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May 1, 2020

Michael A. Heidorn, P.G. – Superintendent  
Hooksett Village Water Precinct  
7 Riverside Drive  
Hooksett, NH 03106

**Re: Water Supply and Usage Evaluation Assessment for the Proposed Future  
Expansion at the Hooksett Village Water Precinct (HVWP)**

Dear Mike:

Lewis Engineering, PLLC is pleased to present to the HVWP this Water System Capacity Report with exhibits that addresses; current well water resources, current water usage within the Precinct, and projections for the Precinct's estimated future water supply needs.

There are a number of exhibits that accompany this letter report. Similar reports for water use and projected future needs were provided to the Precinct during June 2008 and August 2015. Water use data for these reports compared Well Pumpage from 2008 and 2015. This report summarizes Well Pumpage for 2009 through 2019. Pumpage data for the individual wells were evaluated, and certain assumptions were incorporated to support the conclusions drawn.

There has been a general increase in water pumpage over the past 11 years, mostly due to the addition of new residential customers. It is noted that decreased rainfall in 2015 and 2016 likely contributed to the higher water supply demand from the wells. Between 2009 and 2019, total water pumpage showed a +10% increase, or about 0.9% per year as an average. A comparison of a Peak Day to the Average Annualized GPD, shows a Peak to Average ratio of 1.93 in 2009, as compared to a higher 2.45 ratio for 2019. Lawn watering during the period is the likely cause of the increasing Peaking Factor. The Average Peaking Factor over the period was 2.33. During the period from 2009 through 2019; July had the largest number of Peak Day occurrences (5) followed by August with 4 occurrences. May and September each had 1 occurrence. The highest Peak Month was July 2016 (867,608 GPD).

It is our opinion that HVWP has adequate water to meet its present system needs. New customers will continue to be connected to the system from projects that have been previously approved as well as from new growth. This report includes accounting for projected water use at various proposed projects.

Since the last report in 2015, additional storage has been added to the system's first level with the installation of the new 1.0 MG Quarry Storage Tank located on the west side of I-93. A new 12-inch water main connects the new tank to the existing water main at Pinnacle Drive and Vista Drive near the South Well. Future plans are in place for the extension of the 12-inch water main down Vista Drive and then cross-country to the 12-inch water main on Route 3A near Hackett Hill Road. The existing 200,000-gallon tank on the east side of the system will continue to be utilized for now.

A Tax Incrementing Financing (TIF) Commercial Development Zone has been approved for the west side of Hooksett along Route 3A. The Commercial Development Zone will eventually include the installation of approximately 3650 LF of 12-inch water main that will provide an emergency interconnection with Manchester Water Works. A feasibility study to investigate the connection of the water system to the Bow Water System at the Hooksett / Bow Townline on Route 3A is also underway.

The following summarizes information evaluated:

- The HVWP has four gravel packed wells surrounding the Pinnacle Pond on the west side of Hooksett. The gravel packed wells include the North, East, South, and South Backup Wells. The Permitted Production Capacity for the system wells totals approximately 1.872 MGD (1,300 gpm). The individual wells have the following capacities. The North Well has a reported capacity of 0.72 MGD (500 gpm) but no approved volume. The East and South Wells have approved capacities of 0.576 MGD (400 gpm) each. The South Backup Well has an approved capacity of 0.576 MGD and is a backup to the South Well. Only one of the two South Wells may be operated at a time.
- For the purposes of this report, the available water from the HVWP wells is based on an assumption that normally the wells would only be run up to a maximum of 16 hours per day leaving 8 hours per day for well recovery. The limited 16 hours of well pumping per day is a critical safety factor for droughts, fires, and other events with adverse water supply impacts. This yields a practical and safe "Supply Capacity" of 1.248 MGD that may be used to meet projected peak month daily demands. Please note that we did not include the

South Backup Well in any of the supply capacity calculations, as it will not be used coincidentally with the South Well. We did include the South Backup Well pumpage data from 2009 - 2019 as it is water that was pumped into the distribution system.

- To highlight the importance of allowing for the safety factor provided by the Supply Capacity determination, we examined just *one* of the several issues covered by that factor. During the 2016 Drought Emergency for example, water levels were observed 15 feet below normal at the wells and poor recoveries were noted. Even though demand was relatively low during that Fall-Winter period the Precinct was forced to limit and stagger well operations to reduce drawdown; supplement pond levels during a brief precipitation event to try to provide limited indirect recharge to the aquifer; and implement an outdoor water ban. In other words, water level impacts of the magnitude observed during the 2016 Drought Emergency had real-world consequences on the order of hundreds of thousands of GPD. The Precinct could not simply keep pumping all of their wells at their approved rates indefinitely.
- Water use data from all of the wells has been tabulated for the period between 2009 and 2019. Pumpage data from the South Backup Well was included. The average daily demand for each month and year was calculated. The average day demand during the highest water use month was calculated for each year, and the peak daily pumpage for each year was obtained from the yearly data. The peak months were July 2016 (867,608 GPD) and July 2010 (856,000 GPD).
- The Average of the Total Yearly Flows between 2009 and 2019, is calculated at 320,622 GPD. The average yearly GPD trend between 2009 and 2019 increased by 14.5 percent. The Average Daily Flow for 2019 was 318,370 GPD. Extending the 2009 to 2019 water usage trends forward, the estimated Average Daily Flow at the end of **2030** will be approximately **383,200 GPD ±10%** at the current rate of development.
- The trending of the Peak Daily Flows between 2009 and 2019 increased by 12.8 percent. The Peak Daily Flow for 2019 was 778,945 GPD. This trend extended forward to the end of 2030 will be approximately 896,402 GPD ±16% for the Peak Daily Flow at the current rate of development.
- The Peaking Factor for 2030 using 383,200 GPD and 896,402 GPD is 2.34. If a more conservative Peaking Factor of 2.5 is used, then the Peak Daily Flow

would increase from 896,402 GPD to 958,000 GPD. The larger value falls within the error limits of graphical analysis completed above.

- We obtained the Average Daily Flow data for the majority of the years between 1960 and 1988 from a previous report. The flow data for 2009 through 2019 were combined with the 1960 through 1988 data to determine a trend. That trend extended forward resulted in an Average Daily Flow of 404,483 GPD at the end of 2030. This Projected Flow for 2030 is only slightly higher than the 383,200 GPD from the 2009 to 2019 Flow Data.
- The differences between Supply Capacity (1.248 MGD) and Average and Peak Daily Flows were used as the base numbers for our preliminary estimates of Average Day and Peak Day Available Capacities, respectively. In-depth analyses of the 2019 source data, after correction for source meter calibration errors and accounting for individual well yields and Average and Peak Daily Flows, showed an apparent Average Day Available Capacity of approximately 929,630 GPD and a total Peak Day Available Capacity of 469,055 GPD. Available Capacity as defined here represents the potential for new growth in the system before accounting for prior development commitments, planned or “routine” growth and the potential for loss of sources (source vulnerability).
- To account for routine growth, graphical extrapolation of the source data analysis to 2030 was completed. The analysis showed decreases in apparent Average Day Available Capacity and Peak Day Available Capacity to approximately 864,800 GPD  $\pm 10\%$  and 351,598 GPD  $\pm 16\%$ , respectively.
- Growth over the ten-year period between 2009 and 2019 within the Precinct was reviewed to identify what constitutes routine growth of new customer accounts. For the Precinct, this means the construction of 14.4 single-family homes and 1.7 small business units per year. Between 2013 and 2014, one large commercial mixed-use redevelopment (the I-93 Rest Area / State Liquor Store complex with two adjacent residential neighborhoods) and one large multi-family residential development containing 204 apartments were constructed.
- Business growth in the Precinct over the last decade has consisted mainly of the addition of small businesses along Routes 3 and 3A including a gas station, self-storage facility, plumbing shop, restaurant and two small retail strip malls.
- Housing growth in the Precinct, both single-family home and the multi-family apartment complex, has been almost exclusively in the University Heights and

Heads Pond developments. These two developments in the northern half of town east of Route 3 began in the mid-2000s. Earlier studies anticipated that these developments would have been completed by 2020 but market conditions changed in the interim. It is currently looking as if the housing growth in these areas will continue for many years to come, as market conditions allow. If market conditions improve, the developments are shovel-ready and could be complete by 2030.

- The water works improvement agreement signed by the Precinct and the developers of the University Heights and Heads Pond in 2003 stipulated that the Precinct must (a) have “sufficient water availability” to service the two projects and (b) agreed to “reserve sufficient Precinct water capacity in order to assure its availability to the Projects”. This agreement effectively dedicated the use of the capacity provided by the East Well, whose installation was paid for by the developers, to the two housing projects, to the extent that the projects should require that capacity.
- As part of the agreement, Lewis Engineering estimated that the average daily demand for the two housing projects would be 471,000 GPD. This estimate is somewhat less than the approved 24-hour pumping capacity of the East Well (576,000 GPD) and somewhat greater than the 16-hour Supply Capacity for that well (384,000 GPD).
- To further examine the potential impact of the housing project’s capacity commitment on the Precinct’s ability to provide water, we evaluated actual flow through the Booster Station to those projects in 2019. The Average Daily Flow to the projects for 2019 was 79,255 GPD, and the Peak Daily Flow to the projects was 300,000 GPD on July 28, 2019. Subtracting the 2019 Average Daily Flow from the total housing project flow (471,000 GPD) yields an estimated remaining commitment of 391,745 GPD in Average Daily Flow to the projects.
- Remaining additional Peak Daily Flow resulting from the housing projects was estimated by examining 2019 water usage in similar built residential units. On the peak day in 2019, the average flow was approximately 1,500 GPD/unit and during the peak quarter, the average flow of the peak user 2,900 GPD. These are striking numbers (peaking factors > 2.5) and are due to the impact of irrigation. The total additional Peak Daily Flow resulting from the housing projects based on our projections is approximately 937,180 GPD.

- To summarize the impact of prior commitments on the Available Capacity evaluation initiated above, the Precinct appears to be committed to providing an additional 391,745 GPD and 937,180 GPD in Average Daily Flow and Peak Daily Flow to the University Heights and Heads Pond housing projects. If accurate, this commitment would reduce the apparent Average Day Available Capacity and Peak Day Available Capacity to approximately 537,885 GPD  $\pm 10\%$  and minus <468,125> GPD  $\pm 16\%$ , respectively. The latter value represents a significant deficit in Peak Day Available Capacity. NHDES design standards require that the Precinct have adequate supply to meet peak demand with all sources on-line. *This means that the Precinct effectively has an upcoming crisis in terms of meeting Peak Day Available Capacity due to the projects.*
- Discussions regarding the Available Capacity of the Precinct's water system assumes that all of the production wells are all available for use. There are two critical scenarios that should be further considered in this regard. One is the scenario where the largest well is taken off-line for any number of short-term or long-term planned or unplanned reasons. The second is a worst-case scenario where a tanker rollover occurs from Route 93 at Pinnacle Pond and the resulting contamination forces the temporary or perhaps permanent closure of all wells.
- In the first critical well scenario where the largest well is taken off-line, the Available Capacity is immediately and significantly reduced. If we assume the East Well is dedicated to the housing projects and the North Well is the one taken off-line, that leaves the South Well as the sole source for the rest of the entire system, indefinitely. Quantitatively, it means that after consideration of routine growth and prior development commitments as discussed above, the Average Day Available Capacity shrinks to 57,885 GPD and Peak Day Available Capacity deficit swells to about 1 MGD. NHDES design standards require that the Precinct have adequate supply to meet average demand with the largest well out of service. *This means that the Precinct effectively has a maximum of 57,885 GPD of Average Day Available Capacity.*
- In the second critical well scenario where all the wells are temporarily or permanently closed due to a contamination event associated with Route 93 at Pinnacle Pond, the Available Capacity is no longer the immediate concern. The Precinct's basic ability to provide water to its customers has now been compromised and it will be completely reliant on emergency or purchased sources of water until or unless the contamination is rectified. The Precinct's

current emergency connection to Central Hooksett Water Precinct is not designed to handle such a situation; it is intended to assist HVWP in the event of short-term fire incidents of finite duration and limited flow volume.

Based on the above detailed evaluation, we note and recommend:

- While the Precinct currently appears to have adequate Average Day and Peak Day Available Capacity through 2030, it in fact has committed approximately at least a third of its supply and about half of its storage to the University Heights and Heads Pond projects. This results in an estimated Average Day Available Capacity of 57,885 GPD with the North Well off-line and an estimated Peak Day Available Capacity of minus <468,125> GPD with all wells on-line. These effects are not immediate as the projects are not fully built out yet, but they underscore the need for the development of additional water supply sources. The potential sources might be either new gravel packed wells, an interconnection with Manchester Water Works and / or the Town of Bow, or a combination of these three.
- Of the three possible sources, the location of alternative well sites in Hooksett or the installation of an interconnection with the Town of Bow appear to be the most likely candidates. While an emergency interconnection with Manchester Water Works is critical to the Precinct for emergency purposes, the long-term chemistry of blending Manchester's chloramine-treated surface water with the Precinct's minimally-treated ground water could be a significant concern. Long-term mixing may not be practically feasible, and even if so not without the construction of additional treatment facilities and the potential for taste/odor issues, nitrification and increased lead and copper leaching.
- The Town of Bow possesses a groundwater supply with sufficient capacity and similar chemistry, treatment and hydraulic grade line as the Precinct, within 0.75-mile of the Precinct's distribution system on Route 3A. At a minimum, an interconnection with the Town of Bow should be secured for emergencies to provide an alternative source in the event of:
  - The catastrophic loss of the sources due to a potential contamination incident at Pinnacle Pond.
  - The catastrophic loss of the water main river crossings due to a potential natural disaster.

- A major water main break on Route 3A between Pine Street and the I-93 Rest Area / State Liquor Store complex; the Bow interconnection would provide a critical backup source for the two Rest Areas and the residential complex near the town line, which is the Precinct's largest customer and includes an extremely busy commercial convenience center. The upsizing of the existing 8-inch water main on Route 3A from north of Pine Street to the new 12-inch water main to Sullivan Tire should be considered to reinforce the Bow interconnection.
- A water main break on Pine Street that causes the loss of the water supply from the East and North Wells. The existing 6-inch water main is presently the only feed from the North and South Wells to Route 3A and the rest of the system. Consideration should be given to replace this crucial water main with a 12-inch main.

This interconnection would ideally be structured in a mutually beneficial two-way meter vault that would allow the Town of Bow an emergency connection also.

- The Precinct should resume its groundwater exploration program with a focus on any remaining sand-and-gravel deposit target sites located in or near its franchise area. The program should include test well drilling and the proactive procurement of land as needed to secure any promising sites. The likelihood of finding promising sites is dwindling at a fast pace due to the rate of development in Hooksett, and time is of the essence. The Precinct does not need to necessarily permit and construct production wells at this time, but it would be most prudent, at a minimum, to identify and secure those promising sites to the extent possible. It may also be prudent for the Precinct to consider including a preliminary review of bedrock well target sites for the same reasons.
- The Precinct has been implementing an aggressive DES-approved Water Conservation Plan for a number of years, including vigorous public outreach and leak detection and repair programs; innovative features such as customer meter web-based portals for leak detection monitoring; and the adoption of an ascending tier rate structure which targets high residential irrigation water use. Despite these successes, in light of the information gathered during this study regarding housing project irrigation usage, HVWP should consider (1) reviewing the potential for modifying the development agreement to include additional compensation for the additional demand placed on the water system by the Peak Daily Flow of the housing projects and (2) taking even further



actions to reduce the amount of lawn watering during the peak summer months of July and August, such as:

- Further promotion of weather-based irrigation controllers, soil moisture sensors and automatic rain shutoff switches.
  - Exploring ways to further encourage xeriscaping and the use of native vegetation and drought-resistant plantings.
  - Mandatory watering (e.g even/odd) restrictions.
- 
- To reduce the vulnerability of the Precinct to a catastrophic loss associated with a Route 93 tanker rollover, the Precinct should consider meeting with NHDOT and NHDES to review their spill response protocols and notification networks. To the extent possible, the Precinct should become a partner within that network and identify any opportunities to become better prepared for such an event.
  - The upsizing of the existing 6-inch water main on Hooksett Road (Route 3) between the existing meter vault and Main Street should be considered to provide improved emergency flow from the Central Hooksett Water Precinct interconnection.
  - The existing water booster station provides a significant portion of the total well capacity to the ongoing construction of new homes on the northeast corner of the system on a daily basis. As demand increases in the coming decade and beyond, the Precinct may need to dampen the dramatic daily “surge” created by the booster station filling the upper level tank by lengthening the duration of the booster pump stations tank filling cycle or timing the filling of upper level tank to better coincide with low demand periods elsewhere in the system.
  - In the short term, if wells had to be pumped in excess of 16 hours per day for short durations, there would likely not be any significant consequences. As an example, one additional hour of pumping the wells by calculation could theoretically yield up to an additional 78,000 GPD for use within the system.
  - Conversely, for planning purposes it is important not to view the Permitted Production Capacity for the system as the Supply Capacity of the water system. It could be tempting to underestimate and ignore the value of the safety factor provided in the Supply Capacity determination, but to do so would place the Precinct and its users in an unnecessarily vulnerable position.

- Lastly, it has come to our attention that the Specific Capacity of the North Well has been dropping off steadily from about 38 GPM/FT in 1987 to 19 GPM/FT in 2020. In light of the critical importance of this well to the water system, we recommend that the Precinct continue its program of regular redevelopment and testing at the well, and also start planning for its eventual replacement or for the installation of a backup well nearby (similar to the South Well).

Following your review, please contact our office if there are any questions, or if additional information would be helpful at this time.

Respectfully,

**LEWIS ENGINEERING, PLLC**

*Neil W Helberg*

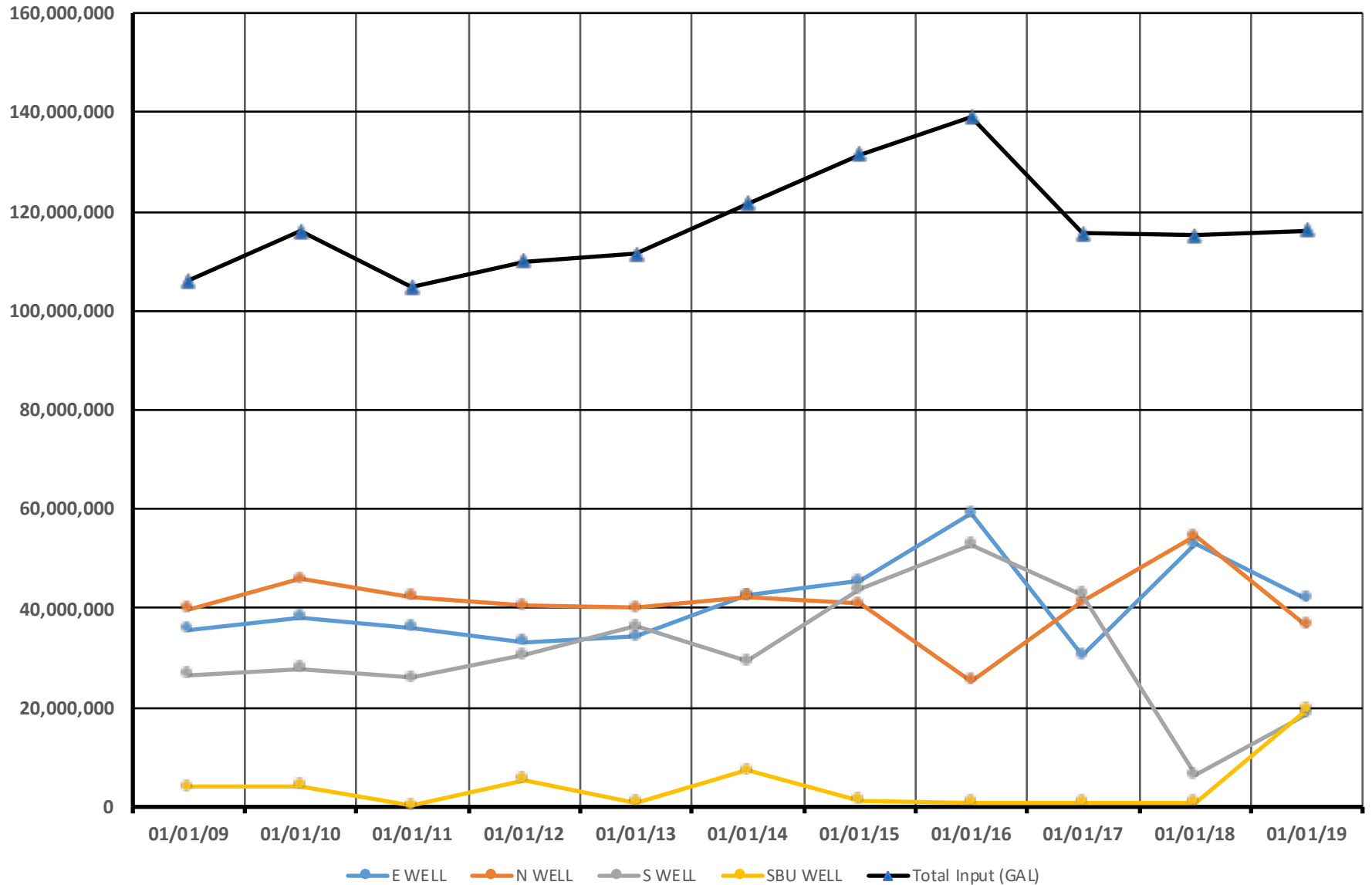
Neil W. Helberg, P.E.

# **EXHIBITS**

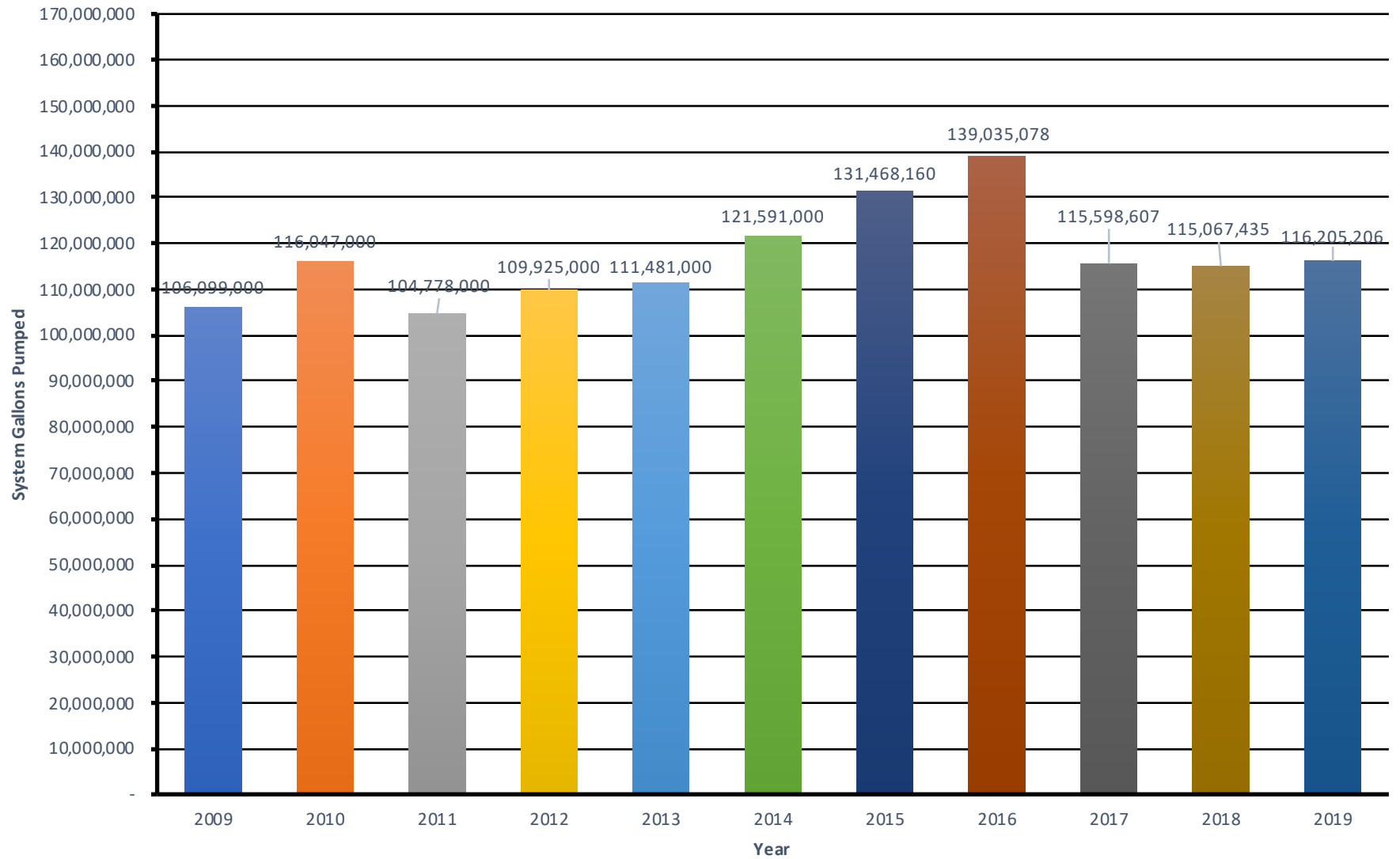
HOOKSETT VILLAGE WATER PRECINCT  
 YEARLY PUMPAGE DATA (2009 THRU 2019)

| YEAR | TOTAL GALLONS | AVE GPD | PEAK GPD | PEAKING FACTOR | PEAK DAY |
|------|---------------|---------|----------|----------------|----------|
| 2009 | 106,099,000   | 290,682 | 561,000  | 1.93           | 8/19/09  |
| 2010 | 116,047,000   | 317,937 | 856,000  | 2.69           | 7/2/10   |
| 2011 | 104,778,000   | 287,063 | 740,000  | 2.58           | 8/9/11   |
| 2012 | 109,925,000   | 301,164 | 739,000  | 2.45           | 7/2/12   |
| 2013 | 111,481,000   | 305,427 | 681,000  | 2.23           | 5/20/13  |
| 2014 | 121,591,000   | 333,126 | 696,000  | 2.09           | 7/2/14   |
| 2015 | 131,468,160   | 360,187 | 844,917  | 2.35           | 8/14/15  |
| 2016 | 139,035,078   | 380,918 | 867,608  | 2.28           | 7/22/16  |
| 2017 | 115,598,607   | 316,709 | 703,237  | 2.22           | 7/11/17  |
| 2018 | 115,067,435   | 315,253 | 760,837  | 2.41           | 6/27/18  |
| 2019 | 116,205,206   | 318,370 | 778,945  | 2.45           | 8/5/19   |

### HVWP Total Well Input Gallons (2009 - 2019)



## HVWP - TOTAL YEARLY PUMPAGE 2009 - 2019



## 2018 MONTHLY WELL PUMPAGE - HOOKSETT VILLAGE WATER PRECINCT (GALLONS)

| MONTH  | NORTH WELL W1 | EAST WELL W4 | SOUTH WELL W2 | SOUTH WELL BACKUP | CENTRAL HOOKSETT | TOTAL WATER            | GPD            | GPM (16 HR DAY) |
|--------|---------------|--------------|---------------|-------------------|------------------|------------------------|----------------|-----------------|
| Jan-18 | 2,602,000     | 2,291,000    | 2,736,000     | 7,000             | 0                | 7,636,000              | 246,323        | 257             |
| Feb-18 | 2,043,000     | 2,383,000    | 2,163,000     | -                 | 0                | 6,589,000              | 235,321        | 245             |
| Mar-18 | 3,050,000     | 2,464,000    | 1,709,000     | -                 | 0                | 7,223,000              | 233,000        | 243             |
| Apr-18 | 4,334,000     | 3,002,000    | 3,000         | 4,000             | 0                | 7,343,000              | 244,767        | 255             |
| May-18 | 6,484,000     | 5,059,000    | -             | -                 | 0                | 11,543,000             | 372,355        | 388             |
| Jun-18 | 9,024,000     | 7,337,000    | -             | -                 | 0                | 16,361,000             | 545,367        | 568             |
| Jul-18 | 9,644,000     | 7,944,000    | -             | -                 | 700              | 17,588,700             | 567,377        | 591             |
| Aug-18 | 7,282,000     | 6,463,000    | -             | -                 | 0                | 13,745,000             | 443,387        | 462             |
| Sep-18 | 6,231,000     | 6,268,000    | -             | -                 | 0                | 12,499,000             | 416,633        | 434             |
| Oct-18 | 4,085,000     | 4,750,000    | 338,145       | 1,758,196         | 3300             | 10,934,641             | 352,730        | 367             |
| Nov-18 | 3,690,000     | 3,681,000    | -             | -                 | 0                | 7,371,000              | 245,700        | 256             |
| Dec-18 | 3,129,000     | 3,236,000    | 102,234       | 983,165           | 0                | 7,450,399              | 240,335        | 250             |
|        |               |              |               |                   | <b>TOTAL</b>     | <b>126,283,740</b>     |                |                 |
|        |               |              |               |                   |                  | <b>AVERAGE</b>         | <b>345,983</b> |                 |
|        |               |              |               |                   |                  | <b>PEAK DAY</b>        | <b>835,000</b> |                 |
|        |               |              |               |                   |                  | <b>PEAK/AVE. RATIO</b> | <b>2.41</b>    |                 |

0.911182

| CORRECTED              |                |                 |
|------------------------|----------------|-----------------|
| TOTAL WATER            | GPD            | GPM (16 HR DAY) |
| 6,957,784              | 224,445        | 234             |
| 6,003,776              | 214,421        | 223             |
| 6,581,466              | 212,305        | 221             |
| 6,690,807              | 223,027        | 232             |
| 10,517,774             | 339,283        | 353             |
| 14,907,849             | 496,928        | 518             |
| 16,026,507             | 516,984        | 539             |
| 12,524,197             | 404,006        | 421             |
| 11,388,864             | 379,629        | 395             |
| 9,963,448              | 321,402        | 335             |
| 6,716,323              | 223,877        | 233             |
| 6,788,669              | 218,989        | 228             |
| <b>115,067,435</b>     |                |                 |
| <b>AVERAGE</b>         | <b>315,253</b> |                 |
| <b>PEAK DAY</b>        | <b>760,837</b> |                 |
| <b>PEAK/AVE. RATIO</b> | <b>2.41</b>    |                 |

| PEAK MONTH              | NORTH WELL W1 | EAST WELL W4 | SOUTH WELL W2 | SOUTH WELL BACKUP | TOTAL WATER | AVAILABLE CAPACITY  |
|-------------------------|---------------|--------------|---------------|-------------------|-------------|---|
| Jul-18                  | 9,644,000     | 7,944,000    | -             | -                 | 17,588,000  | <b>PEAK CAPACITY AVAILABLE</b><br><b>2018</b><br><b>413,000</b><br><b>GPD</b> |
| DAY (6/27)              | 464,000       | 371,000      | -             | -                 | 835,000     |   |
| REPORTED / APPROVED GPD | 720,000       | 576,000      | 288,000       | 288,000           | 1,872,000   |   |
| SUPPLY CAPACITY GPD     | 480,000       | 384,000      | 192,000       | 192,000           | 1,248,000   |   |
|                         |               |              |               |                   |             |   |

\* South Well and South Well Backup Volume Split 50/50 Because Both Wells Cannot Be Run Together.

| CORRECTED        |                              |
|------------------|------------------------------|
| TOTAL WATER      | AVAILABLE CAPACITY           |
| 16,026,507       | <b>487,163</b><br><b>GPD</b> |
| 760,837          |                              |
|                  |                              |
|                  |                              |
|                  |                              |
| <b>1,248,000</b> |                              |

2019 MONTHLY WELL PUMPAGE - HOOKSETT VILLAGE WATER PRECINCT (GALLONS)

| MONTH                  | NORTH WELL W1 | EAST WELL W4 | SOUTH WELL W2 | SOUTH WELL BACKUP | CENTRAL HOOKSETT | TOTAL WATER        | GPD     | GPM (16 HR DAY) |
|------------------------|---------------|--------------|---------------|-------------------|------------------|--------------------|---------|-----------------|
| Jan-19                 | 2,165,000     | 2,987,000    | 1,152,658     | 1,227,992         | 2,600            | 7,535,250          | 243,073 | 253             |
| Feb-19                 | 1,980,000     | 2,812,000    | 927,877       | 983,666           | -                | 6,703,543          | 239,412 | 249             |
| Mar-19                 | 2,223,000     | 2,767,000    | 985,875       | 1,265,179         | -                | 7,241,054          | 233,582 | 243             |
| Apr-19                 | 2,786,000     | 3,066,000    | 1,273,056     | 1,358,919         | -                | 8,483,975          | 282,799 | 295             |
| May-19                 | 3,192,000     | 3,195,000    | 1,394,756     | 1,507,504         | -                | 9,289,260          | 299,654 | 312             |
| Jun-19                 | 4,700,000     | 4,315,000    | 2,215,734     | 2,096,660         | -                | 13,327,394         | 444,246 | 463             |
| Jul-19                 | 6,223,000     | 5,805,000    | 2,925,963     | 2,811,093         | 46,781           | 17,811,837         | 574,575 | 599             |
| Aug-19                 | 5,569,000     | 4,965,000    | 2,569,522     | 2,338,362         | -                | 15,441,884         | 498,125 | 519             |
| Sep-19                 | 4,169,000     | 3,966,000    | 2,107,032     | 1,921,214         | -                | 12,163,246         | 405,442 | 422             |
| Oct-19                 | 3,825,000     | 2,418,000    | 1,741,615     | 1,376,917         | 1,830            | 9,363,362          | 302,044 | 315             |
| Nov-19                 | 2,320,000     | 2,862,000    | 913,649       | 1,357,764         | -                | 7,453,413          | 248,447 | 259             |
| Dec-19                 | 1,701,000     | 3,312,000    | 825,278       | 1,229,834         | -                | 7,068,112          | 228,004 | 238             |
| <b>TOTAL</b>           |               |              |               |                   |                  | <b>121,882,330</b> |         |                 |
| <b>AVERAGE</b>         |               |              |               |                   |                  | <b>333,924</b>     |         |                 |
| <b>PEAK DAY</b>        |               |              |               |                   |                  | <b>817,000</b>     |         |                 |
| <b>PEAK/AVE. RATIO</b> |               |              |               |                   |                  | <b>2.45</b>        |         |                 |

CORRECTED

| TOTAL WATER            | GPD            | GPM (16 HR DAY) |
|------------------------|----------------|-----------------|
| 7,184,268              | 231,751        | 241             |
| 6,391,301              | 228,261        | 238             |
| 6,903,775              | 222,702        | 232             |
| 8,088,802              | 269,627        | 281             |
| 8,856,578              | 285,696        | 298             |
| 12,706,621             | 423,554        | 441             |
| 16,982,185             | 547,812        | 571             |
| 14,722,621             | 474,923        | 495             |
| 11,596,698             | 386,557        | 403             |
| 8,927,229              | 287,975        | 300             |
| 7,106,243              | 236,875        | 247             |
| 6,738,889              | 217,384        | 226             |
| <b>116,205,206</b>     |                |                 |
| <b>AVERAGE</b>         | <b>318,370</b> |                 |
| <b>PEAK DAY</b>        | <b>778,945</b> |                 |
| <b>PEAK/AVE. RATIO</b> | <b>2.45</b>    |                 |

0.9534213

| PEAK MONTH                          | NORTH WELL W1 | EAST WELL W4 | SOUTH WELL W2 | SOUTH WELL BACKUP | TOTAL WATER | AVAILABLE CAPACITY |
|-------------------------------------|---------------|--------------|---------------|-------------------|-------------|--------------------|
| Jul-19                              | 6,223,000     | 5,805,000    | 2,925,963     | 2,811,093         | 17,765,056  |                    |
| DAY (8/5)                           | 245,000       | 243,000      | 166,000       | 163,000           | 817,000     |                    |
| REPORTED / APPROVED GPD             | 720,000       | 576,000      | 288,000       | 288,000           | 1,872,000   |                    |
| SUPPLY CAPACITY GPD                 | 480,000       | 384,000      | 192,000       | 192,000           | 1,248,000   |                    |
| <b>PEAK CAPACITY AVAILABLE 2019</b> |               |              |               |                   |             | <b>431,000 GPD</b> |

\* South Well and South Well Backup Volume Split 50/50 Because Both

CORRECTED

| TOTAL WATER | AVAILABLE CAPACITY |
|-------------|--------------------|
| 16,982,184  |                    |
| 778,945     |                    |
|             |                    |
|             |                    |
| 1,248,000   |                    |
|             | <b>469,055 GPD</b> |



## **2019 Booster Station Flows (Gallons)**

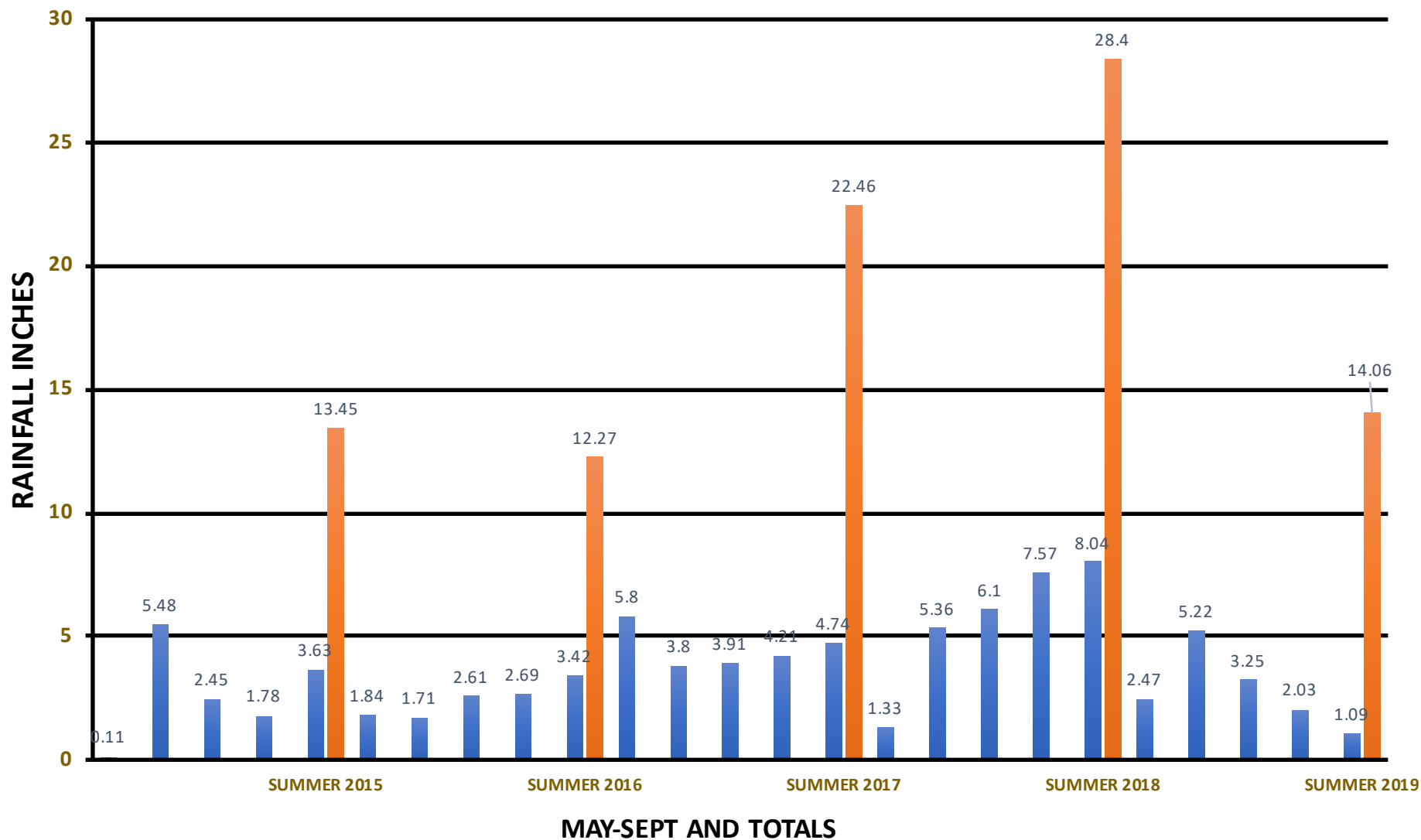
***University Heights & Heads Pond Projects, Hooksett Village Water Precinct***

| <b>Month</b> | <b>Total</b> | <b>Average Day</b> | <b>Peak Day</b> | <b>Peak Date</b> |
|--------------|--------------|--------------------|-----------------|------------------|
| Dec-19       | 1,247,000    | 40,226             | 149,000         | 12/27/19         |
| Nov-19       | 1,248,000    | 41,600             | 103,000         | 11/22/19         |
| Oct-19       | 1,825,000    | 58,871             | 146,000         | 10/1/19          |
| Sep-19       | 3,737,000    | 124,567            | 183,000         | 9/24/19          |
| Aug-19       | 4,526,000    | 146,000            | 193,000         | 8/6/19           |
| Jul-19       | 6,187,000    | 199,581            | 300,000         | 7/28/2019 (max.) |
| Jun-19       | 3,422,000    | 114,067            | 197,000         | 6/22/19          |
| May-19       | 1,890,000    | 60,968             | 159,000         | 5/10/19          |
| Apr-19       | 1,246,000    | 41,533             | 57,000          | 4/22/19          |
| Mar-19       | 1,243,000    | 40,097             | 75,000          | 3/4/19           |
| Feb-19       | 1,107,000    | 39,536             | 55,000          | 2/25/19          |
| Jan-19       | 1,250,000    | 40,323             | 105,000         | 1/6/19           |

**Total:**                    **28,928,000**  
**Average:**                **79,255**                **(Annualized Average Daily Flow)**

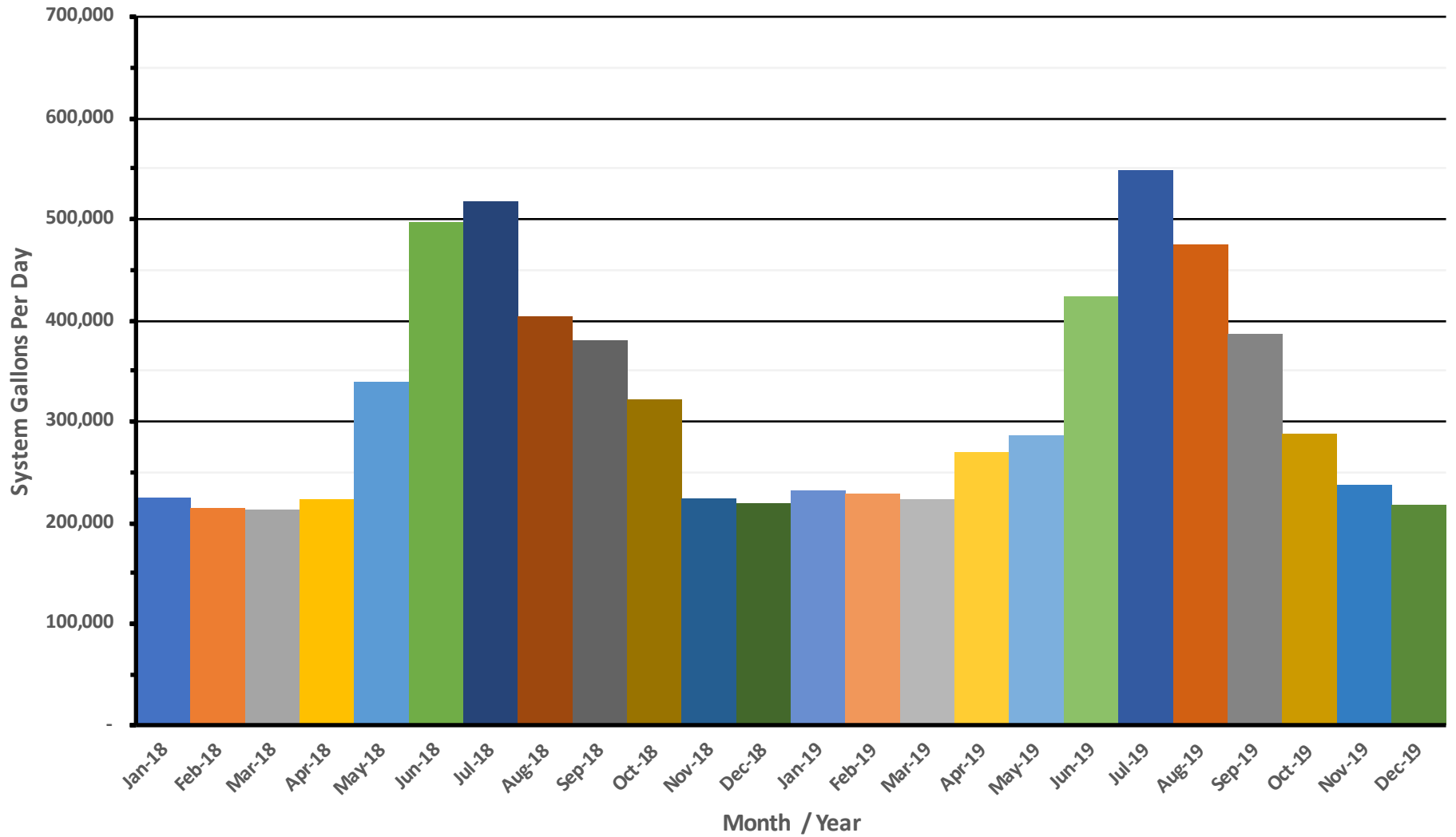
# RAINFALL FOR LAWN IRRIGATION

## SOUTHERN NH SUMMER RAINFALL

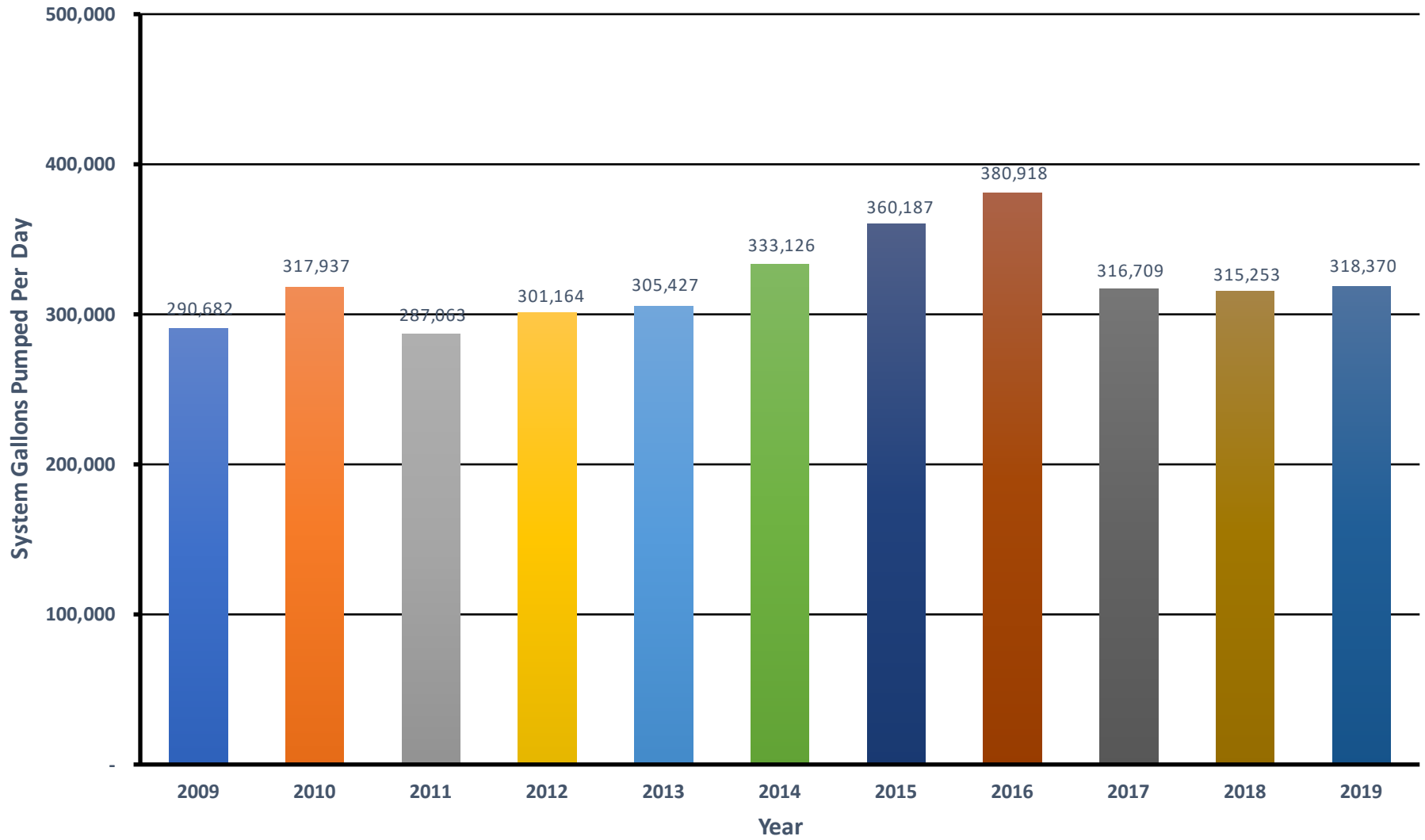


# HVWP - WELLS

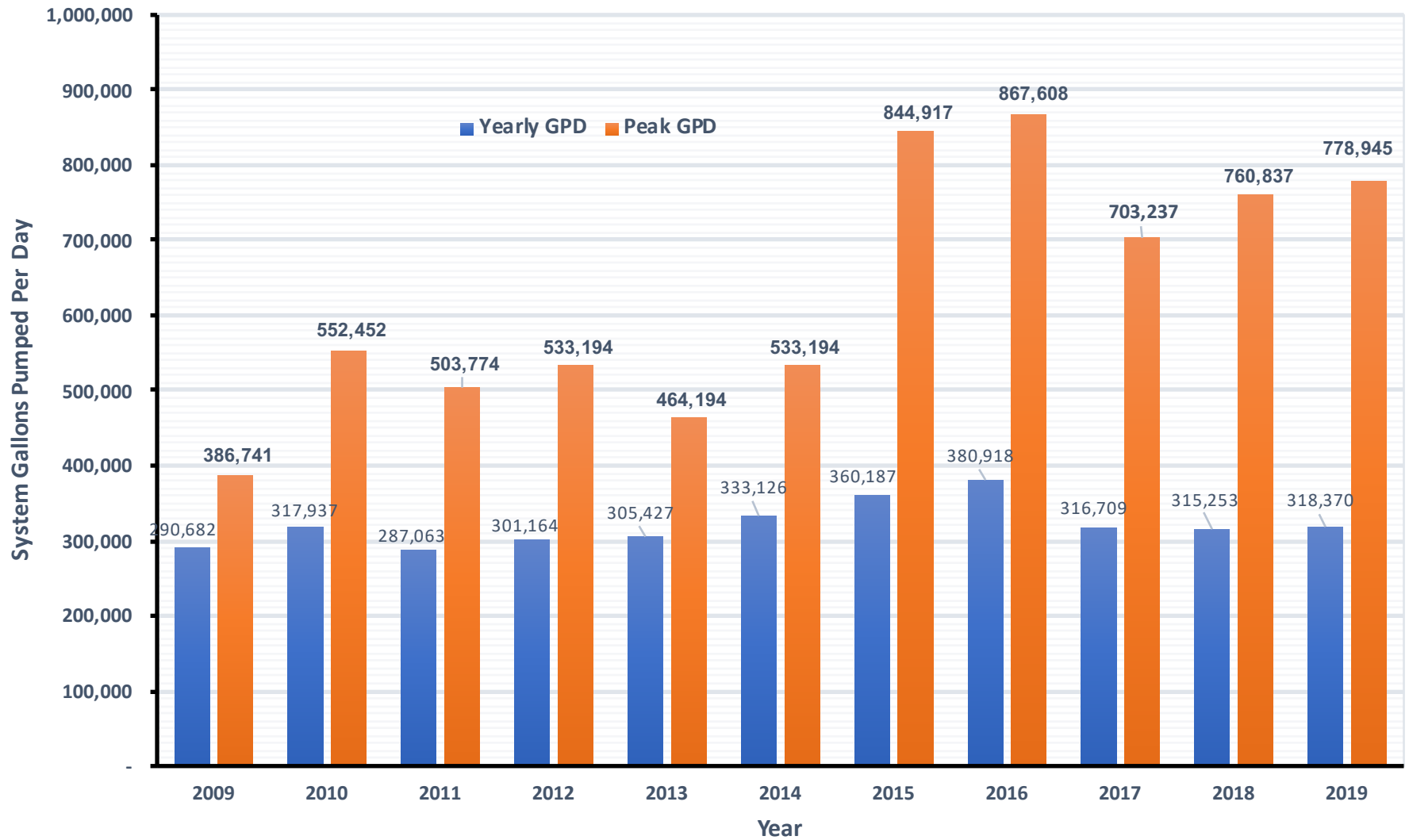
## MONTHLY GPD FOR 2018 - 2019



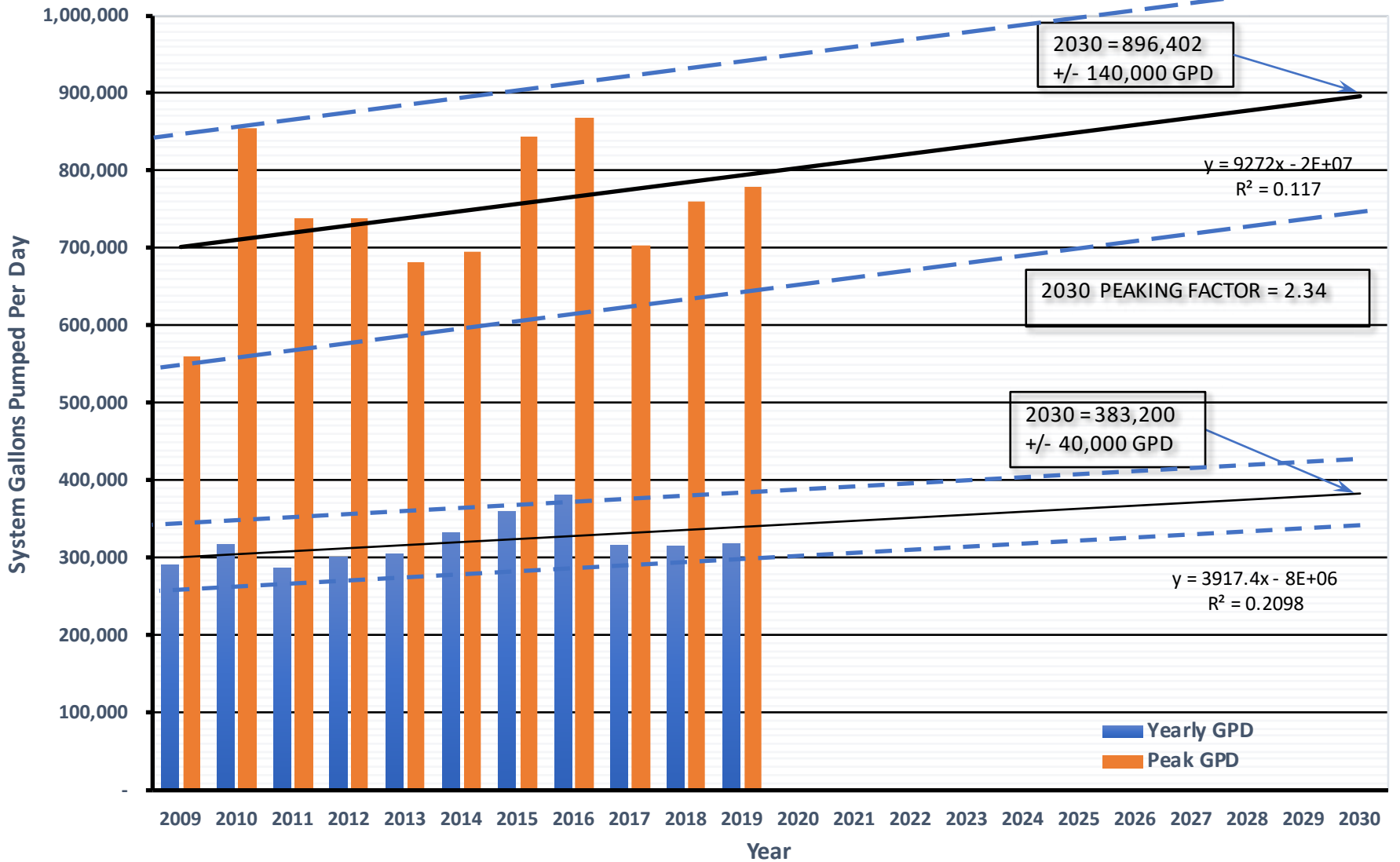
## HWWP - YEARLY AVERAGE GPD 2009 - 2019



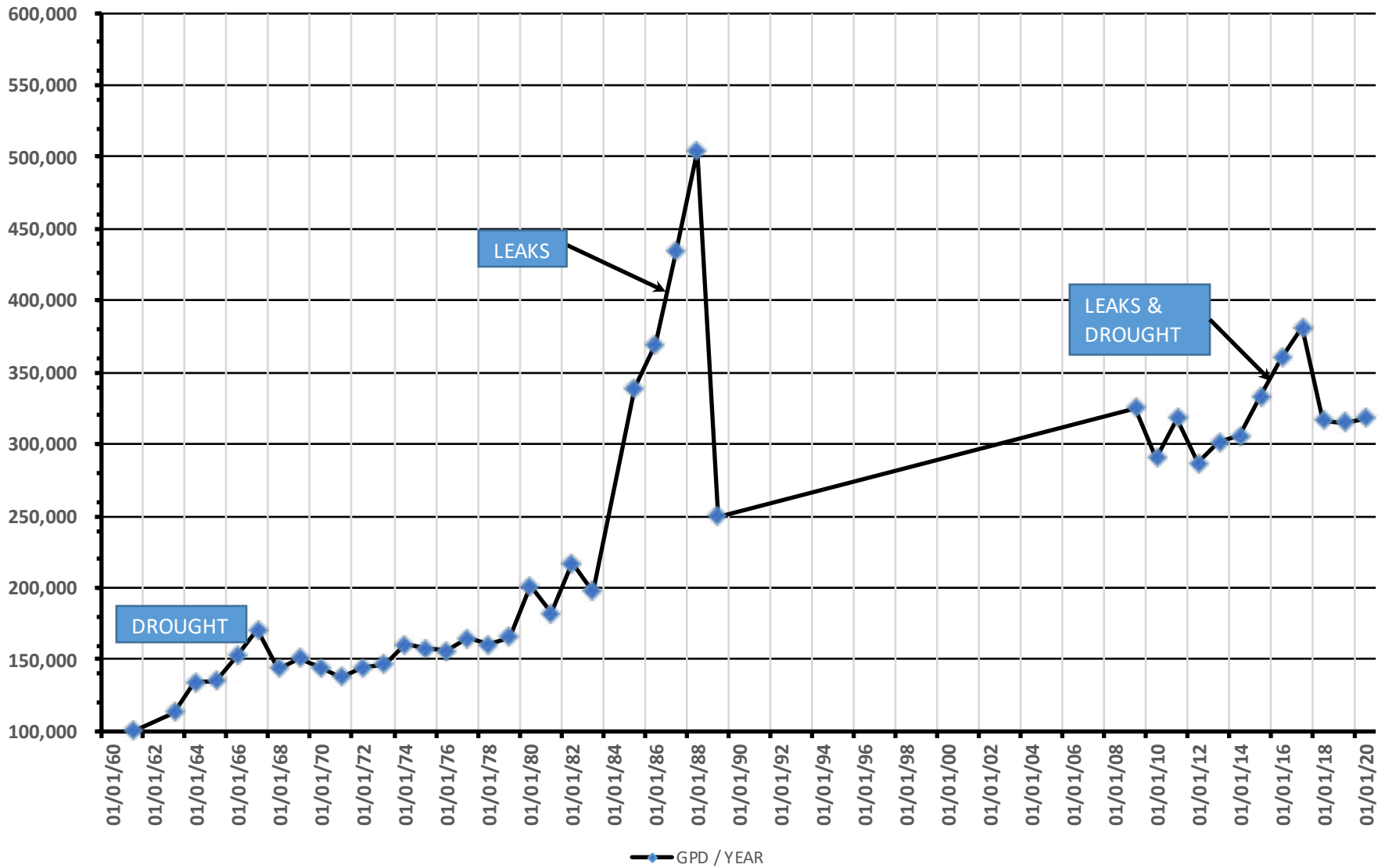
## HVWP - YEARLY PEAK GPD 2009 - 2019



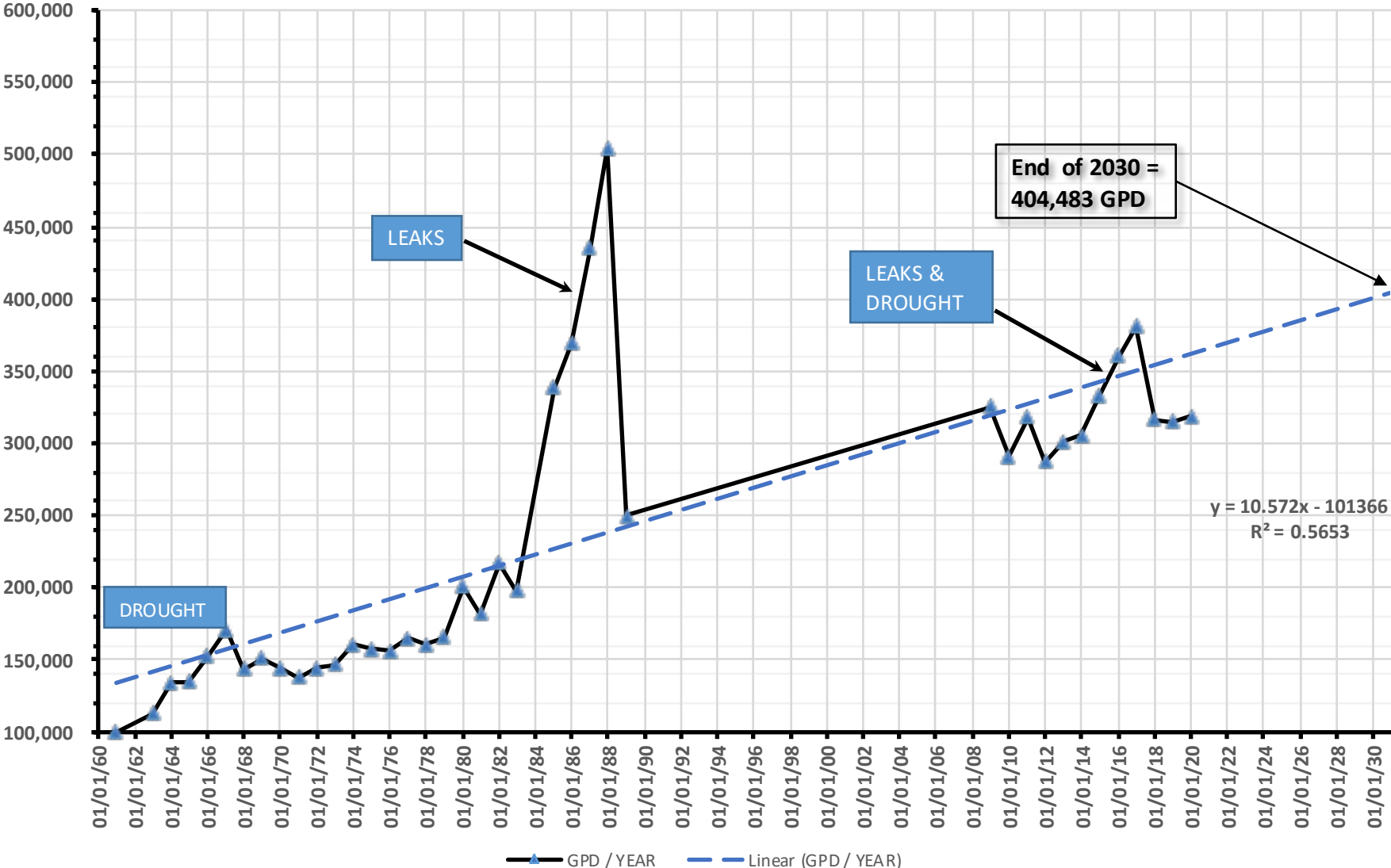
## HVWP - YEARLY PEAK GPD 2009 - 2019



### HVWP Total Input Gallons (1960 - 2019)



# HVWP Total Input Gallons (1960 - 2019)





**PROJECTED WATER REQUIRED TO SERVE PROPOSED OR TO-BE-BUILT DEVELOPMENT PROJECTS**

*Hooksett Village Water Precinct, April 2020*

| NAME OF PROJECT  | TOTAL UNITS | BUILT UNITS | PLANNED UNITS <sup>b</sup> | PEAK GPD PER UNIT <sup>c</sup> | MAX DAILY WATER USE FOR PLANNED UNITS (gal) <sup>d</sup> |
|--|-------------|-------------|----------------------------|--------------------------------|--|
| Harmony Place w/limited irrig.   | 63          | 0           | 63                         | 160                            | 10,080   |
| Bernice St. Subdiv. - SFH w/irrig.   | 27          | 0           | 27                         | 1500                           | 40,500   |
| University Heights Development <sup>d</sup> :                                      | --          | --          | --                         | --                             | --   |
| - <i>SFH w/irrig.<sup>a</sup></i>  | <i>148</i>  | <i>96</i>   | <i>52</i>                  | <i>1500</i>                    | <i>78,000</i>  |
| - Townhouses w/irrig.  | 48          | 0           | 48                         | 285                            | 13,680   |
| - Assisted Living w/limited irrig.   | 100         | 0           | 100                        | 160                            | 16,000   |
| - <i>Apartment buildings w/irrig.<sup>a</sup> (204 apts.)</i>                      | <i>10</i>   | <i>10</i>   | <i>0</i>                   | <i>285</i>                     | <i>0</i>   |
| - Office/Comm./Retail - 120,000 ft <sup>2</sup>                                    | 1           | 0           | 1                          | 6000                           | 6,000  |
| - <i>Self-storage<sup>a</sup> - 80,000 ft<sup>2</sup></i>                          | <i>1</i>    | <i>1</i>    | <i>0</i>                   | <i>150</i>                     | <i>0</i>   |
| Head's Pond Development <sup>d</sup> :   | --          | --          | --                         | --                             | --   |
| - <i>SFH w/irrig.<sup>a</sup></i>  | <i>650</i>  | <i>105</i>  | <i>545</i>                 | <i>1500</i>                    | <i>817,500</i>   |
| - 18-hole golf course/clubhouse w/o irrig.   | 1           | 0           | 1                          | 6000                           | 6,000  |
| Ritchie Bros. Development - Exit 11 East:  | --          | --          | --                         | --                             | --   |
| - <i>124-room hotel w/o irrig.<sup>a</sup></i>                                     | <i>1</i>    | <i>0</i>    | <i>1</i>                   | <i>18660</i>                   | <i>18,660</i>  |
| - <i>4,490 ft<sup>2</sup> restaurant<sup>a</sup></i>                               | <i>1</i>    | <i>0</i>    | <i>1</i>                   | <i>2240</i>                    | <i>2,240</i>   |
| - 3 additional restaurants (total 18,368 ft <sup>2</sup> )                         | 3           | 0           | 3                          | 2240                           | 6,720  |
| - Winery (75 pkg. spaces)  | 1           | 0           | 1                          | 2240                           | 2,240  |
| - Event ctr - 86,400 ft <sup>2</sup> (362 pkg. spaces)                             | 1           | 0           | 1                          | 5000                           | 5,000  |
| - 2 2-story office buildings (75,000-80,000 ft <sup>2</sup> each; 569 pkg. spaces) | 2           | 0           | 2                          | 4000                           | 8,000  |
| Supreme Ind. Development - Exit 11 West:   | --          | --          | --                         | --                             | --   |
| - 124-room hotel w/o irrig.  | 1           | 0           | 1                          | 18660                          | 18,660   |
| - 100-Seat restaurant  | 1           | 0           | 1                          | 2240                           | 2,240  |
| - 5,400 ft <sup>2</sup> restaurant   | 1           | 0           | 1                          | 2240                           | 2,240  |
| - Event ctr - 8 pavilions, 2 stages, amphitheater (400 pkg. spaces)                | 1           | 0           | 1                          | 5000                           | 5,000  |
| - 12,600 ft <sup>2</sup> retail building   | 1           | 0           | 1                          | 630                            | 630  |
| - Small office building (10-12 employees)  | 1           | 0           | 1                          | 250                            | 250  |
| Misc. Commercial Development   | 1           | 0           | 1                          | 10000                          | 10,000   |
| Misc. Residential Development  | <u>1</u>    | <u>0</u>    | <u>1</u>                   | 10000                          | <u>10,000</u>  |
| <b>TOTALS:</b>   | <b>1066</b> | <b>212</b>  | <b>854</b>                 | <b>--</b>                      | <b>1,079,640</b>   |

NOTES: (a) Projects italicized with an "a" are approved. The remainder have not yet been approved.

(b) Planned units are outstanding units scheduled to be built as part of project plans.

(c) Peak GPD estimated for residential SFH units using actual 2018-19 billed usage for existing units; on the peak day in 2019, the average flow was approximately 1,500 GPD/unit and during the peak quarter, the average flow of the peak user was 2,900 GPD. Peak GPD estimated for non-residential units using developer's design flows or NHCAR Env-Wq 1000 design flows.

(d) The total maximum daily water use for planned units at the University Heights and Head's Pond developments = 937,180 GPD.

## **New Customer Account History 2010-2019**

### *Hooksett Village Water Precinct*

| <b><u>Year</u></b> | <b><u>Single Fam.<br/>Resid. Units</u></b> | <b><u>Multi. Fam.<br/>Resid. Units<sup>a</sup></u></b> | <b><u>Small Comm.<br/>Business</u></b> | <b><u>Lg. Comm.<br/>Business<sup>b</sup></u></b> |
|--------------------|--|--|--|--|
| 2019               | 19   | --   | --                                     | --   |
| 2018               | 18   | --   | 5                                      | --   |
| 2017               | 26   | --   | 6                                      | --   |
| 2016               | 15   | --   | 1                                      | --   |
| 2015               | 10   | --   | --                                     | --   |
| 2014               | 13   | --   | 1                                      | 1  |
| 2013               | 8  | 9  | --                                     | --   |
| 2012               | 8  | --   | 1                                      | --   |
| 2011               | 16   | --   | 2                                      | --   |
| 2010               | 11   | --   | 1                                      | --   |
| <hr/>              |  |  |  |  |
| <i>Total:</i>      | <i>144</i>                                 | <i>9</i>   | <i>17</i>                              | <i>1</i>   |
| <i>Avg./Year:</i>  | <i>14.4</i>                                | <i>See below</i>                                       | <i>1.7</i>                             | <i>0.1</i>                                       |

*\*Notes: (a) Multi-family residential account includes 9 apartment buildings with a total of 204 living units, plus a clubhouse. Avg./year ~ 20 apts./year.*

*(b) Large commercial account (largest user) includes two modern rest areas with restaurants/liquor stores plus two residential neighborhoods. This redevelopment project was an expansion of an existing account.*

## CAPACITY EVALUATION SUMMARY as of APRIL 2020

*Hooksett Village Water Precinct, Hooksett, NH*

| <u>Flow Condition</u>              | <u>Average Day (All Wells)</u> | <u>Average Day (N Well Off)</u> | <u>Peak Day (All Wells)</u> | <u>Comments</u>  |
|------------------------------------|--------------------------------|---------------------------------|-----------------------------|--|
| Permitted Production Volume ±      | 1,872,000                      | 1,152,000                       | 1,872,000                   | Assumes N Well volume = 720,000 GPD (pre-dates PPV).   |
| Current Design Capacity            | 1,692,000                      | 1,116,000                       | 1,692,000                   | Based on actual pump capacities; N and E Wells = 576,000 GPD each, S and SBU Wells = 540,000 GPD (avg combined).                   |
| Current Supply Capacity            | 1,248,000                      | 768,000                         | 1,248,000                   | Equals 16 hours at PPV. Includes safety factor for well recovery, drought impacts, fire demands, etc. Does not account for demand. |
| <i>2019 ADD/PDD</i>                | <i>318,370</i>                 | <i>318,370</i>                  | <i>778,945</i>              | Actual Average and Peak Daily Demands from 2019.   |
| 2019 Apparent Available Capacity   | 929,630                        | 449,630                         | 469,055                     | Equals Current Supply Capacity - 2019 ADD or PDD. Does not include future growth to 2030 or prior commitments.                     |
| <i>2030 ADD/PDD</i>                | <i>383,200</i>                 | <i>383,200</i>                  | <i>896,402</i>              | Predicted Average (±10%) and Peak (±16%) Daily Demands in 2030.  |
| 2030 Apparent Available Capacity   | 864,800                        | 384,800                         | 351,598                     | Equals Current Supply Capacity - 2030 ADD or PDD. Does not include prior commitments to provide capacity.                          |
| <i>UH/HP ADD/PDD</i>               | <i>391,745</i>                 | <i>391,745</i>                  | <i>937,180</i>              | Equals estimated remaining commitment to provide dedicated capacity to the Univ. Hgts. / Heads Pond development projects.          |
| 2030 Estimated Available Capacity* | 537,885                        | <b>57,885</b>                   | <b>-468,125</b>             | <b>Equals 2019 Supply Capacity - UH/HP ADD or PDD.</b>   |

\* Note: 2030 Actual Available Capacity estimates do not account for possible temporary or permanent loss of sources due to a contamination incident at Pinnacle Pond.