14	102	7	7	7	3	9	8	13	9	11	9	10	9	102	Medium Density Residential
26407	380194009	Water - Domestic	26	197	13	13	15	15	15	16	19	19	18	21	16	17	197	Medium Density Residential
26408	380194012	Water - Domestic	43	337	23	20	24	29	27	42	37	35	39	32	29	0	337	Medium Density Residential
26409	380240010	Water - Commercial	42	295	21	21	23	24	32	27	27	25	26	24	24	21	295	Commercial
26410	380240037	Water - Commercial	251	1871	104	147	150	180	167	154	199	175	173	153	164	105	1871	Commercial
26411	380250037	Water - Domestic	808	6327	562	246	305	345	555	536	659	674	570	443	866	566	6327	Commercial
26412	380280018	Water - Domestic	63	347	36	27	27	26	28	26	25	31	31	29	32	29	347	High Density Residential
26413	380300008	Water - No Charge - C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Medium Density Residential
26414	380311006	Water - Domestic	44	345	19	25	27	27	23	27	40	38	39	29	29	22	345	Medium Density Residential
26415	380311011	Water - Domestic	22	208	11	11	13	24	18	20	19	21	20	16	17	18	208	Medium Density Residential
26416	380311020	Water - Domestic	25	239	9	16	16	13	19	20	15	27	28	27	22	27	239	Medium Density Residential
26417	380311025	Water - Domestic	27	270	14	13	14	17	26	28	33	36	38	20	16	15	270	Medium Density Residential
26418	380312013	Water - Domestic	19	128	12	7	10	14	10	10	8	13	10	12	11	11	128	Medium Density Residential
26419	380312016	Water - Domestic	24	162	15	9	7	15	14	14	17	15	14	15	14	13	162	Medium Density Residential
26420	380312021	Water - Domestic	22	179	12	10	7	12	16	19	22	23	19	16	12	11	179	Medium Density Residential
26421	380321002	Water - Domestic	24	278	8	16	17	22	30	31	30	30	32	31	18	13	278	Medium Density Residential
26422	380321010	Water - Domestic	36	220	15	21	15	15	21	15	23	25	23	12	16	19	220	Medium Density Residential
26423	380322001	Water - Domestic	31	229	16	15	17	18	26	29	29	25	14	13	13	14	229	Medium Density Residential
26424	380322029	Water - Domestic	21	194	13	8	12	15	17	23	22	21	19	14	15	15	194	Medium Density Residential
26425	380322036	Water - Domestic	26	202	18	8	9	13	22	20	27	26	18	18	14	9	202	Medium Density Residential
26426	379381042	Water - Domestic	19	293	10	9	9	8	9	9	9	33	39	36	40	82	293	Medium Density Residential
26427	379381047	Water - Domestic	15	106	8	7	8	8	8	9	8	12	11	9	9	9	106	Commercial
26428	379381048	Water - Domestic	17	79	8	9	7	8	8	6	6	7	5	6	5	4	79	Commercial

# AMI data and hydraulic modeling

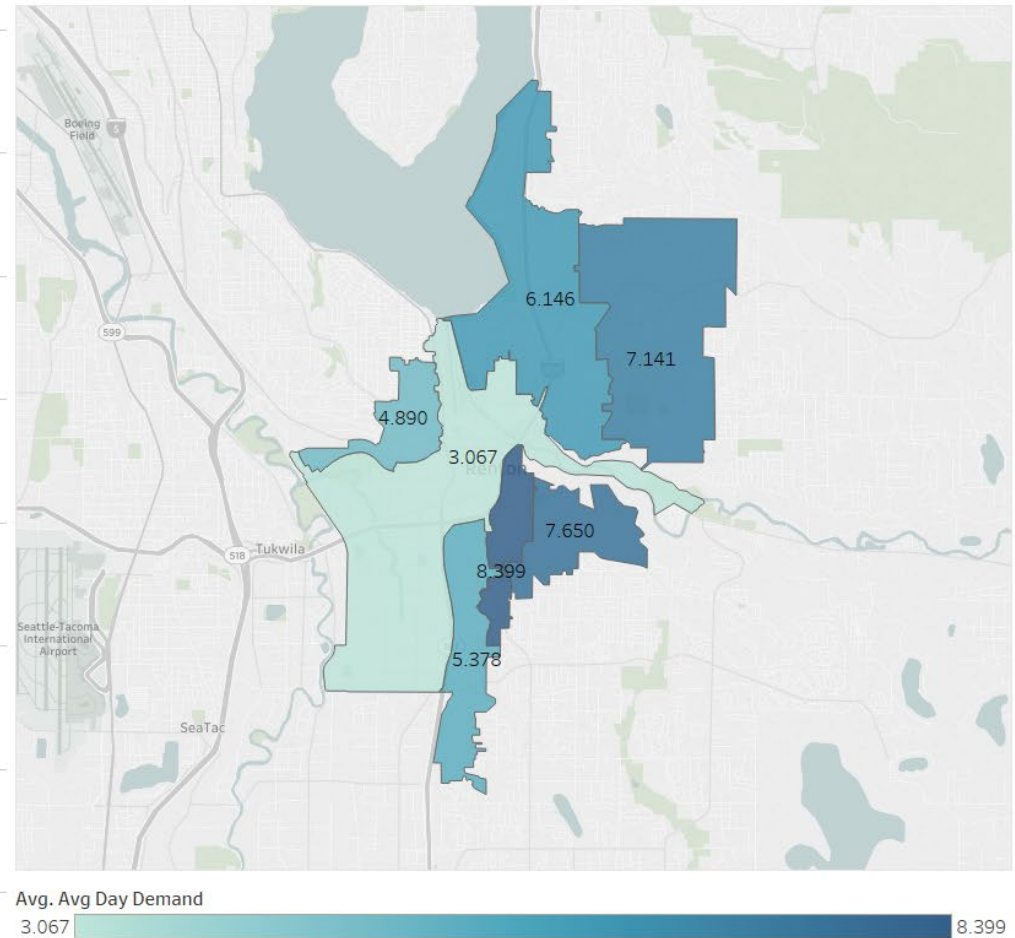


# AMI data and hydraulic modeling

Distribution of Daily Demand by Operational Area



Operational Areas



# 3

## Distributing demands

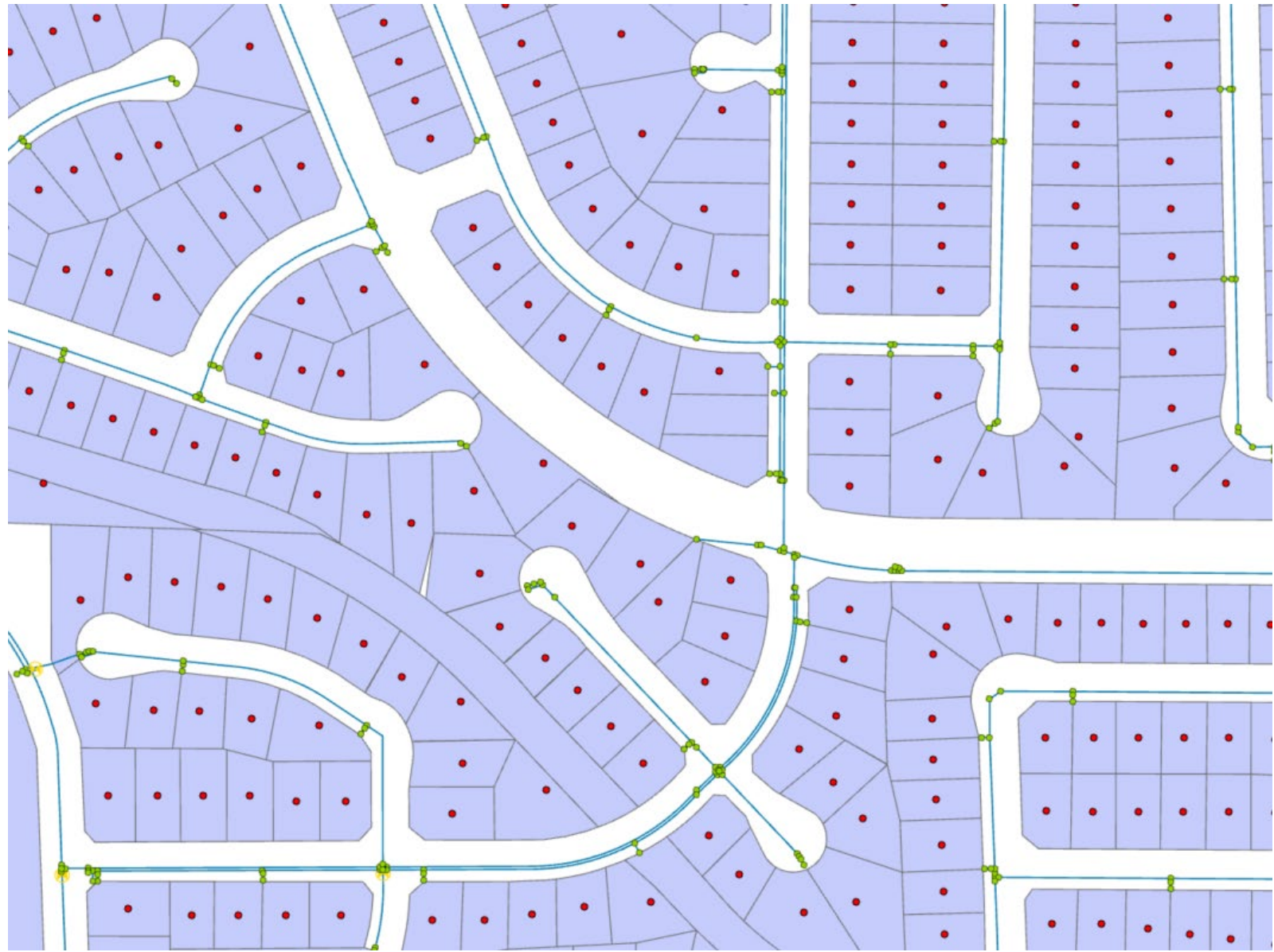
**How do I put my demands  
in a hydraulic model?**

# Distributing demands in a hydraulic model

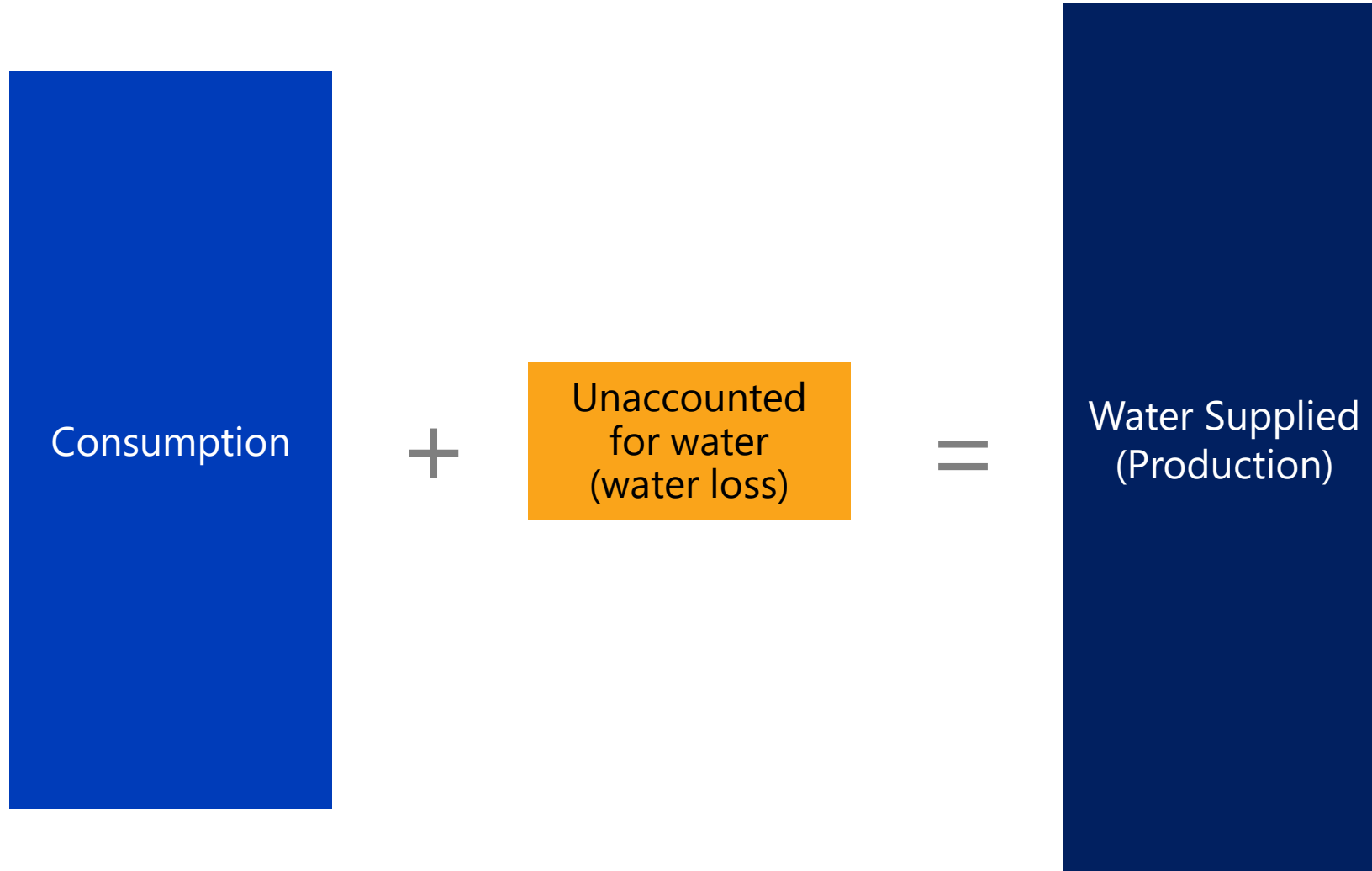
- Equal, spread over system or pressure zone
- Large users
- Use of billing data



—  
Demands assigned to closest junction or pipe



# Don't forget about water loss

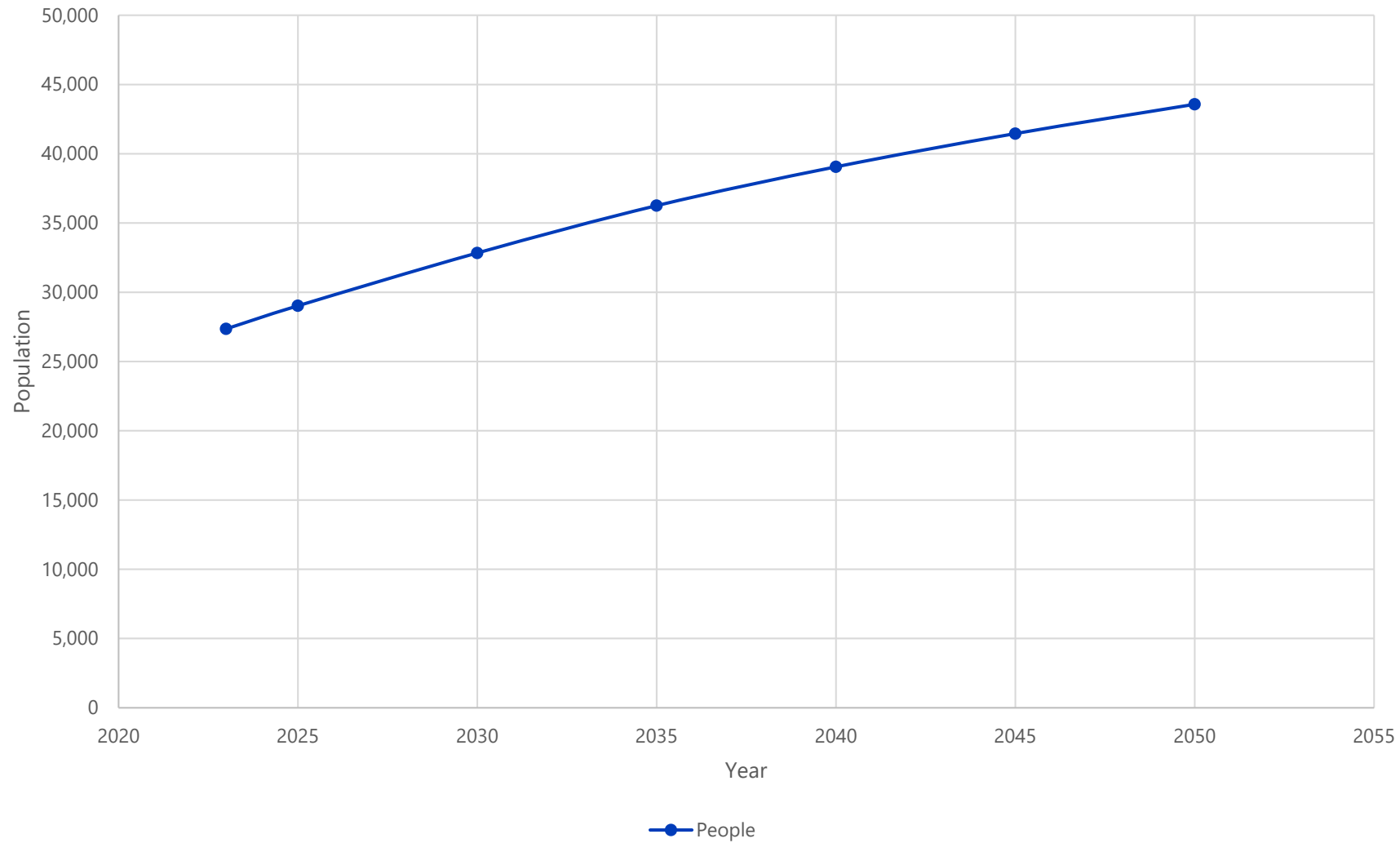


# 4

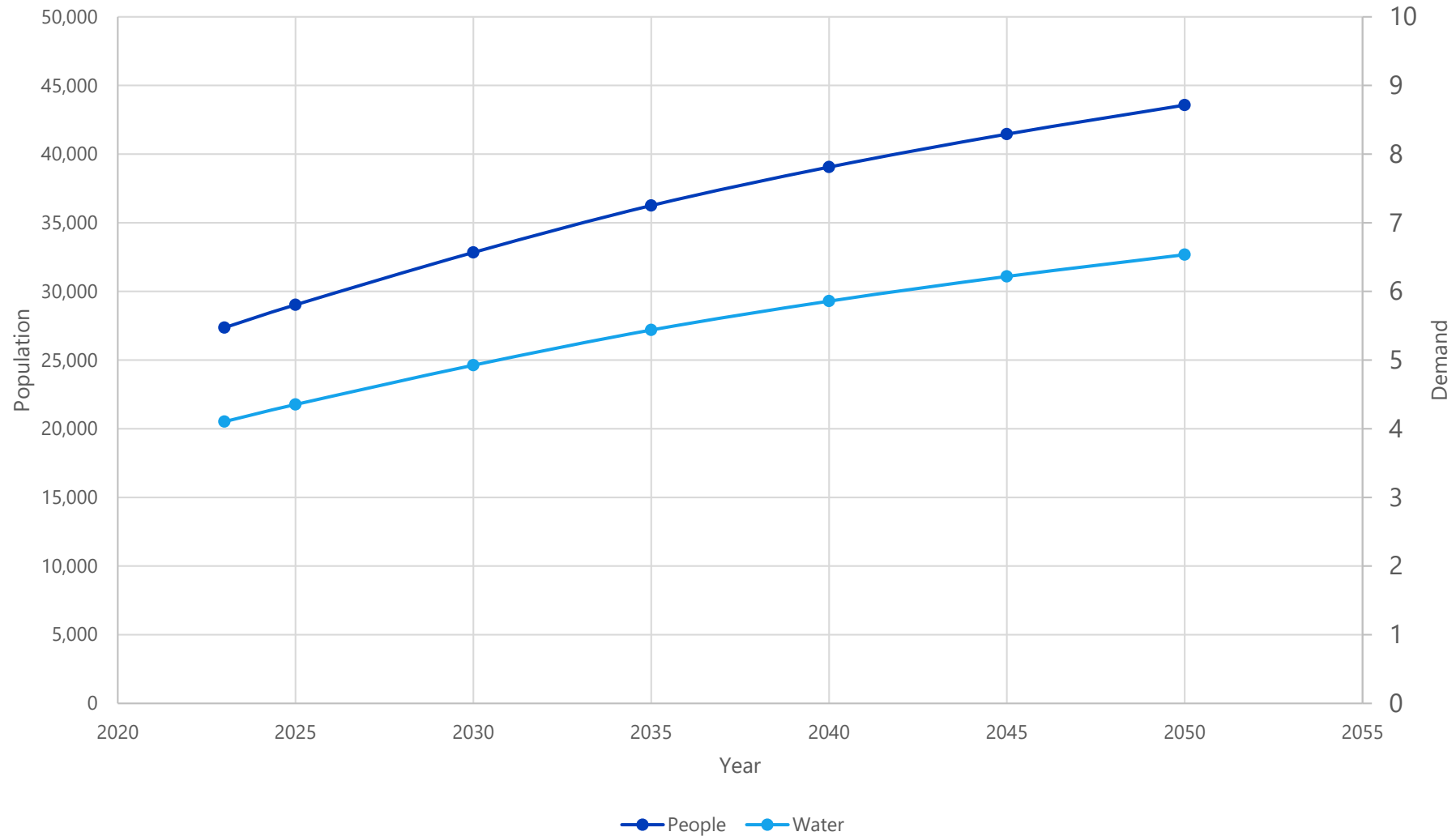
## Development and demands

**How do I best plan for the future?**

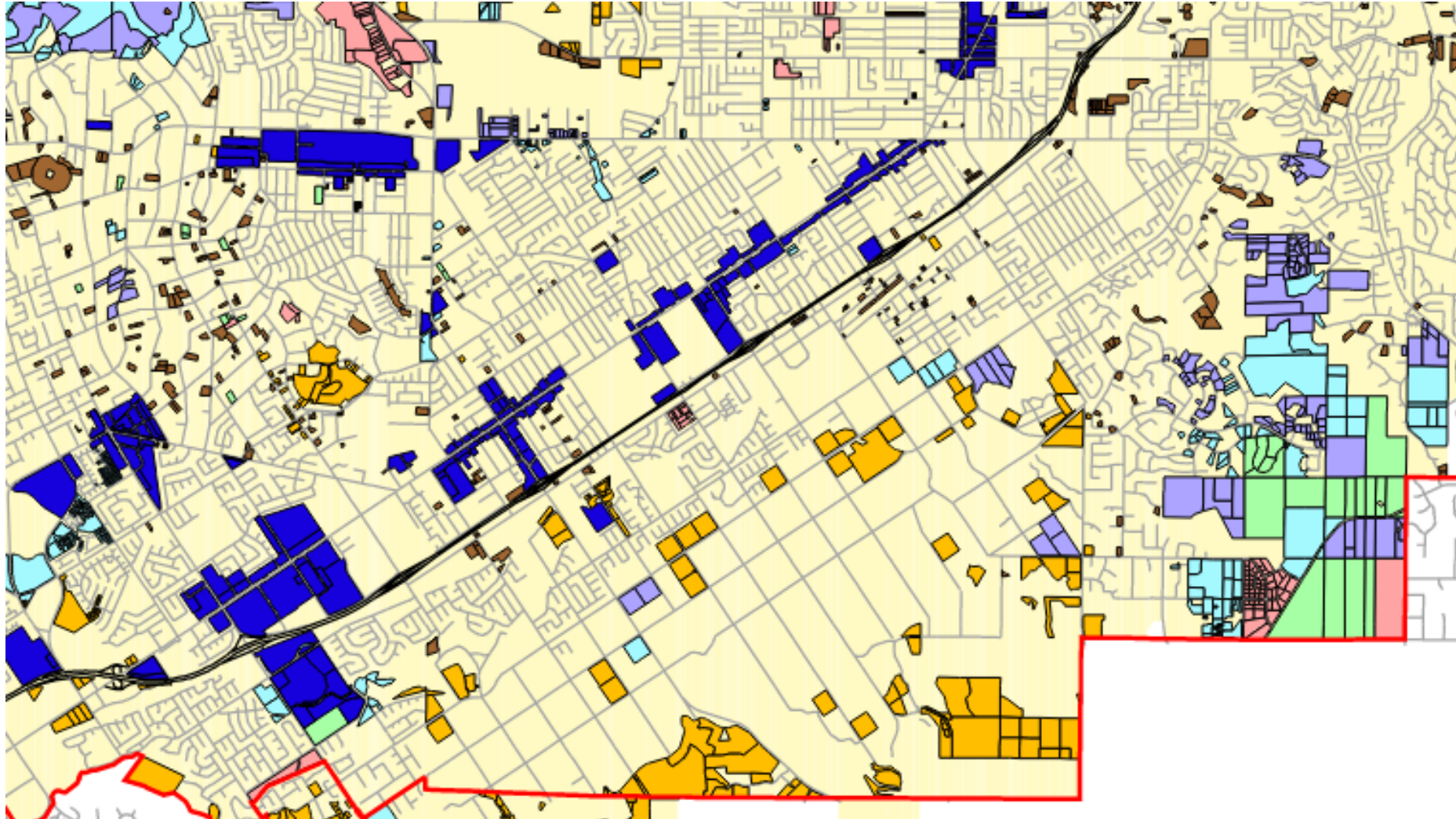
# Population-based demand projections



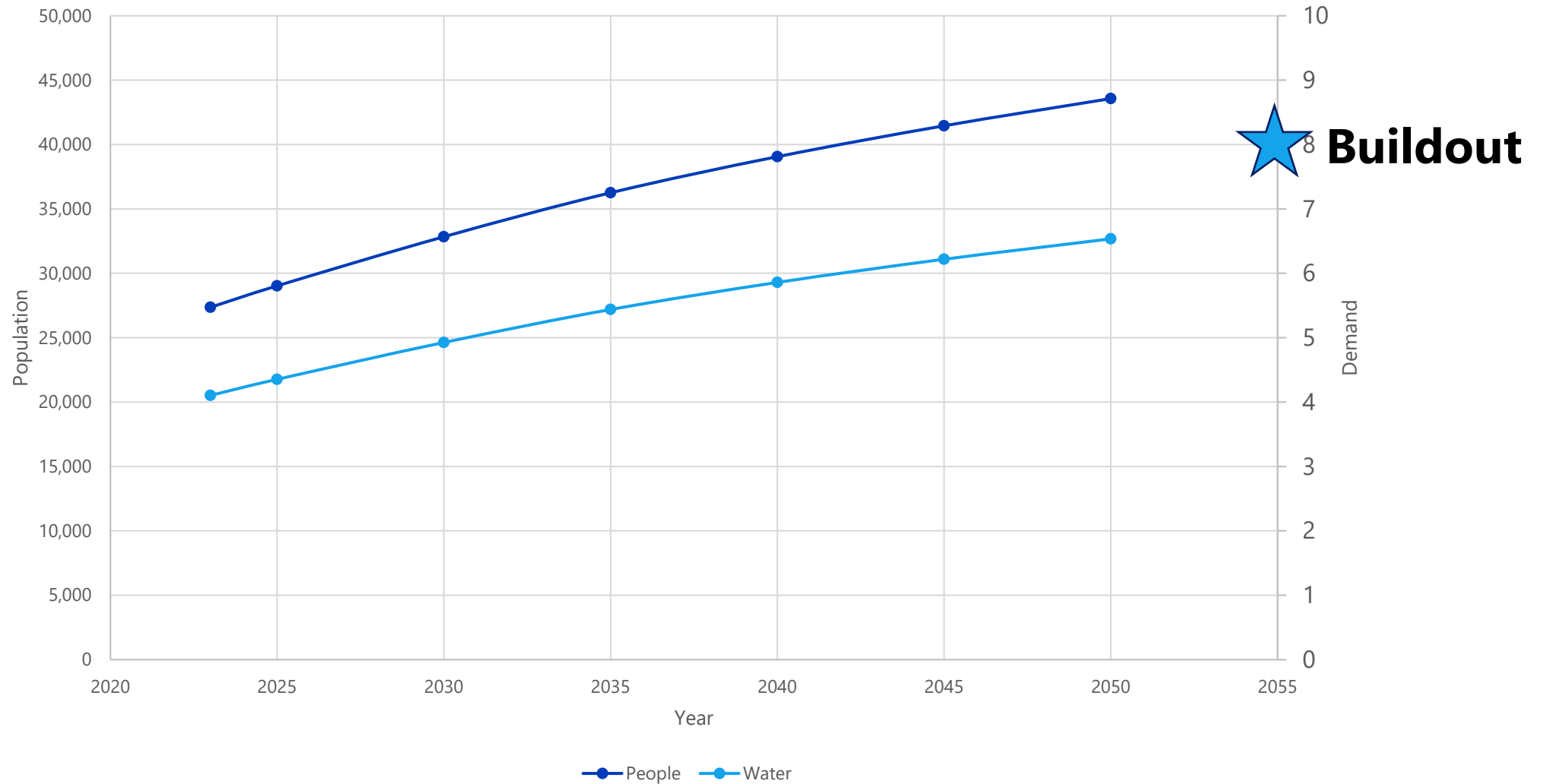
# Population-based demand projections



# Parcel-based demand/flow projections



# Combining population and land-use based projections



# Keeping track of development

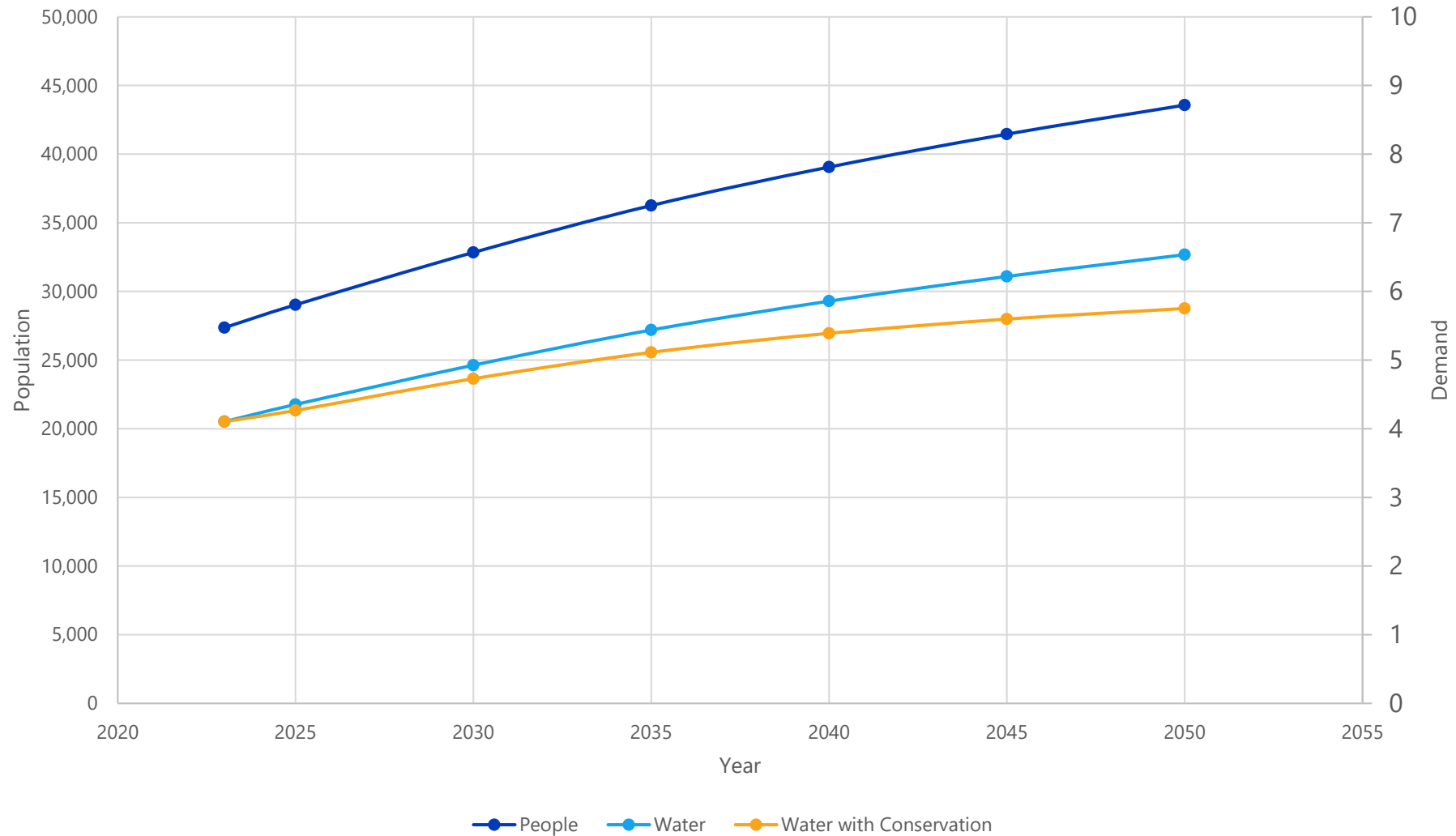
The screenshot displays a web application for tracking developments. The interface is divided into three main sections:

- Left Sidebar:** A navigation menu with tabs for 'ALL', 'RESIDENTIAL', and 'COMMERCIAL'. Below the tabs, there is a 'Status: All' filter and a 'FILTER >' button. A list of development projects is shown, each with an icon, name, address, and date.
- Main Map Area:** A map titled 'Existing Calibrated' showing various development zones in shades of brown and tan. A blue line indicates a route or boundary. A search bar in the top right corner allows for finding addresses or places.
- Right Sidebar:** A legend titled 'Development Projects' with color-coded buttons for 'Commercial', 'Residential', 'MixedUse', 'Multi-Family', 'Other', and 'N/A'. There is also an 'others' category and a row of five colored circles at the bottom.

At the bottom of the map area, there is a footer with the text: 'Esri Community Maps Contributors, Loma Linda University, County of Riverside, California State Parks, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, Bureau of Land Management, EPA, NPS, US Census Bureau, USDA' and 'Powered by Esri'.



# Don't forget about conservation



# 5

## Conclusions

**There are no good synonyms  
that start with the letter “D”.**

# Closing thoughts

- Understand your demands (spatial and temporal distribution)
- There are lots of data available for demands  
Use the best data you have
- Spatial allocation is best done using billing data
- Demands will change over time

# Thank you!

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