Demand forecast at Tampa Bay Water and how it is being used for long-term supply planning

Agency' Mission

Tampa Bay Water reliably provides clean, safe water to the region now and for future generations

What drives long-range demand forecast?

- Master water supply contract:
  - States the agency has unequivocal obligation to supply water

If demand exceed permitted capacity by 75% during any twelve month period, initiate a preparation of permit applications for new supply projects;

If demand exceed permitted capacity by 85% during any twelve month period, file permit application; and

If actual delivery during any 12-month period exceeds 94% of aggregated permitted capacity, it is considered a production failure

TAMPA BAY WATER

"Forecasting is the art of saying what will happen, and then explaining it why it didn't"

-Anonymous

Forecasting Methodology

Sector Water Use (Q)

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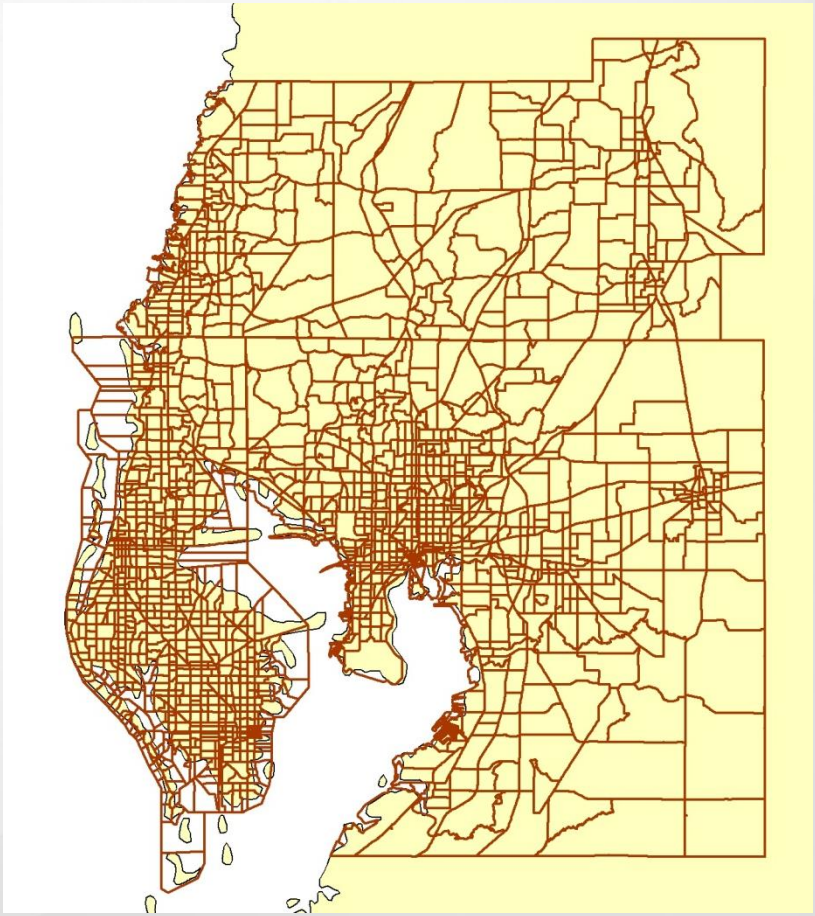
Average Rate of Use (q = unit use)	X	Number of Users (N = drivers)
• per household • per employee		• housing units • employment

Disaggregated Framework

- Rate of use reflects monthly average gal/unit/day for each
  - Sector
  - Month/Year
  - Geographic unit
- Total use for each sector, month/year, geographic unit reflects:
  - Average rate of use per unit
  - Number of units

TAZ Geographical Modeling Unit

- TAZ geographies
  - Defined: Florida Dept. of Transportation (FDOT)
  - 1800 across region
  - Growth projections available
- TAZ maps to WDPA



Modeling Approach uses TAZ as Modeling Unit

- Observations for water use aggregated/averaged to the Traffic Analysis Zone (TAZ) level
  - Provides large number of geographic cross-sections
  - Rich source for estimating model parameters
- Socioeconomic variables collected at TAZ level
  - Income
  - Housing density
  - Persons per household
  - Housing units
  - Employment and distribution of employment

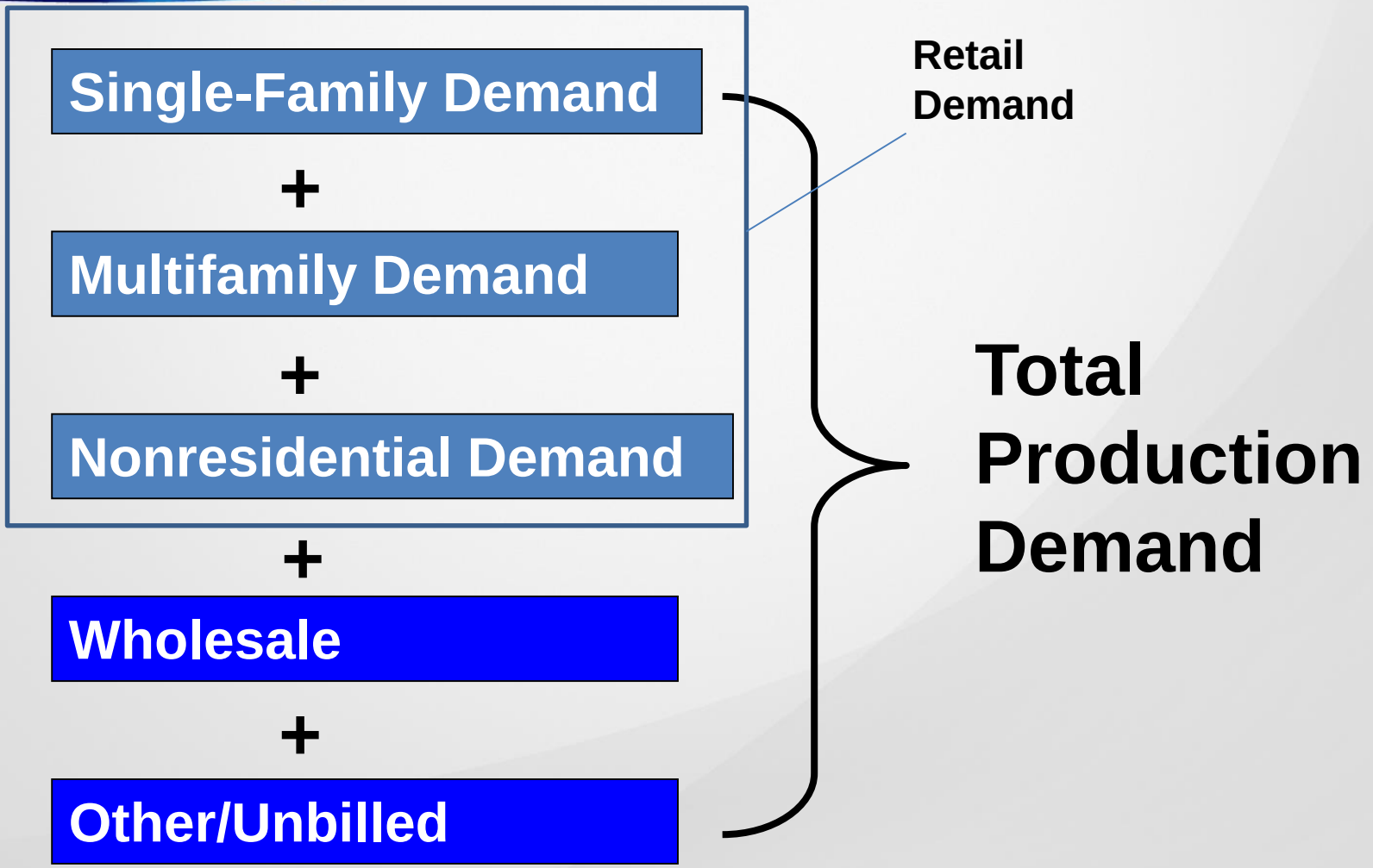
Other modeling data assigned to TAZ

- Weather variables
  - Data collected from multiple weather reporting stations
  - TAZ-level values derived through distance-weighting
- Data collected from or derived from member data
  - Price of water
  - Fraction of accounts with access to reclaimed water

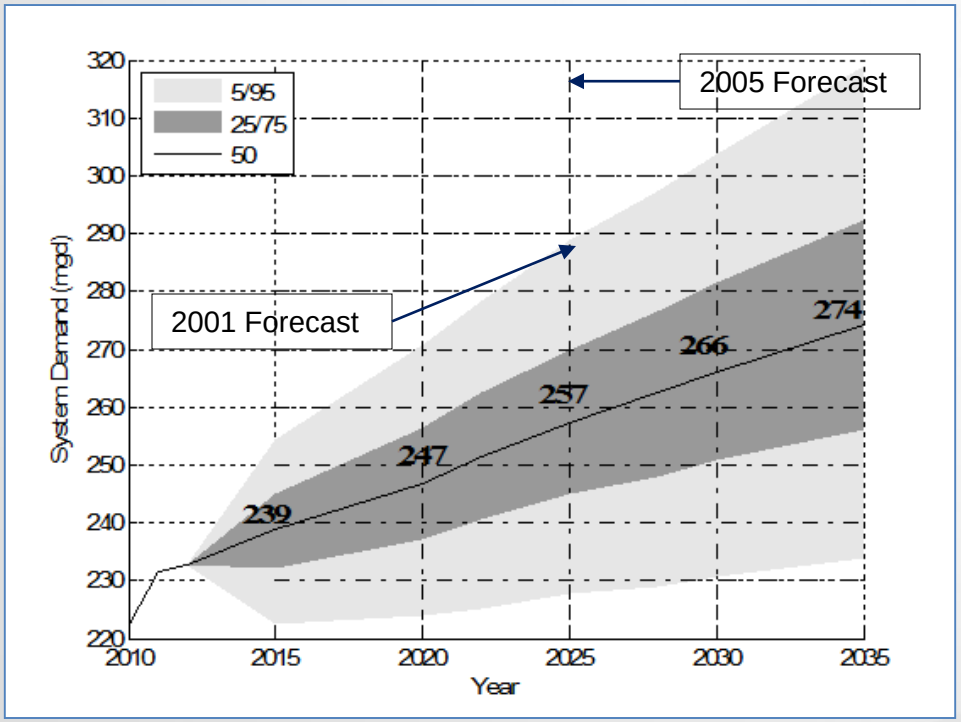
Model Variables/Drivers: Relative Effects on Demand Forecast

VARIABLES/DRIVERS	EFFECT
Housing units (SF&MF)	+++
Total Employment (NR)	++
Fraction of Employment by Major Employment Sector	+
Median household income (SF, MF, NR)	++
Housing density (SF&MF)	-
Persons per household (SF)	+
Marginal price (SF)	- -
Temperature departure (SF)	+
Rainfall departure (SF&NR)	-
Rainfall (MF)	-
Number of Rainy Days (SF)	-
Fraction of reclaimed accounts (SF&MF)	-

Aggregation of Sectors

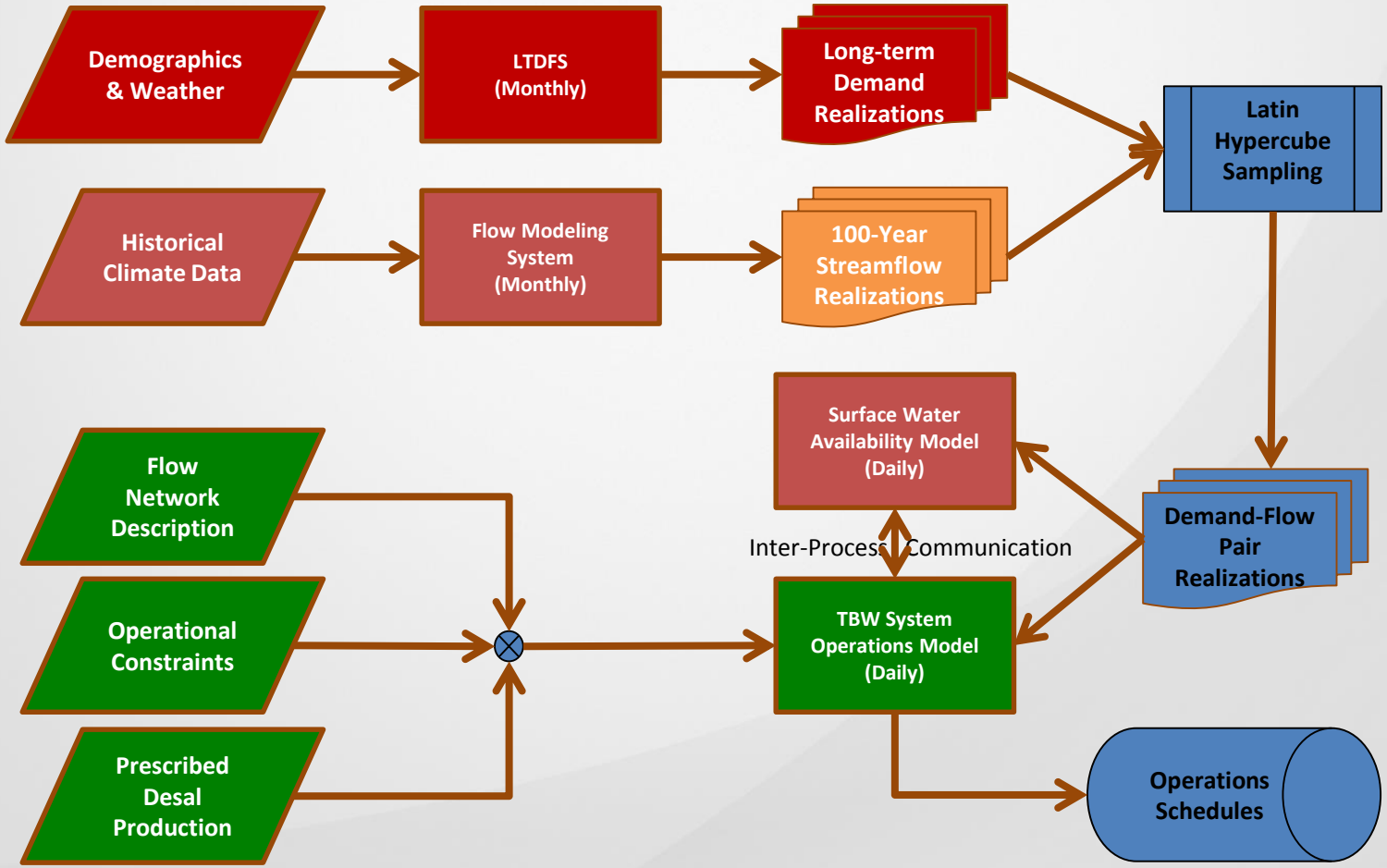


Probabilistic Demand Forecast

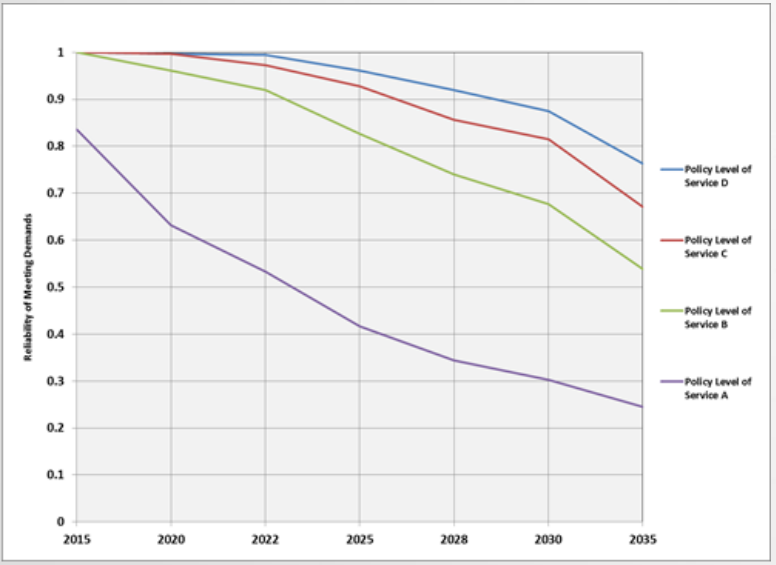


- For a given demand slice, e.g., 2030
  - A range of socio-economic factors were used
  - Longterm rainfall and temperature values used

Schematic of Operational Model



Use of long-range forecast



A) Results of Additional Supplies by 2025 Compared Against Existing System					
Policy Level	Existing Supply Reliability	5 MGD Reliability	10 MGD Reliabiliy	15 MGD Reliability	20 MGD Reliability
A	42%	54%	65%	72%	79%
B	82%	89%	94%	95%	96%
C	93%	95%	97%	99%	99%
D	96%	98%	99%	99%	99%

B) Results of Additional Supplies by 2030 Compared Against Existing System					
Policy Level	Existing Supply Reliability	5 MGD Reliability	10 MGD Reliabiliy	15 MGD Reliability	20 MGD Reliability
A	30%	40%	48%	56%	65%
B	68%	75%	81%	88%	91%
C	81%	87%	90%	93%	95%
D	87%	91%	94%	95%	98%

C) Results of Additional Supplies by 2035 Compared Against Existing System					
Policy Level	Existing Supply Reliability	5 MGD Reliability	10 MGD Reliabiliy	15 MGD Reliability	20 MGD Reliability
A	25%	33%	38%	45%	53%
B	54%	61%	70%	78%	81%
C	67%	78%	80%	86%	88%
D	76%	81%	85%	90%	93%