

# Exempt Well Use in Skagit County Results from a Voluntary Metering Program

## Conducted in the Carpenter- Fischer and Upper Nookachamps Sub-Basins

Funded by Skagit County, Ecology, and the City of Anacortes

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## Key Questions

- Where and when was metering conducted?
- Is the volunteer metering network representative of other non-metered properties?
- Were climatic conditions during the study representative of average, wet, or dry conditions?



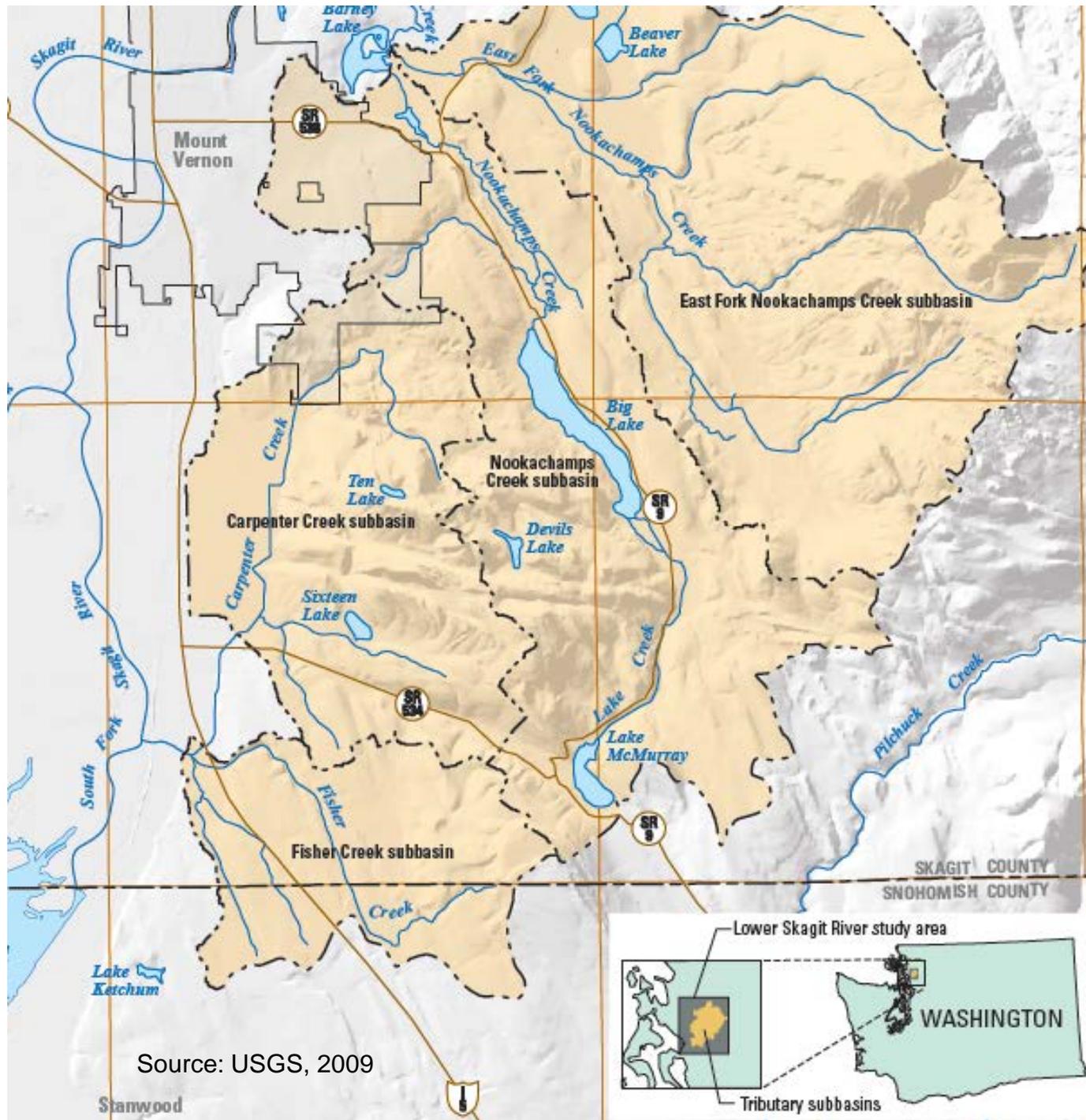
## Key Questions

- What is the average water use, and how does water use vary among the properties?
- How does water use vary seasonally because of outdoor watering, and how does this vary among the properties?
- What are considerations for water management in Skagit County based on the study results?

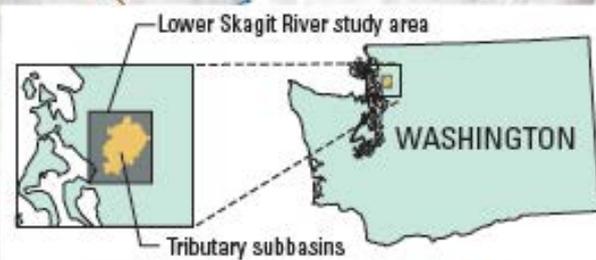


# Background

- 2001: Ecology administrative rule establishing minimum instream flows for the Skagit River system.
- 2006: Rule amended to establish 27 reservations of water for sub-basins to specifically allow a limited number of exempt wells not subject to minimum instream flows.
- The rule assumed exempt well use would total 350 gallons per day for the purposes of allocating the reservation.
- The rule allow for further study to evaluate actual water use. This study was undertaking to provide this information.
- October 3, 2013 Supreme Court ruling – 2006 rule amendments invalid.



Source: USGS, 2009





# Metering Data Collection

- Water use survey and solicitation for volunteers
- Study initiated in late 2011 with 18 volunteer households
  - Data presented for 2012
  - 2013 data collection in progress
- Equipment
  - Badger Recordall M-25 meters
  - Hourly data
  - Periodic downloads at wellhead





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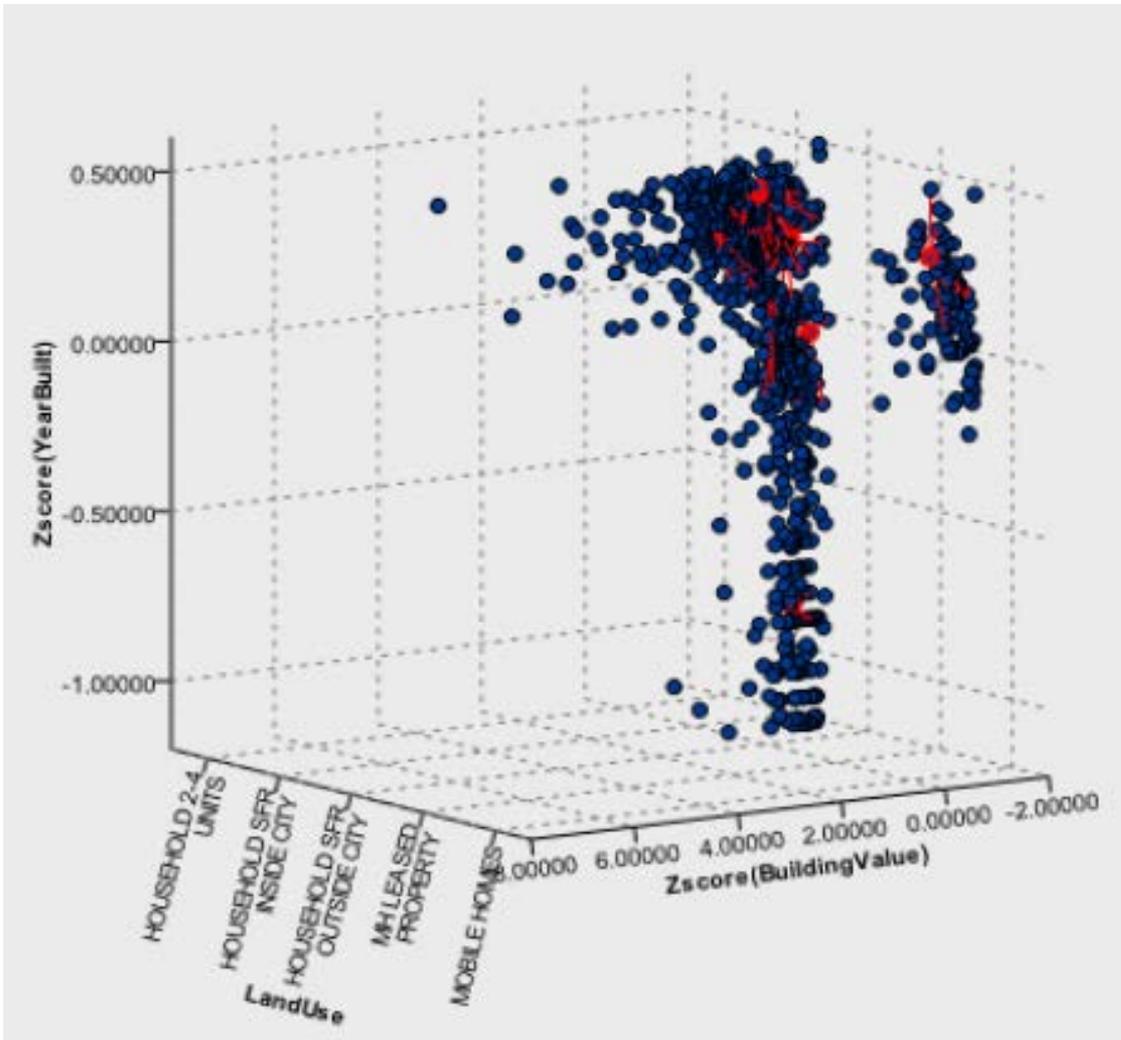
## Are the 18 Properties Representative?

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- Approach: Statistically compare parcel attributes of the 18 monitored properties to all parcels not on public water in the sub-basins
- Data source: Attributes available in Skagit County parcel database
- Statistical Tool: K-Nearest Neighbor (KNN) cluster analysis – multi-dimension regression technique for pattern/cluster recognition
- Key attributes for similarity determined by KNN analysis included:
  - Building value, construction year, improved land value, land area, unimproved land value
- Based on KNN analysis, the monitored parcel attributes are well distributed among the unmonitored parcel attributes.



# K-Nearest Neighbor Results

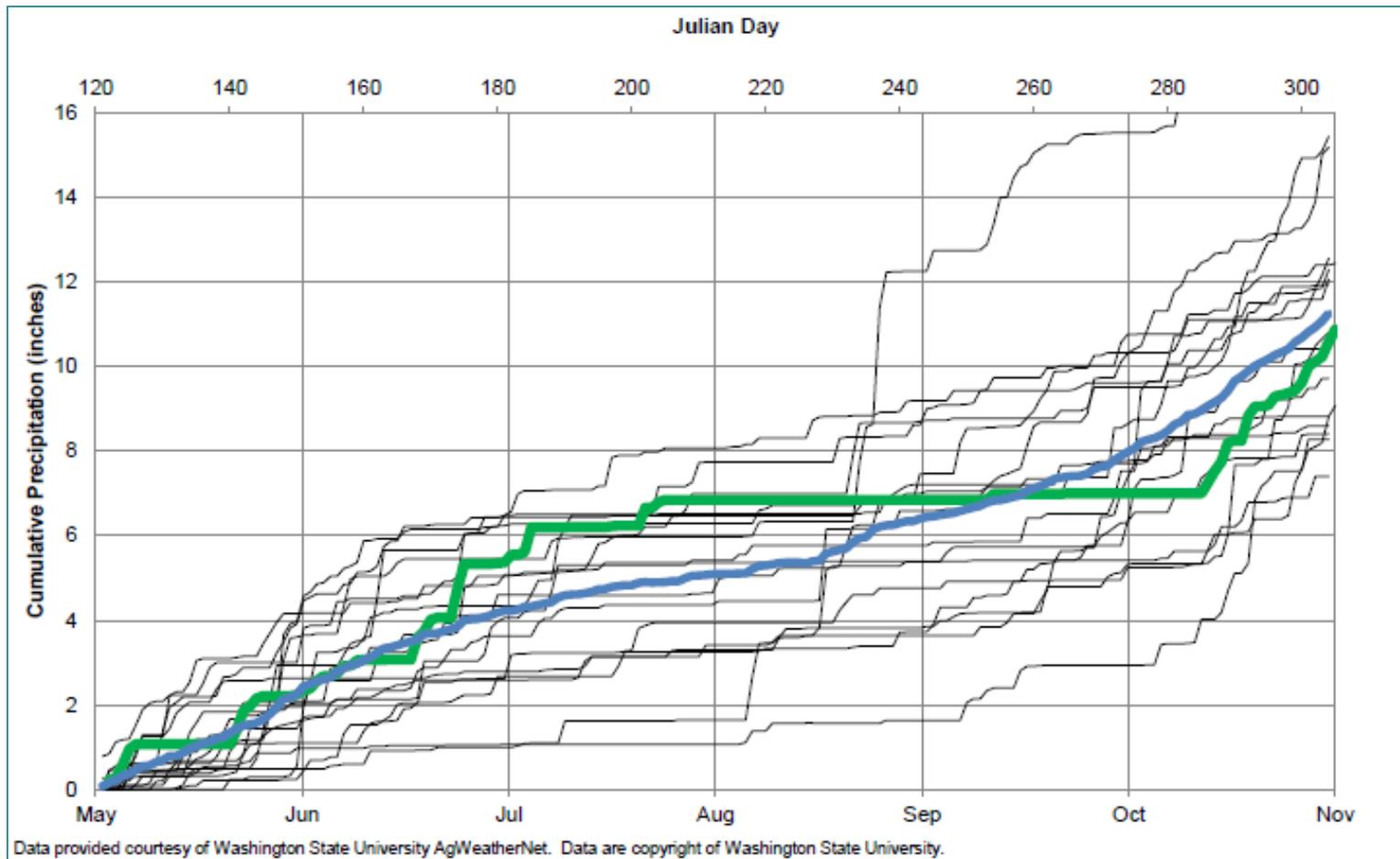


Property No.	% Similar
1	2.35%
2	3.79%
3	2.89%
4	8.76%
5	0.45%
6	6.14%
7	1.08%
8	6.41%
9	4.88%
10	11.56%
11	5.69%
12	2.80%
13	1.08%
14	4.97%
15	3.97%
16	1.36%
17	20.23%
18	11.56%



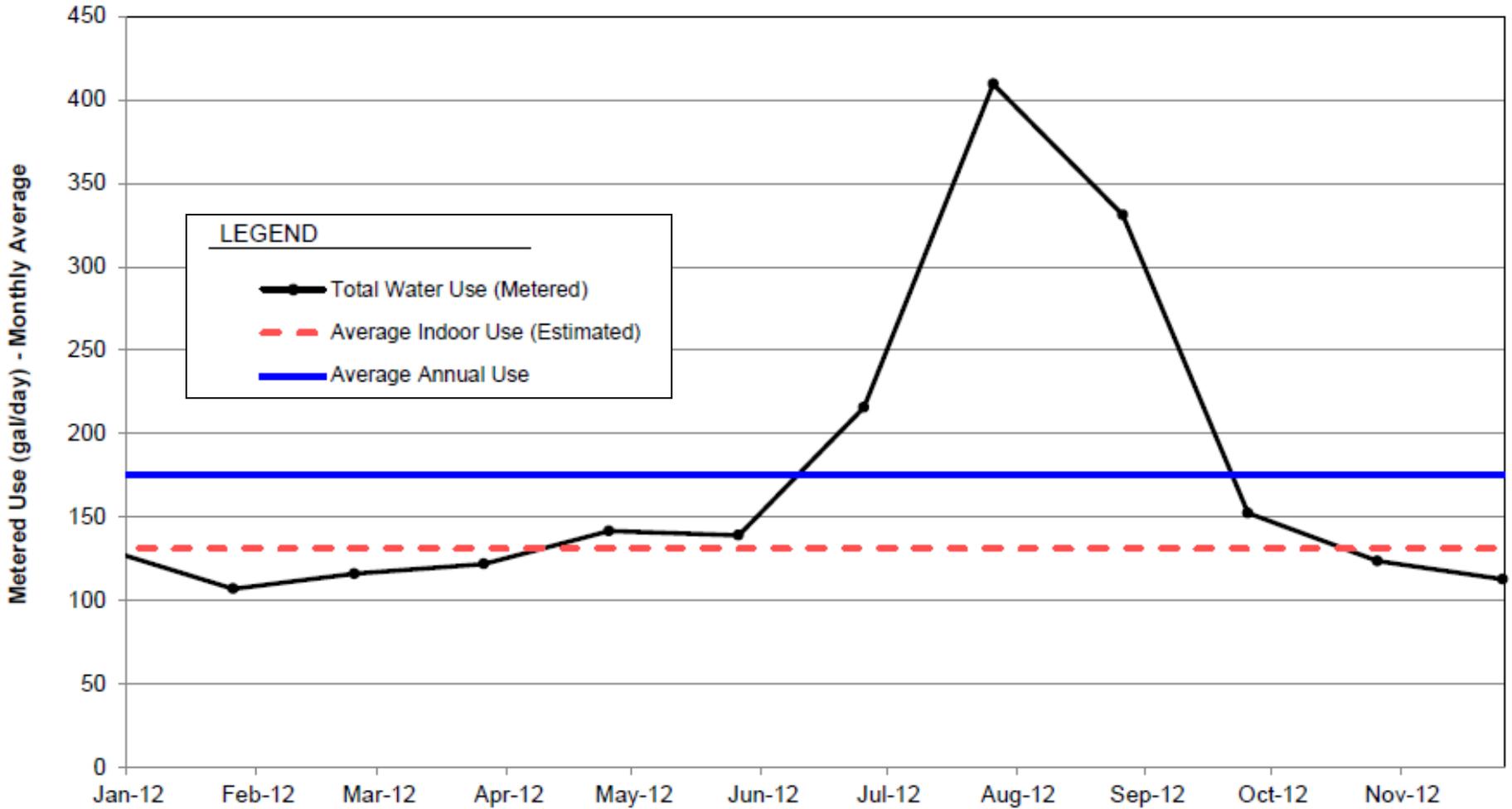
# 2012 Climatic Conditions

- Compared to 1994 through 2011 at WSU Mt Vernon station:
  - Average until late June
  - Short period of high rainfall late June – early July
  - Long dry spell from early July through mid-October



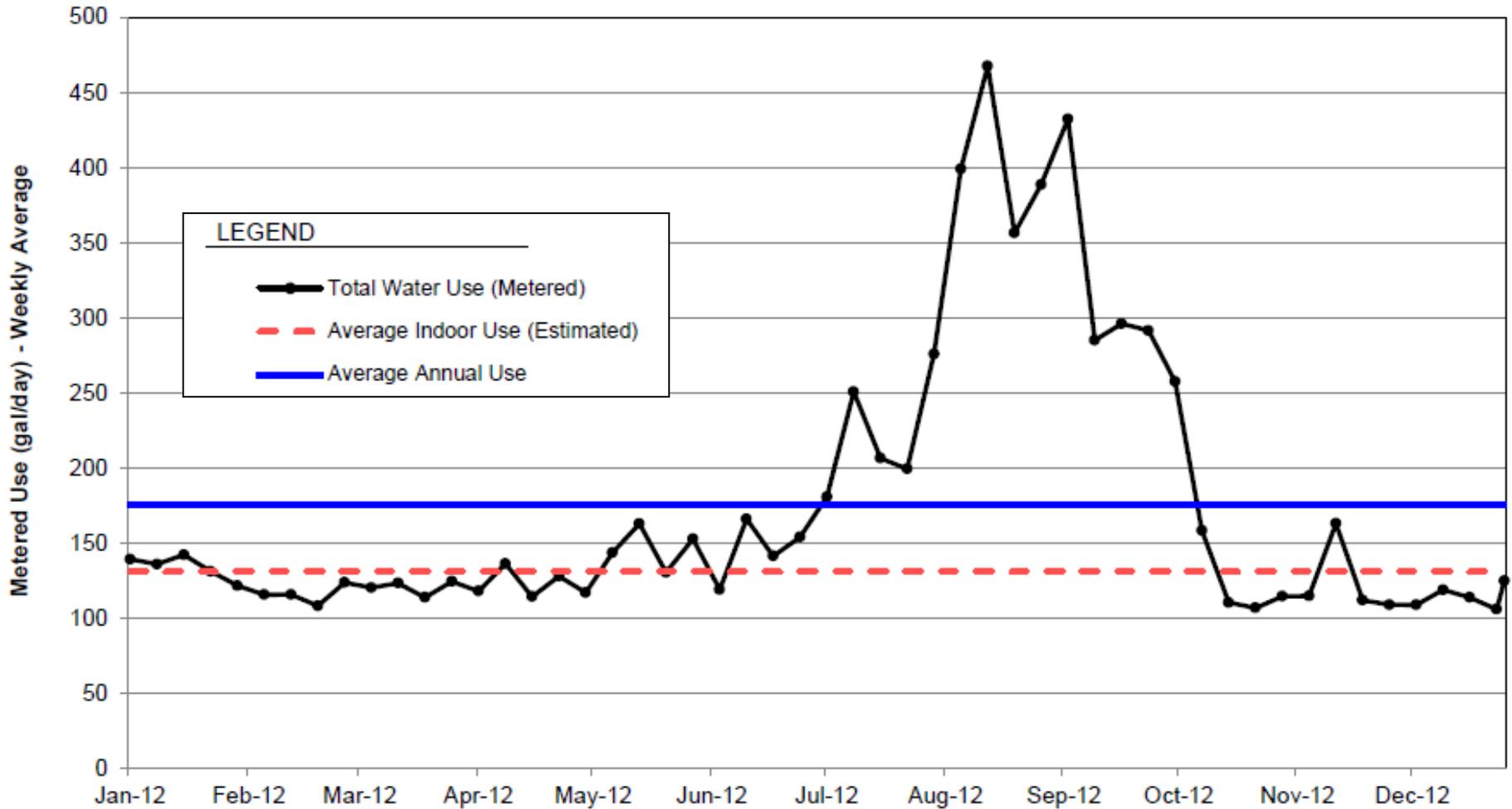


# Mean Daily Water Use (Monthly Average – All Properties)



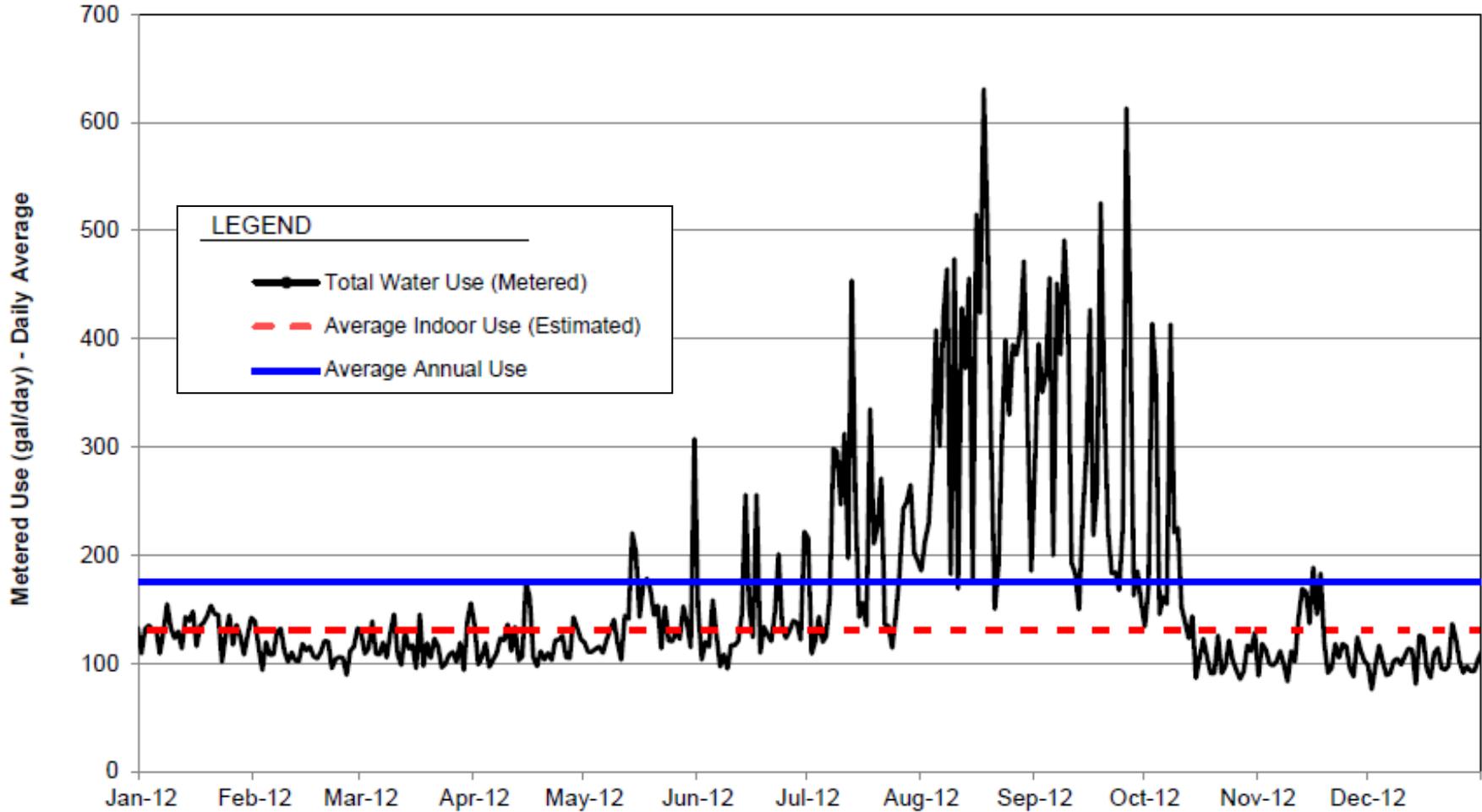


# Mean Daily Water Use (Weekly Average – All Properties)



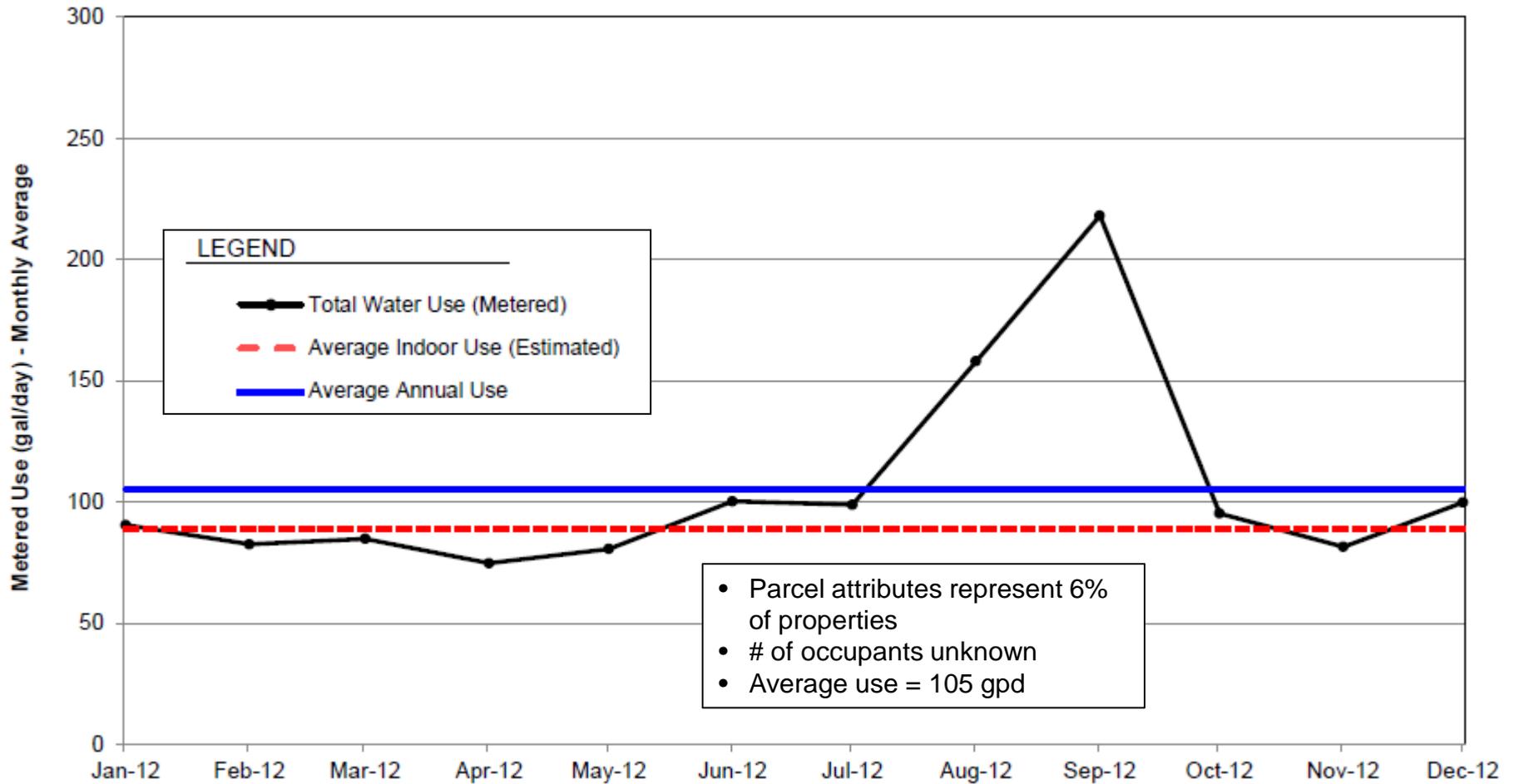


# Mean Daily Water Use (Daily Average – All Properties)



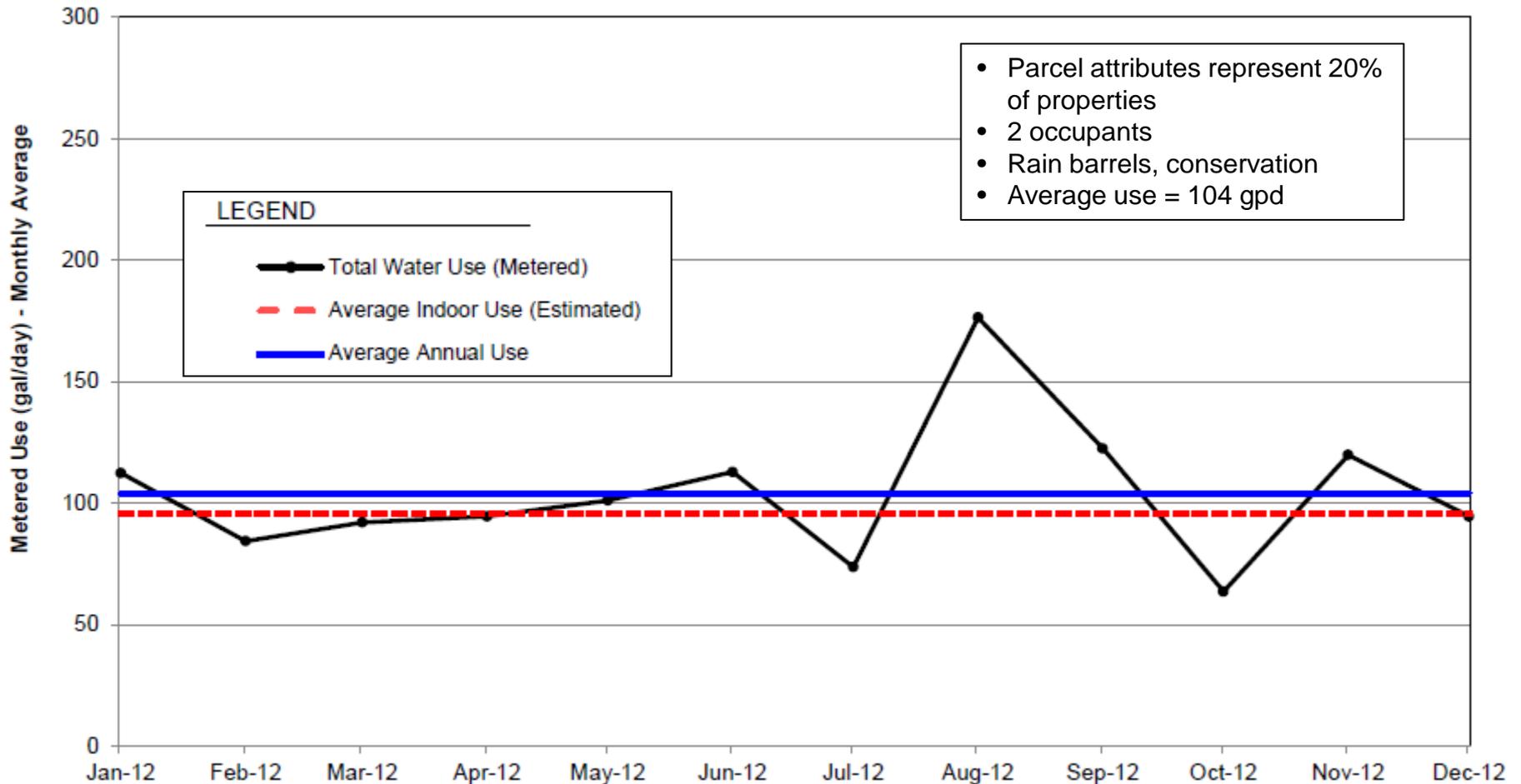


# Property 6 – Daily Water Use (Monthly Avg.)



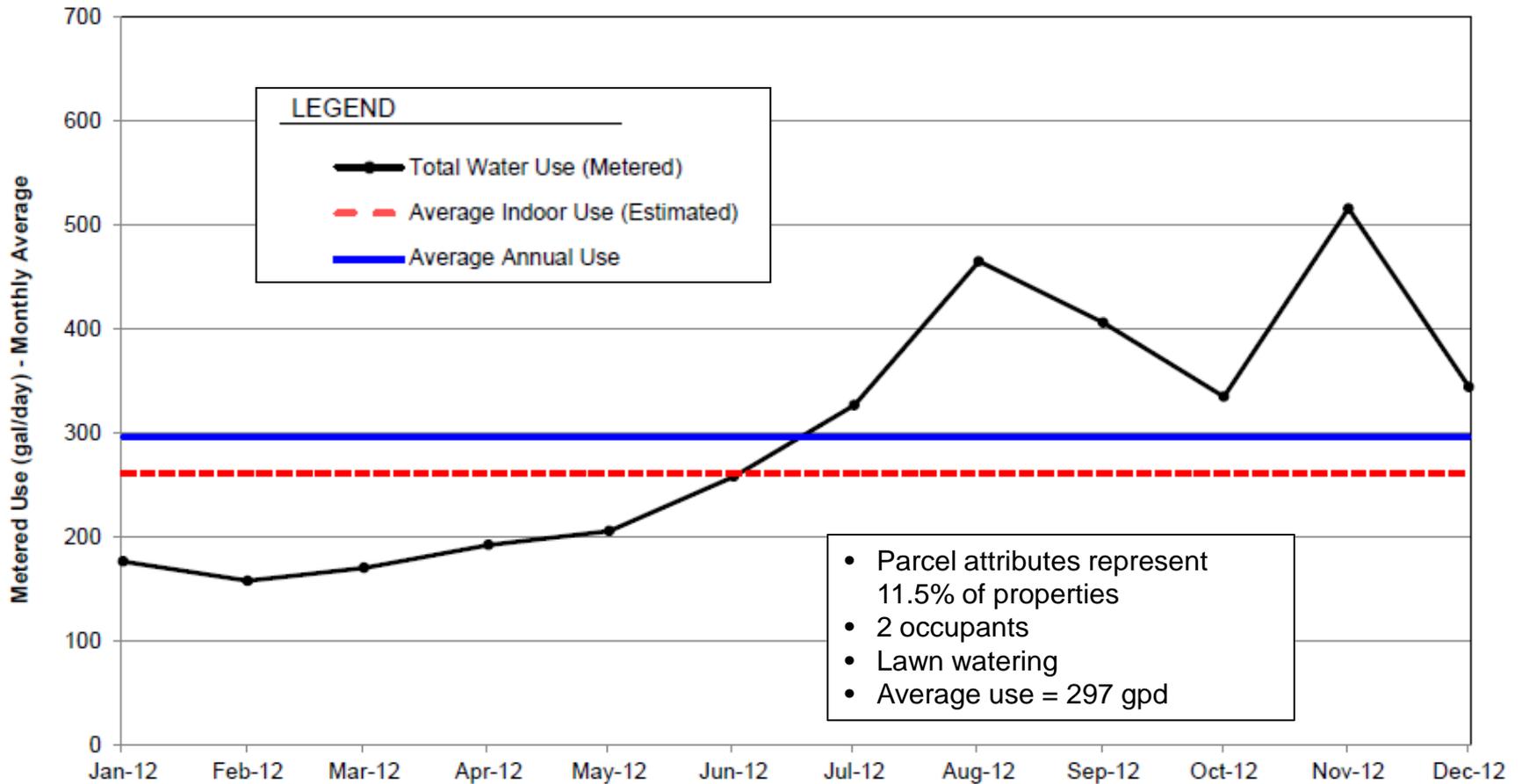


# Property 17 – Daily Water Use (Monthly Avg.)



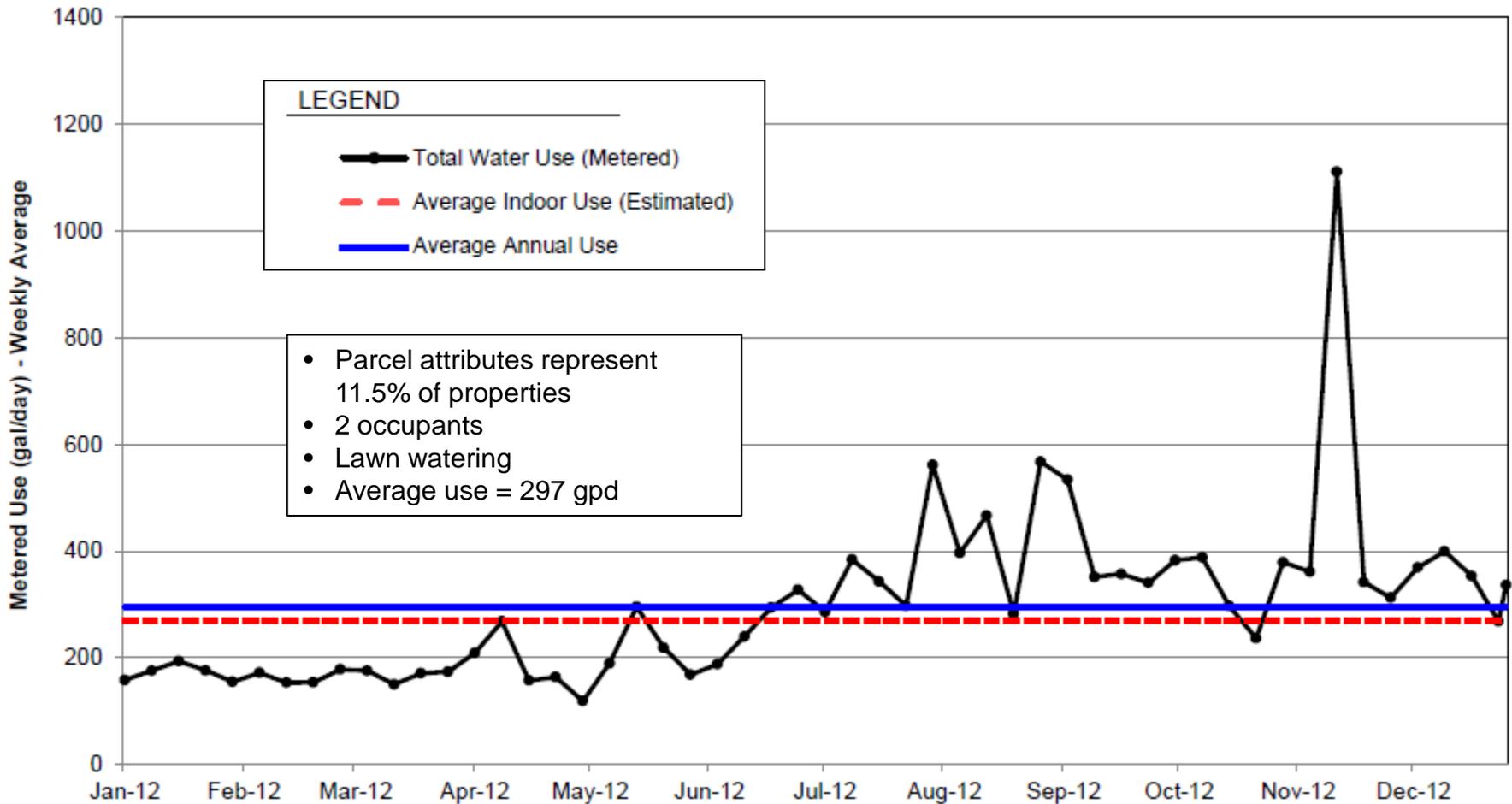


# Property 18 – Daily Water Use (Monthly Avg.)



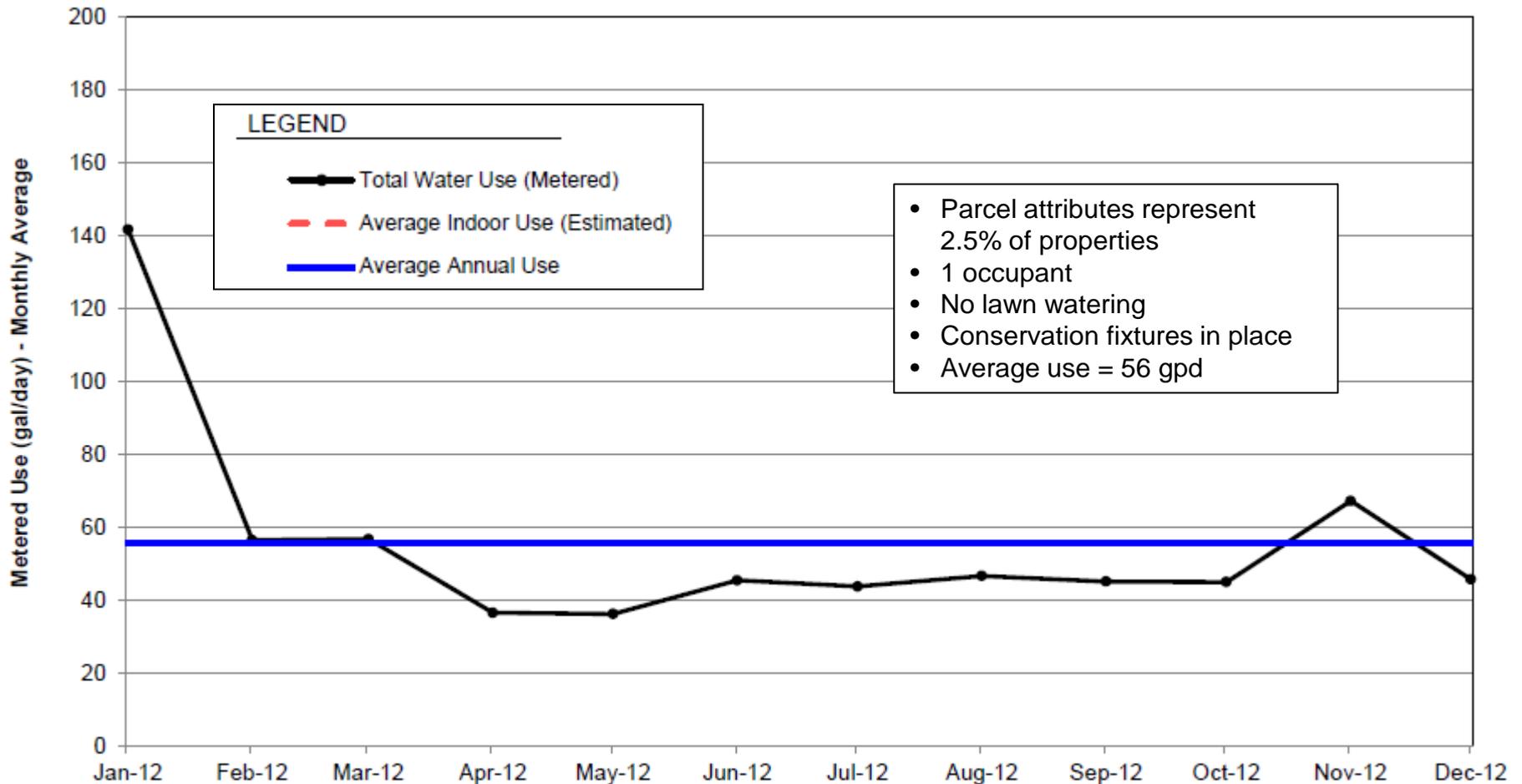


# Property 18 – Daily Water Use (Weekly Avg.)





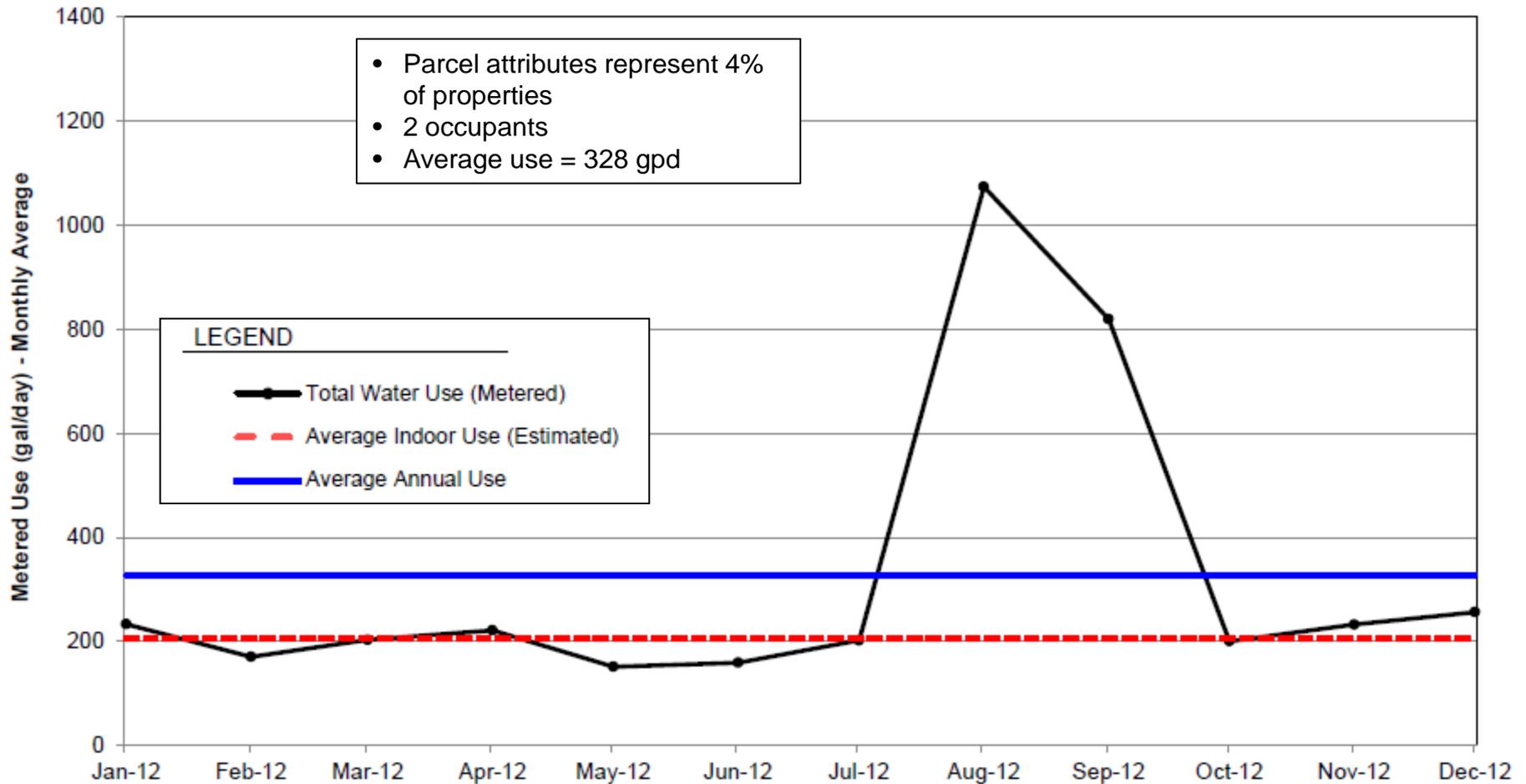
# Property 1 – Daily Water Use (Monthly Avg.)



Note: Indoor vs. outdoor use not determined.

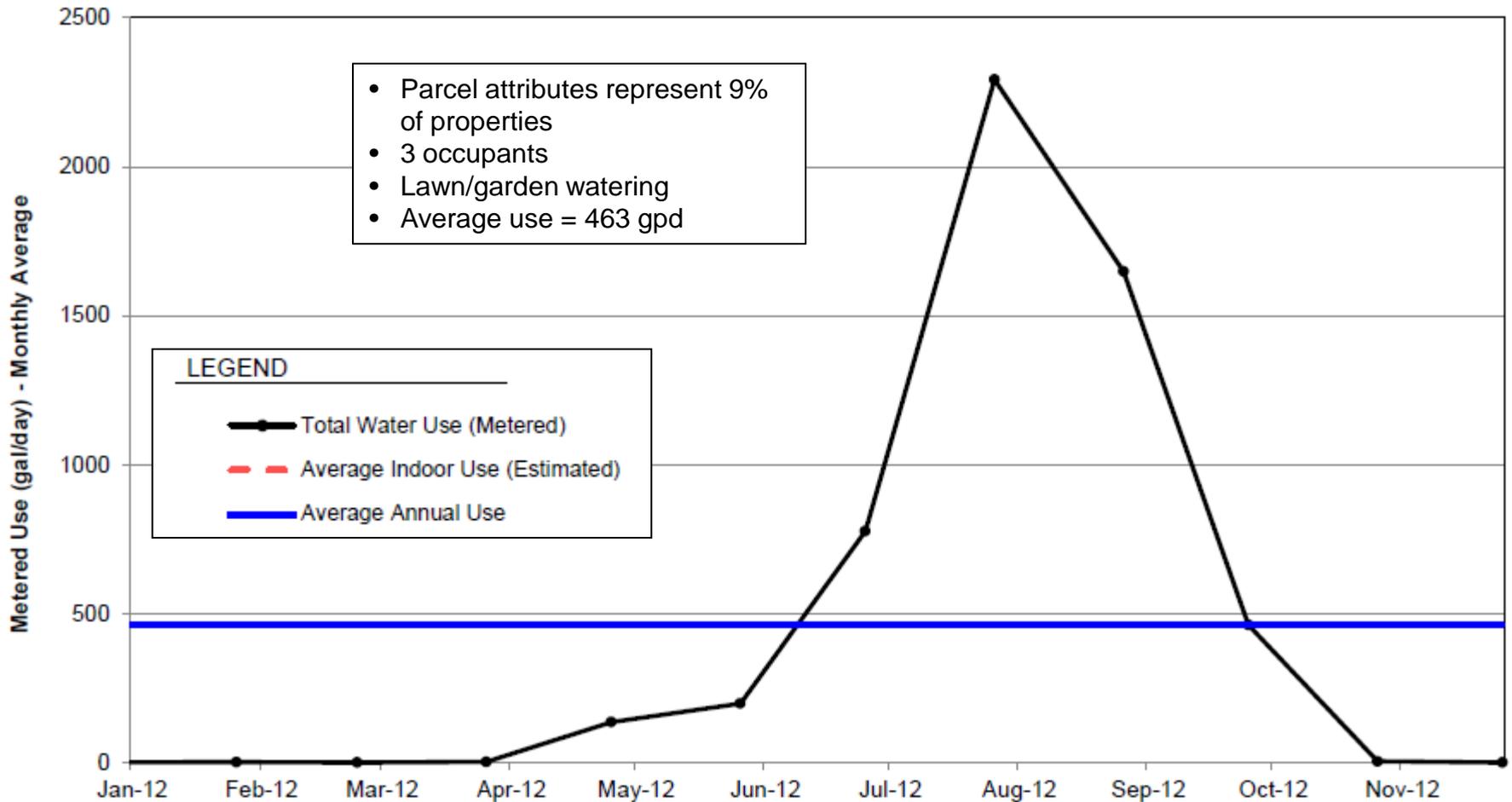


# Property 2 – Daily Water Use (Monthly Avg.)





# Property 4 – Daily Water Use (Monthly Avg.)



Note: Indoor vs. outdoor use not determined.



# Summary of Exempt Well Metering Data

Weekly Average of Total Daily Use  
During Peak Period of Outdoor Use (gal/day)

Property No.	Annual Average Daily Use (gal/day)	Average Annual Indoor Daily Use (estimated) (gal/day)	Average Annual Outdoor Daily Use (estimated) (gal/day)	Minimum Monthly Average of Total Daily Use (gal/day)	Maximum Monthly Average of Total Daily Use (gal/day)	Weekly Average of Total Daily Use During Peak Period of Outdoor Use (gal/day)					
						8/11/2012	8/18/2012	8/25/2012	9/1/2012	9/8/2012	9/15/2012
1	56	Not Estimated	Not Estimated	36	142	52	44	39	55	50	34
2	328	206	122	152	1074	1084	1100	1163	1117	1042	1009
3	95	85	10	58	169	183	189	135	120	160	77
4	463	Not Estimated	Not Estimated	0	2293	2371	2941	1924	2332	3015	1138
5	163	119	44	84	388	291	614	329	482	250	226
6	105	89	16	75	218	281	110	136	133	149	100
7	181	Not Estimated	Not Estimated	81	242	28	217	245	108	120	180
8	148	Not Estimated	Not Estimated	72	226	88	82	83	90	60	86
9	145	Not Estimated	Not Estimated	126	176	126	109	140	152	118	136
10	183	Not Estimated	Not Estimated	142	226	277	189	173	165	174	201
11	197	180	16	0	498	359	483	483	515	652	481
12	188	Not Estimated	Not Estimated	172	222	179	207	209	159	213	132
13	106	75	31	15	260	227	438	199	134	186	46
14	154	93	61	0	463	548	466	463	473	571	452
15	88	84	4	61	133	133	217	63	104	126	132
16	165	146	19	120	286	291	296	236	275	274	220
17	104	96	8	64	176	268	247	117	16	91	132
18	297	270	26	156	516	397	467	283	568	534	352
All Properties	176	131	33	107	410	399	468	357	389	432	285



## Summary of Measured Water Use:

- Average annual daily use ranged from 56 to 463 gal/day, with an average for all of the properties of 176 gal/day.
- The estimated average annual indoor daily use ranged from 84 to 270 gal/day, with an average of 131 gal/day for the 12 properties where it was estimated.
- Average annual outdoor daily use ranged from 4 to 122 gal/day with an average of 33 gal/day for the 12 properties where it was estimated.
- The minimum monthly average of total daily use ranged from zero to 172 gal/day, with an average of 107 gal/day.
- The maximum monthly average of total daily use ranged from 133 to 2293 gal/day, with an average of 410 gal/day.



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# Considerations for Water Management

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- Actual measured water use provides a potential basis for:
  - Determining mitigation needs for new exempt wells
  - Evaluating the impact of Low Impact Development approaches
  - Evaluation of the effects on water use of various limitations on outdoor watering that may be under consideration
  - Encourage water conservation by providing residents data on the range of water use observed



# *Questions and Discussion*