Hydrogeologic Evaluation for Jacob’s Well
Presented for consideration in creation of a Jacob’s Well Groundwater Management Zone
Scientific Technical Committee Report

Presented to
Hays-Trinity GCD – Board of Directors
July 17, 2019

Technical Committee Members
Marcus Gary, Ph.D., P.G. ... Edwards Aquifer Authority, The University of Texas at Austin
Brian Hunt, P.G., ............... Barton Springs Edwards Aquifer Conservation District
Brian Smith, Ph.D., P.G. .... Barton Springs Edwards Aquifer Conservation District
Jeffery Watson, P.G. ........ Hays Trinity Groundwater Conservation District
Doug Wierman, P.G. ........ Fellow - Meadows Center for Water and the Environment
Charge of the Scientific Technical Committee

1. Define the spatial extent (springshed) of the JWGMZ based on hydrogeologic observations, data, and related information.
2. Work with Stakeholder Group to update drought indicators and identify flow rate triggers for the JWGMZ.
3. Evaluation of pumping volume (permitted and exempt) within the JWGMZ.
4. Conduct a hydrologic analysis of the water budget to determine cumulative effects of pumping on springflow at Jacob’s Well, particularly during drought conditions.
5. Develop a set of possible strategies to minimize negative anthropogenic influences on Jacob’s Well springflow.
6. Identify any gaps in data and determine what future studies would improve the GCD’s ability to manage groundwater resources in the JWGMZ.
MEMORANDUM

To: HTGCD Board Members, JWGMZ Stakeholders, JWGMZ Technical Team
From: Robin Rather
Date: July 15, 2019
Re: Facilitator’s Report: Jacob’s Well Spring Flow Stakeholder Task Force--Final Recommendations

Executive Summary

Thirty-five volunteer members of the Hays Trinity Groundwater Conservation District (HTGCD) “Spring Flow” Task Force were asked to review technical and scientific data and to identify best practices to ensure perennial spring flow at Jacob’s Well and Cypress Creek. The Task Force came to 100% consensus on all but one of seven recommendations, and that one recommendation had all but two members in consensus. This memo contains a summary of the Task Force’s work.

The first three recommendations are the most immediate and the most impactful in the short term:

1. We recommend the immediate establishment of one groundwater management zone shown in dark green in the map at right (the Jacob’s Well Groundwater Management Zone, or JWGMZ). We also ask that the establishment of second zone be considered shown in yellow below (Regional Recharge Zone).

For more detailed maps and technical background please refer to the Technical Report written by the JWGMZ Technical team (forthcoming.)

2. Using Jacob’s Well Spring as a trigger for permitted
Datasets used in evaluation for this process.

1. Hydrogeologic setting
2. Geologic structure
3. Recharge area for JW
4. Well pumping data
5. Spring flow data
6. Groundwater level data
• 1-mile buffer around Dry Cypress Creek watershed upstream of Tom Creek Fault Zone.

• Includes Fault Zone – wells in this area respond similarly to wells in upstream watershed.
Three separate areas that each influence flow at Jacob’s Well are identified.

1. Jacob’s Well catchment area (springshed)
2. Tom Creek Fault area.
3. Regional recharge area.
JW Regional Recharge Area

• Bounded by Hays County line to the west, Region K-L boundary to the north, Dry Cypress Creek to the east, and Tom Creek Fault to the south.
• Regional GW flow into the JWS springshed area.
• Includes PVS and Blanco Rv springs.
Regional Groundwater Surface

- Water levels in the Middle Trinity aquifer in this portion of the Hill Country are generally from the west to east.
- The water level surface tends to “flatten out” in areas where extensive karst exists, such as JWS.
The HTGCD produced a regional cross-section through JWS running from west to east from the Hays Co. line through the Wimberley area.
Pleasant Valley Spring (PVS) is a single spring that provides all the flow to the Blanco River in Wimberley under drought conditions.
Tom Creek Fault Zone Area

- Bounded by Regional Recharge Area and JW Catchment to the west.
- Reflects a 1-mile wide fault zone southeast from the Tom Creek Fault as mapped by the BEG.
Wells located in the Tom Creek Fault Area and the Jacob’s Well Spring Catchment Area (updip) respond differently than wells to the southeast (downdip) where the Middle Trinity aquifer is deeper in the subsurface.
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Jacob’s Well Spring Catchment Area

- Represents the primary recharge area for JW.
- Water levels in the Middle Trinity aquifer are directly tied to spring flow.
- Cave passages feeding JW developed in this area.
Multiple recharge analyses were conducted to evaluate area of greatest influence to spring flow.

Springshed is estimated by integrating hydrologic data with methods published by Lanini et al., 2016 and Bonacci and Andric, 2015.

Springshed of Dry Cypress Creek (~31 mi², or less) is sufficient for all recharge estimates.

Estimated average annual effective recharge is about 30% of rainfall.

Hunt et. al, in prep
Jacob’s Well Spring emerges from the underwater cave system that has developed along fractures in the limestone running from the spring to the northwest.
Observed effects of pumping on spring flow
JWS Areas of Hydrogeologic Influence

- Permitted wells shown as large triangles
- Exempt wells registered in HTGCD database shown as small dots.
- CCN areas shown as colored polygons.
Two suggested areas for potential GMZs
Pumping Trends: 2009-2018

Reported Pumping from Large Permits

Pumping Peaks in Summer
The Stakeholder Task Force recommended the following drought trigger levels for permitted pumping reductions based on a flow index directly from Jacob’s Well.

- 6 cfs – 10% reduction
- 5 cfs – 20% reduction
- 3 cfs – 30% reduction
- 2 cfs – 40% reduction
Drought vs. No-Drought Average Monthly Pumping: Aqua Texas, WWSC, WSP

- No Drought Declared
- Drought Declared
- Average Drought Curtailment (26%)
<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Drought curtailments</strong></td>
<td>Implementation of a simple, representative drought declaration methodology using Jacob’s Well as one of the triggers.</td>
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<tr>
<td><strong>Education</strong></td>
<td>Effective communication to the public related to water resources, drought, and conservation efforts the public can take.</td>
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<tr>
<td><strong>Conservation</strong></td>
<td>Measures and actions taken to reduce the use of water. These could include watering schedules.</td>
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<tr>
<td><strong>Permit reductions and restrictions</strong></td>
<td>Right-sizing and placing ceilings on permitted pumping during non-drought periods.</td>
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<tr>
<td><strong>Infrastructure and efficiency</strong></td>
<td>Reduce line loss and fix other water infrastructure problems that may waste groundwater.</td>
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## Alternative Water Supply Tools for Maintaining Sustainable Base Flow at Jacob’s Well Spring

<table>
<thead>
<tr>
<th>Strategy</th>
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<tr>
<td>Conjunctive use</td>
<td>Use of surface water and groundwater sources</td>
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<tr>
<td>Aquifer storage and recovery (ASR)</td>
<td>Injection of surface or other water supplies into the Lower Trinity Aquifer for withdrawal during drought periods.</td>
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<tr>
<td>Lower Trinity</td>
<td>Development of the Lower Trinity Aquifer to (1) temporarily or permanently replace pumping from the Middle Trinity and (2) use as a sole-source for future permitted pumping.</td>
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<tr>
<td>Rainwater</td>
<td>Promotion of the use of rainwater for commercial and domestic uses.</td>
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<tr>
<td>Alternative Water Supplies</td>
<td>Importing water from more distant sources.</td>
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<td>Temporary interconnections and pipelines</td>
<td>These could alleviate pumping in certain areas.</td>
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Evaluation for the Development of a Jacob’s Well Groundwater Management Zone
Hays County, Texas

Technical Report prepared for the Hays Trinity Groundwater Conservation District, Hays County, Texas

Report: 2019-05
July 2019

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