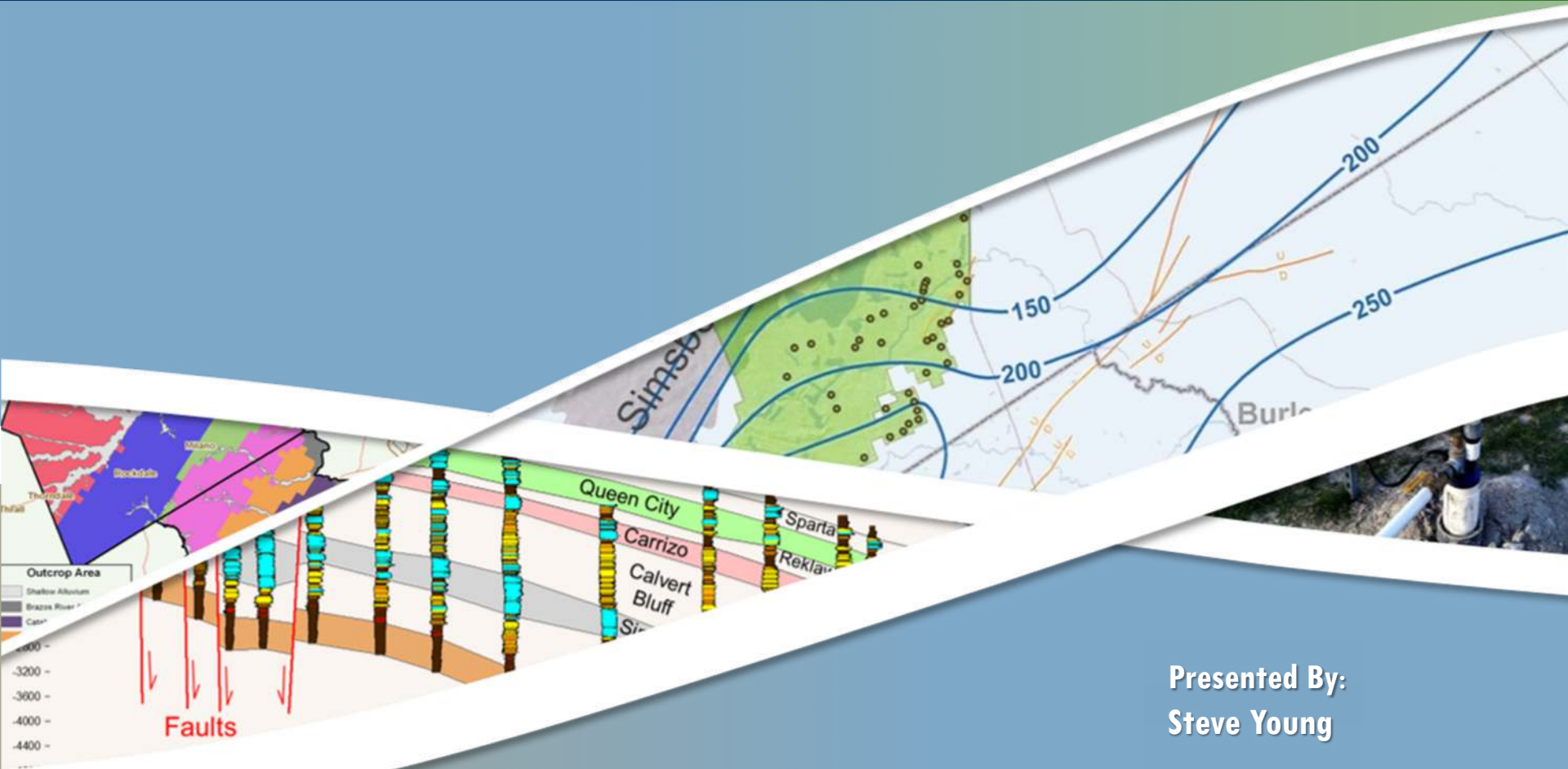


PRESENTATION TO GMA-12: POSGCD Groundwater Monitoring



Presented By:
Steve Young

INTERA
GEOSCIENCE & ENGINEERING SOLUTIONS

May 11, 2018

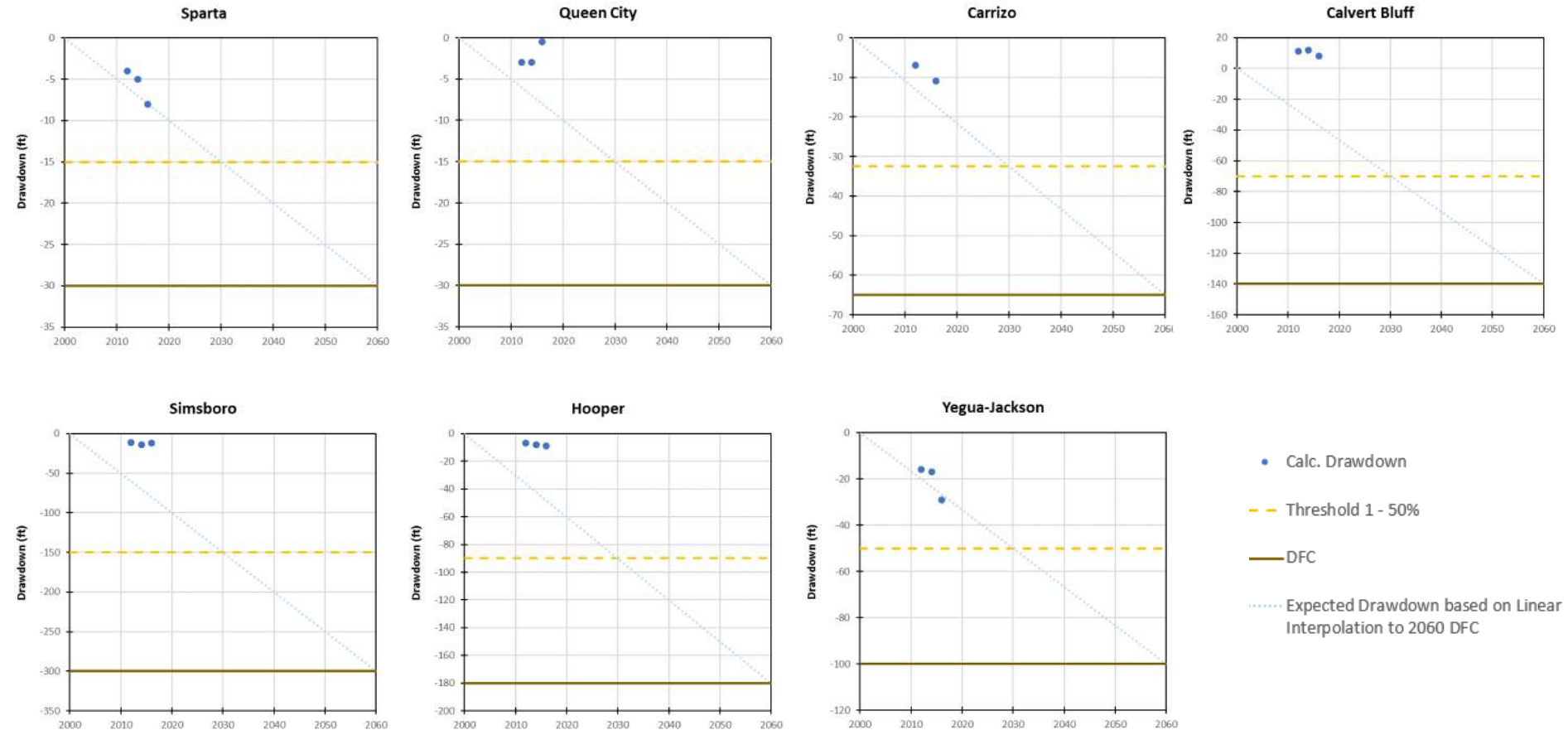
Groundwater Monitoring

- Compliance with Desired Future Conditions
- Compliance with Protective Drawdown Limits
- Groundwater Guidance Document for Evaluating Compliance

Compliance with Desired Future Conditions

Aquifer	Zone	DFC	Drawdown from 2000 to 2012			Drawdown from 2000 to 2014			Drawdown from 2000 to 2016		
			# of Wells	Calculated Drawdown	Percent of DFC	# of Wells	Calculated Drawdown	Percent of DFC	# of Wells	Calculated Drawdown	Percent of DFC
Sparta	Total	30	3	4	12%	8	5	15%	6	8	27%
Queen City	Total	30	5	3	10%	9	3	11%	7	0.5	2%
Carrizo	Total	65	1	7	10%	1	--	--	2	11	17%
Calvert Bluff (Upper Wilcox)	Total	140	11	-11	-8%	16	-12	-8%	15	-8	-6%
Simsboro (Middle Wilcox)	Total	300	14	11	4%	29	14	5%	29	12	4%
Hooper (Lower Wilcox)	Total	180	5	7	4%	5	8	5%	5	9	5%
Yegua Jackson	Total	100	1	16	16%	8	17	17%	5	29	29%
Brazos River Alluvium	Burleson	6	--	--	--	--	--	--	--	--	--
	Milam	5	--	--	--	--	--	--	--	--	--

Compliance with Shallow Zone Protective Water Levels



DFC Compliance Methodology

Step #1

Step #2

1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017

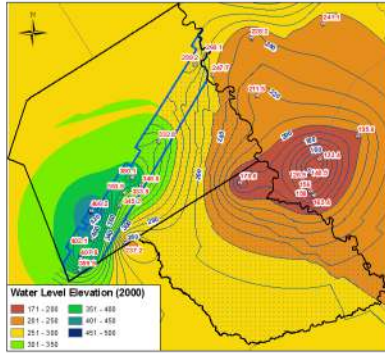


Average Water Level
For 2000

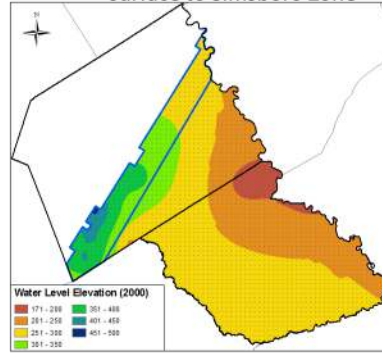
Average Water Level
for 2012

Average Water Level
for 2015

Step #3a Interpolate Baseline Simsboro
Water Level surface

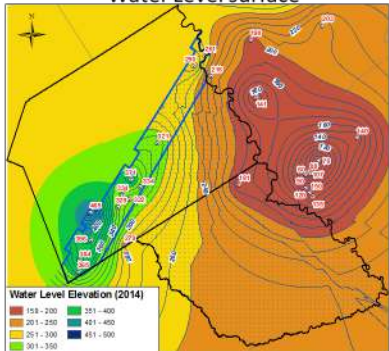


Step #4a Clip Baseline Water Level
surface to Simsboro Zone

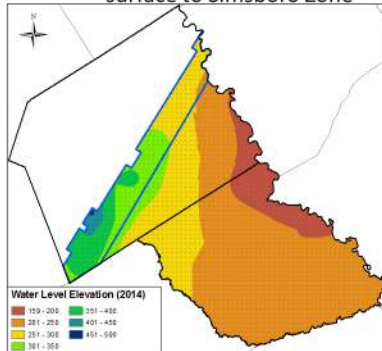


Step #5a : Calculate
Average *Baseline*
Simsboro Water Level
from clipped surface

Step #3b Interpolate Current Simsboro
Water Level surface



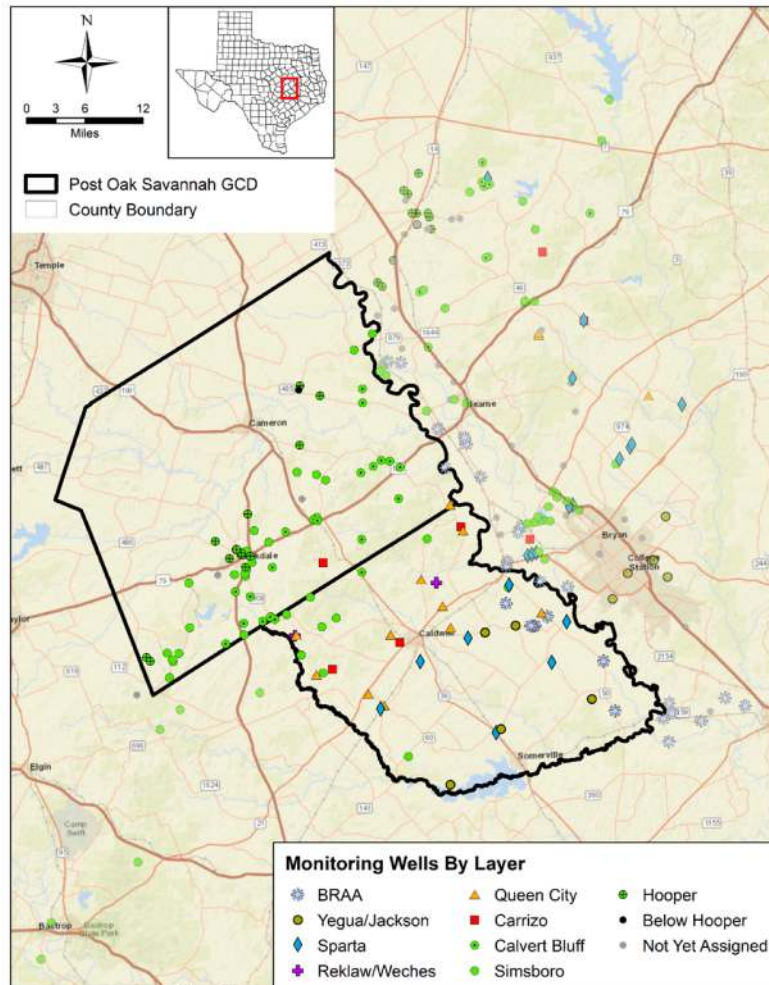
Step #4b Clip Current Water Level
surface to Simsboro Zone



Step #5b : Calculate
Average *Current*
Simsboro Water Level
from clipped surface

Step #6:
Drawdown = *Baseline* – *Current*
Water Level

Comparison of Well Pairs for 2000-2016 Interval and 2010-2016 Interval

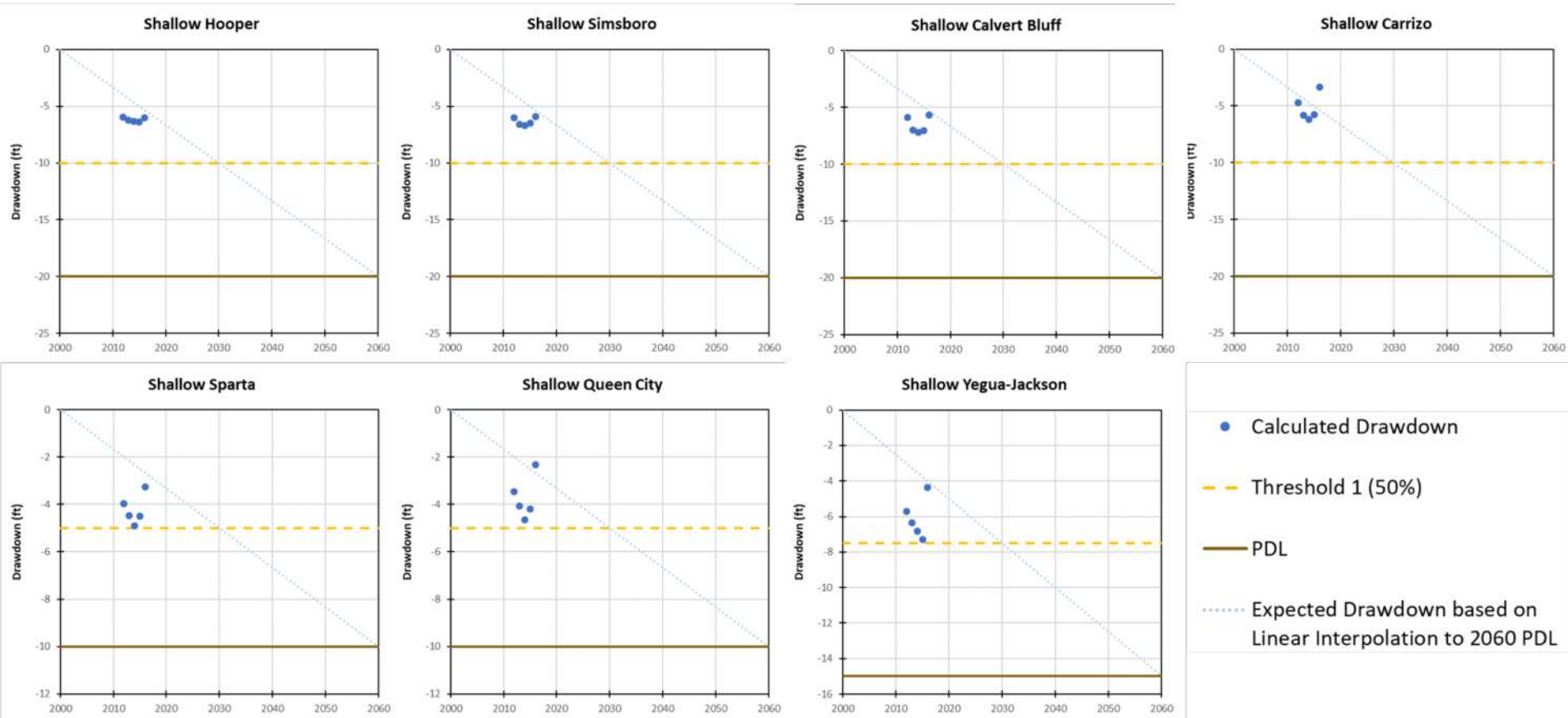


Aquifer	Zone	DFC	Drawdown from 2000 to 2016	Drawdown from 2010 to 2016
			# of Wells	# of Wells
Sparta	Total	30	6	18
Queen City	Total	30	7	15
Carrizo	Total	65	2	5
Calvert Bluff (Upper Wilcox)	Total	140	15	25
Simsboro (Middle Wilcox)	Total	300	29	60
Hooper (Lower Wilcox)	Total	180	5	21
Yegua Jackson	Total	100	5	5

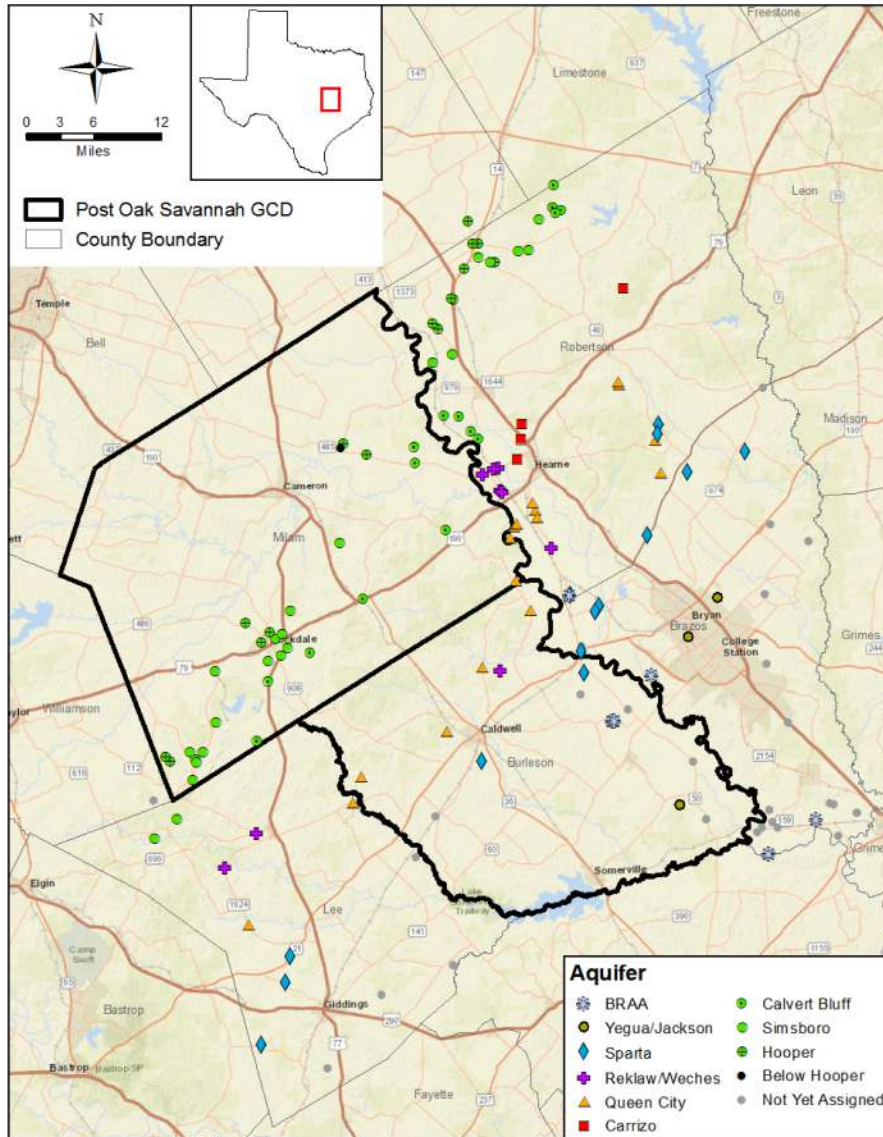
Compliance with POSGCD Shallow Protective Drawdown Limit (PDLs)(January 2018)

Shallow Management Zone	PDL	Drawdown from 2000 to 2012		Drawdown from 2000 to 2013		Drawdown from 2000 to 2014		Drawdown from 2000 to 2015*		Drawdown from 2000 to 2016*	
		<i>Calculated Drawdown</i>	<i>Percent of PDL</i>	<i>Calculated Drawdown</i>	<i>Percent of PDL</i>	<i>Calculated Drawdown</i>	<i>Percent of PDL</i>	<i>Calculated Drawdown</i>	<i>Percent of PDL</i>	<i>Calculated Drawdown</i>	<i>Percent of PDL</i>
Yegua Jackson	15	5.7	38%	6.4	42%	6.8	46%	7.3	49%	4.4	29%
Sparta	10	4.0	40%	4.5	45%	4.9	49%	4.5	45%	3.3	33%
Queen City	10	3.4	34%	4.1	41%	4.6	46%	4.2	42%	2.3	23%
Carrizo	20	4.7	23%	5.8	29%	6.2	31%	5.8	29%	3.4	17%
Calvert Bluff (Upper Wilcox)	20	5.9	29%	7.0	35%	7.2	36%	7.0	35%	5.7	28%
Simsboro (Middle Wilcox)	20	6.0	30%	6.6	33%	6.7	33%	6.5	33%	5.9	30%
Hooper (Lower Wilcox)	20	6.0	30%	6.2	31%	6.3	32%	6.4	32%	6.0	30%

Compliance with POSGCD Shallow PDLs (January 2018)

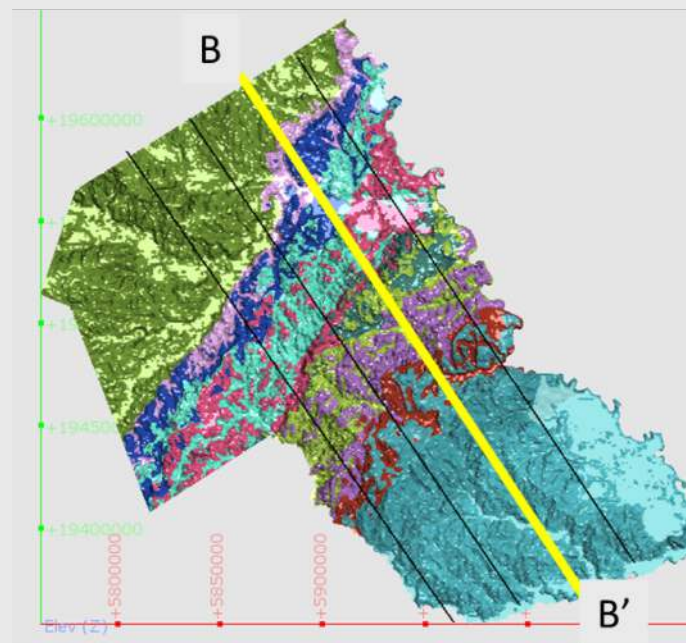
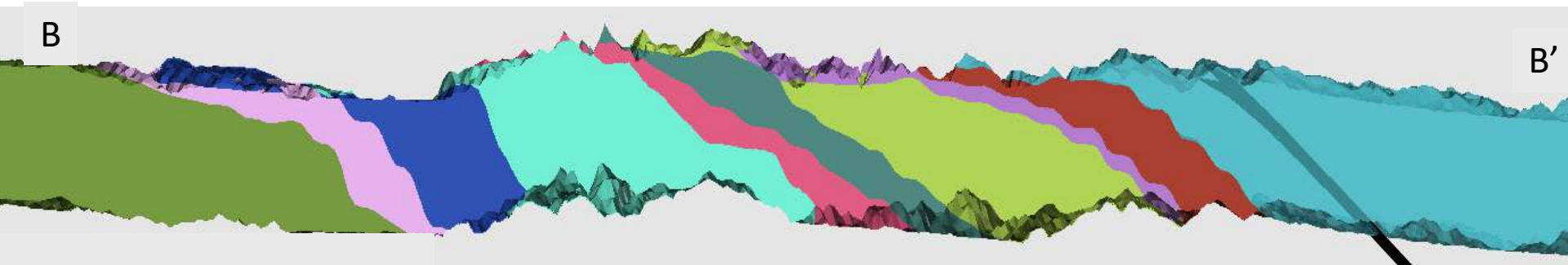


Location of Wells for 400-ft Zone



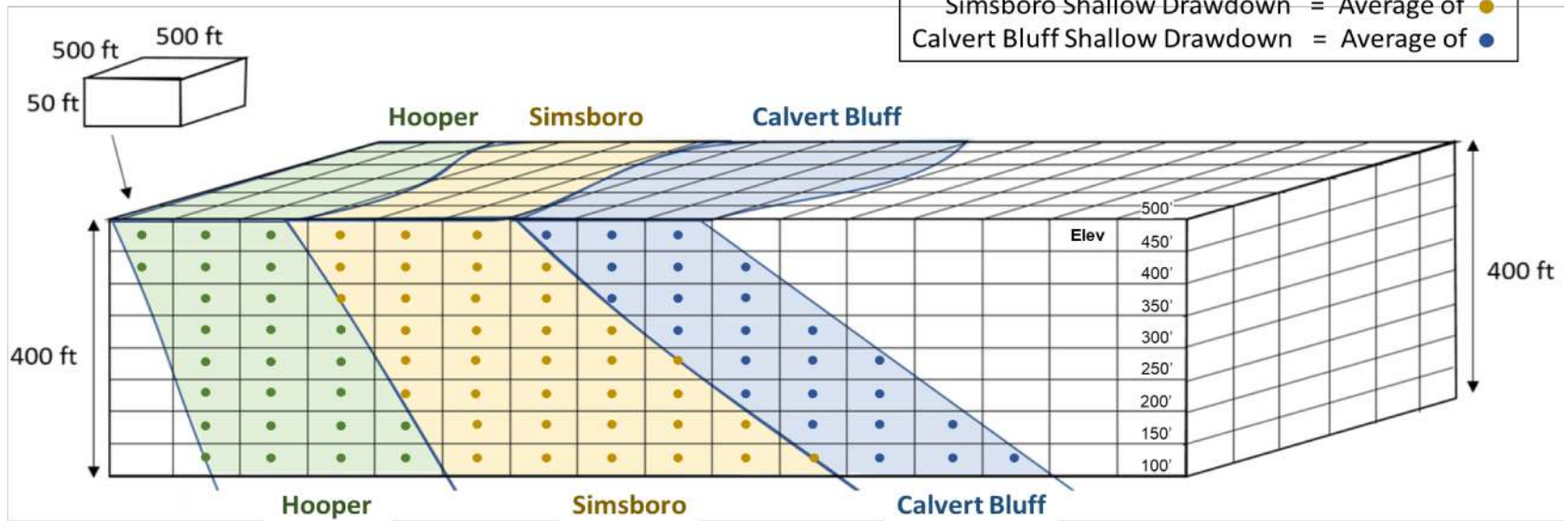
Aquifer	POSGCD wells	with outside Wells
<i>Hooper</i>	3	3
<i>Simsboro</i>	9	10
<i>Calvert Bluff</i>	3	5
<i>Carrizo</i>	0	0
<i>Queen City</i>	4	7
<i>Sparta</i>	1	5
<i>Yegua-Jackson</i>	1	1

400-ft Thick Vertical Cross Section B-B'

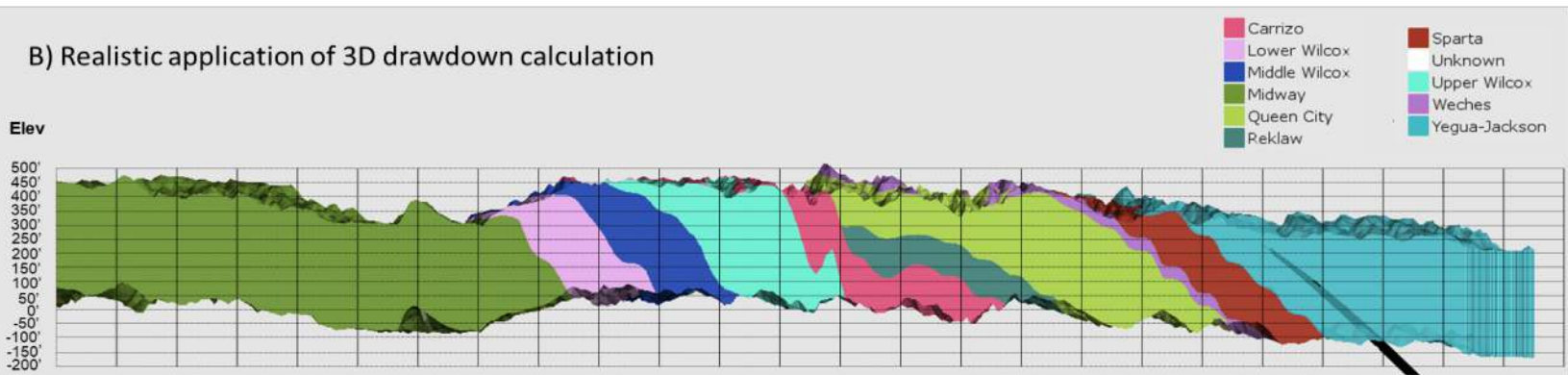


Conceptualization of Three-Dimensional Approach for Averaging Water Levels

A) Idealized schematic of 3D drawdown calculation



B) Realistic application of 3D drawdown calculation



POSGCD Draft Guidance Document

Draft: Post Oak Savannah Guidance Document for Evaluating Compliance with Desired Future Conditions and Protective Drawdown Limits

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Prepared for:



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Post Oak Savannah Groundwater Conservation District
310 E Ave C
Milano, TX 76556

1

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Prepared by:



INTERA Incorporated
1812 Centre Creek Drive
Suite 300
Austin, TX 78660
512-425-2000

1

January 2018

Version 2.0

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Desired Future Conditions	1
1.2	Protective Drawdown Limits	2
2	MONITORING PERFORMANCE STANDARDS DEFINED IN POSGCD MANAGEMENT PLAN	3
3	POSGCD GROUNDWATER MONITORING WELL NETWORK	4
3.1	Locations	4
3.2	Aquifer Assignments	4
3.3	Monitoring Frequency	4
4	COLLECTING AND RECORDING MONITORING DATA	6
4.1	Collection procedures	6
4.2	Health and Safety Plan	6
4.3	Water Level Records	6
4.4	Data Availability	6
5	METHODOLOGY FOR CALCULATING DRAWDOWN FROM MEASURED GROUNDWATER LEVELS	7
5.1	Total Aquifer Management Zone	7
5.2	Shallow Aquifer Management Zone	7
6	EVALUATING COMPLIANCE WITH DFCs AND PDLs	8
6.1	DFC Compliance--Total Aquifer Management Zones	8
6.2	PDL Compliance--Shallow Aquifer Management Zones	8

1

Appendix A: POSGCD Groundwater Monitoring Well Network

Appendix B: POSGCD Aquifer Assignment Methodology

Appendix C: POSGCD Monitoring Protocols

Appendix D: POSGCD Health and Safety Plan

Appendix E: POSGCD Water Level Measurement Form

Appendix F: Determining Average Drawdown in POSGCD Aquifer Management Zones for GMA-12 DFCs

Appendix G: Determining Average Drawdown in Shallow Aquifer Management Zones for POSGCD PDLs

LIST OF FIGURES

Figure 1	Monitoring well locations used in the DFC drawdown calculation	10
Figure 2	Shallow Monitoring well locations used in the PDL drawdown calculation	11
Figure 3	Monitoring wells with aquifer assignments in Calvert Bluff and Simsboro aquifers	12
Figure 4	Monitoring wells with aquifer assignments in Yegua-Jackson, Queen City, Sparta, Carrizo and Hooper aquifers	13
Figure 5	POSGCD total aquifer management zones for evaluating GMA-12 DFCs	14
Figure 6	Diagram of drawdown calculation method for total aquifer management zones, using Simsboro as example	15
Figure 7	POSGCD shallow aquifer management zones for evaluating District PDLs	16
Figure 8	Status of DFC compliance by total aquifer management zone	17
Figure 9	Status of PDL compliance by shallow aquifer management zone	18
Figure E-1	Diagram of 3-year moving average calculation. Dots represent water level measurements	45



Questions?