

### TECHNICAL MEMORANDUM

**To:** Shannon LaRocque, P.E.

**From:** Jim Andersen, P.G.  
Shelley Day, P.G.

**RE:** Village of Wellington Water Supply Evaluation -Water Use Permit and Permitted Capacity Review – Results

**Date:** April 12, 2017

### *INTRODUCTION*

JLA Geosciences, Inc. (JLA) was contracted by the Village of Wellington (Village) to review their existing South Florida Water Management District (SFWMD) water use permit (WUP) number 50-00464-W, as well as the technical analyses completed by other entities in support of water use permit applications.

In addition to the public water supply water use permit, the Village of Wellington also has a SFWMD diversion and impoundment (D&I) water use permit (WUP no. 50-00548-W), which is issued to the Acme Improvement District (AID) to meet irrigation demands, maintain water levels in the surficial aquifer system, and recharge local wellfields within the AID's boundaries. A discussion of the AID WUP is included in this technical memorandum.

### *DISCUSSION*

#### **PUBLIC WATER SUPPLY**

The Village operates a public water supply utility located in east-central Palm Beach County, serving approximately 56,000 customers within its service area. The Village's water use withdrawals are from the Surficial Aquifer System (SAS).

#### **Overview of Village Raw Water Supply and Operations**

The Village operates three wellfields tapping the SAS: the North, South, and East Wellfields. The North Wellfield is comprised of nine wells: wells R1, R2, R3, R4, R6, R7, R8, R9, and R10.

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The South Wellfield consists of seven wells: 18, 19, 20, 21, 22, 23, and 24. Two wells make up the East Wellfield: wells 28 and 29.

Water from the North Wellfield is fresh to slightly brackish with chloride concentrations ranging from approximately 150 to 270 mg/L and is treated using nanofiltration. The nanofiltration treatment plant has a capacity of 6.3 million gallons per day (MGD) and a recovery efficiency range between 70 and 78%. The raw water required to run the plant at capacity is between 9.0 MGD and 8.1 MGD at 70% and 78% efficiency, respectively.

Water from the South Wellfield is fresh, with reported chloride concentrations between 38 and 115 mg/L, and is treated using lime softening technology. The treatment capacity of the lime softening plant is 4.7 MGD, with a recovery efficiency range of approximately 95 to 98%.

Water from the East Wellfield is also fresh, with chloride concentrations less than 40 mg/L, and can be directed to either the RO plant or the lime softening plant.

### **Water Treatment Capacity Analysis**

The nanofiltration water treatment facility has a capacity of 6.3 MGD. If a recovery efficiency of 75% is used, the raw water demand is 8.4 MGD. The lime softening plant has a capacity of 4.7 MGD. Using a recovery efficiency of 95%, the raw water demand is 4.9 MGD. Therefore, the overall maximum raw water demand for both plants at capacity is 13.3 MGD. The permitted maximum daily withdrawal is 9.35 MGD (average day is 8.0 MGD). The maximum daily reported raw water use between 2012 and 2016 is 9.221 MGD. The average daily raw water use during the last four years is 6.7 MGD.

### **Water Use Permit Evaluation**

The Village's water use permit for public water supply was most recently renewed on November 21, 2011. The permit authorizes an annual and maximum monthly allocation of 2,926 MG/yr and 290 million gallons per month (or 9.35 MGD), respectively, for withdrawals from the SAS using the 18 existing, primary water supply wells listed above; however, there are specific source limitations that accompany this allocation:

| <b>Wellfield</b>       | <b>Annual Allocation (MG)</b> |
|------------------------|-------------------------------|
| <b>North Wellfield</b> | 1,364                         |
| <b>South Wellfield</b> | 1,002                         |
| <b>East Wellfield</b>  | 573                           |

The Staff Report accompanying the permit notes that well 18 has limited capacity and will be pumped at a rate of approximately 0.1 MGD. There are no proposed wells listed in the 2011

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permit or accompanying Staff Report; however, in the previous 2002 permit there were an additional nine wells listed as proposed (wells R11-R15 and wells 25-28). The omission of the proposed wells from the water use permit was an oversight of the SFWMD during the 2011 permit renewal. The locations of all existing and proposed wells are shown in Figure 1.

The operational plan provided in the renewal application specified 57% of the raw water being treated by the nanofiltration facility, with a recovery efficiency of 75%, and 43% of the raw water being treated by the lime softening facility, with a recovery efficiency of 95%. There is no limiting condition requiring this operational ratio (57% nanofiltration and 43% lime softening), nor is there any reporting of the ratio of treatment method.

The current blend of treated water sent to distribution is approximately 60% lime softening finished water and 40% nanofiltration finished water.

### **Evaluation of Demand**

The demonstrated demand for the 20-year permit was based upon a projected Village of Wellington population of 59,831 people in the year 2029, with a raw water per capita use rate of 134 gallons per day (gpd) and a finished per capita rate of 116 gpd. The population data were derived from Traffic Analysis Zone data provided by Palm Beach County and submitted by the Village's consultant. It is noted in the Staff Report accompanying the permit that the population data projections provided were lower than those that were submitted as part of the 2009 Water Supply Facility Work Plan.

A review of the population data concludes that the data provided in the permit were very low relative to current estimates. Based on the Bureau of Economic and Business Research (BEBR), the 2016 population of the Village of Wellington is 60,308, which exceeds the permit projected 2029 population of 59,831. To see how Wellington's projected population in 2029 may vary, data were gathered from several sources including the:

- SFWMD 2013 Lower East Coast Water Supply Plan,
- Palm Beach County Planning, Zoning, and Building (PZB) - Planning Division, and
- Palm Beach County Traffic Analysis Zone (TAZ)

Projected population data from these sources far outpace the permit projected population data for 2029. The data are plotted, along with the water use permit projected population data, in Figure 2.

### **Evaluation of Annual Water Use**

Monthly water use data submitted to the SFWMD quarterly between January 2012 and December 2016 were reviewed. The data are displayed graphically in Figure 3, which shows the total pumpage from all wellfields, in addition to a per wellfield analysis. Between 2012 and

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2015, the Village's overall annual withdrawals have increased from 2,350 MG/yr to 2,503 MG/yr. This represents an increased use from 80 to 86% of the permitted allocation of 2,926 MG/yr. The total water use for 2016 is approximately 84% of the permitted allocation.

The permit projects future water demands through the year 2029. The annual projected water use for the years 2013, 2015, and 2016 was 2,575, 2,612, and 2,622 MG, respectively. Actual reported water use for the same years was between 94 and 96% of the projected use amount (2,409 MG, 2,503 MG, and 2,622 MG for 2013, 2015, and 2016 respectively).

### **Evaluation of Maximum Monthly Water Use**

Quarterly pumpage reports submitted to the SFWMD were reviewed. The data are displayed in Figure 4. Between 2012 and 2016, the maximum monthly pumpage was at most 84% of the permitted amount of 290 MG. A 12-month rolling average maximum monthly water use is also plotted on the graph. The 12-month rolling average shows that the maximum monthly water use is increasing over the period of record.

### **Evaluation of the Groundwater Model Submitted in Support of the WUP**

In support of the 2007 water use permit application, an impact analysis was performed. A groundwater model, COAUQ, developed by Lou Motz (et al) was adopted by the Village's consultant to predict potential impacts to the aquifer and surrounding users resulting from the Village's withdrawals. The model allowed the heterogeneous transmissivity within the Village's production interval to be modeled. The very high transmissivity zone, the "Turnpike Aquifer" located within the SAS below the East Wellfield was simulated, along with the more moderate transmissivities characteristic of the SAS beneath the South and North wellfields. All simulations were run using a requested maximum daily withdrawal of 10.2547 MGD (which is larger than the currently permitted allocation of 9.35 MGD) for 90-days with no recharge to the aquifer. Withdrawals were simulated from 18 of the Village's wells at rates ranging from approximately 15,000 to 975,000 gallons per day (gpd). The low end of the range corresponds to pumpage from Well 18. Excluding this well, the lower end of the range is 255,000 gpd. No withdrawals were simulated from wells 25, 26, and 27, which are constructed, but lack pumps, piping, and appurtenances.

The modeling provided was a simple, non-calibrated solution with well withdrawals optimized to limit impacts and comply with the Regional Water Availability rule, which states that an applicant must provide assurance that the requested allocation will not cause a net increase in the volume or cause a change in timing on a monthly basis of surface water and groundwater withdrawn from the Lower East Coast Everglades Waterbodies or the North Palm Beach County/Loxahatchee River Watershed Waterbodies over that resulting from the base condition water use, which is defined as that allocation permitted to the user on April 1, 2006.

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### **Discussions with the SFWMD Regarding the Existing WUP and Options for Potential Modification**

Since the Village has a demonstrated need for more water than currently permitted (based on current population data), a meeting was arranged with John Lockwood and Simon Sunderland of the SFWMD, Jim Andersen, Paul Stout, and Shelley Day of JLA, and Shannon LaRocque from the Village of Wellington to discuss potential future permit modification.

Additional water from the surficial aquifer could be obtained from:

- Offsetting additional regional impacts; for instance, by supplying SFWMD water use permittee's currently using water derived from the regional system with reclaimed water.

The Village does supply reclaimed water to a couple of projects permitted for reclaimed water, namely Village Park (SFWMD Water Use Permit No. 50-03848-W) and the Forest Hill Boulevard from State Road 80 to US 441 right-of-way (including Wellington's Town Center and six other areas adjacent to Forest Hill Boulevard). However, no credit is given to the Village for supplying the reclaimed water.

The Village also supplies reclaimed water to at least one other project that is permitted by the SFWMD for a water source other than reclaimed water. The Community Park (Old Boys and Girls Club) is permitted to withdraw 149,000 gallons per month and 1.1 MG per year from the AID Canal System per SFWMD Water Use Permit No. 50-08636-W).

There are several other projects receiving reclaimed water from the Village which may have SFWMD water use permits. The sites receiving reclaimed water should be further investigated to determine whether they have active SFWMD water use permits. A list of all water use permits issued to the Village for irrigation is included as Table 1.

The feasibility of supplying reclaimed water to large surface water users close to existing distribution lines should be investigated. Golf courses, such as the Palm Beach Polo and Country Club's course (SFWMD Water Use Permit 50-00883-W) and the Polo West course (SFWMD Water Use Permit 50-01653-W), which are close to existing reuse lines should be approached regarding reclaimed water service. Both courses currently use on-site lakes and the AID canal system for irrigation.

- A more comprehensive modeling approach.
- Additional wells sourced away from regional water bodies (if possible).

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## **SURFACE WATER – DIVERSION AND IMPOUNDMENT**

As mentioned previously, the Village of Wellington, through the Acme Improvement District, has a diversion and impoundment (D&I) permit for surface water withdrawals from the C-51 and L-40 canals to meet irrigation water demands, maintain water levels in the surficial aquifer system, and recharge local wellfields within the AID. The AID is currently divided into two drainage areas by a canal running east to west along Pierson Road. Basin A is located north of Pierson Road, whereas Basin B is located to the south. The permit authorizes the withdrawal of up to 253.79 MG per month and 413 MG per year, for the maximum month and annual allocation, respectively. Two surface water pumps are located along the C-51 canal (pumping into Basin A) and one pump is located along the L-40 canal (pumping into Basin B). When water levels within the AID's internal canals drop 0.5 to 1.0 feet below the control elevation of 11.0 feet NGVD for Basin A and 12.0 feet NGVD for Basin B, water is pumped from the C-51 and/or L-40 canal until the water levels within AID's internal canals are within 0.2 feet below the respective control elevation.

The AID D&I permit has numerous secondary users who withdrawal surface water from canals within the AID. Large users of the AID permit, and those users close to the Village's wellfield should be identified and an evaluation should be made as to whether reclaimed water can be the sole source or a supplementary source of irrigation water for the projects. By removing users from the D&I permit, the Village can begin to use the permit for one of the permit-stated objectives, recharging local wellfields.

The largest secondary user of the AID is the Palm Beach Polo and Country Club (50-00883-W), which is authorized to pump up to 67.2 MG per month and 501 MG per year of surface water from the AID canal system and onsite lakes. The permit limits AID canal system withdrawals to 55.76 MG per month and 415.5 MG per year. The water use permit is for the irrigation of 423.89 acres of golf courses, tennis court areas, residential areas, common areas and polo fields. The golf course acreage alone is 318.89 acres, which corresponds to a maximum monthly irrigation allocation of 50.54 MG per month and 376.6 MG per year.

## **CONCLUSIONS AND RECOMMENDATIONS**

### **CONCLUSIONS**

Based on a review of the available data, the following conclusions can be made regarding the Village's SFWMD water use permit no. 50-00464-W:

- The Village is currently using 84% of their annual allocation. Future expansion within the Village's service area could result in the Village approaching their maximum monthly or annual allocation.

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- The available water treatment capacity is 42% greater than the permitted allocation (based on a maximum day withdrawal of 9.35 MGD).
- The current population of Wellington (60,308 people) is greater than the SFWMD permit projected population of 59,831 in the year 2029.
- The groundwater model submitted in support of the 2009 SFWMD permit involved a simple, non-calibrated scenario simulating 90-days of maximum monthly withdrawals and no recharge to the aquifer. A different modeling approach may allow for greater surficial aquifer withdrawals, while still complying with the Regional Water Availability rule. However, a calibrated model alone will not likely result in a significant increase in water.

## RECOMMENDATIONS

- The Village should evaluate current irrigation water use permits issued by the SFWMD to determine which permits within the Village's service area or within the AID can be supplied with reclaimed water.
- Obtaining offset credits from the SFWMD through reclaimed water service or by removing other permitted significant users of the surficial aquifer or surface water should be explored.
- The Village of Wellington should further explore the feasibility of a permit modification to increase the surficial aquifer allocation based on the current and projected population data. Increasing the allocation beyond a maximum monthly allocation of 10.2547 MGD would require an updated modeling effort and would likely require the development of a calibrated groundwater model to comply with the Regional Water Availability rule.
- During the permit modification process, the Village should request that the omitted proposed well sites (wells R11-R15 and wells 25-28) be listed in future issued water use permits. These well sites could also be added back into the permit via a corrected permit issued by the SFWMD. However, the SFWMD would prefer that the omitted wells be added back into the permit the next time a modification is sought. In the meantime, any groundwater modeling analysis performed can include withdrawals from the proposed wells.
- The current population within the service area should be confirmed. Specifically, the population within the following areas should be calculated
  - o areas currently supplied with potable water service,
  - o areas not currently utilizing potable water service, but with the potential to convert to potable water (i.e. large tracts in southern Wellington), and
  - o areas of potential for future development.
- The results of the recently completed wellfield evaluation should be reviewed to ensure the existing wellfields can supply an increased allocation.

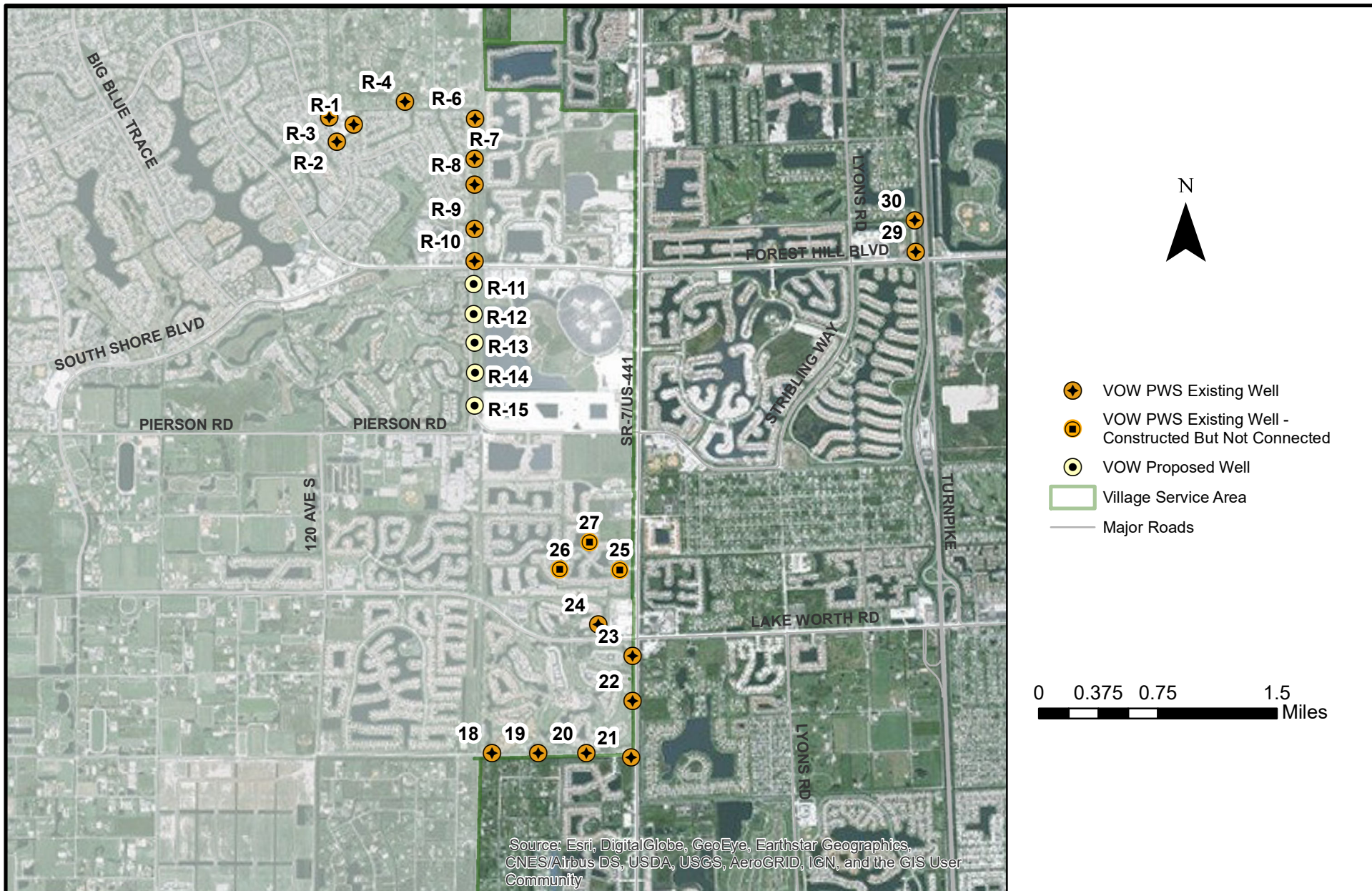


FIGURE TITLE:

**VILLAGE OF WELLINGTON  
LOCATIONS OF EXISTING AND PROPOSED  
PUBLIC WATER SUPPLY WELLS**

JLA Geosciences, Inc.

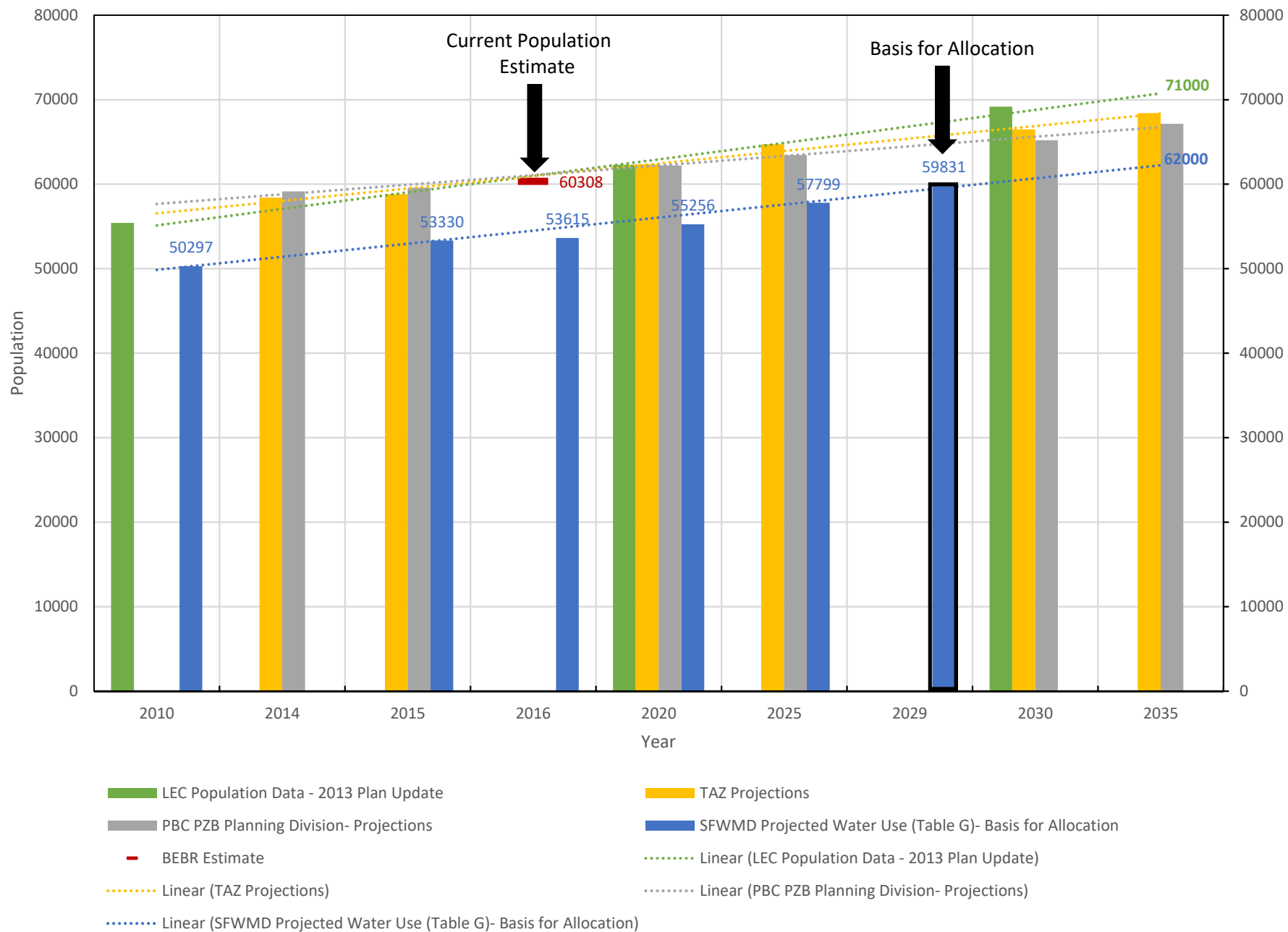
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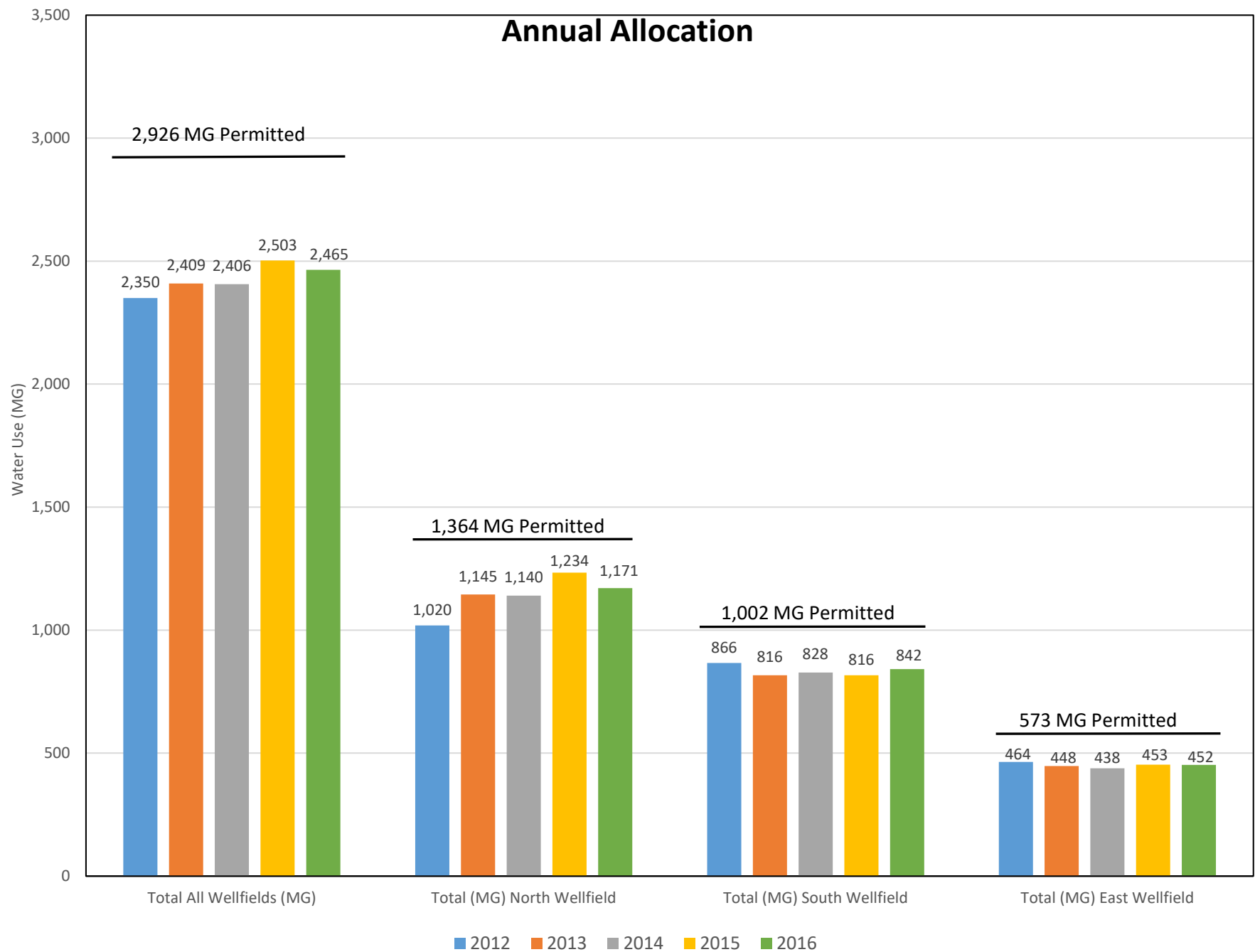
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FIGURE NO.:

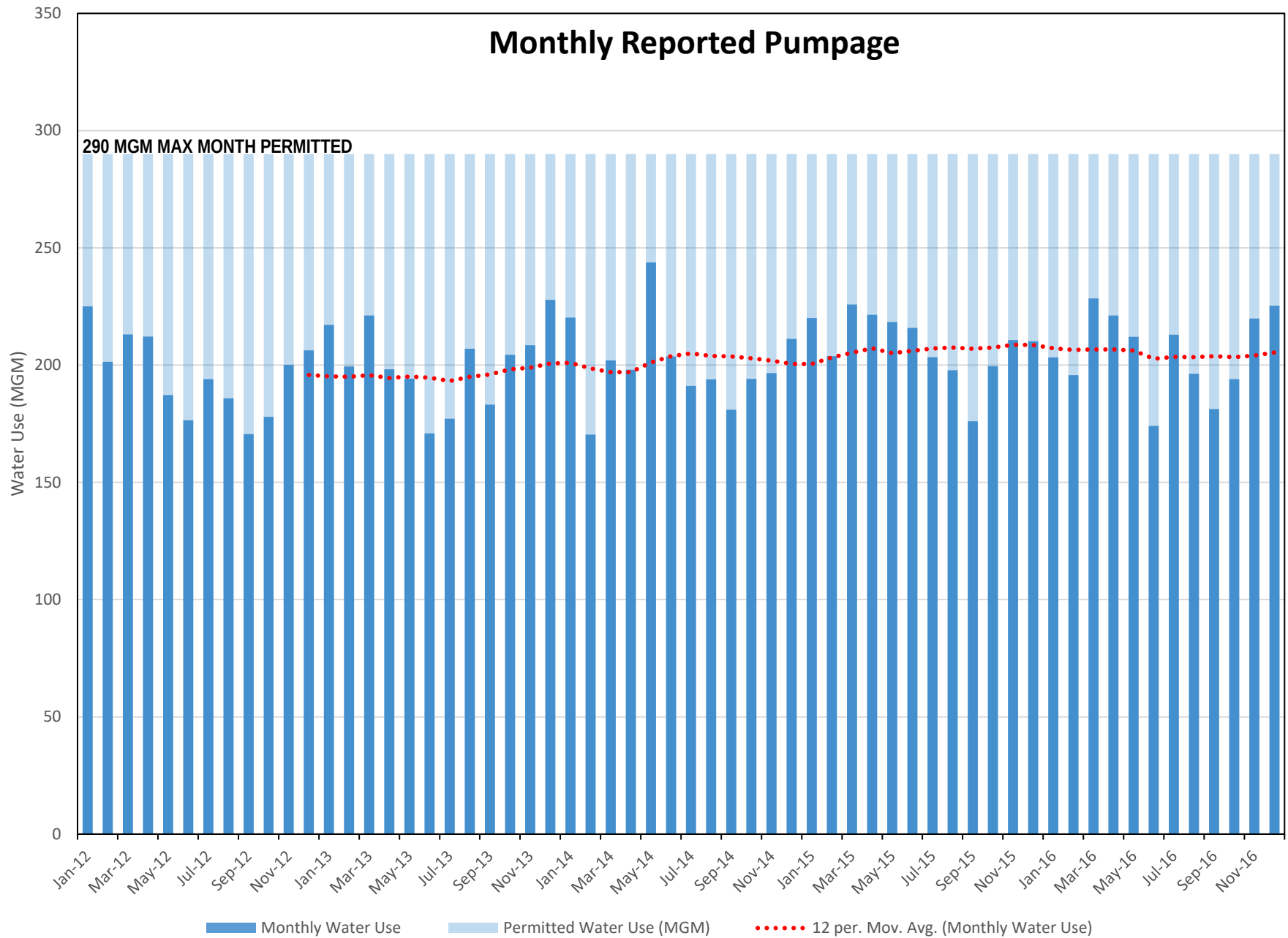
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**Figure 2**  
 Technical Memorandum  
 Village of Wellington -Water Use Permit Evaluation  
 Current and Projected Population



**Figure 3**  
Technical Memorandum  
Village of Wellington -Water Use Permit Evaluation  
Annual Water Use



**Figure 4**  
Technical Memorandum  
Village of Wellington - Water Use Permit Evaluation  
Monthly Reported Pumpage