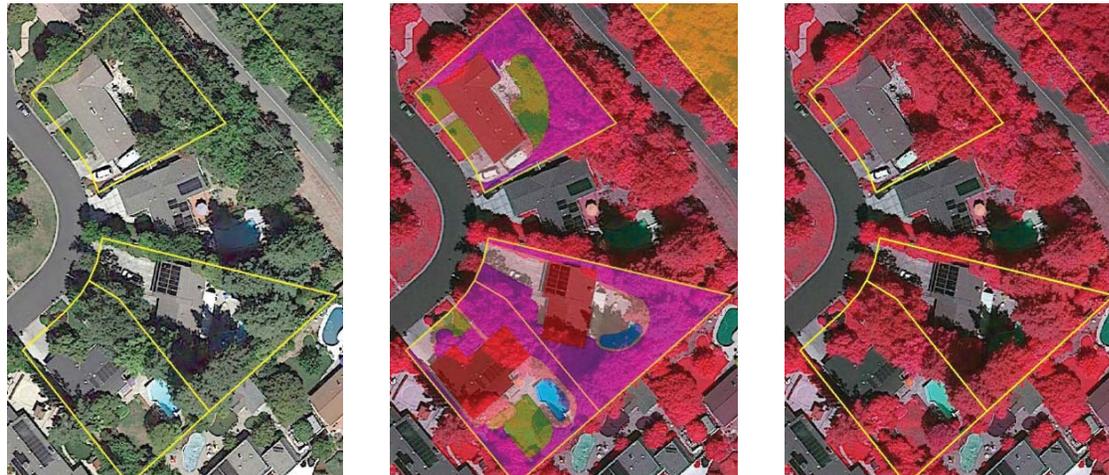


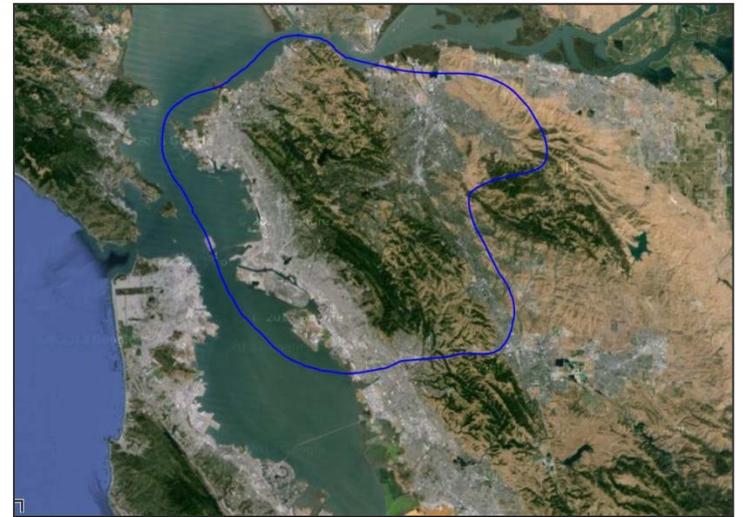
## **SBx7-7 Target Method 2: Using Detailed Imagery, GIS & Software to Enhance Landscape Water Budgets**



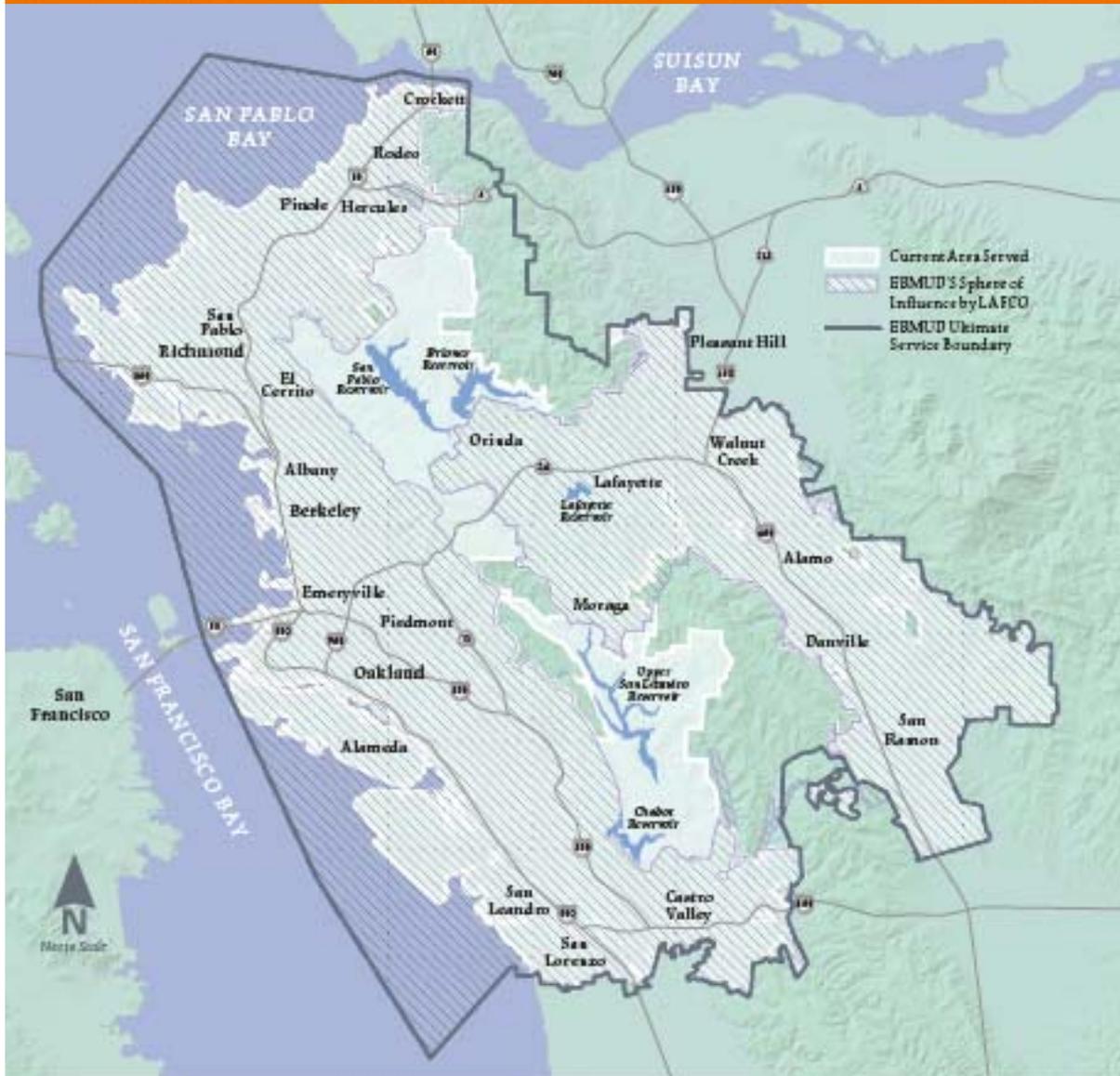
# Presentation Overview



- EBMUD statistics
  - gross water use
  - water accounts
  - GIS files
- Applied methods and tools
- Summary findings
- Lessons learned
- Looking Forward

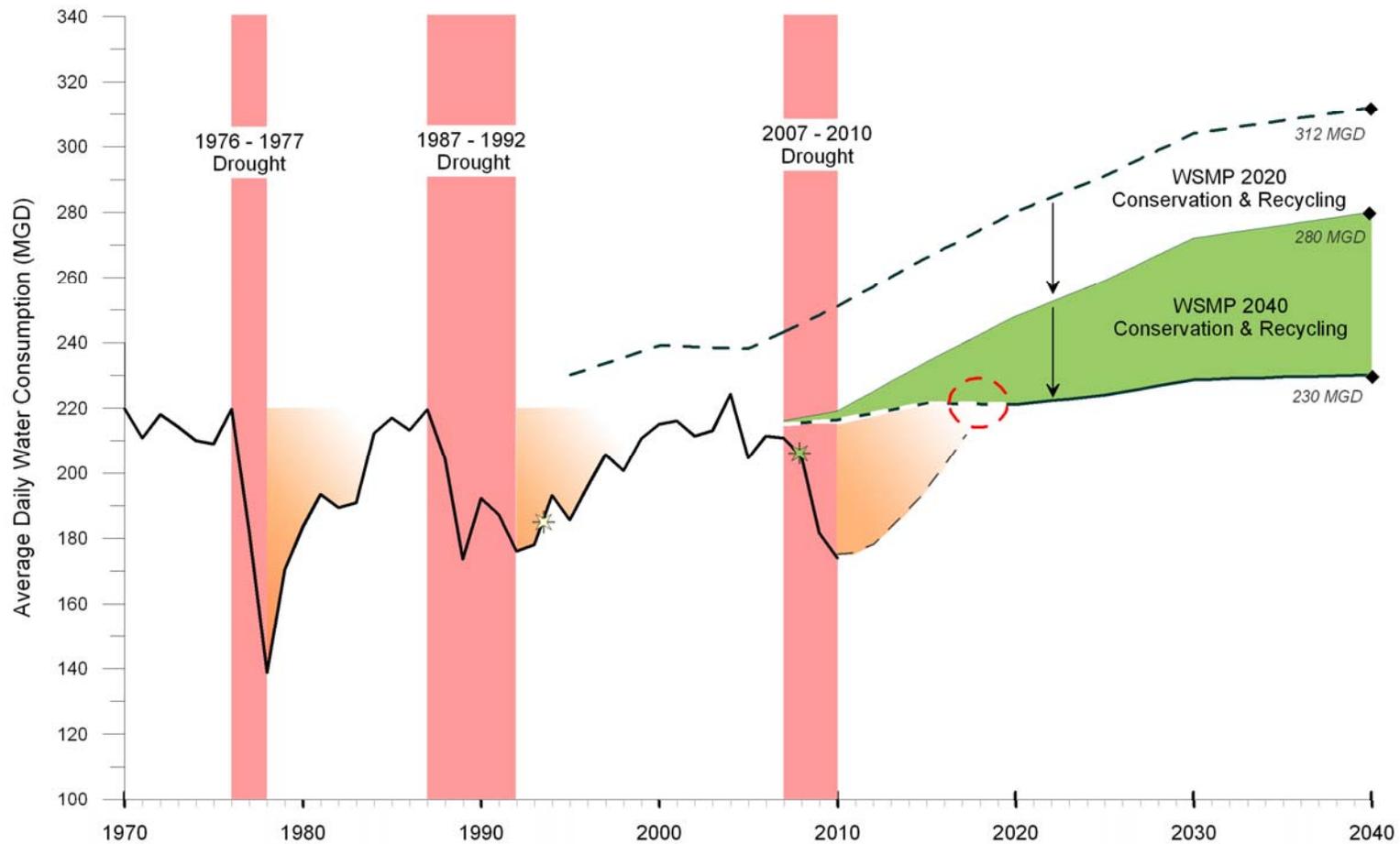


# EBMUD Water and Wastewater Service Areas



- 330 sq/mi service area
- 35 communities
- 1.4 million water customers
  - ~ 400,000 meters
  - ~ 382,000 accounts
  - ~ 85 % residential
- 650,000 wastewater customers
- Distinct microclimates
- >4,200 miles of pipe

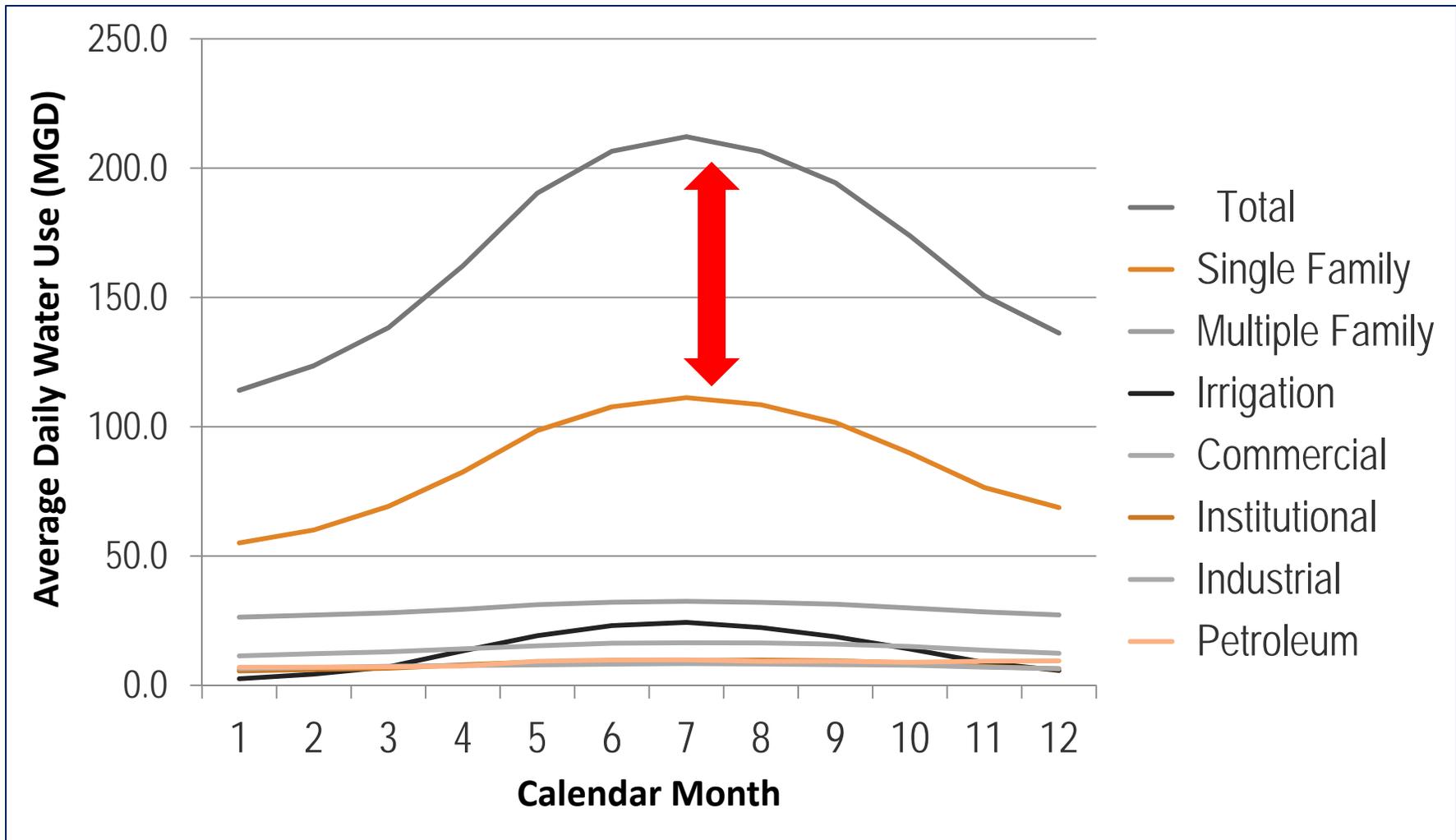
# 2040 Demand Projection with Conservation & Recycling



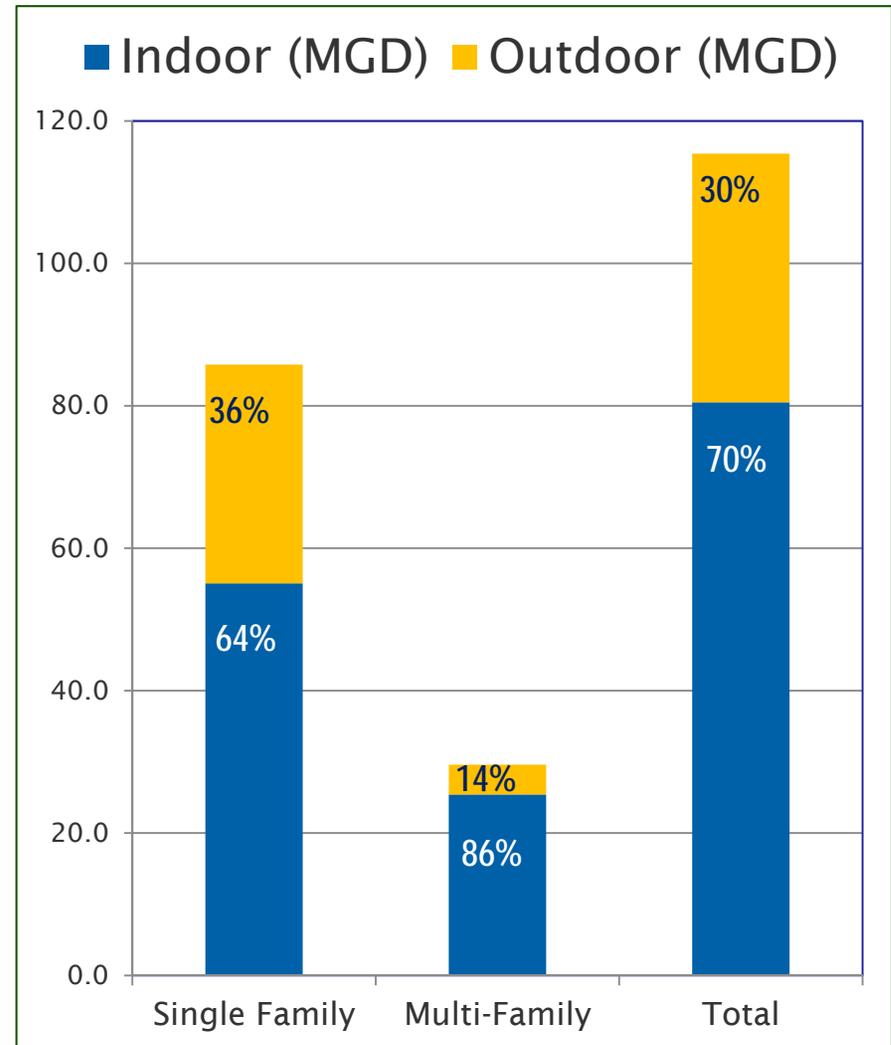
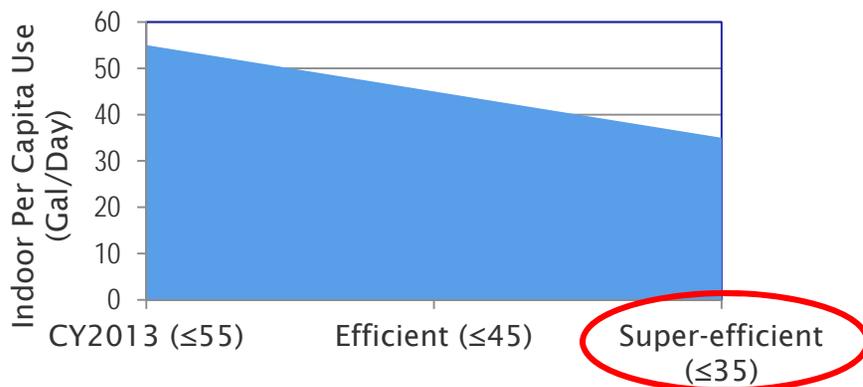
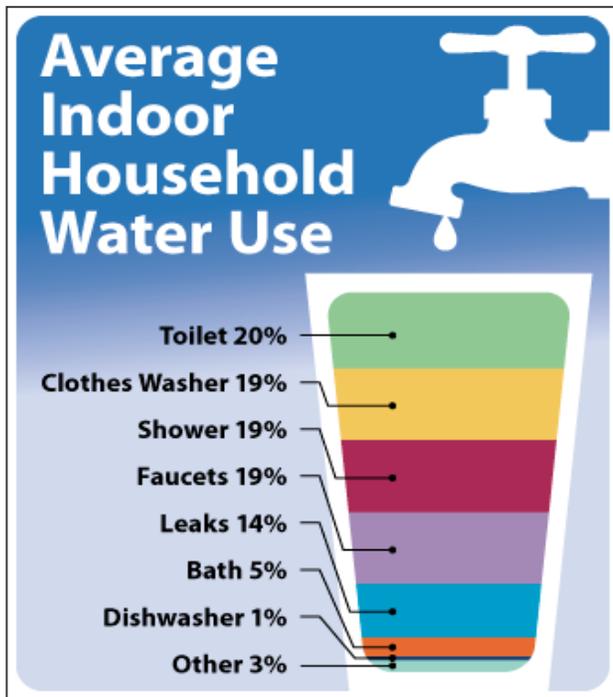
\* WSMP 2020 Conservation & Recycling Goals - Implementation of these goals began in 1994 with the adoption of the Water Conservation Master Plan and Reclamation Implementation Plan. An estimated 32 MGD of Water Conservation and Water Recycling savings have been achieved as a result of the WSMP 2020 through 2010.

\* WSMP 2040 Conservation & Recycling Goals - As part of the WSMP 2040 the Water Conservation and Water Recycling goals were reassessed and expanded.

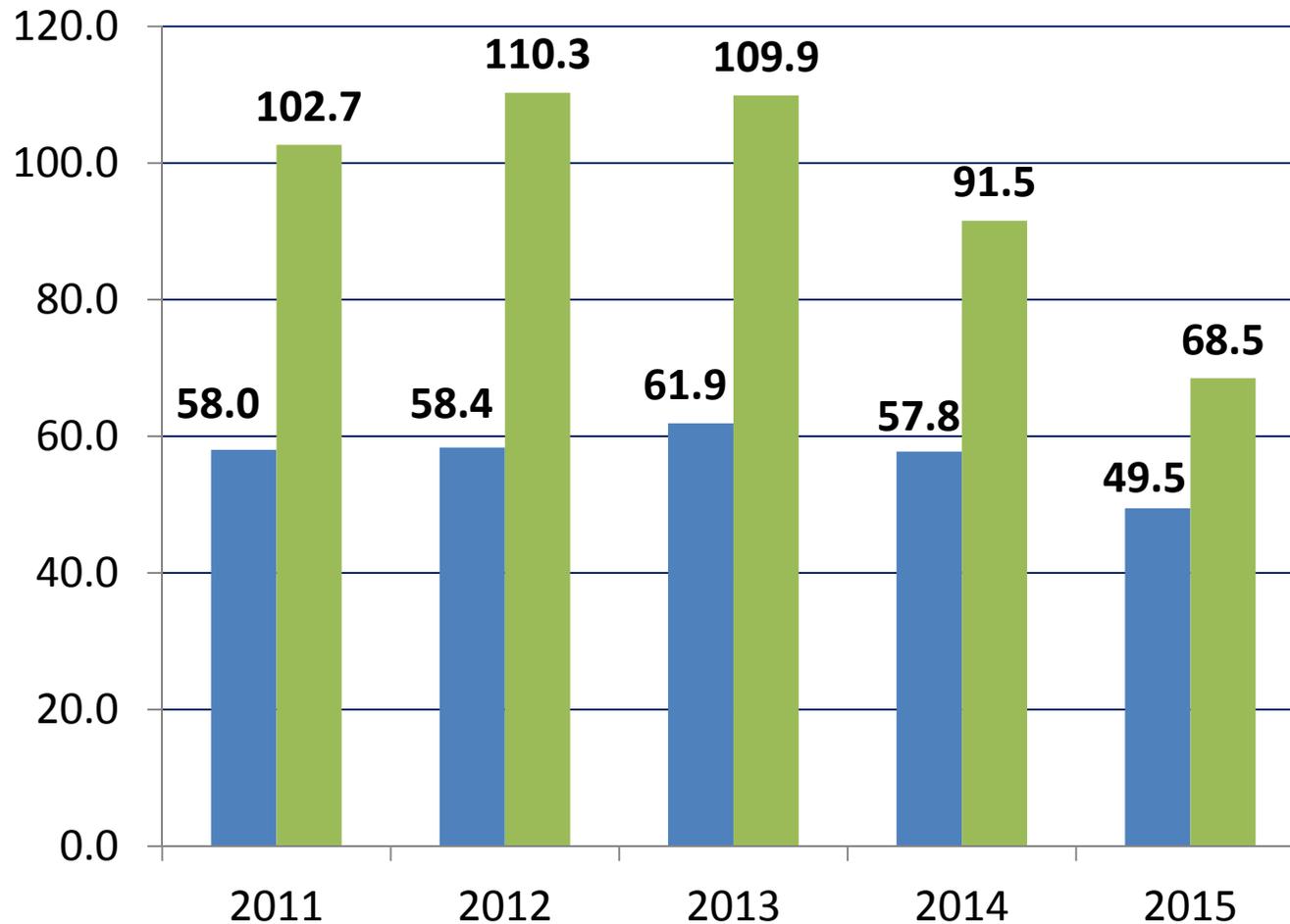
# 2013 Seasonal Water Use by Customer Category



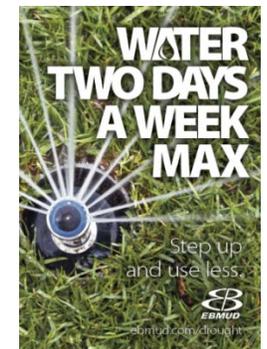
# Average Single-Family & Multi-Family Residential Use (2013)



# Single-Family Seasonal Demand CY2011-2015 (MGD)



■ Winter/Indoor  
■ Summer/Outdoor



**Notes:**

- (1) Summer use based on July, August consumption data.
- (2) Winter use based on December, January consumption data.

# SBx7-7 Target Method 2 Applicability

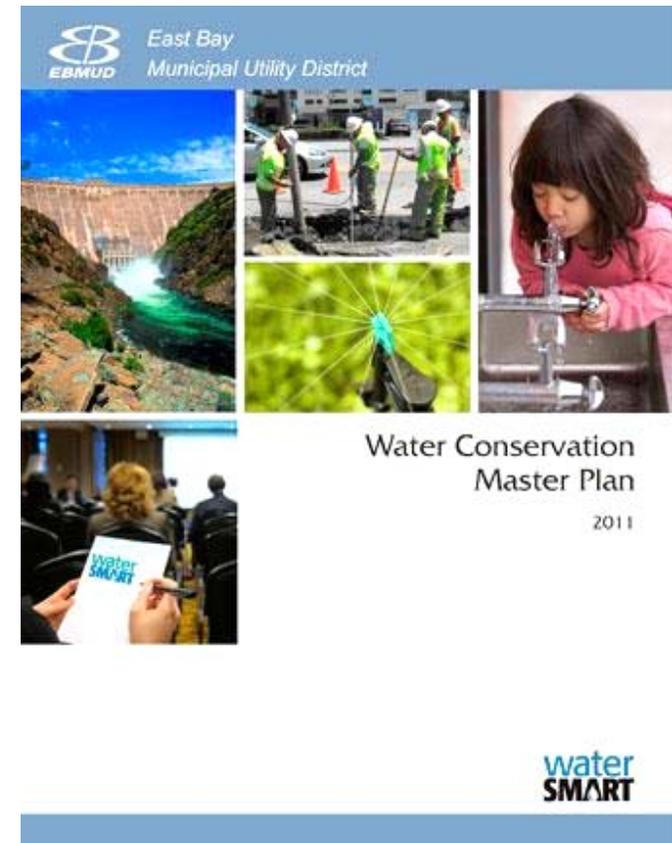


- EBMUD recently completed long-term water supply plan out to year 2040
  - 2009 Land Use Demand Study
  - 2008 long-term water conservation evaluation
- Deemed best fit to recognize prior conservation and recycling investments and per capita use reductions
- Provides valuable data and tools for landscape water management services going forward

# 2011 Water Conservation Master Plan Update



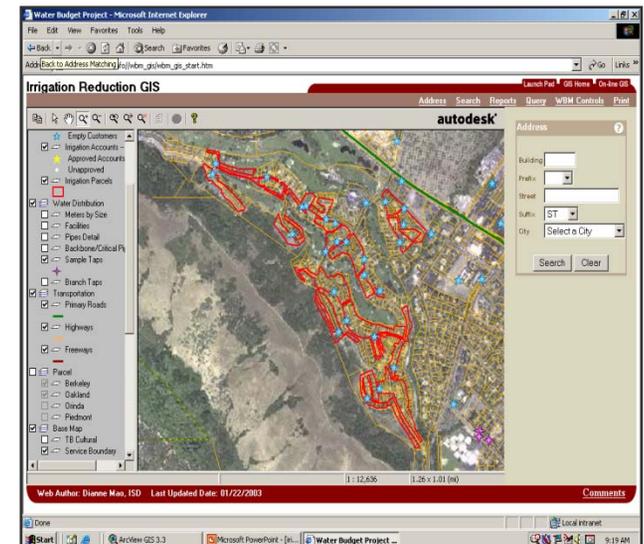
- 10-year internal planning document
- Guides implementation and schedule to achieve 2020 target
- Obtains customer input through surveys, focus groups, facilitated meetings, and workshops
- Increased focus on leveraging information technology to help customers make decisions about their water use



# Landscape Water Budget Program (1999-2015 ; Irrig. & Resid. Accts)



- Obtained digital infrared image of 330 sq. mi. service area
- 9 separate image classifications: (irrigated grass, shrubs, trees, dry grass, buildings, and more...)
- GIS-billing system integration developed in-house:
  - calculates irrigated area of each polygon.
  - captures daily weather data (from CIMIS weather stations).
  - files stored in EBMUD Oracle database



# Outdoor Water Use



- Irrigation is the main driver and mainly in the summer months
- Previously only 4 weather stations over 330 s.q. miles
- Upgraded to spatial ET weather data by zip-codes (72 in EBMUD service area)
- EBMUD has three very distinct climate zones
  - West of Hills ~36-38 in.
  - Lamorinda ~42-45 in.
  - East of Hills ~48-50 in.



# Water Management Services

## Landscape Irrigation Water Budgets



EAST BAY MUNICIPAL UTILITY DISTRICT



### Maximum Allowable Water Budget

Thank you for participating in our Landscape Irrigation Water Budget Program. The following is your customized water usage profiles for the last two years. EBMUD records indicate that this account primarily serves landscape irrigation. The graphical description compares your measured water usage versus your budgeted water usage for each billing period.

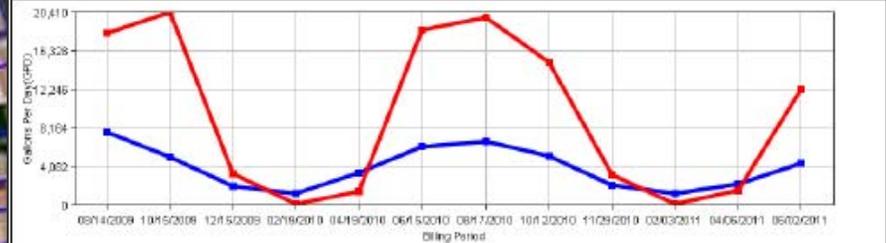
Customer Name: City Of California  
 Service Address: 2115 California Pky  
 City: California City  
 Account #: 1234567-8  
 Meter #: 87654321  
 Est. Irrigated Area (sq. ft): 66811



Irrigated Area at 2115 California Pky

Water Budget Summary	Used	Budgeted
Gallons used last 12 months	3,071,288	1,306,586
Gallons used previous year	3,701,852	1,552,129

Used: 6,773,140 Budget: 2,858,715 Percent: 237%  
 Meeting your water budget could have saved you \$ 13,501.63



Billing Period	06/14/2009	10/15/2009	12/15/2009	02/19/2010	04/19/2010	06/15/2010	08/17/2010	10/12/2010	11/29/2010	02/03/2011	04/06/2011	05/02/2011
Budget (GPD)	7786	5172	2048	1268	3500	6241	6736	5287	2152	1704	1268	4455
Consumption (GPD)	18255	20410	3320	135	1520	18555	19920	15130	3255	155	1400	11220
Evapotranspiration (ET)	11200	77	3	230	438	857	1019	711	248	211	423	789

\*ET\* Represents the estimated water need of cool season grass (in inches) for each billing period. The Water Budget Calculation does not use rain, typically irrigation systems can be turned off for the winter months of November, December, January, and February. The Maximum Allowable Water Budget, effective January 2010, is calculated using 80% of Reference Evapotranspiration (ET<sub>0</sub>) for the irrigated area of established landscapes, using the new Model Efficient Landscape Ordinance from the State of California, Department of Water Resources (DWR). If you feel the irrigated area is not accurate or would like more information on this program, contact EBMUD at (510) 986-7615.



# Water Management Services: Single Family Water Budgets



- Email reports up to 4 recipients
- Customer usage from billing system
- Reports sent on bi-monthly billing cycle
- Shows 2-years of water budget history

EAST BAY MUNICIPAL UTILITY DISTRICT



## Home Water Use Calculator

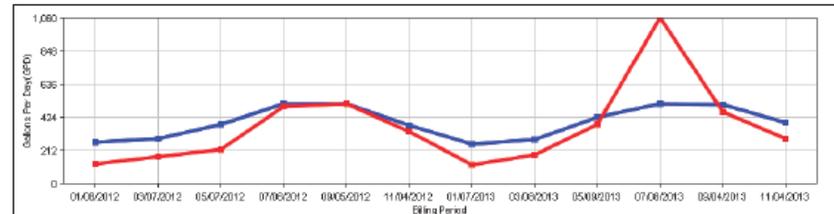
Thank you for participating in our Single Family Water Budget Program. The following is your customized water usage profiles for the last two years. The graphical description compares your measured water usage versus your budgeted water usage for each billing period. The purpose of the budget report is to show customers how efficiently water is being used inside and outside the home.

Customer Name: Charles Bohlig  
 Service Address: 47 Bates Bl  
 City: Orinda  
 Account #: 13050400001  
 Meter #: 92841187  
 Est. Irrigated Area(sq. ft): 3105  
 Household occupants: 4  
 Base Household use: 200



Irrigated Area at 47 Bates Bl

Water Budget Summary	Used	Budgeted
Gallons used last 12 months	150,348	142,803
Gallons used previous year	114,444	143,306
Percent of budget last 12 months		105%
Percent of budget for previous year		80%
2 years estimated savings in gallons:		21,317



Billing Period	01/08/12	03/07/12	05/07/12	07/06/12	09/05/12	11/04/12	01/07/13	03/08/13	05/09/13	07/08/13	09/04/13	11/04/13
Budget(GPD)	267	291	381	516	510	378	256	285	428	513	508	391
Consumption(GPD)	132	177	221	499	515	337	129	187	380	1060	464	294
Evapotranspiration(ET)	2.93	3.45	7.15	12.26	12.21	6.89	2.2	3.29	8.67	12.13	11.52	7.53

EBMUD estimates the average indoor water use per person with high efficiency fixtures at 50 gpd (gallons per day). Evapotranspiration (ET) represents the estimated water need of cool season grass (in inches) for each billing period. The Water Budget Calculation does not use rain, typically irrigation systems can be turned off for the winter months of November, December, January, and February. The Maximum Allowable Water Budget for landscaping, effective January 2010, is calculated using 80% of ET for the irrigated area of landscaping. If you feel the irrigated area is not accurate or would like more information on this program, contact EBMUD at (510) 287-1900.



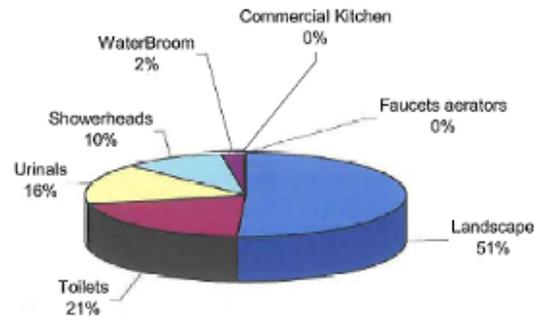
# Water Management Tools: Business Site Survey Reports



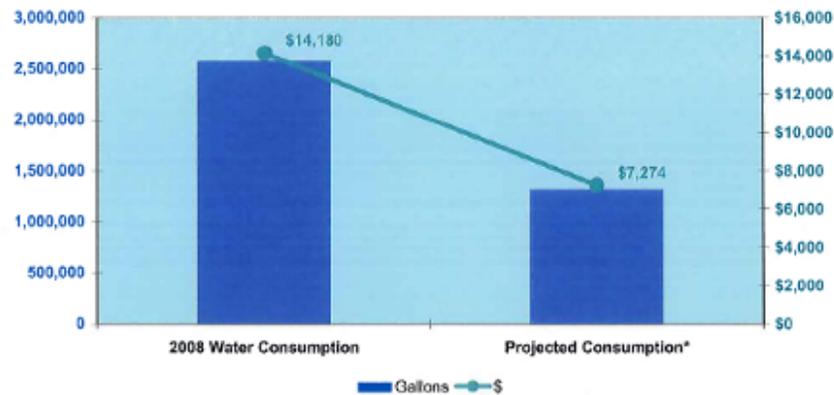
## Water Savings Summary

Estimated Annual Savings		Return on Investment	
Water Savings (gallons)	1,254,777	Estimated cost for water efficiencies:	\$14,445
Energy Savings (therms)	423	EBMUD Rebates:	\$1,574
<b>Total Dollar Savings</b>	<b>\$6,906</b>	<b>Payback (years):</b>	<b>1.9</b>

## Identified Water Savings by Device/Area



## Current and Projected Consumption and Cost



## Savings and Payback Summary for Water Efficient Measure(s) Identified

Identified Measures	Initial Cost <sup>1</sup>	Incentives & Rebates <sup>1</sup>	Annual Water Savings (gallons)	Energy Savings (Therms)	Annual Water & WW Savings (\$)	Annual Energy Savings (\$)	Total Annual Savings (\$)	Simple Payback (years)
Landscape	\$0	\$0	638,335	0	\$3,507	\$0	\$3,507	Immediate
Toilets	\$7,845	\$576	261,469	0	\$1,437	\$0	\$1,437	5.1
Urinals	\$6,300	\$848	196,184	0	\$1,078	\$0	\$1,078	5.1
Showerheads	\$ FREE	\$ FREE	128,571	412	\$706	\$0	\$706	Immediate
WaterBroom	\$300	\$150	26,863	0	\$148	\$0	\$148	1.0
Commercial Kitchen	\$ FREE	\$ FREE	3,355	11	\$18	\$11	\$30	Immediate
Faucets aerators	\$ FREE	\$ FREE	0	0	\$0	\$0	\$0	Immediate
<b>Totals</b>	<b>\$14,445</b>	<b>\$1,574</b>	<b>1,254,777</b>	<b>423</b>	<b>\$6,895</b>	<b>\$11</b>	<b>\$6,906</b>	<b>1.9</b>

<sup>1</sup> \$ FREE indicates that EBMUD provided your facility of free water efficient device.

# 20x2020 Vendor Request For Proposals



- Mailed RFP to 5 known firms plus web posting
- Proposals received from 2 teams
  - Eagle Aerial/Quantum Spatial
  - OmniEarth
- Both teams could perform work, yet measurable differential in costs, expertise, methodology
  - Imagery and classification
  - Software API
- Recommendation is to proceed with two contracts for specialized services

# 20x2020 System Wide Computing Tools



- 2015 UWMP Update

- Approx. 360,000 parcels
- Reduce manual processing time & costs

- Application Tools

- High-resolution 4-band imagery (Google Candid & Air Bus)
- 6-inch resolution
- 6 microclimate zones
- Manual & software integration services



# EBMUD Parcel Data



**TABLE G-5** **PARCEL STRATA DISTRIBUTION**

PARCEL SIZE (SQFT)	SINGLE FAMILY PARCELS	MULTI- FAMILY PARCELS	IRRIGATION PARCELS	TOTAL # PARCELS FOR STRATA
<4,000	73,213	6,413	2,672	82,298
4,001-8000	152,661	15,380	3,113	171,154
8,001-12,000	40,625	3,393	1,428	45,446
12,001-16,000	16,729	1,493	755	18,977
16,001-20,000	9,201	761	491	10,453
20,001-24,000	8,046	544	390	8,980
>24,000	15,173	3,651	4,396	23,220
<b>TOTAL</b>	<b>315,648</b>	<b>31,635</b>	<b>13,245</b>	<b>360,528</b>

# EBMUD SBx 7-7 Target Methodology No. 2 Findings



Projected 2020  
Indoor Use

**55 GPCD**



+

Projected 2020  
Landscape Use

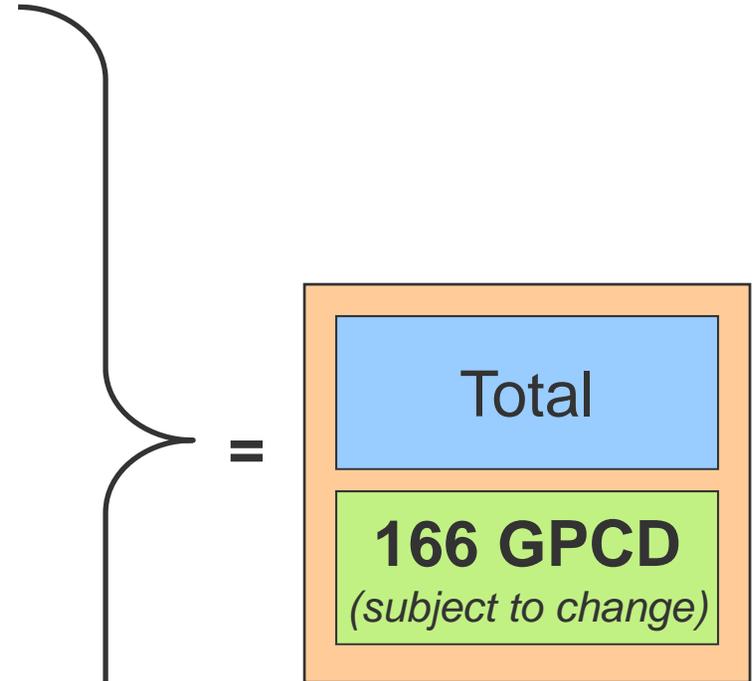
**59 GPCD**



+

Projected 2020  
CII Use

**52 GPCD**



Total

**166 GPCD**

*(subject to change)*

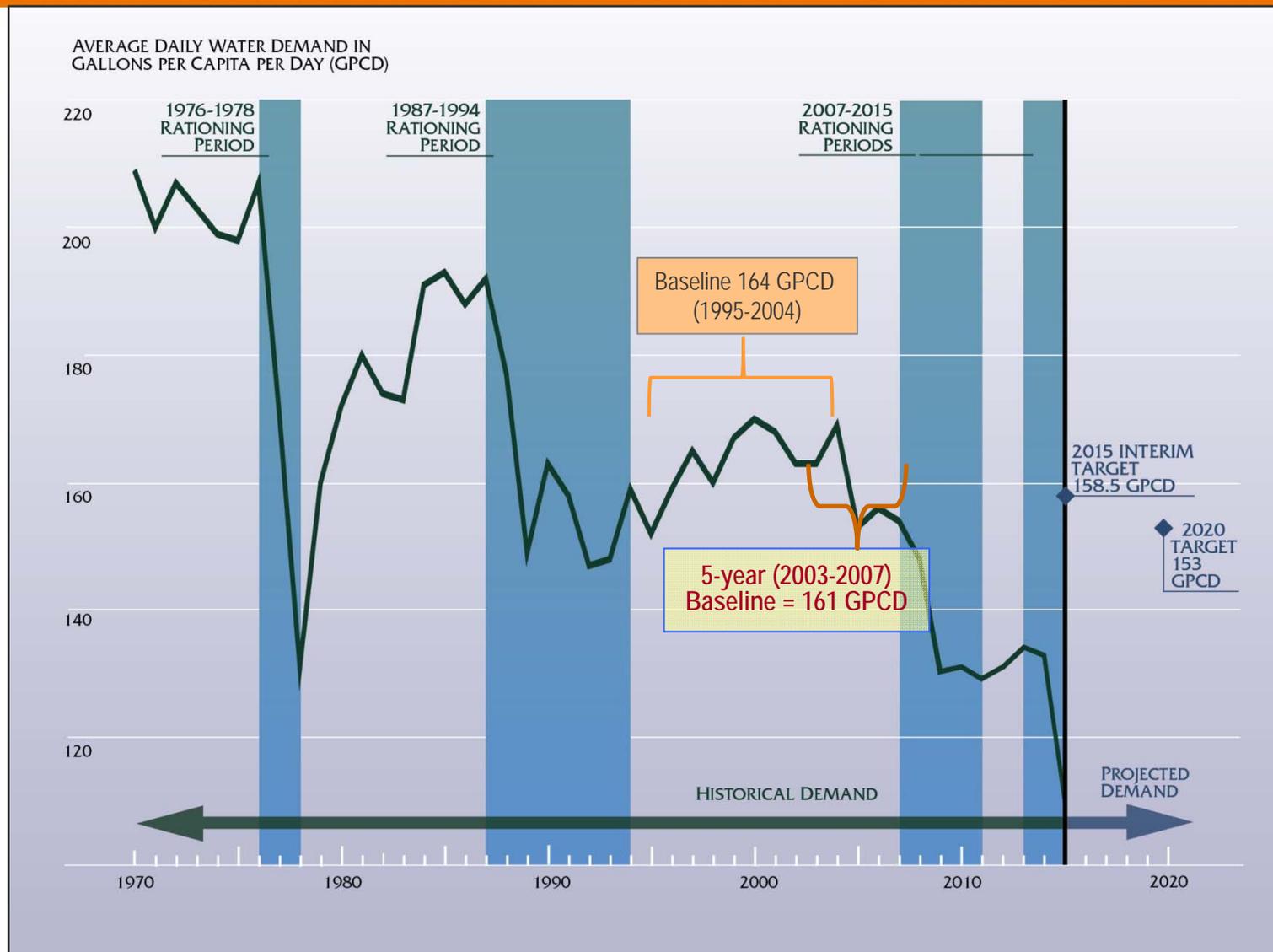
# EBMUD SBx 7-7 Target Methodology No. 2 Findings



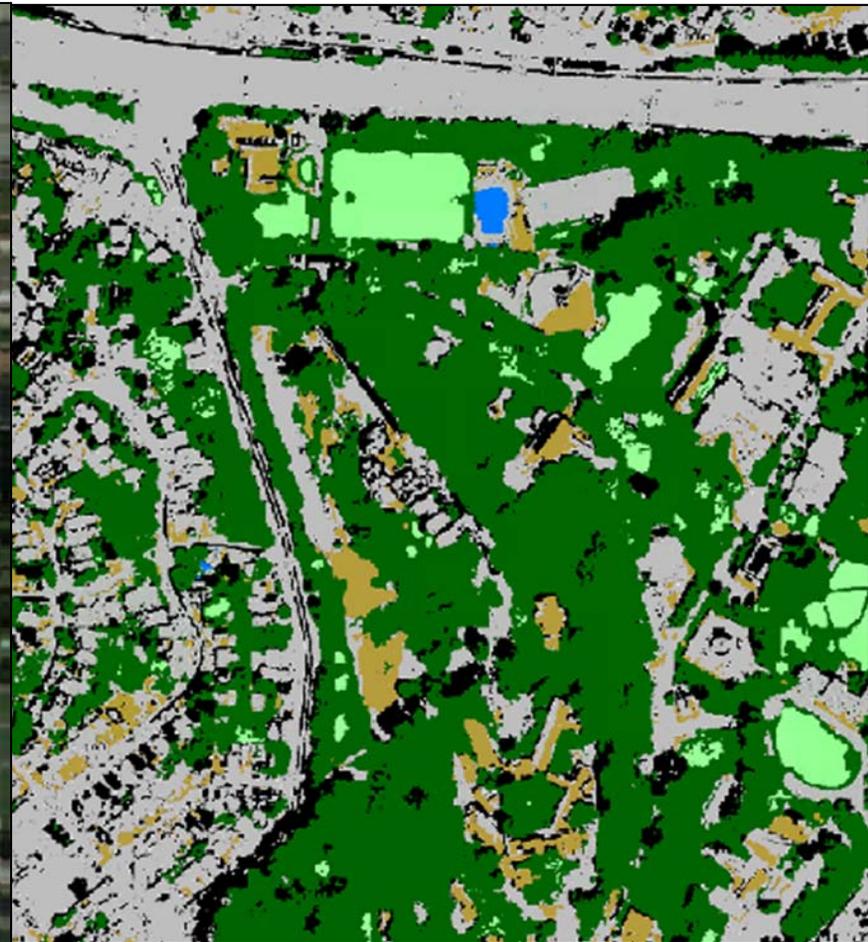
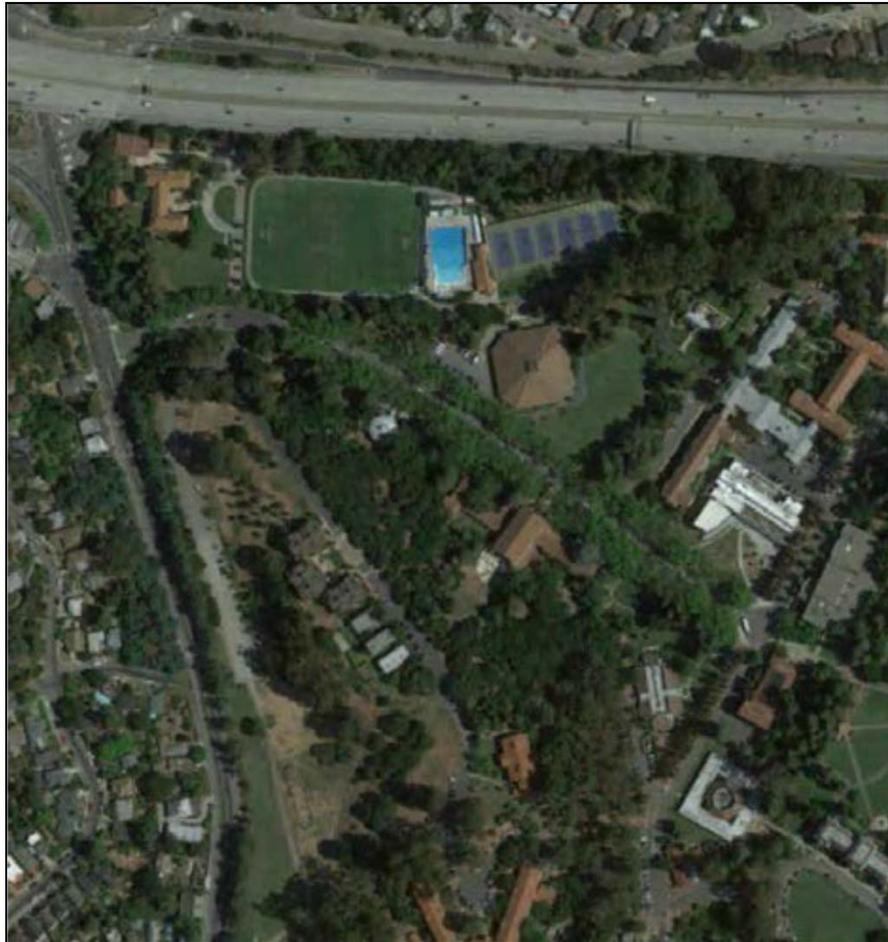
Water Use Period	GPCD
10-Yr Baseline (1995-2004)	164
5-Yr Baseline (2003-07)	161
2020 Updated TM2 Calculation	166
5% Reduction from 5-Yr Baseline	<b>153</b>
2015 Interim Target	<b>158</b>
2015 Actual	106
<b>2020 TARGET</b>	<b>153</b>

*-149 w/no  
rationing*

# SBx 7-7 Gross Water Use Baseline and Targets



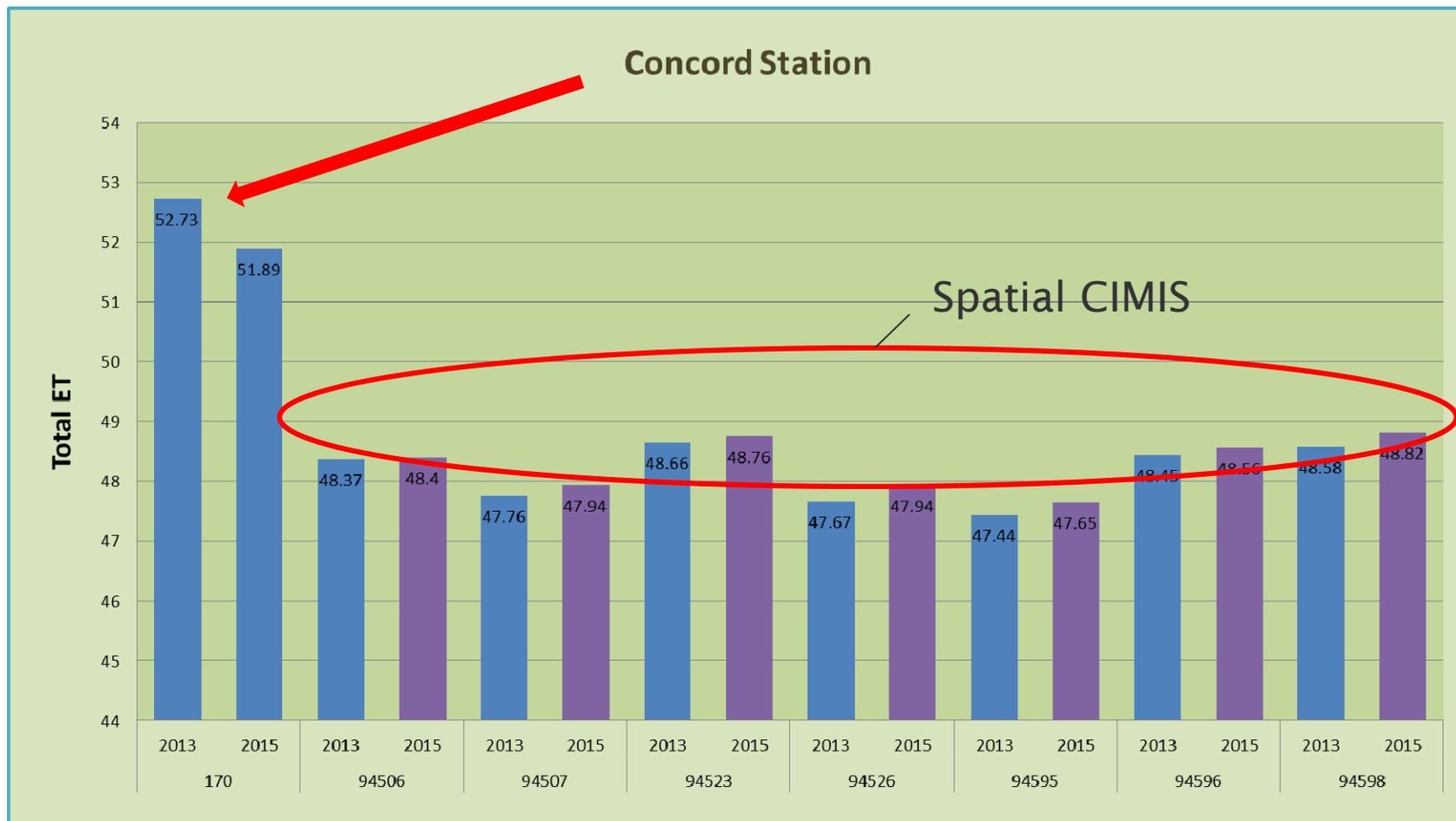
# Airbus Land Cover Side-by-Side Assessment For Central Oakland



# Observations, Suggestions & Recommendations



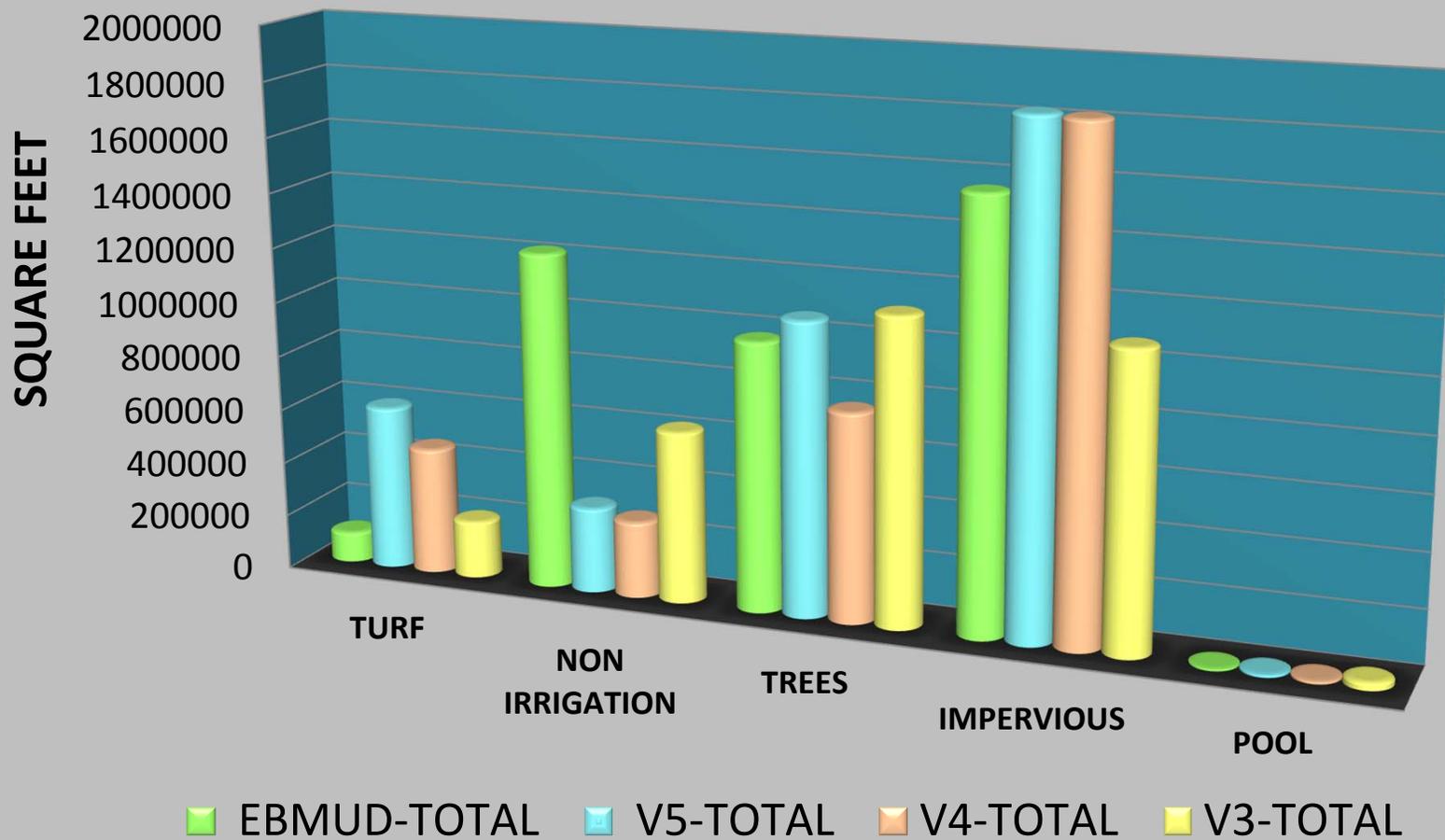
## Climate Zone ET Factor Variation



# Observations, Suggestions & Recommendations



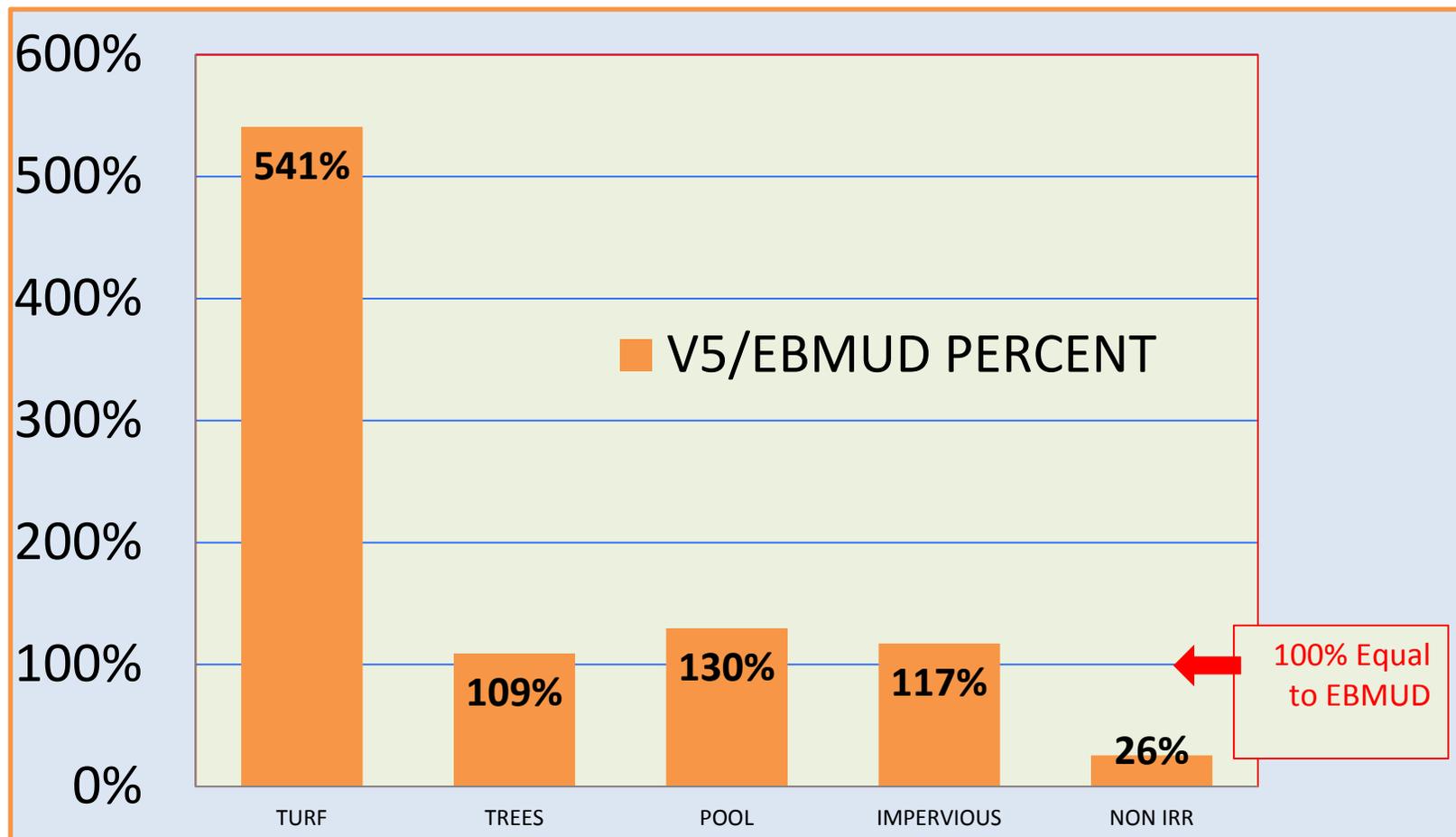
## Software vs Manual Analysis



# Observations, Suggestions & Recommendations



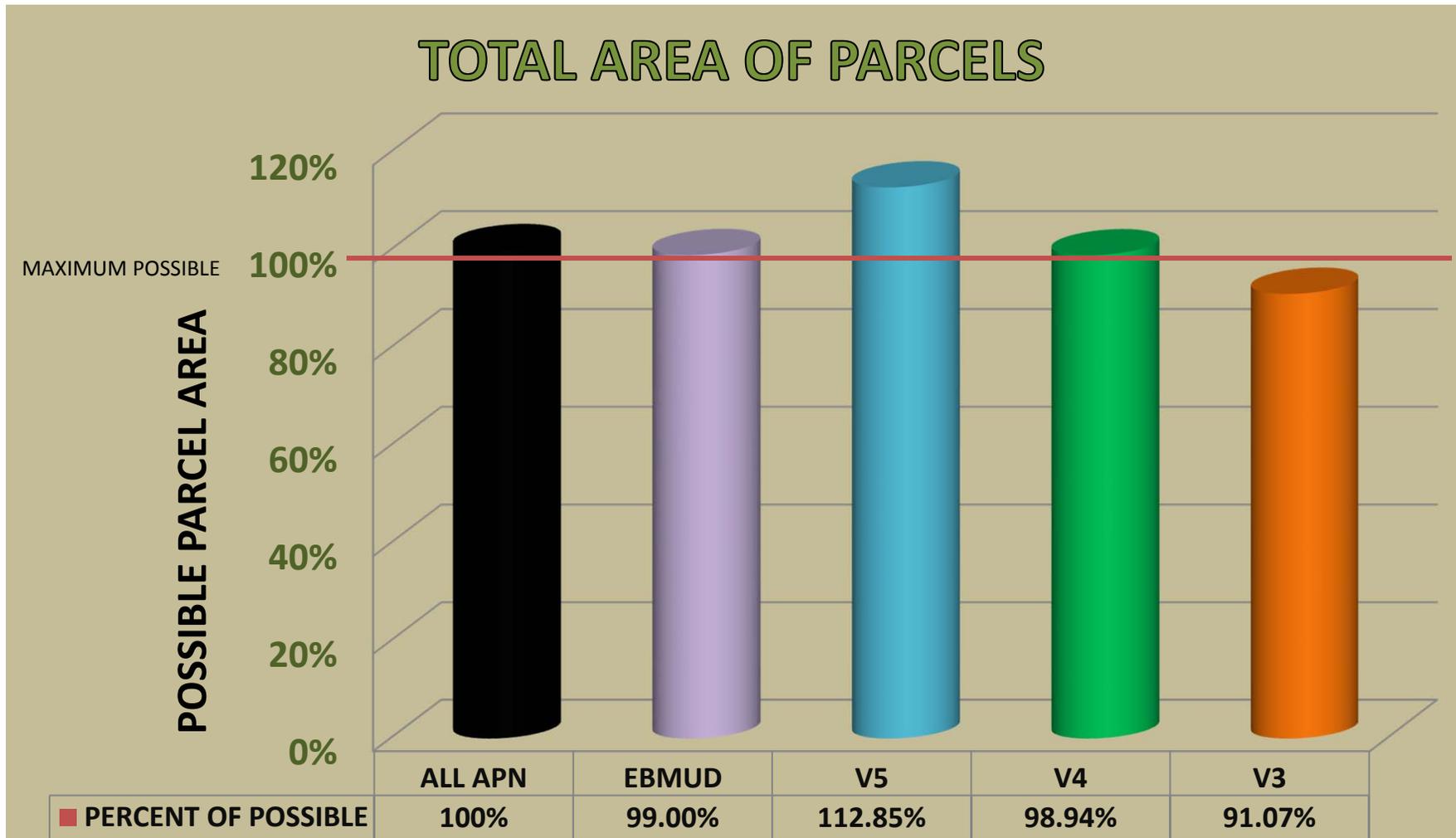
## Software Applications Improving Manual Checks Still Needed



# Observations, Suggestions & Recommendations



Software Applications Improving, Manual Checks Still Needed



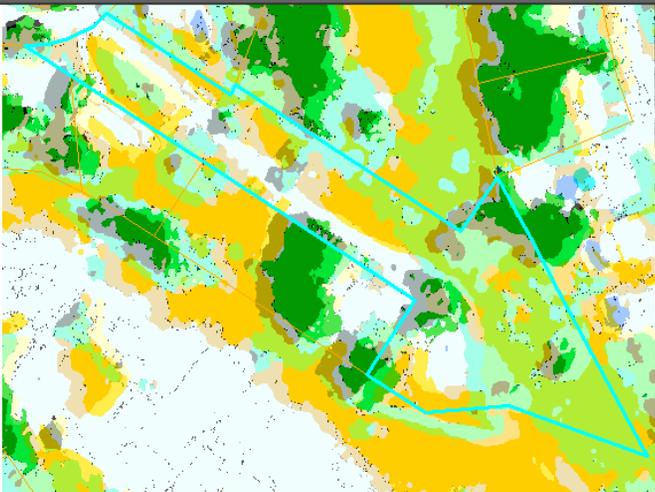
# Observations, Suggestions & Recommendations (Moraga, CA)



Manual Turf Measurement = 0



V4 Turf: 23,811 FT<sup>2</sup>



V5 Turf: 63,862 FT<sup>2</sup>



# Observations, Suggestions & Recommendations (Moraga, CA)



Manual turf measurement: 2,023



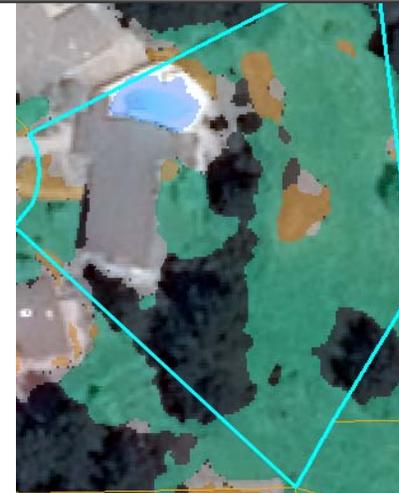
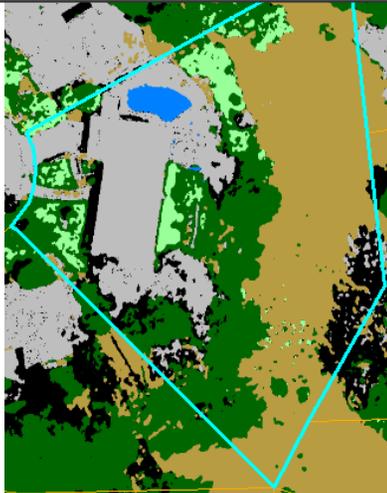
V3 Turf: 2,121



V4 Turf: 6,320



V5 Turf: 24,049



# Observations, Suggestions & Recommendations



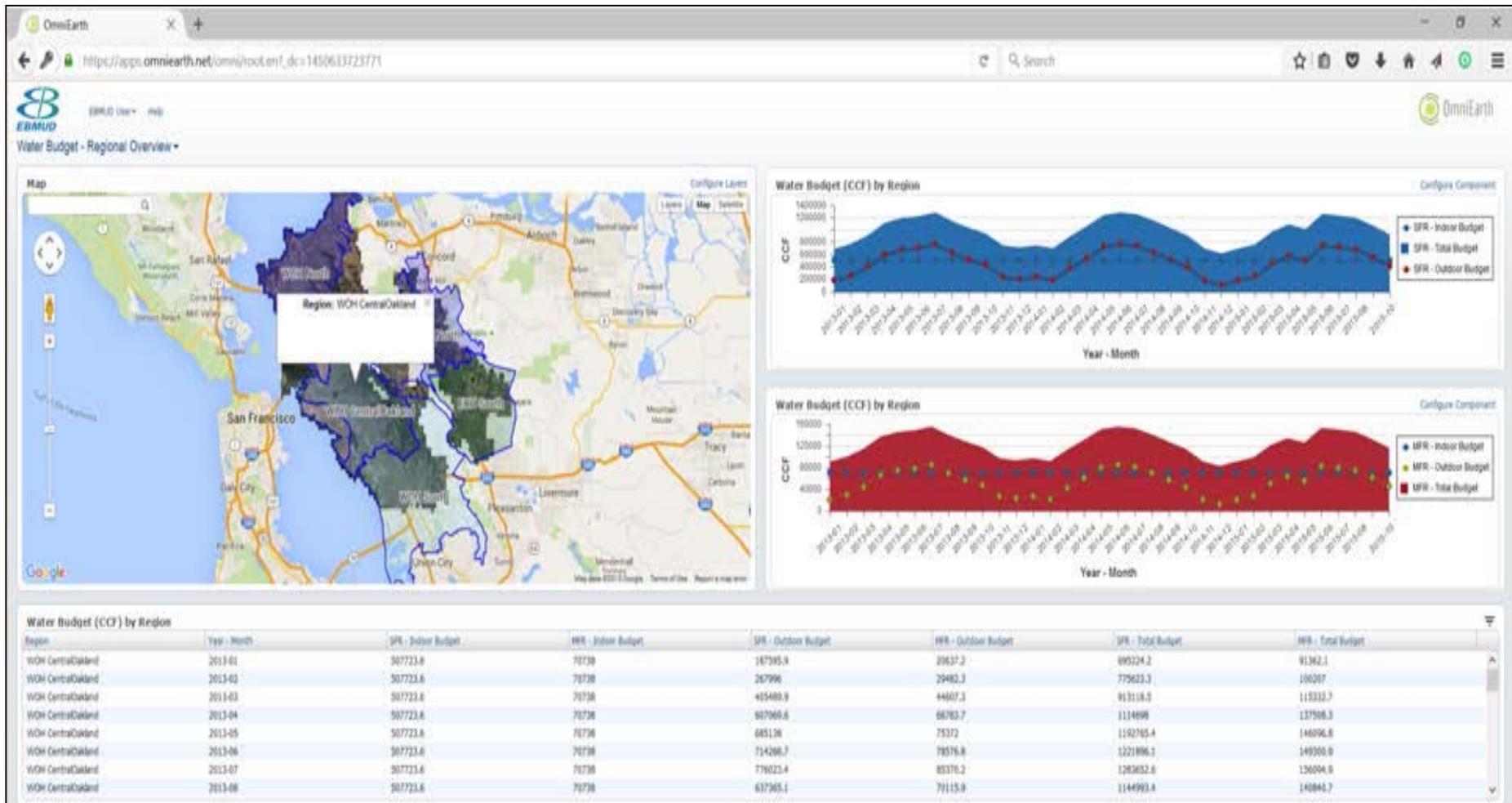
- “Irrigable area” needed for parcel water budget w/changing ownership.
- “Irrigated area” needed for current property owner water budget/MAWA.
- Parcel size does not always correlate well to irrigated area (parcels can be totally impervious or vegetated within a size class.
- An increase in variance of the stratum reduces the precision of the estimate.

# Looking Forward: Land use change management



- Where do future outdoor water savings come from?
  - a) Non-participating parcels
  - b) Locking in achieved savings (lessen rebound)
- Using parcel data to model water budget rate structures

# Looking Forward: Water Budget Dashboards



# Questions/Discussion...



*hardscape or xeriscape?*



# Contact Info:



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