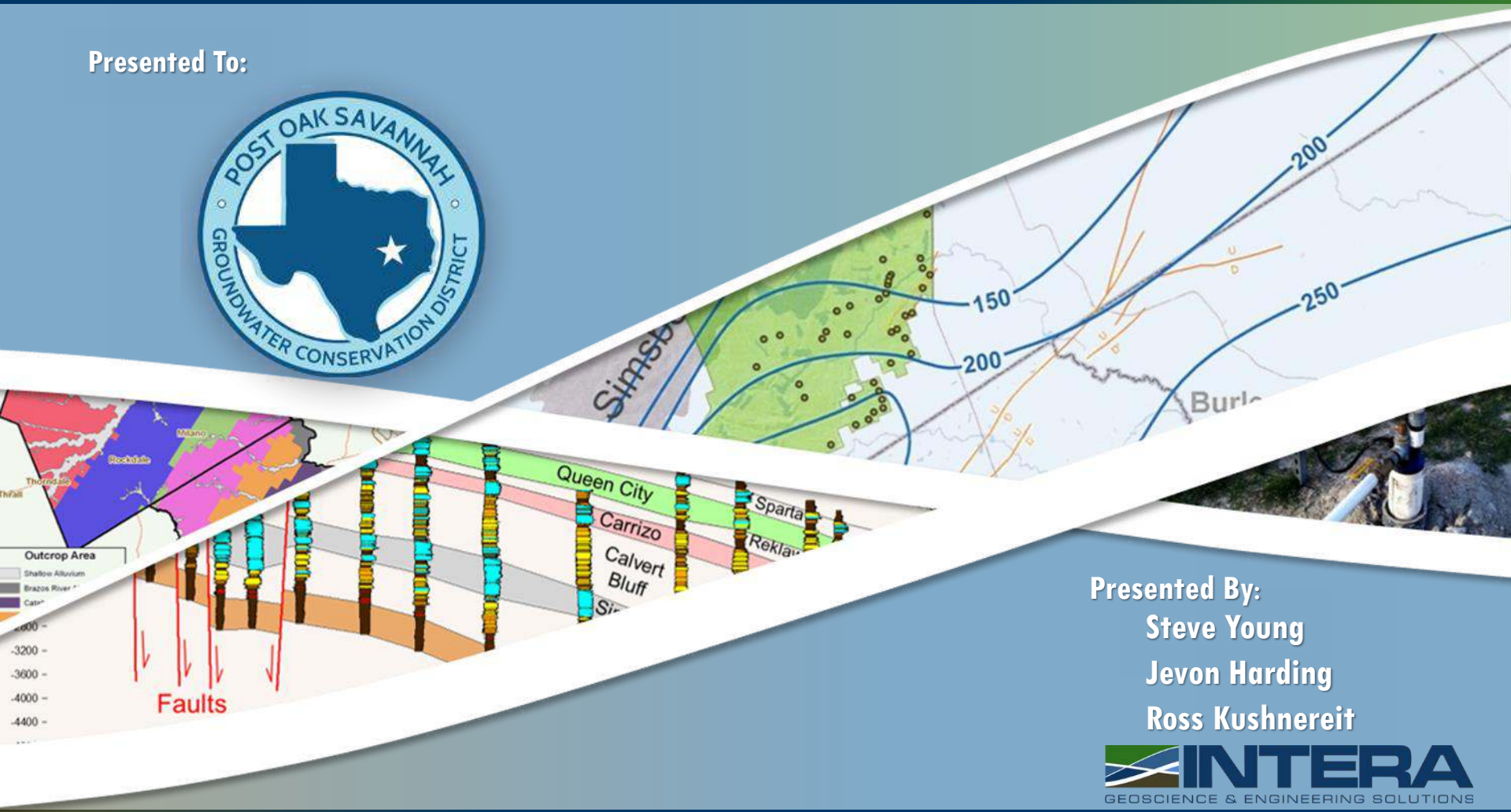
Workshop to DFC Committee: Collection, Management, Evaluation, and Reporting of Monitoring Data

Presented To:

POST OAK SAVANNAH GROUNDWATER CONSERVATION DISTRICT



Presented By:
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Jevon Harding
Ross Kushnereit

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

August 38, 2020

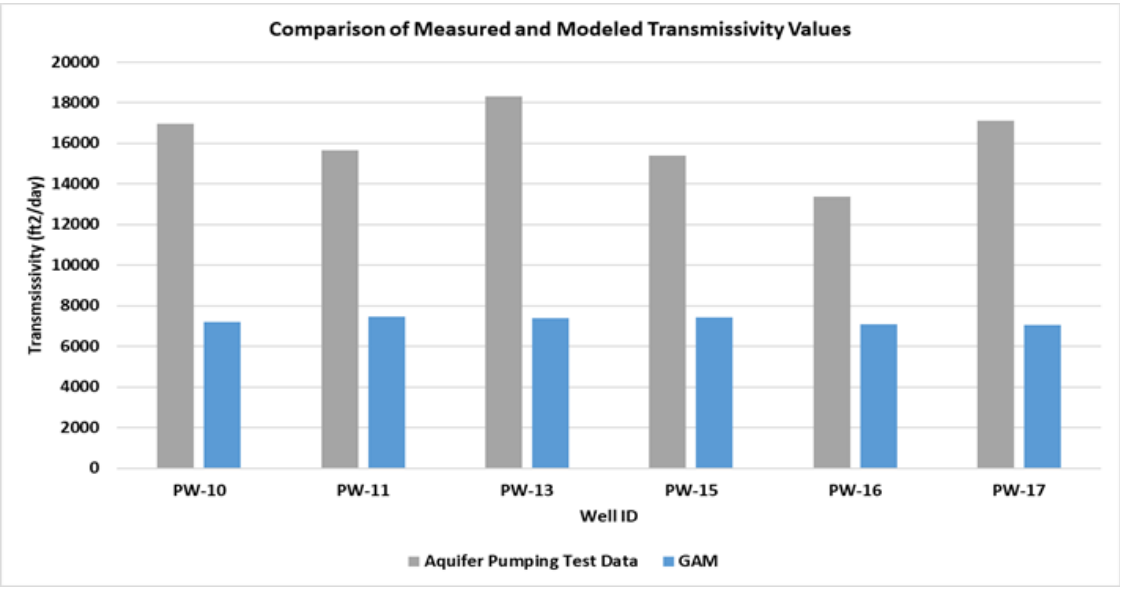
Agenda

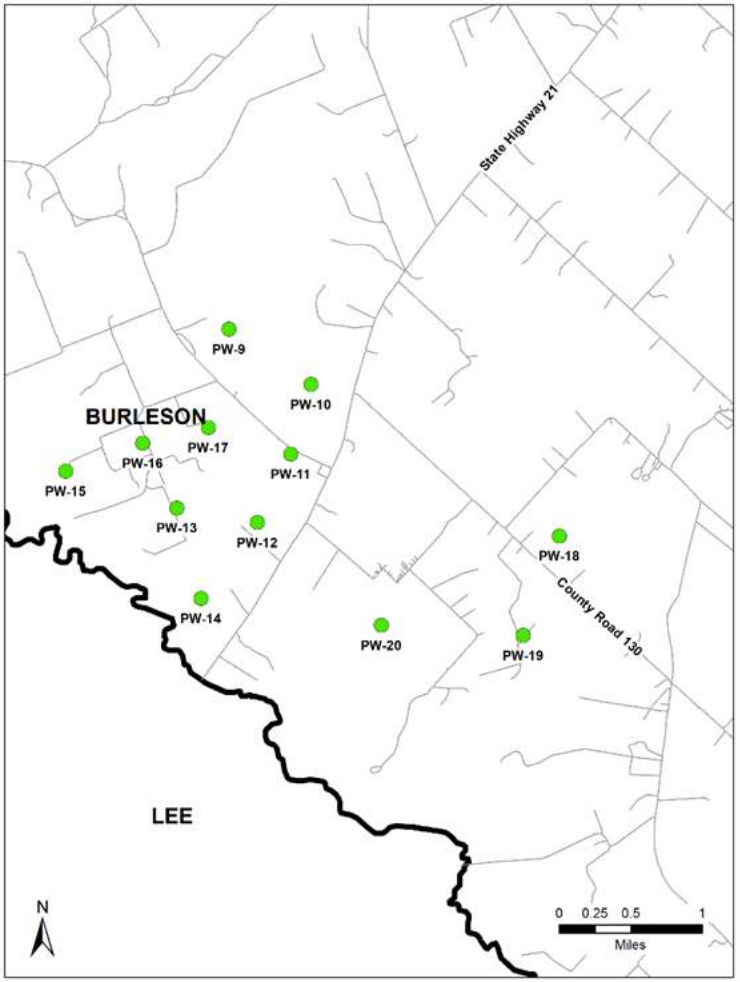
- GAM Update using Vista Ridge Aquifer Pumping Test
  - Updated GAM
  - Results from PS-7 DFC Simulation
  - Simulated and Measured Impacts from Vista Ridge Pumping Since Dec 2019
- Suggested Changes to GWAP
- Completion of Monitoring Dashboard
  - Summary of Results
  - Comparison of POSGCD and TWDB Well Assignments
- Evaluating Compliance for PDLs and DFCs
  - Methods Investigated
  - Results

Modified GAM to Account for New Simsboro Transmissivity Data Near Vista Ridge Wells

Reason for GAM Update

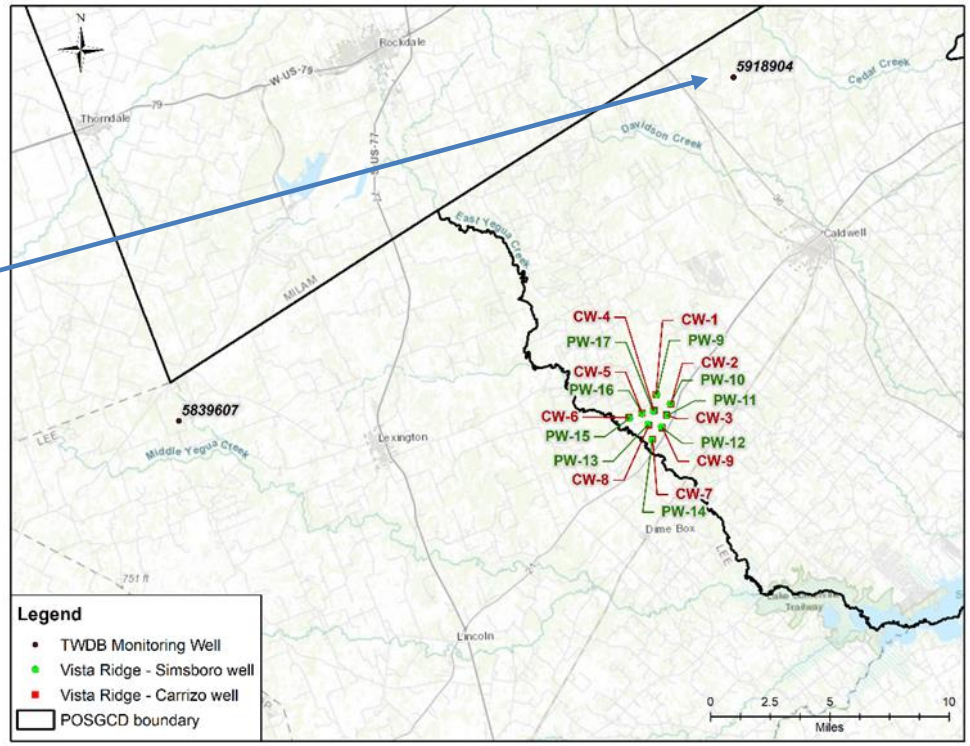
GAM Transmissivity for Simsboro Aquifer is about 50% of Transmissivity Calculated from Aquifer Tests

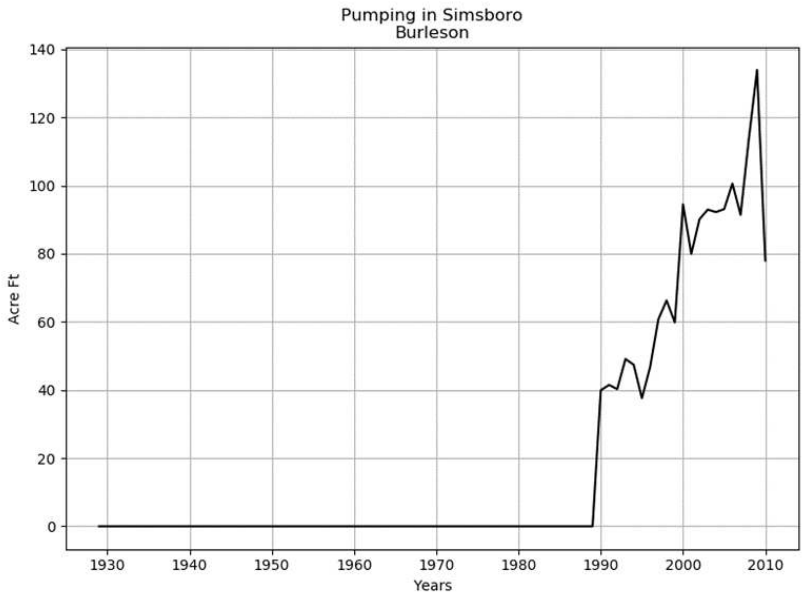




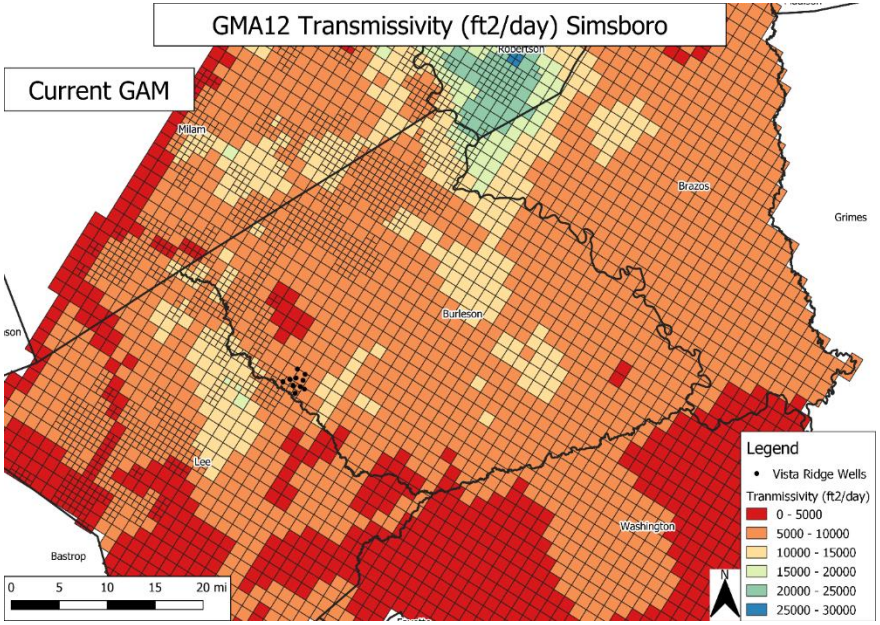
Reason for Low Transmissivity Values in Burleson County

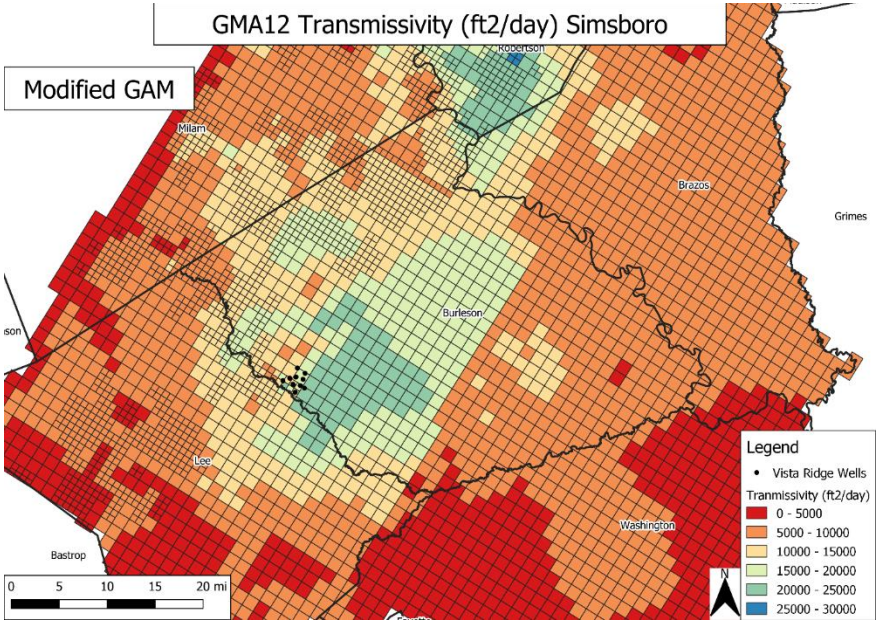
- Historical (1930 -2010) Data in Burleson for Simsboro Provides is Very Limiting
  - One hydrograph in Burleson and only one in Lee, many hydrographs in Brazos
  - Historical pumping in Burleson is very low



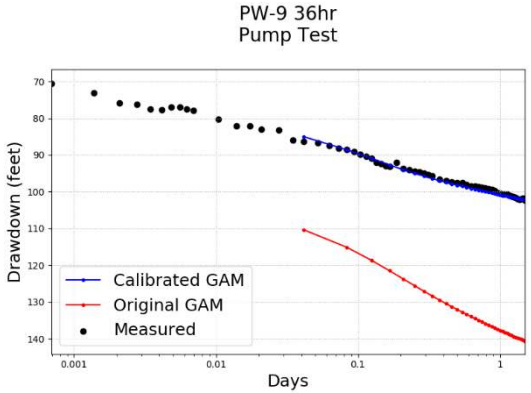


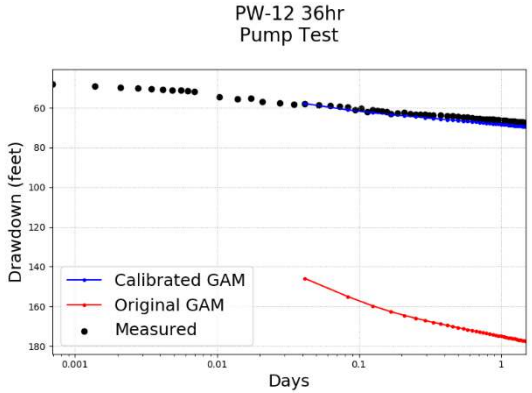
Transmissivity Values in Groundwater Model

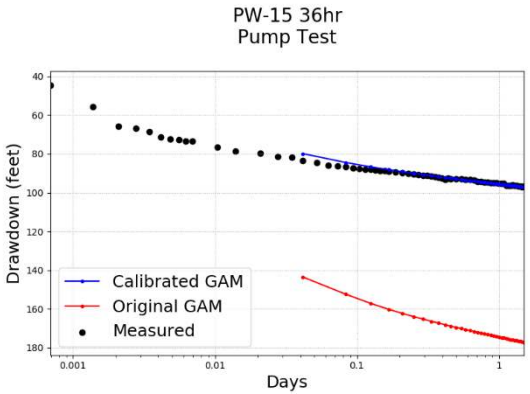


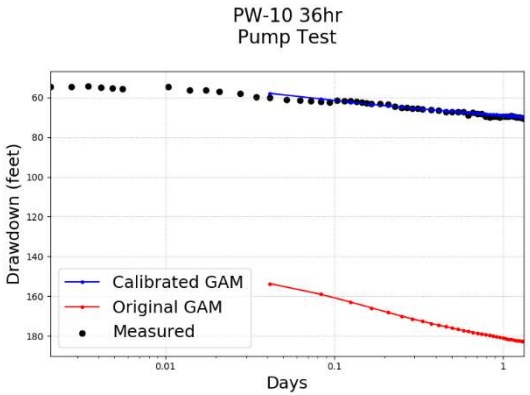


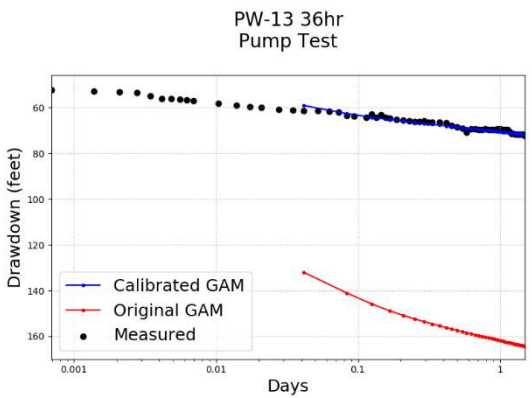
Simulated Drawdowns During Aquifer Pumping Tests

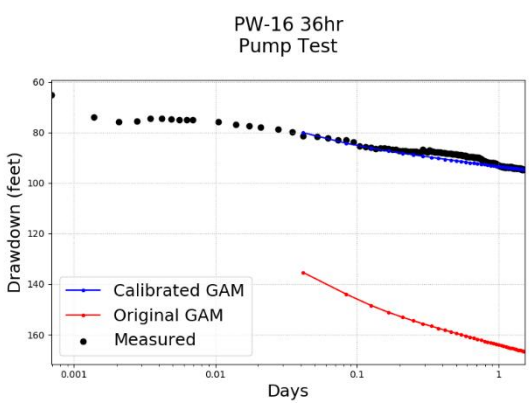


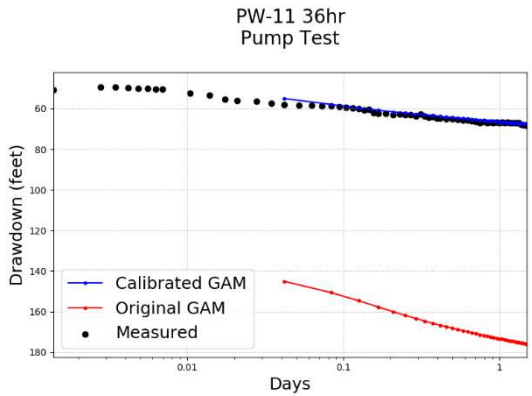


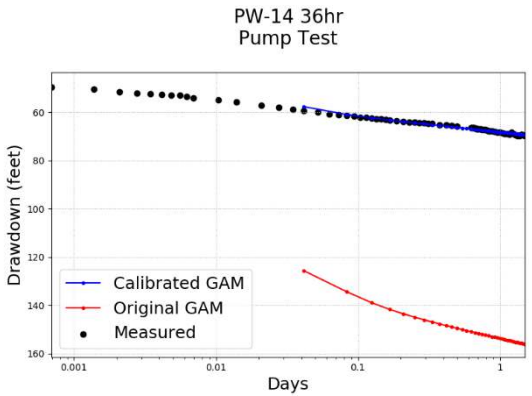


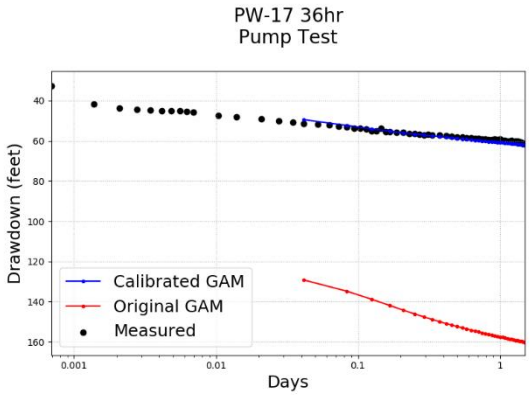












Calculated Transmissivities From Aquifer Tests

Well	Aquifer Test		Transmissivity (ft^2/day)		
	Pumping Rate (gpm)	Duration (hrs)	Aquifer Test	Modified GAM	GAM
PW-9	3110	36	10,928	11,648	5,607
PW-10	3008	36	13,906	15,709	5,979
PW-11	3110	36	17,335	15,709	5,979
PW-12	3110	36	19,785	17,034	7,326
PW-13	3110	36	14,559	16,142	7,036
PW-14	3,008	36	14,664	16,776	7,297
PW-15	3503	36	15,215	13,583	7,175
PW-16	3110	36	10,736	14,552	7,011
PW-17	3110	36	19,629	15,709	5,979
		Average	15,195	15,207	6,599

Well	Aquifer Test		Transmissivity (ft^2/day)		
	Pumping Rate (gpm)	Duration (days)	Aquifer Test	Modified GAM	GAM
PW-13	3110	36	15,871	15,756	8,453

Simulated Drawdown for PS-7

POSGCD DFCs

Aquifer	Drawdown (ft)(2010-2070)		Change in Drawdown (ft)
	GAM	Modifed GAM	
Carrizo	176	176	0
Calvert Bluff	182	183	-1
Simsboro	352	347	5
Hooper	220	220	0

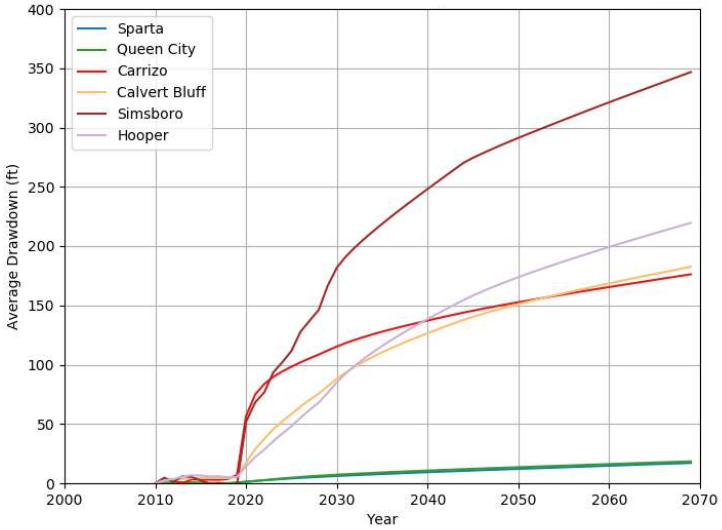
LPGCD DFCs

Aquifer	Drawdown (ft)(2010-2070)		Change in Drawdown (ft)
	GAM	Modifed GAM	
Carrizo	139	138	2
Calvert Bluff	161	156	4
Simsboro	332	317	15
Hooper	181	176	5

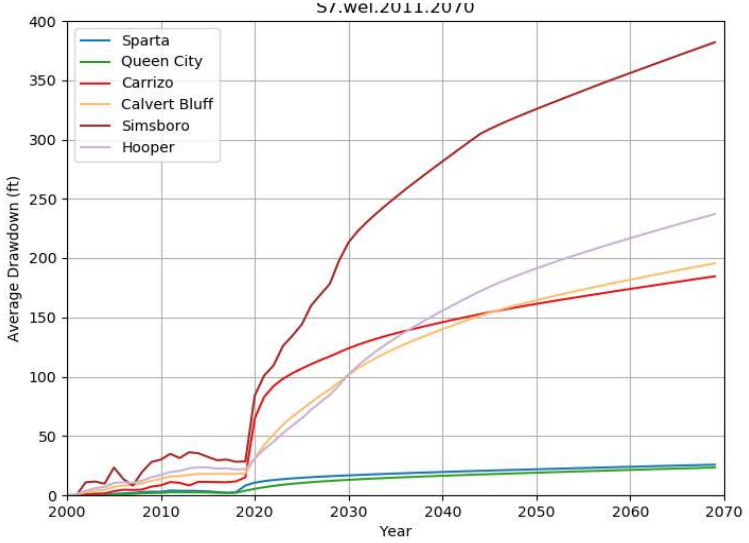
BVGCD DFCs

Aquifer	Drawdown (ft)(2010-2070)		Change in Drawdown (ft)
	GAM	Modifed GAM	
Carrizo	76	76	0
Calvert Bluff	95	97	-2
Simsboro	211	217	-5
Hooper	151	153	-3

GAM Results for POSGCD

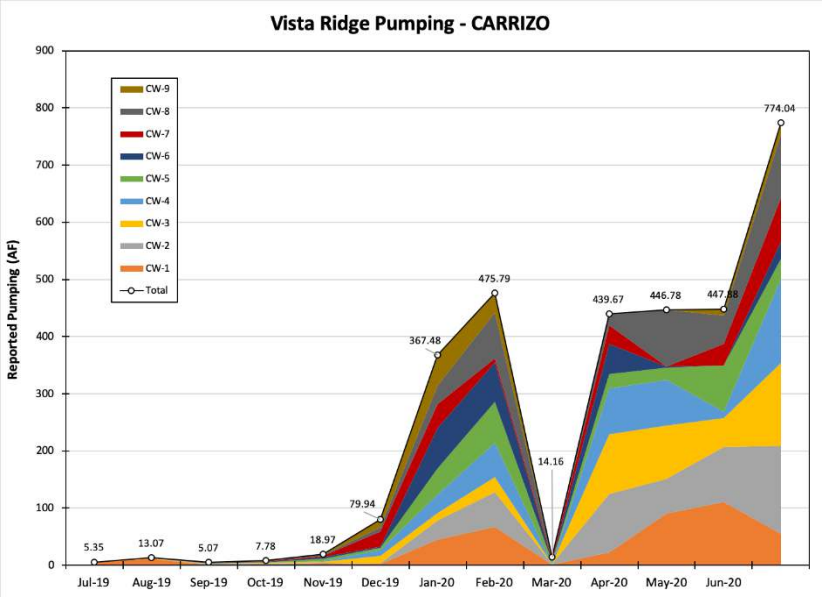


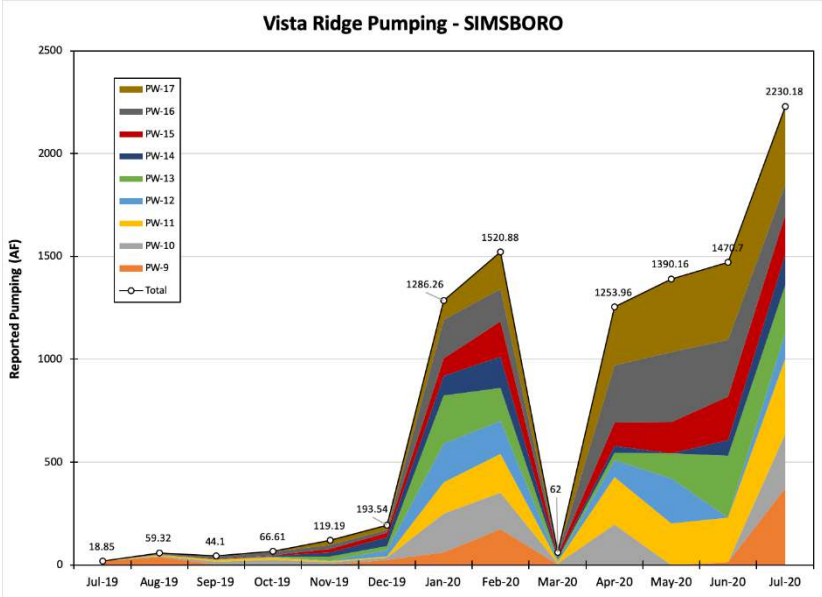
Modified GAM Results for POSGCD



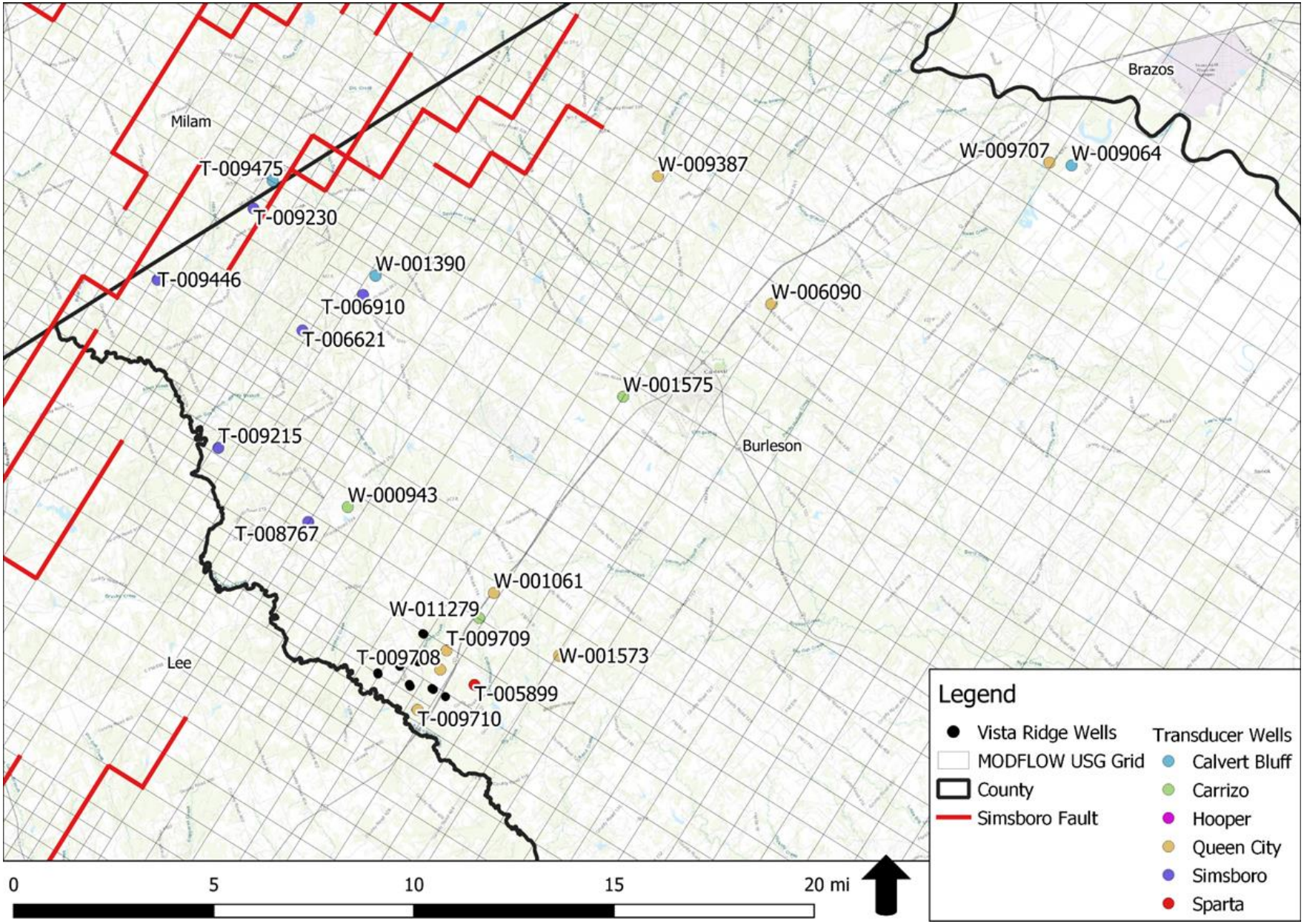
Vista Ridge Pumping Through July 2020

Month	Monthly acre-feet		
	Carrizo	Simsboro	Total
Dec 2019	80	193	273
Jan 2020	367	1,286	1,653
Feb 2020	476	1,520	1,996
Mar 2020	14	62	76
Apr 2020	439	1,253	1,692
May 2020	446	1,390	1,836
Jun 2020	447	1,471	1,918
Jul 2020	774	2,230	3,004
Monthly Permitted	1,250	2,920	4,170

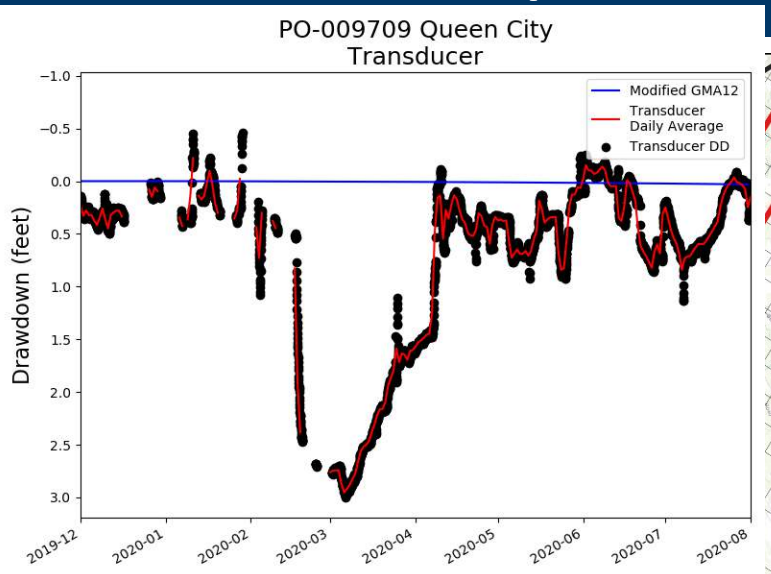


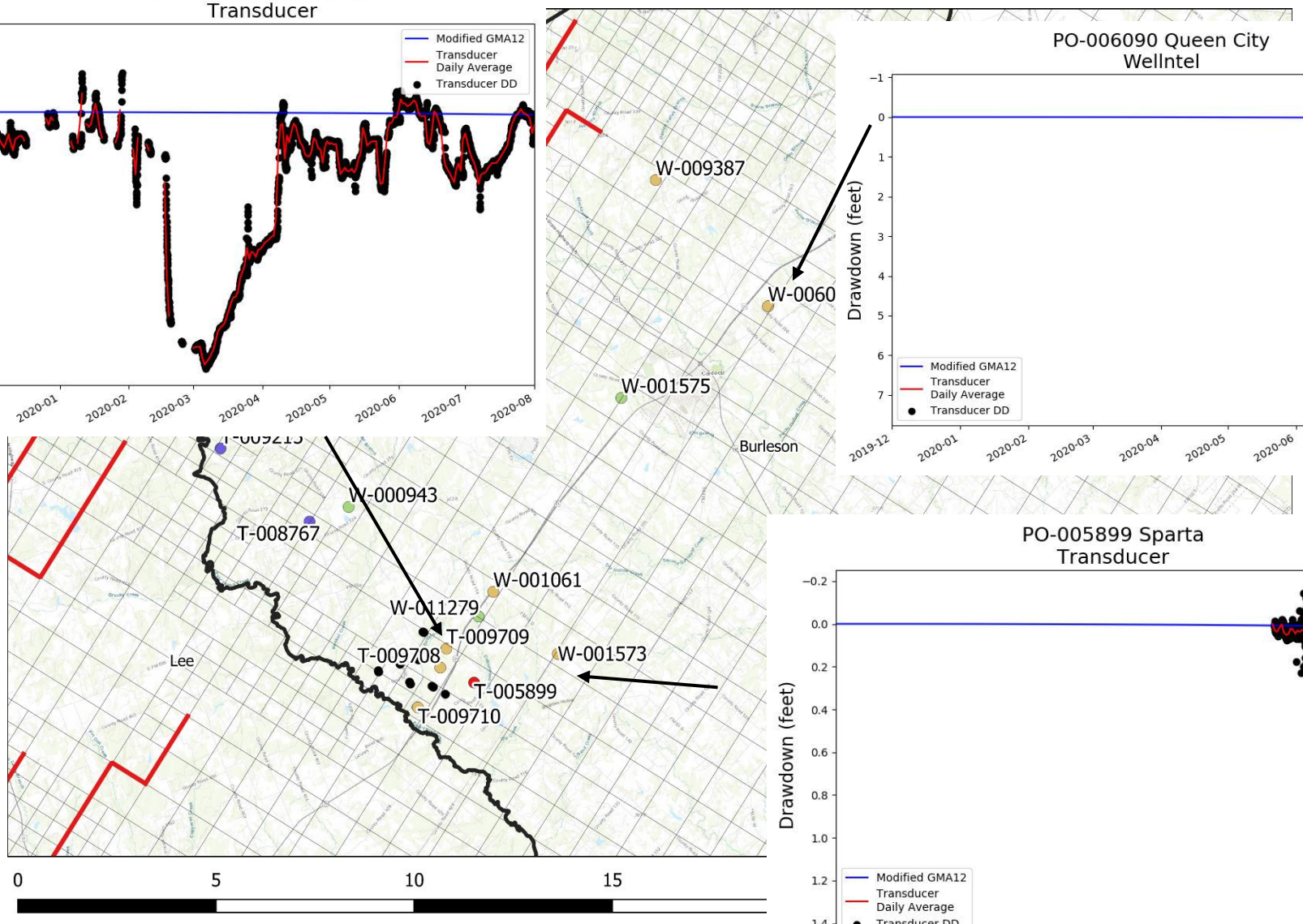


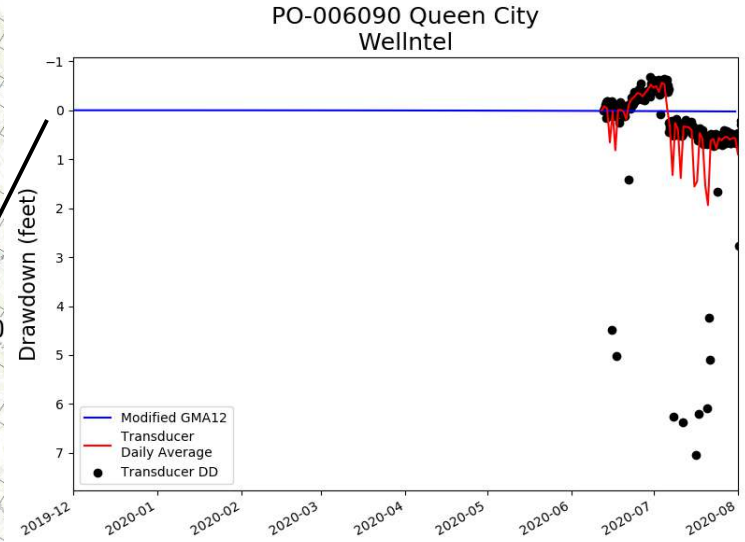
Location of Transducers

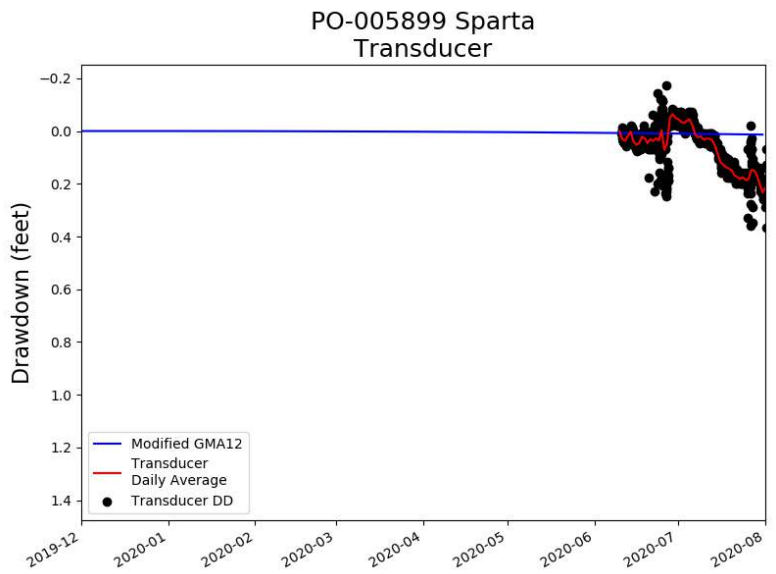


Sparta & Queen City

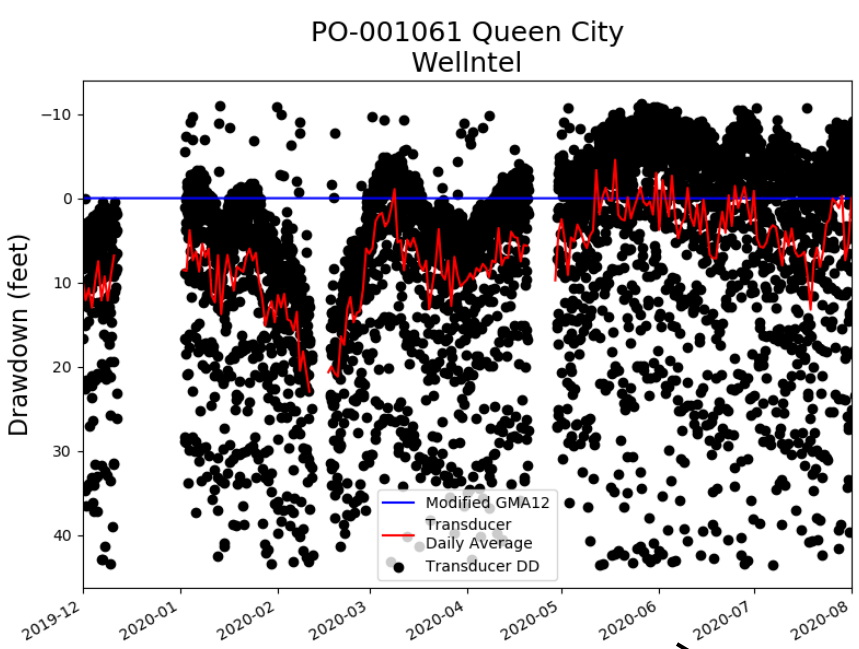


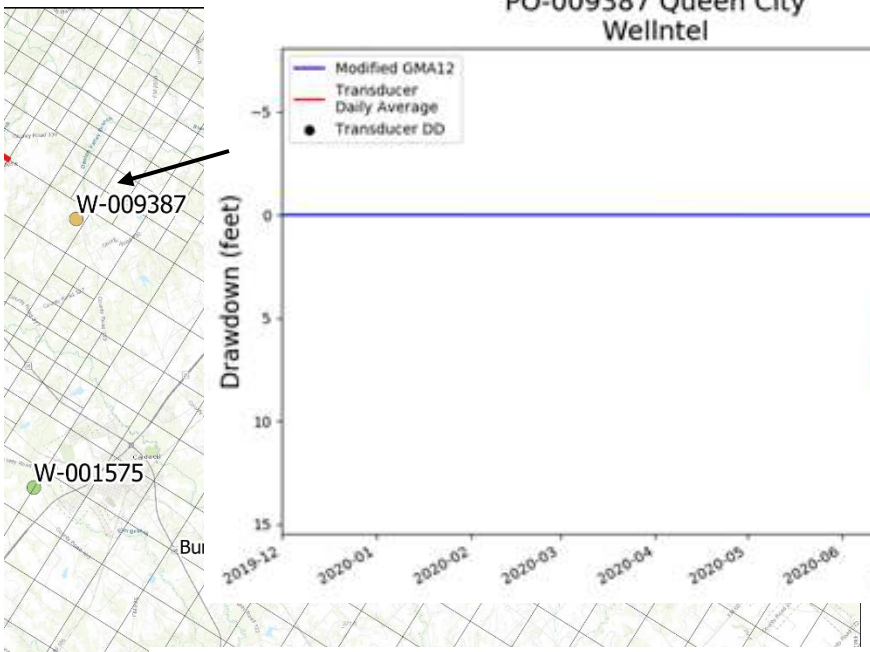






Queen City


PO-001061 Queen City
Wellntel
Drawdown (feet)
Modified GMA12
Transducer
Daily Average
Transducer DD
2019-12
2020-01
2020-02
2020-03
2020-04
2020-05
2020-06
2020-07
2020-08


W-009387
W-001575

PO-009387 Queen City
Wellntel
Drawdown (feet)
Modified GMA12
Transducer
Daily Average
Transducer DD
2019-12
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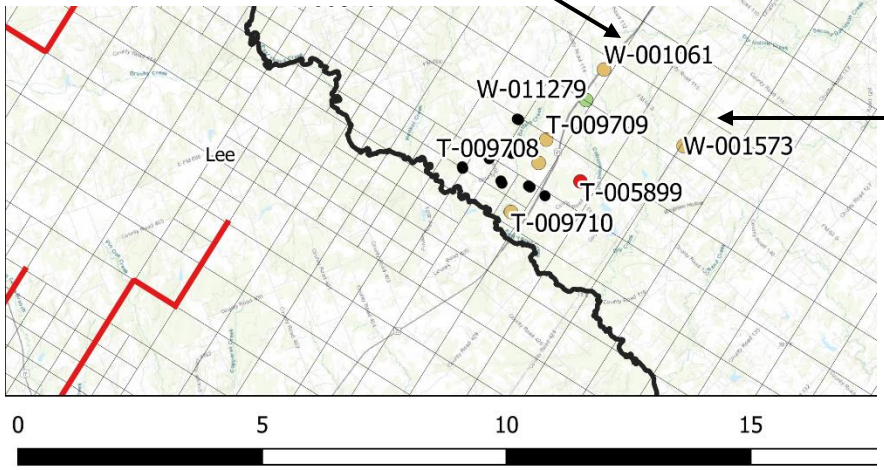
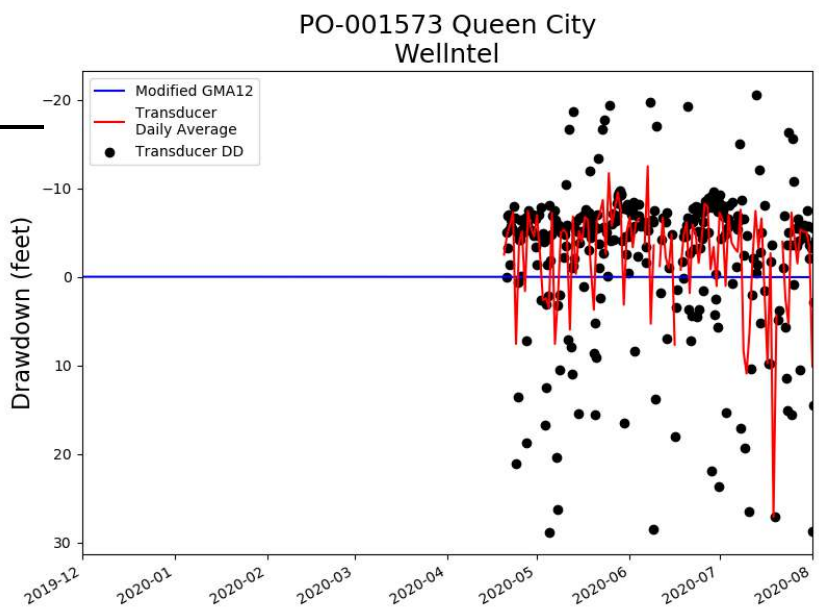
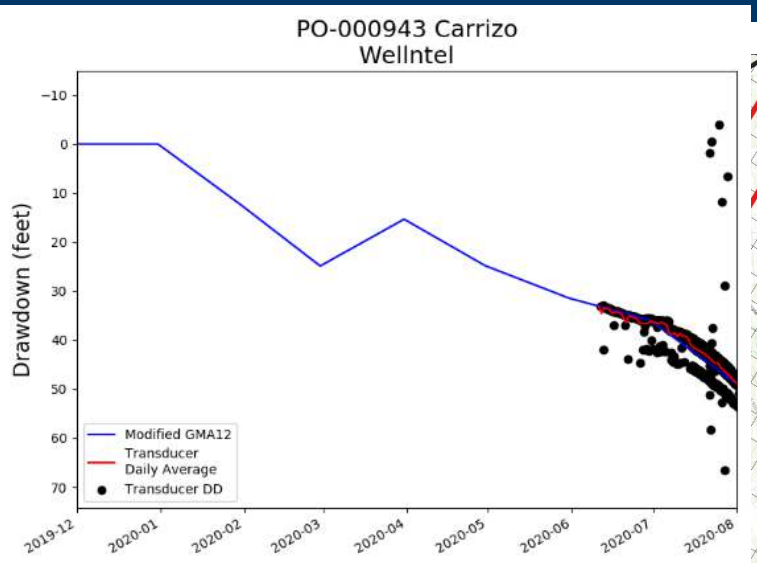
2020-02
2020-03
2020-04
2020-05
2020-06
2020-07
2020-08


W-001061
W-011279
T-009709
T-009708
W-001573
T-005899
T-009710
Lee
0
5
10
15


PO-001573 Queen City
Wellntel
Drawdown (feet)
Modified GMA12
Transducer
Daily Average
Transducer DD
2019-12
2020-01
2020-02
2020-03
2020-04
2020-05
2020-06
2020-07
2020-08

Carrizo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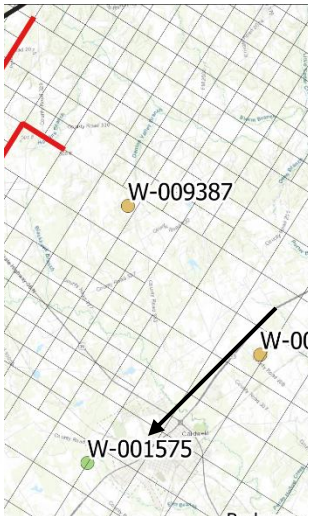
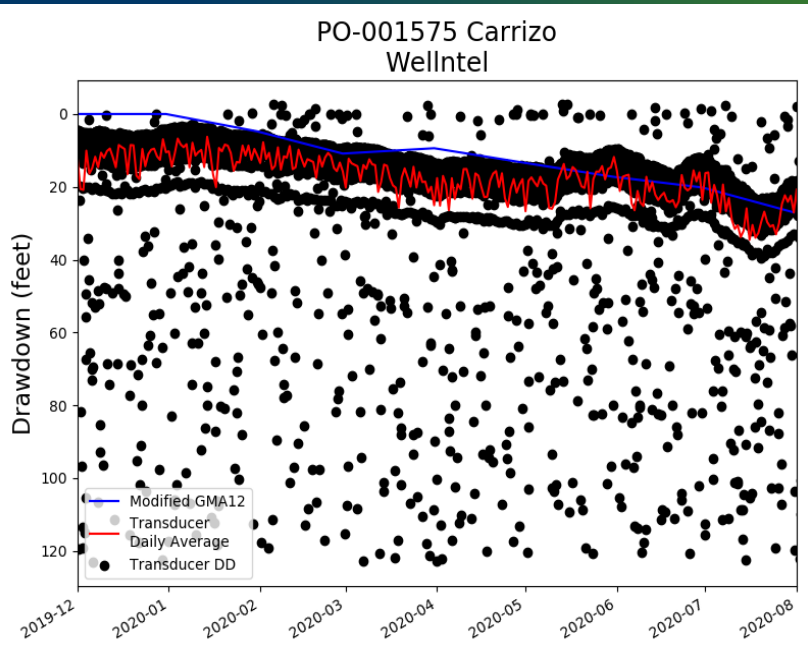
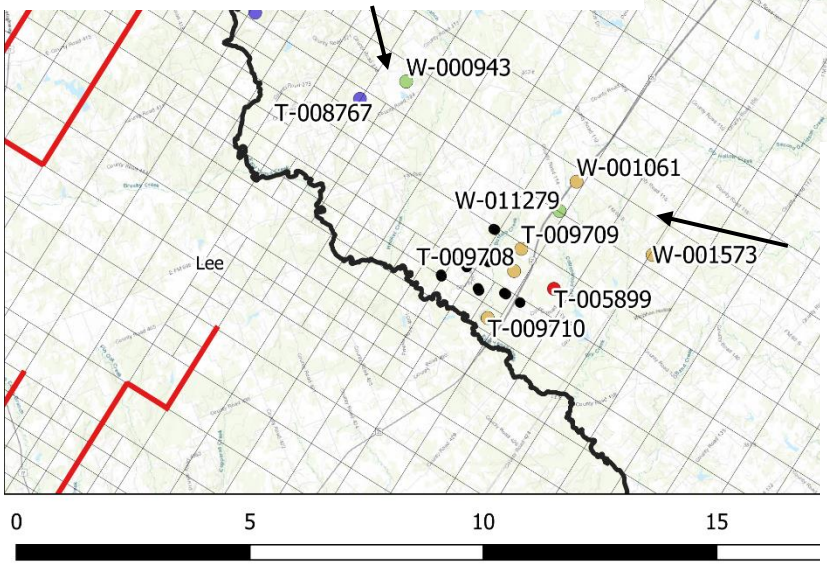
Wellntel
Drawdown (feet)
Modified GMA12
Transducer
Daily Average
Transducer DD


W-009387
W-001575
Burleson


PO-001575 Carrizo
Wellntel
Drawdown (feet)
Modified GMA12
Transducer
Daily Average
Transducer DD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Lee
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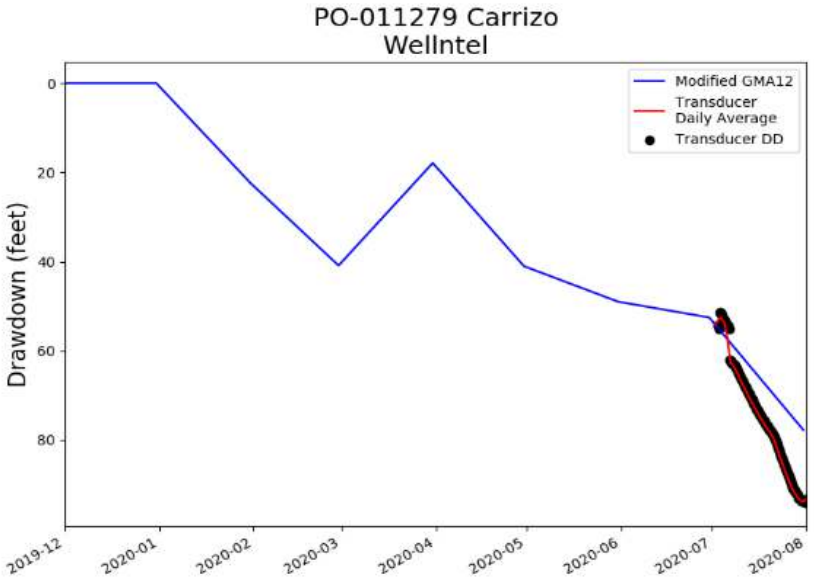
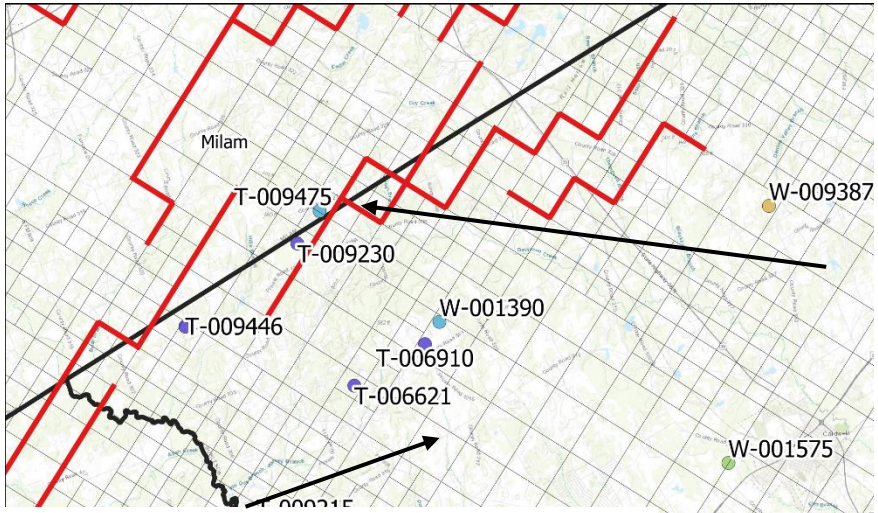
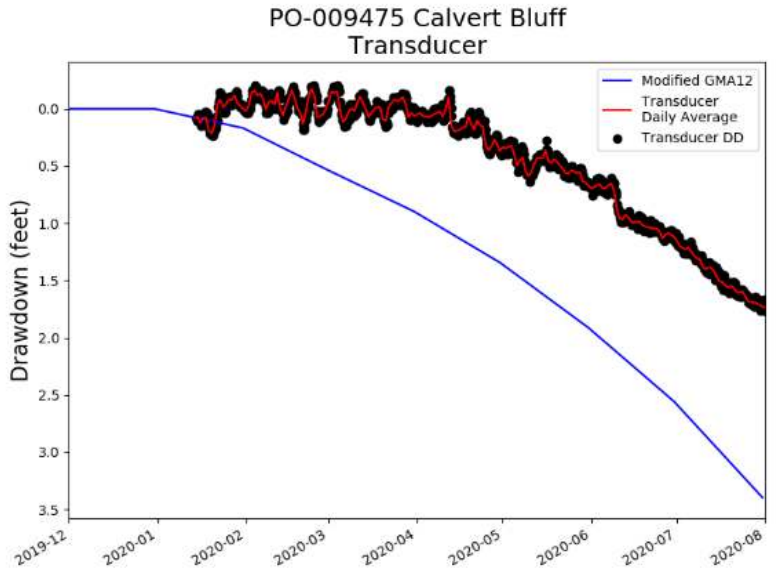
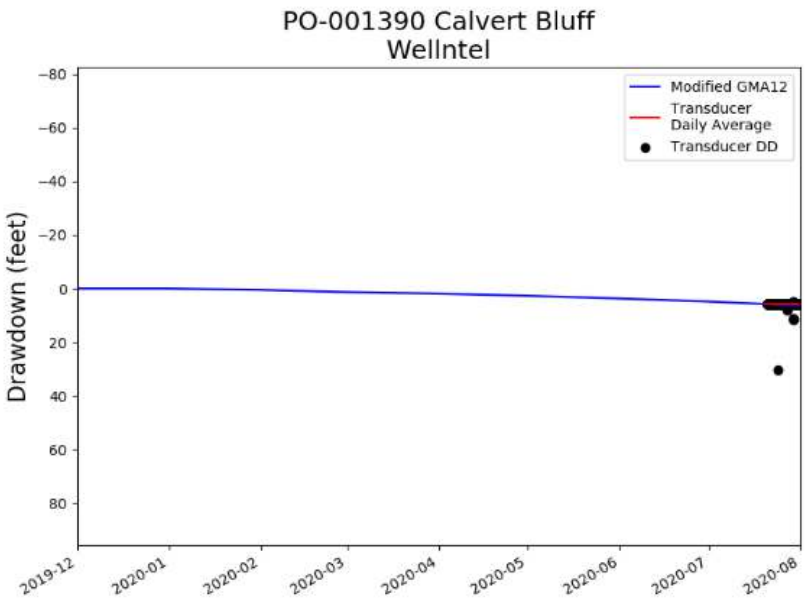
10
15

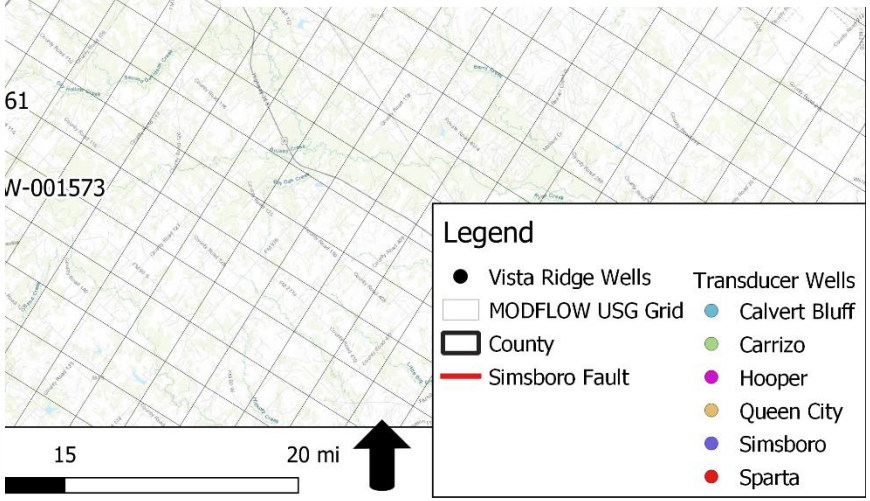

PO-011279 Carrizo
Wellntel
Drawdown (feet)
Modified GMA12
Transducer
Daily Average
Transducer DD

Calvert Bluff

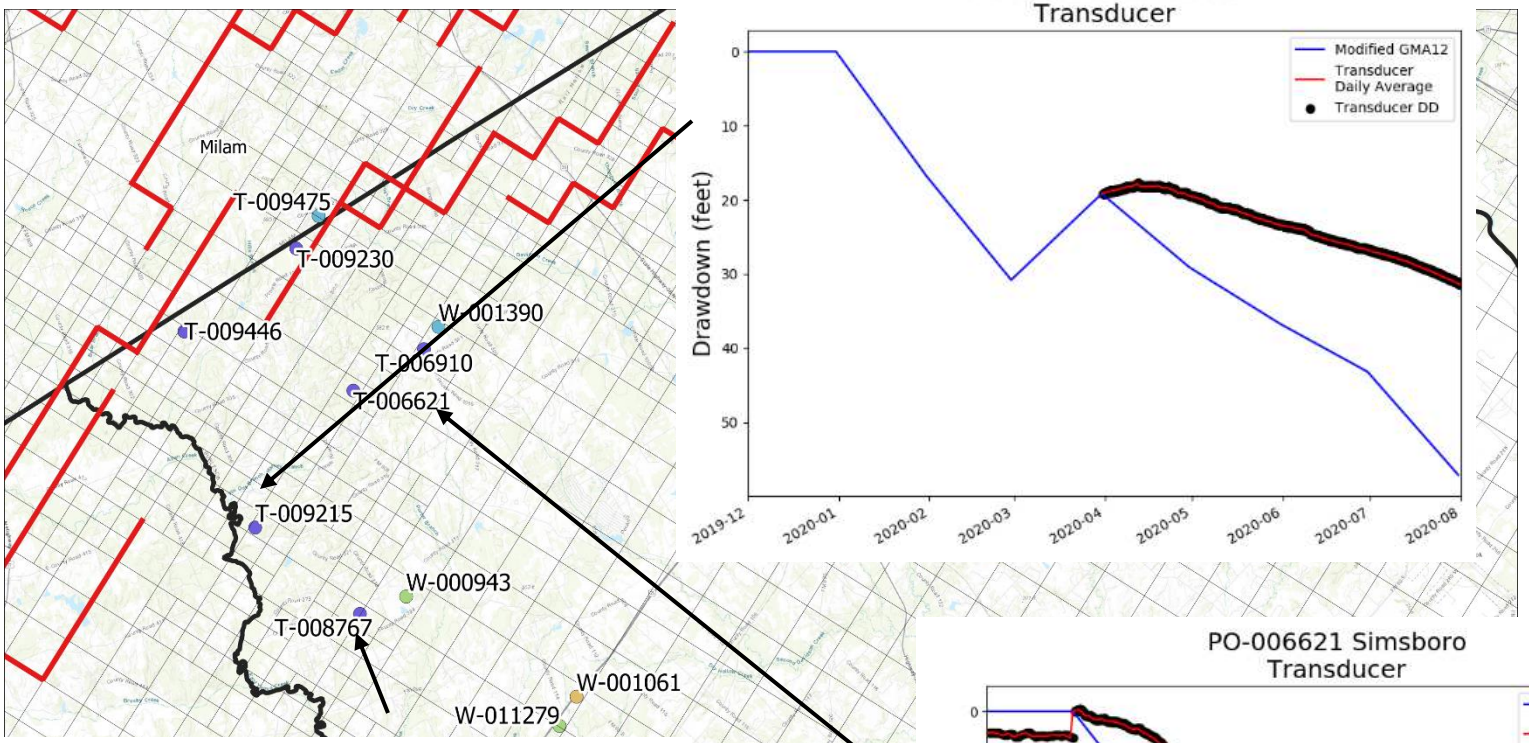


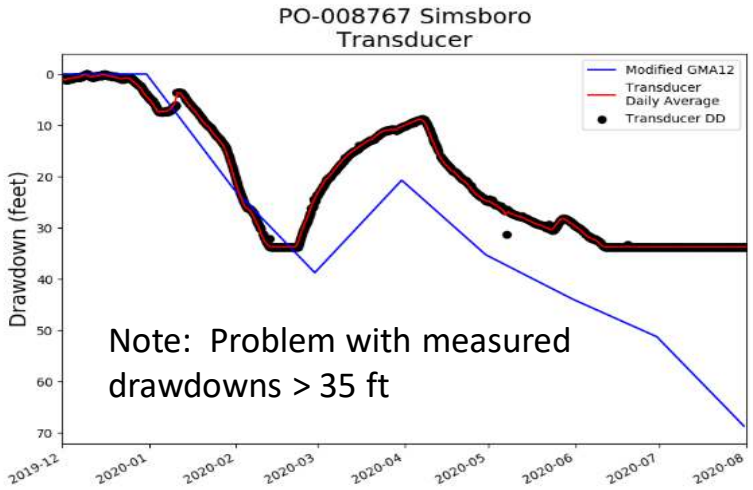




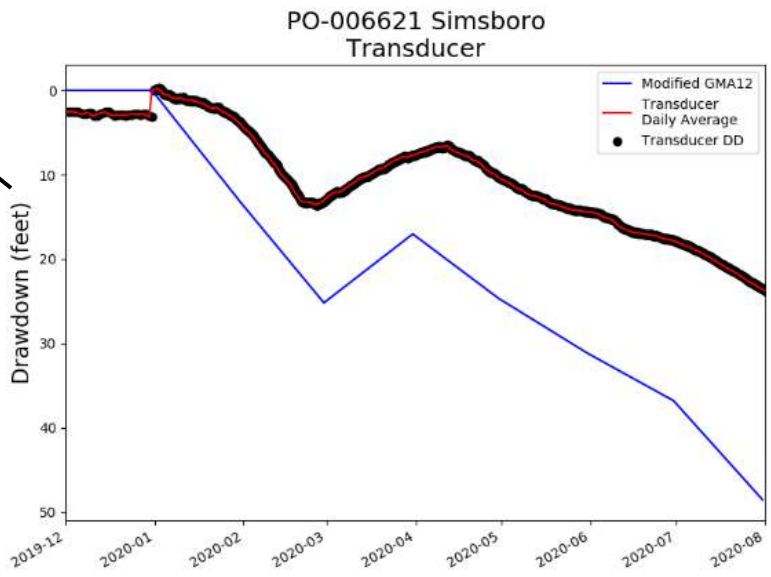


Simsboro

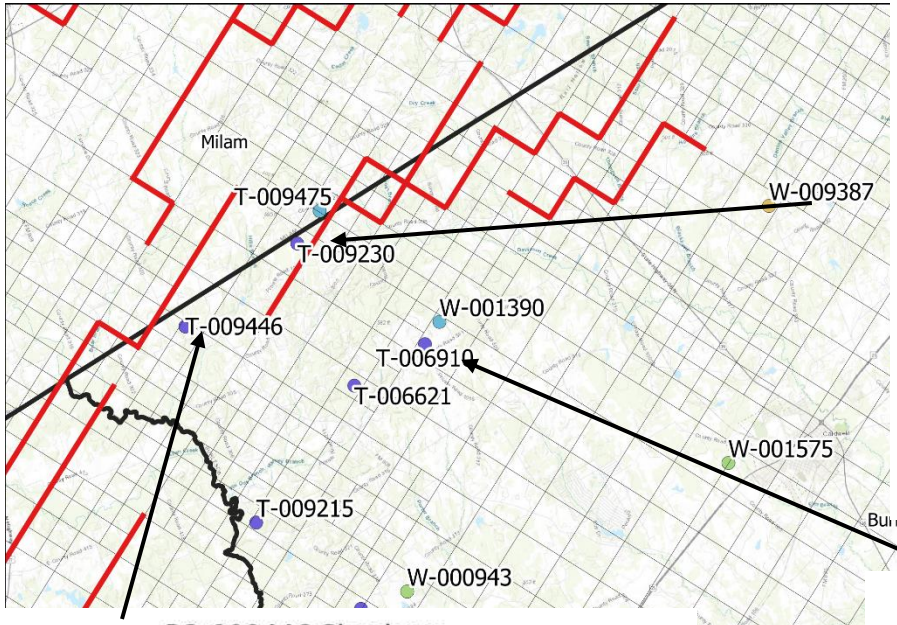


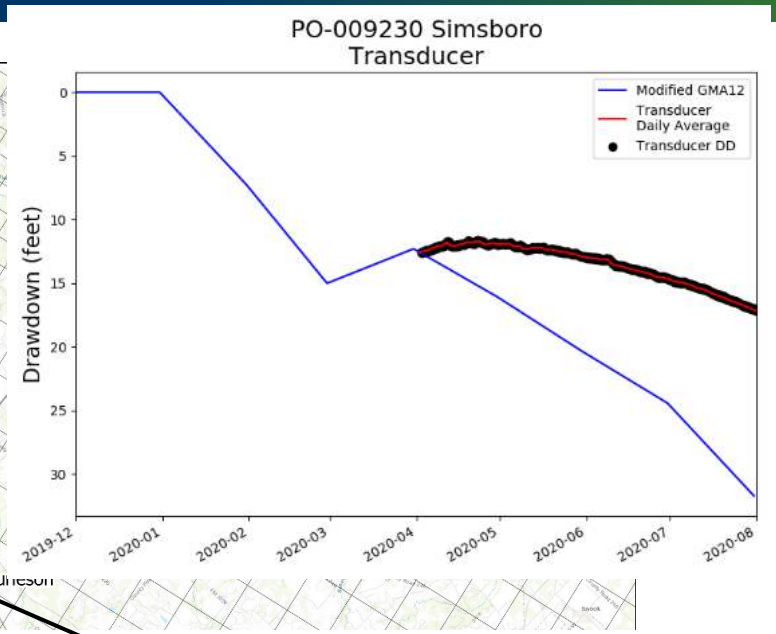


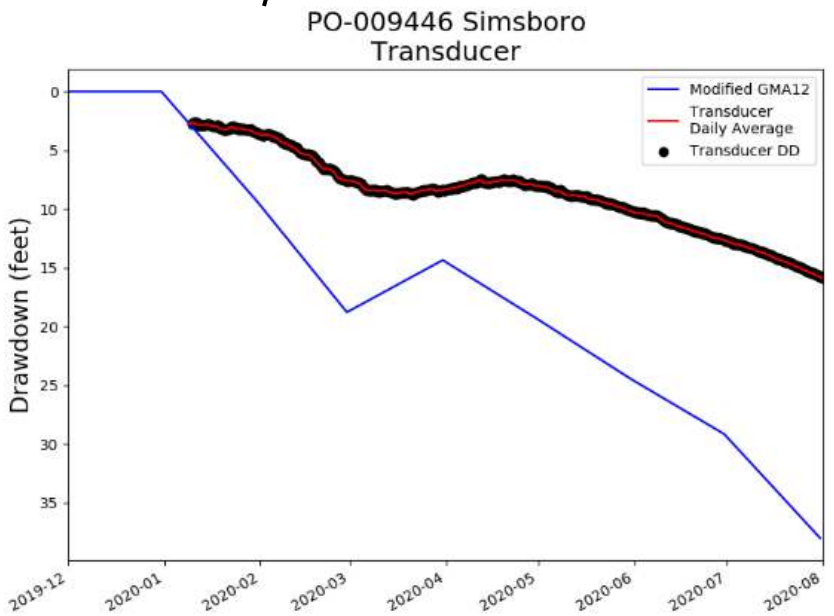
Note: Problem with measured drawdowns > 35 ft

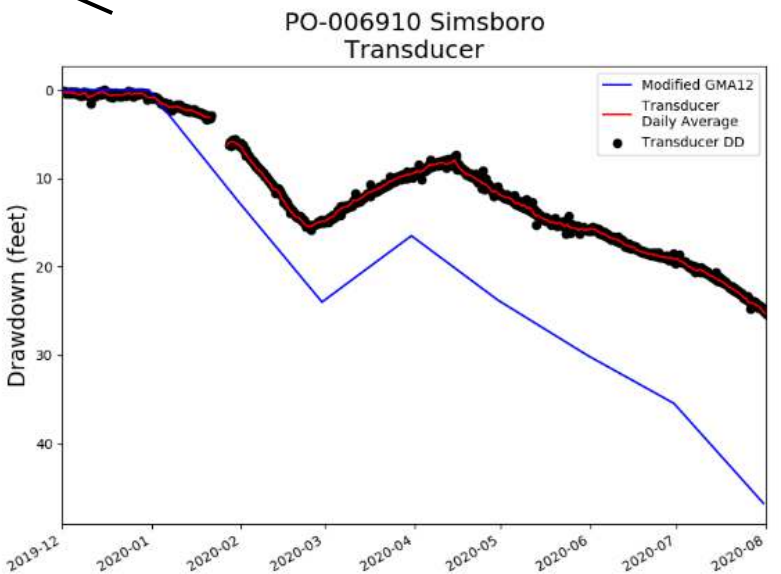


Simsboro (cont)

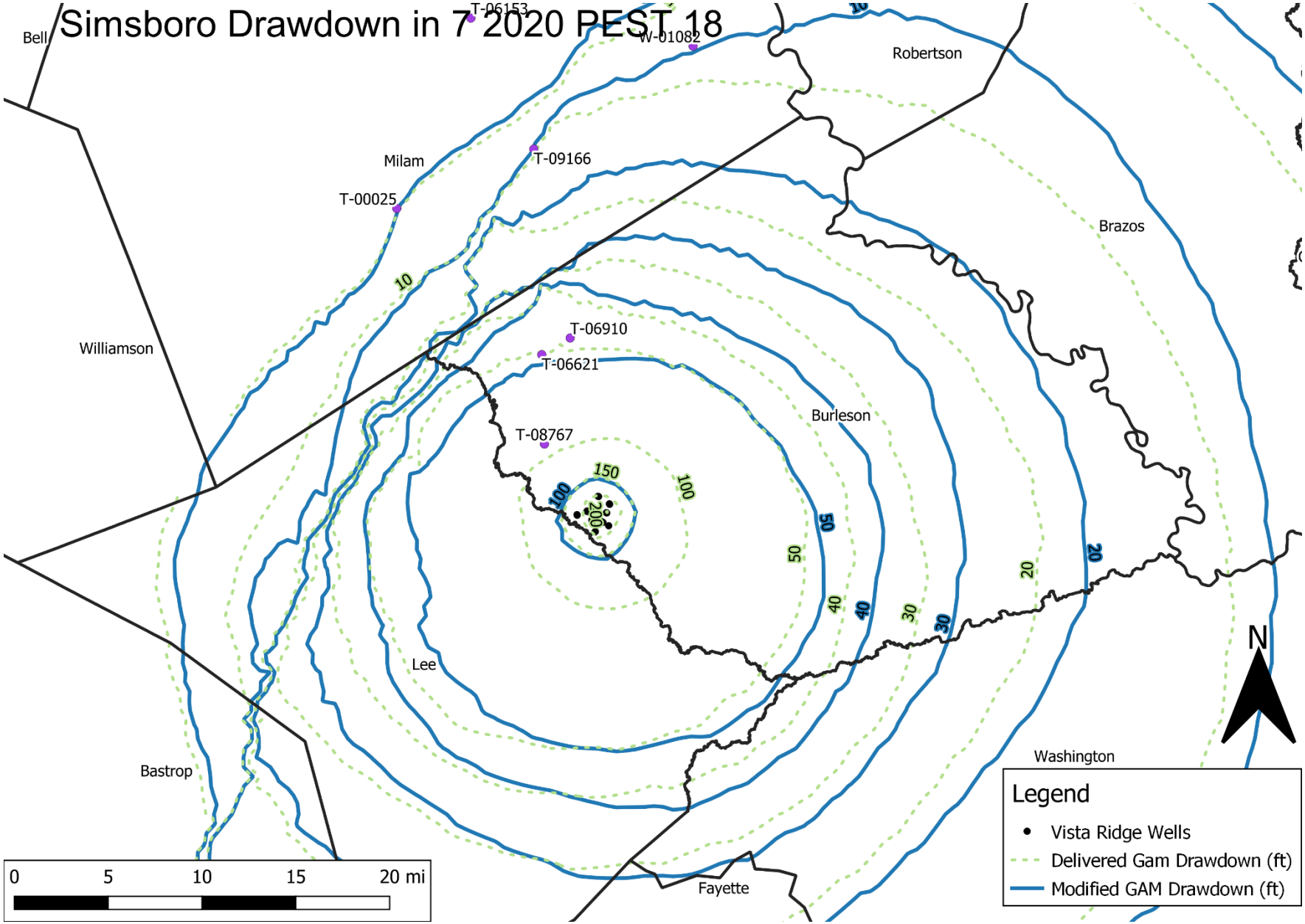




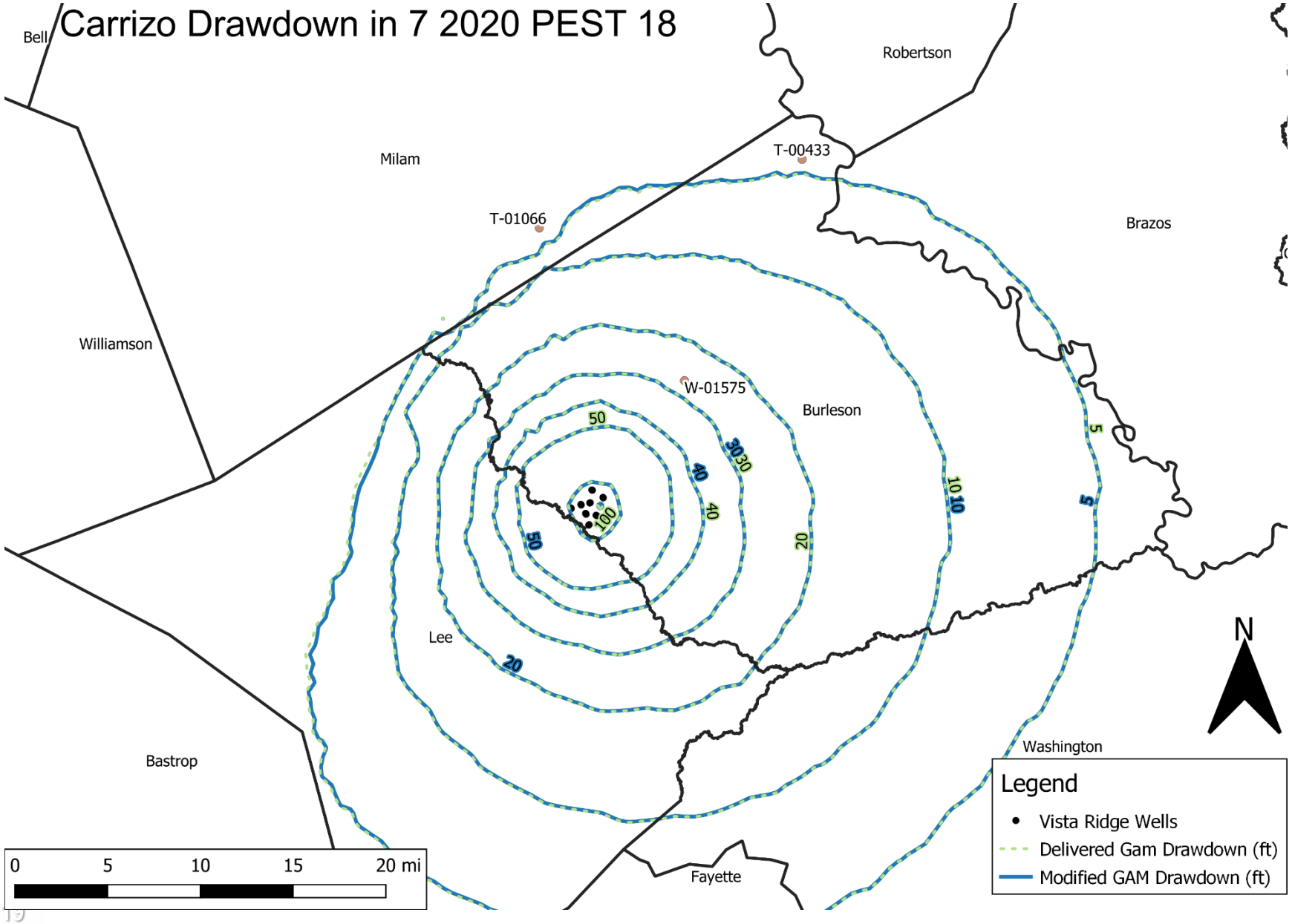




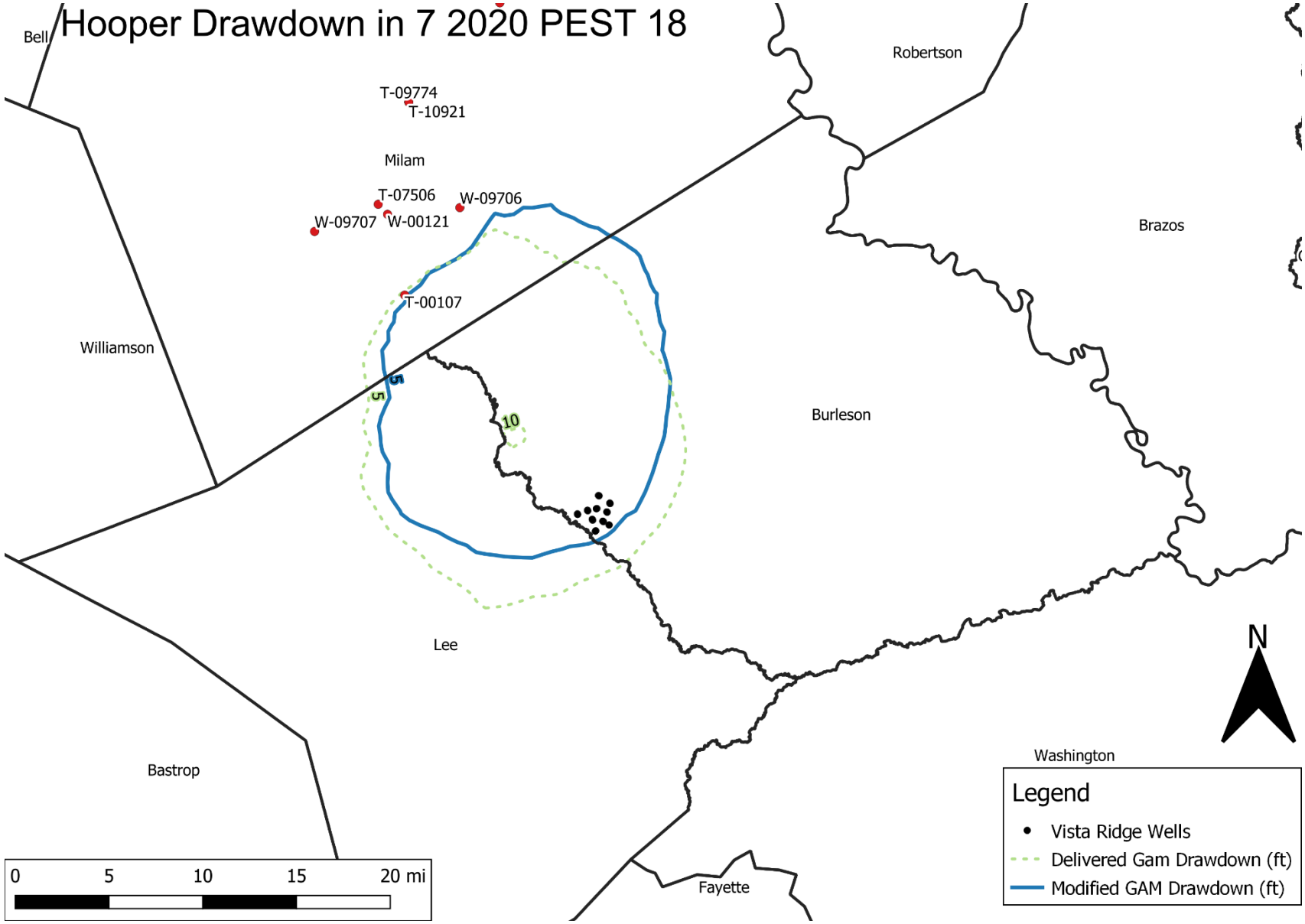
GAM and Modified GAM Drawdowns: Simsboro



GAM and Modified GAM Drawdowns: Carrizo



GAM and Modified GAM Drawdowns: Calvert Bluff



Observations: First 7 months

- All measured drawdowns are about the same or less than in any aquifer are greater than expected – no surprises
- No measurable impacts in Sparta or Queen City
- Measurable impacts in all formations in the Carrizo, Calvert Bluff, and Simsboro
- Revised GAM is over estimating drawdown in the Simsboro
- Revised GAM simulations are based on simple assumption
  - Assumes a steady-state condition in Dec. 2019 (this will underestimate drawdown)
  - One improvement is to use monthly pumping rates from all permits estimates in POSGCD

Suggested Changes to GWAP

Guidance for Developing Suggested Modifications

Discussion Questions from June DFC Committee Meeting

- Based strictly on modeling results?
- POSGD to assume “no-fault” policy and pay for all costs?
- What does “as soon as possible” mean?
- Should requirement be “pump being set at a depth that will exceed the 50-year water level decline” ?
- Who is responsible party to conduct investigation?
- What components comprise the investigation and evaluation?
- What is meaning of “aquifer-wide” pumping
- Is owner responsible for providing accurate well construction specifications?

Suggested Modifications

- Section 1 – Introduction
  - Revised mission statement
- Section 2 – Objectives
  - Remove to “up to ten years in advance”
  - Remove “secondary purpose to improve monitoring program”
  - Identify “high-priority” wells

Suggested Modifications

- Section 3 – Annual Assessments
  - Begin assessments in 2019
  - Remove require of presenting results by September
  - Remove the several hardwire requirements in GANA
  - Provide more flexible with the data and approach used in the GANA
  - Additional flexible allows for recognition of potential biases in GAM, in assumed aquifer properties, and in pumping estimates
  - POSGCD will use conservative assumptions to in-fill missing well construction information

Suggested Modifications

- Section 4 – Corrective Action
  - High-priority wells are candidates for corrective action
  - Removes requirement of setting pump depth to anticipated 50-year water level elevation and establishes as a guideline
- Section 5 – Investigation (Entirely New)
  - Funding will be based on the findings of an investigation
  - Identifies eight tasks with the investigation

Suggested Modifications

- Section 5 – Investigation (Entirely New)

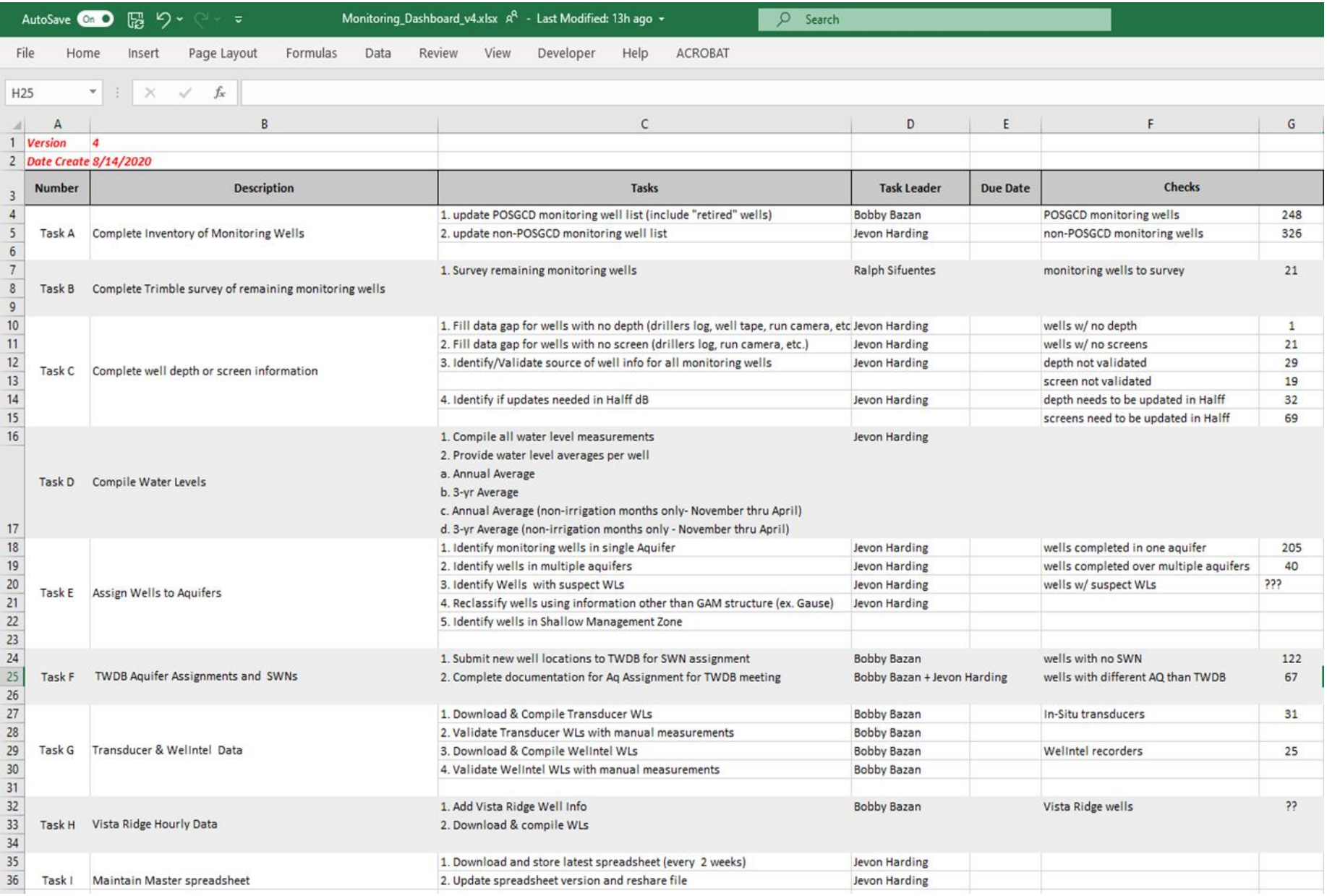
1) POSGCD contacts the well owner of an identified high-priority well to discuss the GANA findings and to schedule a well inspection.
2) POSGCD performs well inspection to gather information (well construction, etc.) required to continue the investigation.
3) POSGCD gathers information on nearby wells to determine how local pumping could impact the water levels in the high-priority well.
4) POSGCD evaluates the condition of the well and pump and the adequacy of the well design.
5) POSGCD documents why the well is unable to produce an adequate amount of groundwater. If multiple causes, POSGCD will rank these in order of importance for corrective action.
6) POSGCD assesses the options for corrective actions and discusses these options with the well owner.
7) POSGCD documents recommendations for the type of corrective action and amount of financial assistance to the well owner and provides these recommendations to the POSGCD Board for consideration.
8) POSGCD meets with the well owner to discuss a path forward based on the decision of the POSGCD Board.

Suggested Modifications

- Section 6 – GWAP Funding
  - Removal of "District will cover all costs associated with this program for qualifying wells"
  - Removal of provide 105% of District estimated costs if well owner selects more expensive option
- Section 7 – Administration of GWAP
  - Trinity wells are excluded
- Section 8 – Eligibility
  - Removed requirement to be in the monitoring well network

Completion of Monitoring Dashboard

Monitoring Dashboard: Overview



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H25

	A	B	C	D	E	F	G
1	*Version*	*4*					
2	*Date Create*	*8/14/2020*					
3	**Number**	**Description**	**Tasks**	**Task Leader**	**Due Date**	**Checks**	
4	Task A	Complete Inventory of Monitoring Wells	1. update POSGCD monitoring well list (include "retired" wells)	Bobby Bazan		POSGCD monitoring wells	248
5			2. update non-POSGCD monitoring well list	Jevon Harding		non-POSGCD monitoring wells	326
6							
7	Task B	Complete Trimble survey of remaining monitoring wells	1. Survey remaining monitoring wells	Ralph Sifuentes		monitoring wells to survey	21
8							
9							
10	Task C	Complete well depth or screen information	1. Fill data gap for wells with no depth (drillers log, well tape, run camera, etc	Jevon Harding		wells w/ no depth	1
11			2. Fill data gap for wells with no screen (drillers log, run camera, etc.)	Jevon Harding		wells w/ no screens	21
12			3. Identify/Validate source of well info for all monitoring wells	Jevon Harding		depth not validated	29
13						screen not validated	19
14			4. Identify if updates needed in Halff dB	Jevon Harding		depth needs to be updated in Halff	32
15						screens need to be updated in Halff	69
16	Task D	Compile Water Levels	1. Compile all water level measurements 2. Provide water level averages per well a. Annual Average b. 3-yr Average c. Annual Average (non-irrigation months only- November thru April) d. 3-yr Average (non-irrigation months only - November thru April)	Jevon Harding			
17							
18	Task E	Assign Wells to Aquifers	1. Identify monitoring wells in single Aquifer	Jevon Harding		wells completed in one aquifer	205
19			2. Identify wells in multiple aquifers	Jevon Harding		wells completed over multiple aquifers	40
20			3. Identify Wells with suspect WLs	Jevon Harding		wells w/ suspect WLs	???
21			4. Reclassify wells using information other than GAM structure (ex. Gause)	Jevon Harding			
22			5. Identify wells in Shallow Management Zone				
23							
24	Task F	TWDB Aquifer Assignments and SWNs	1. Submit new well locations to TWDB for SWN assignment	Bobby Bazan		wells with no SWN	122
25			2. Complete documentation for Aq Assignment for TWDB meeting	Bobby Bazan + Jevon Harding		wells with different AQ than TWDB	67
26							
27	Task G	Transducer & WellIntel Data	1. Download & Compile Transducer WLs	Bobby Bazan		In-Situ transducers	31
28			2. Validate Transducer WLs with manual measurements	Bobby Bazan			
29			3. Download & Compile WellIntel WLs	Bobby Bazan		WellIntel recorders	25
30			4. Validate WellIntel WLs with manual measurements	Bobby Bazan			
31							
32	Task H	Vista Ridge Hourly Data	1. Add Vista Ridge Well Info	Bobby Bazan		Vista Ridge wells	??
33			2. Download & compile WLs				
34							
35	Task I	Maintain Master spreadsheet	1. Download and store latest spreadsheet (every 2 weeks)	Jevon Harding			
36			2. Update spreadsheet version and reshare file	Jevon Harding			

Monitoring Dashboard: Purpose

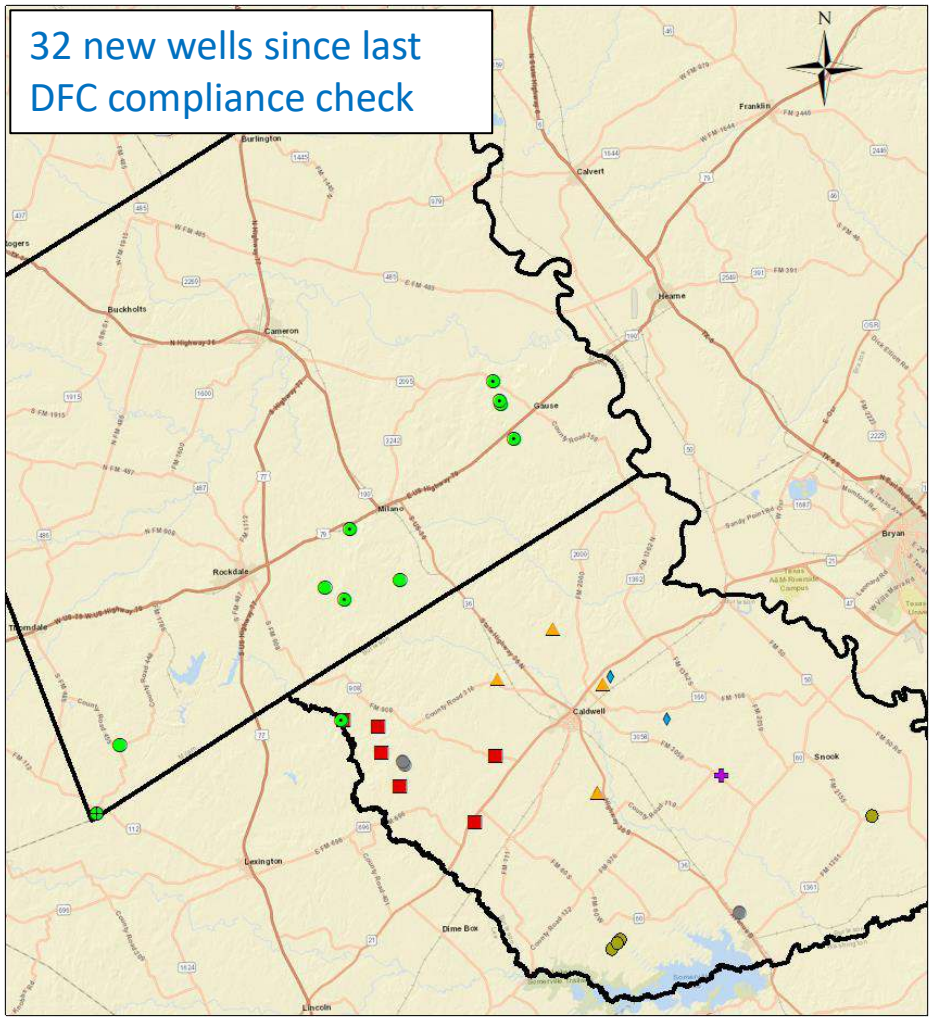
- Thorough documentation
  - Paper trail for well aquifer assignments, water well levels, well construction
  - Provides info and backup for assumptions & calculations associated with data analysis
- Repository
  - DFC compliance
  - Water levels (3-year average, seasonal and yearly average, flagged data)
  - Extensive transducer data and checks with manual measurements (still in progress)
  - Vista Ridge Data

Monitoring Dashboard: Purpose (con't)

- Platform for Coordination with District
  - Provides transparency and clarity to data & calculations
  - Can be updated in real time
  - Provides ability to communicate and coordinate efficiently
- Streamlined Master Datasets
  - Helps provides high level of quality control
  - Provides ability to access large amount information from numerous wells
  - Provides ability to manage data using a wide range of formats
  - Comprehensive information set readily available for use by programs

Monitoring Dashboard: New Data

32 new wells since last DFC compliance check



Monitoring Wells

- BRAA
- Yegua/Jackson (4)
- Sparta (3)
- Reklaw/Weches/Cook (1)
- Queen City (4)
- Carrizo (6)
- Calvert Bluff (7)
- Simsboro (3)
- Hooper (1)
- Below Hooper
- No Assignment (Depth unknown) (3)

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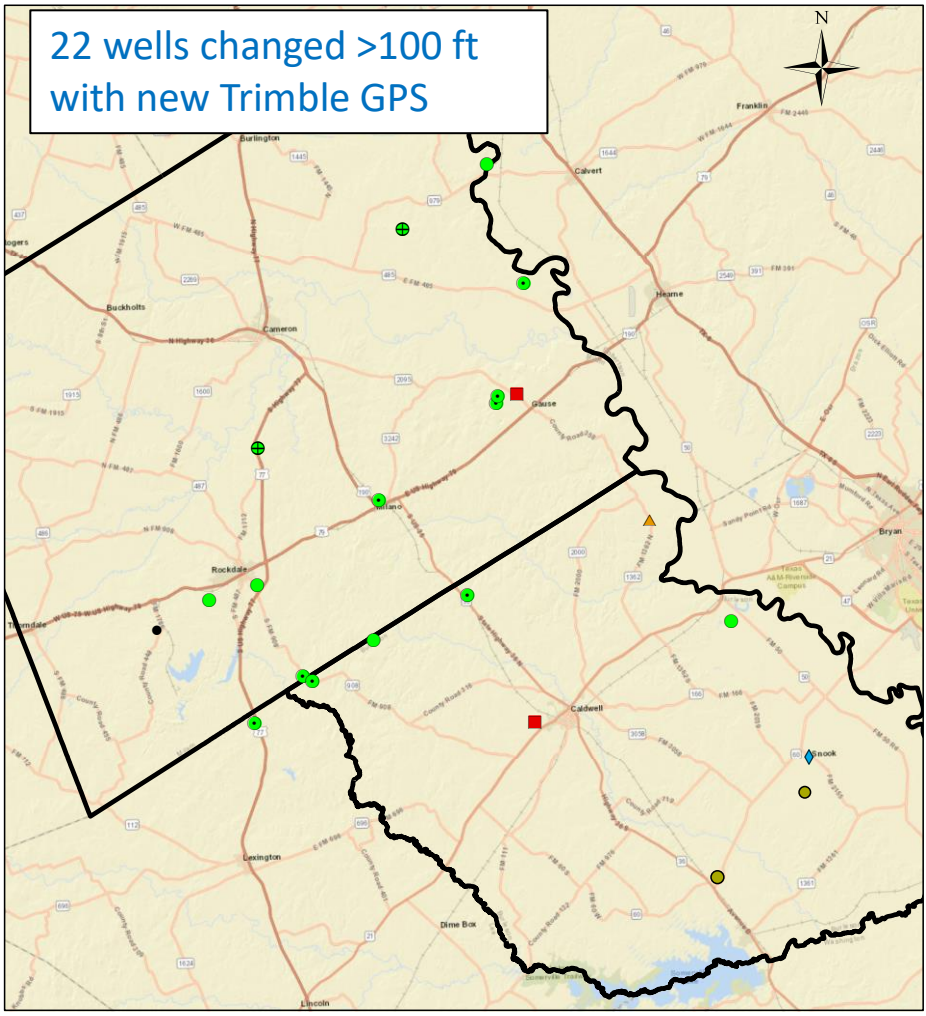
22 wells changed >100 ft with new Trimble GPS



Monitoring Wells

- BRAA
- Yegua/Jackson (2)
- Sparta (1)
- Reklaw/Weches/Cook
- Queen City (1)
- Carrizo (2)
- Calvert Bluff (8)
- Simsboro (5)
- Hooper (2)
- Below Hooper (1)
- No Assignment (Depth unknown)

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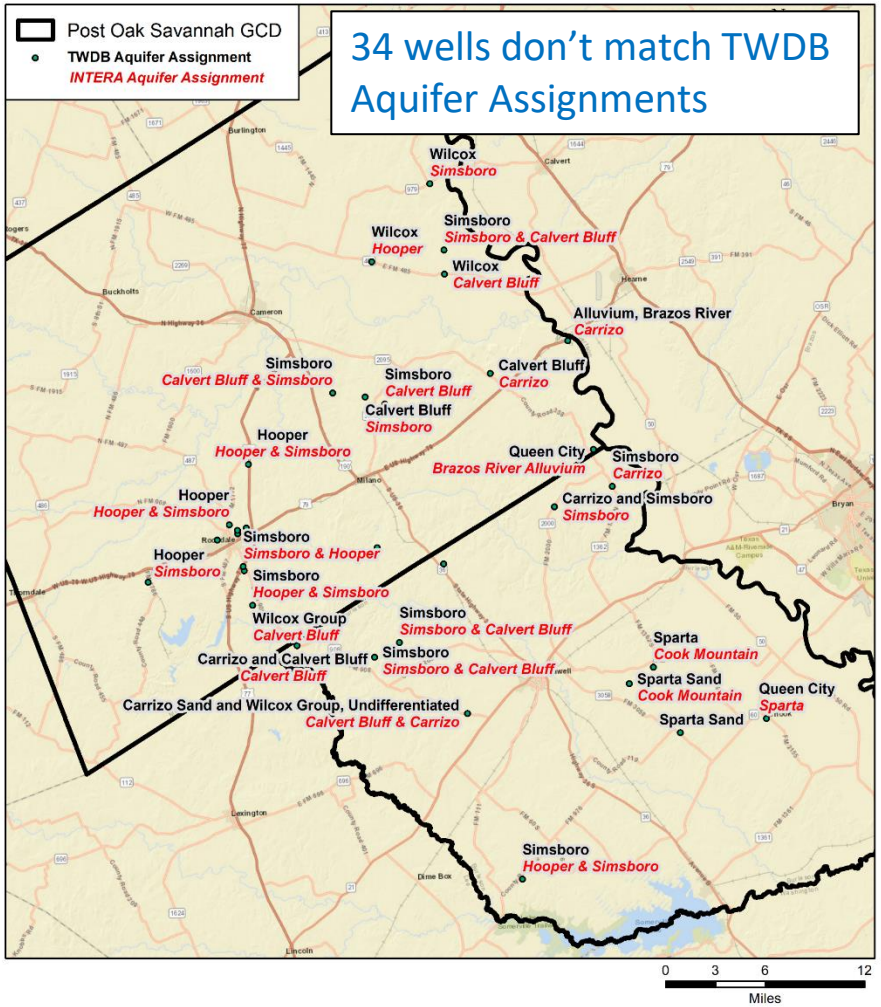
Monitoring Dashboard: TWDB Checks



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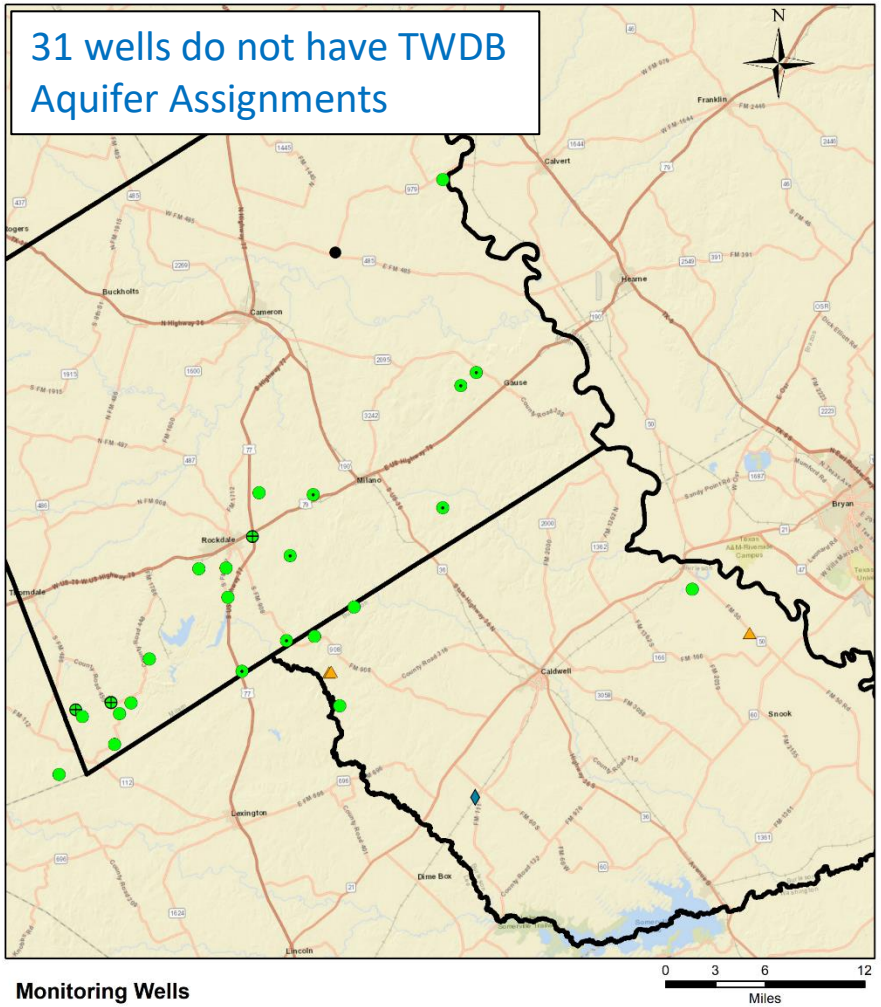

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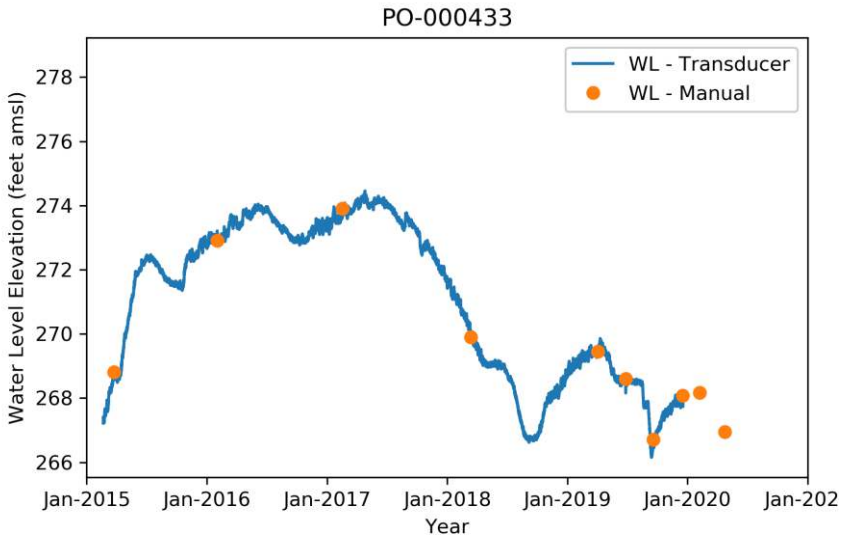
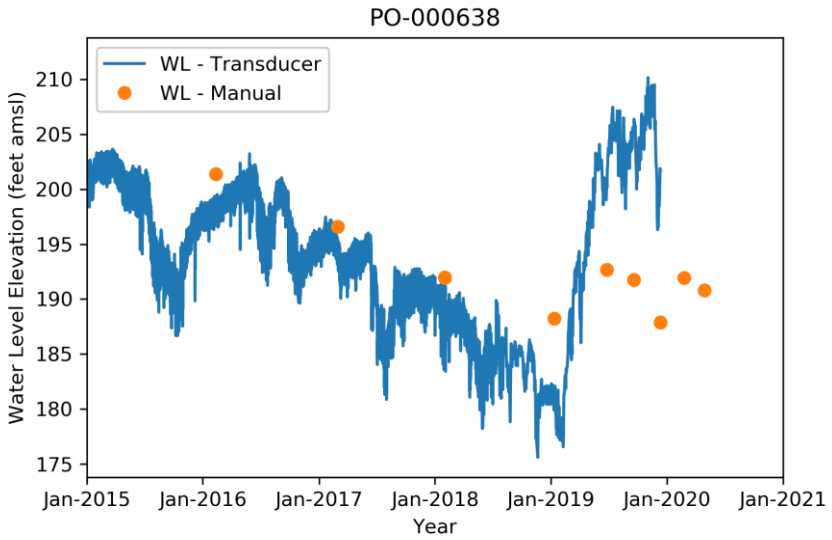
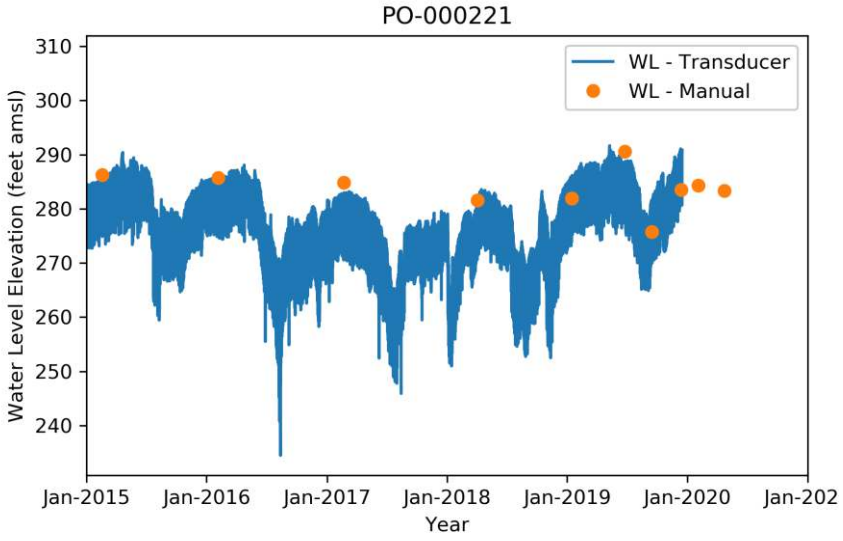
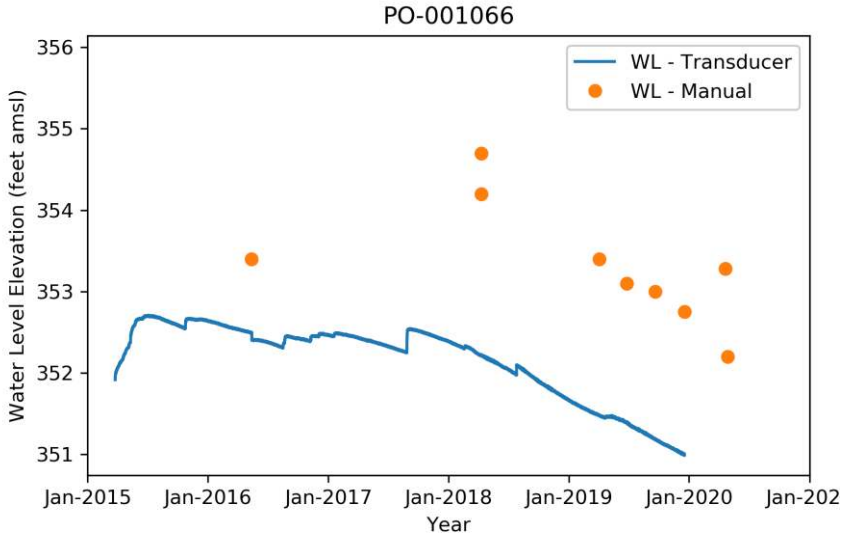
Monitoring Dashboard: Transducer

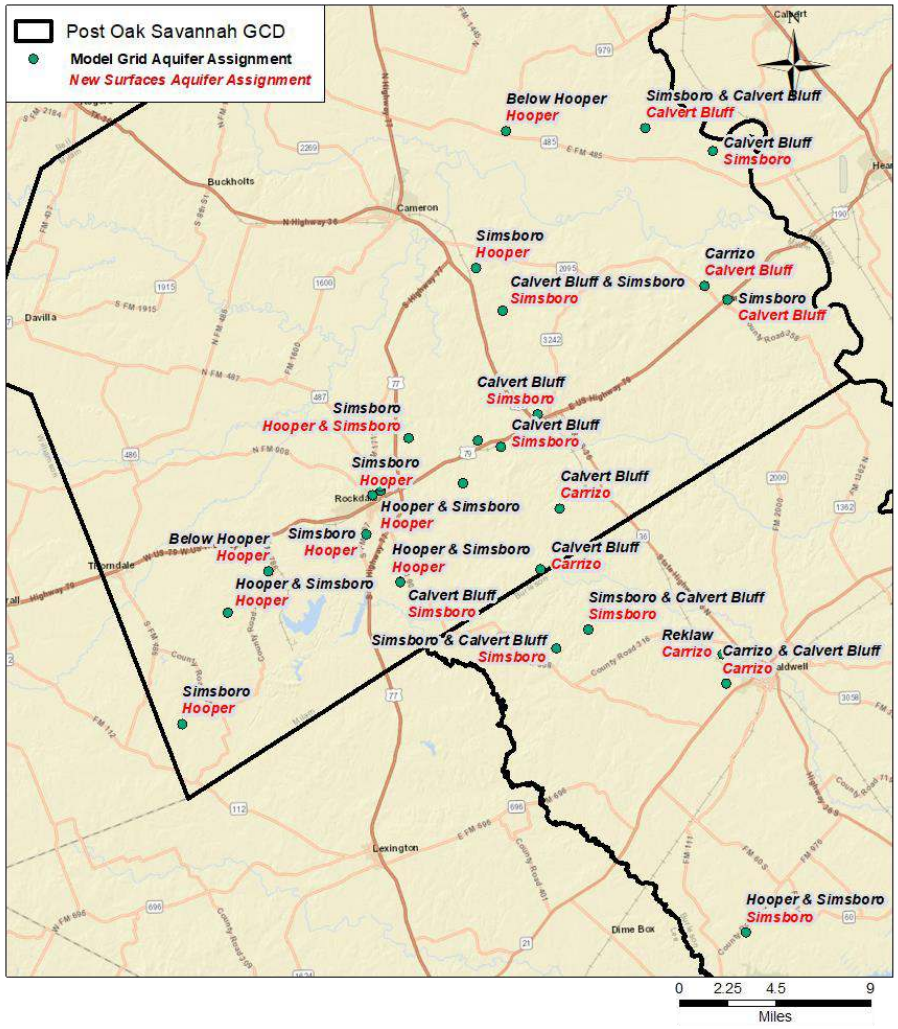








Monitoring Dashboard: Aquifer Assignments



30 Wells have a different Aq Assignment based on new surfaces

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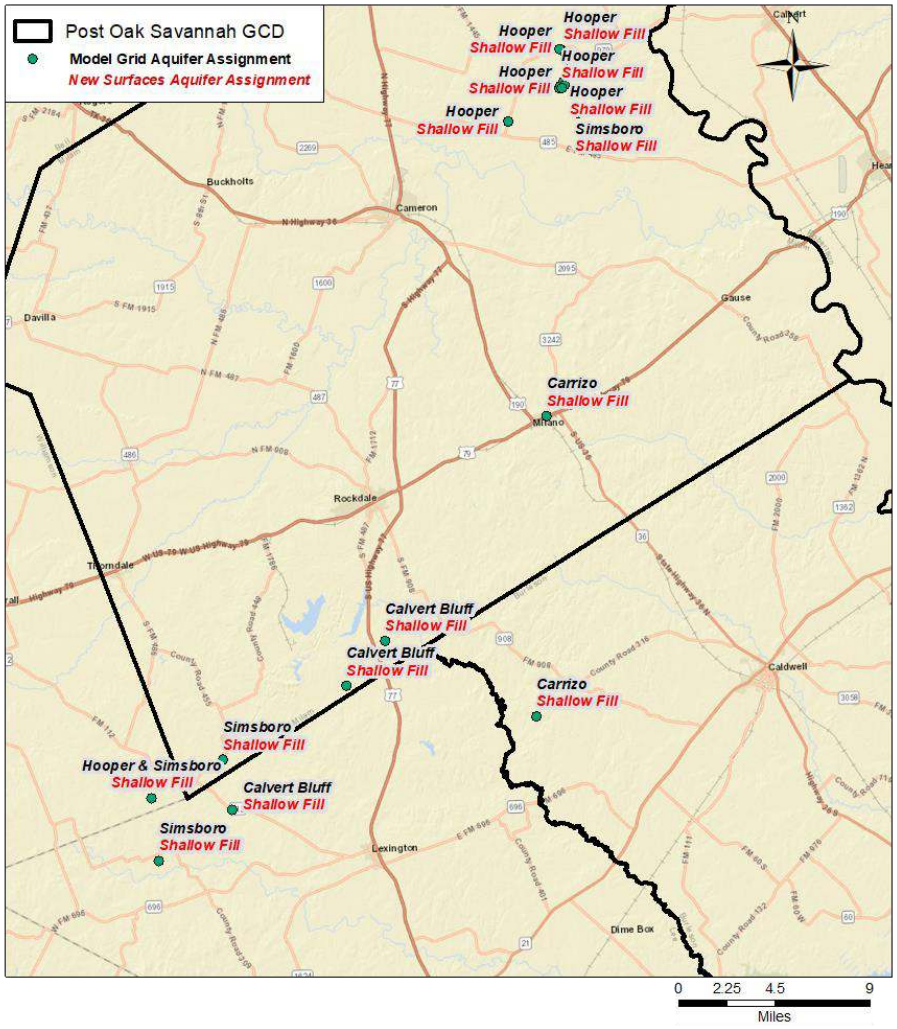

18 Wells were above new Carrizo-Wilcox surfaces (assigned "Shallow Fill")

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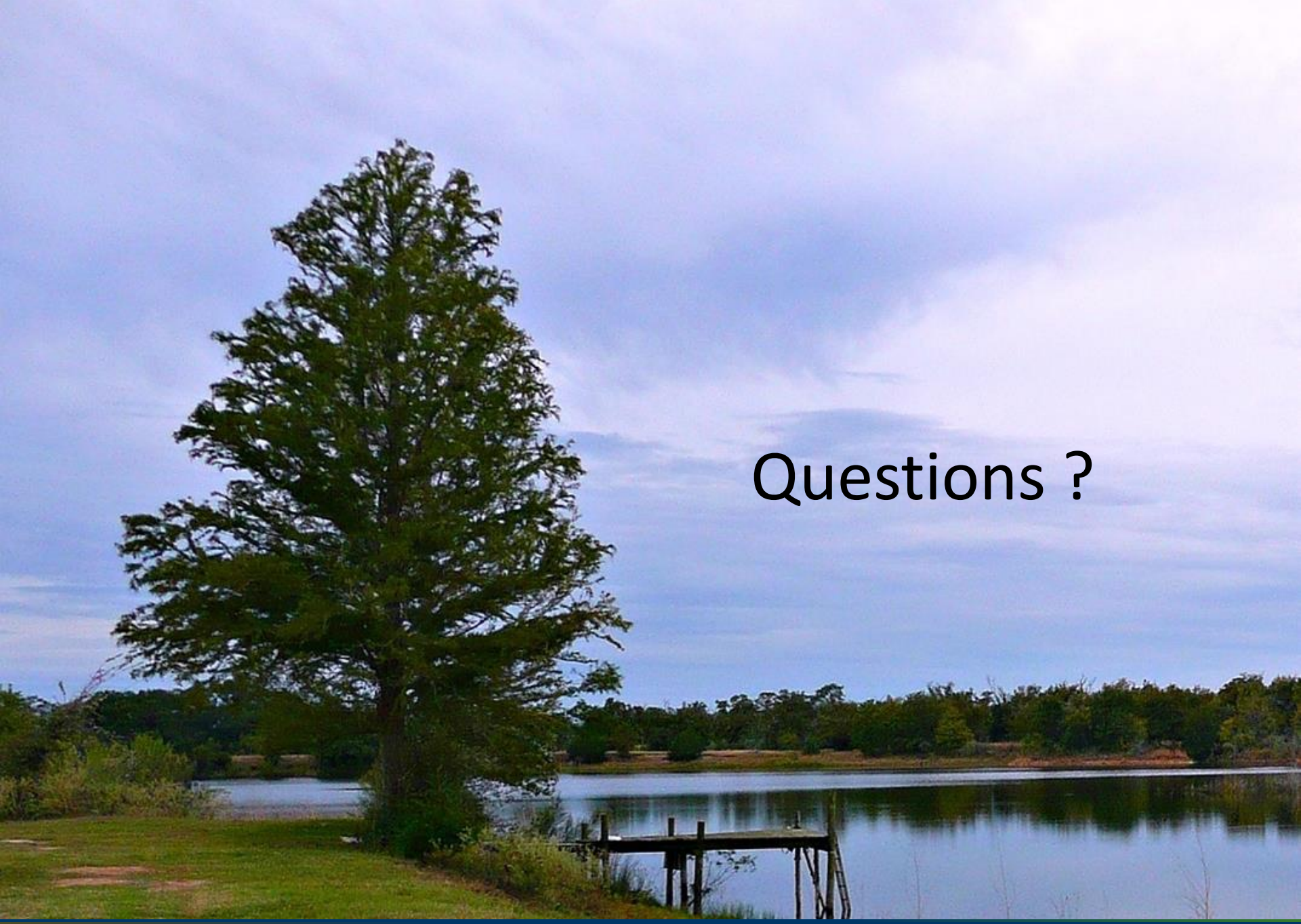
Questions ?