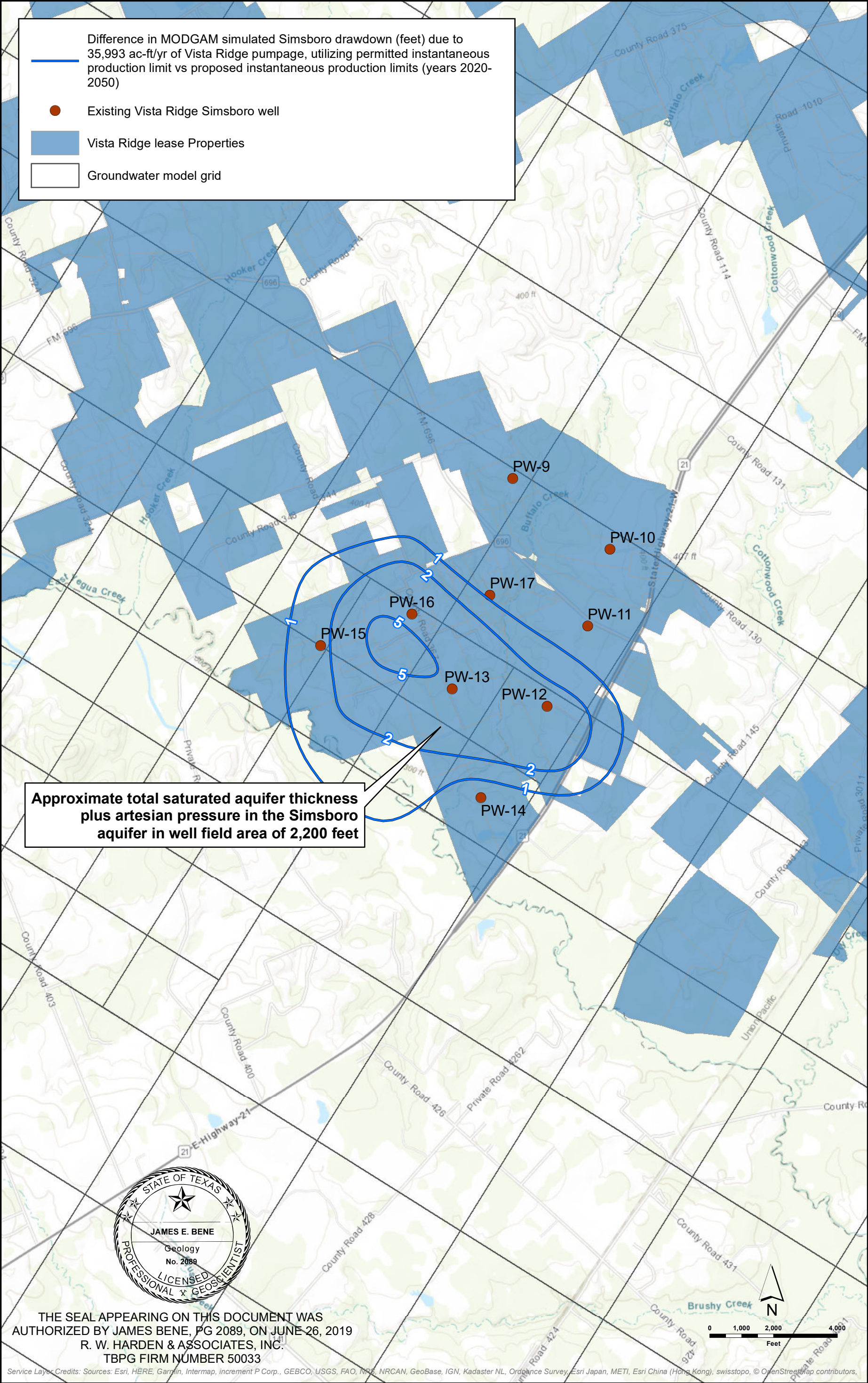


Difference in MODGAM simulated Simsboro drawdown (feet) due to 35,993 ac-ft/yr of Vista Ridge pumpage, utilizing permitted instantaneous production limit vs proposed instantaneous production limits (years 2020-2050)

Existing Vista Ridge Simsboro well

Vista Ridge lease Properties

Groundwater model grid



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TBPB FIRM NUMBER 50033

Difference in GAM simulated Simsboro drawdown (feet) due to 35,993 ac-ft/yr of Vista Ridge pumpage, utilizing permitted instantaneous production limit vs proposed instantaneous production limits (years 2020-2050)

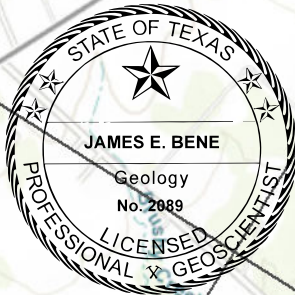
Existing Vista Ridge Simsboro well

Vista Ridge lease properties

Groundwater model grid

Note: The contours shown on this plate were generated using the Central Carrizo-Wilcox-Queen City-Sparta Groundwater Availability Model (GAM). The hydraulic parameters assigned to the GAM in the Vista Ridge area are not consistent with pump test results recorded during construction and testing of Vista Ridge production wells and, consequently, the results shown are not accurate. Please see the Groundwater Modeling Technical Memorandum under Tab 4 for details.

Approximate total saturated aquifer thickness plus artesian pressure in the Simsboro aquifer in well field area of 2,000 feet



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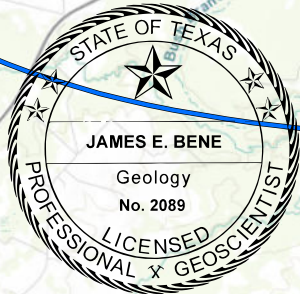
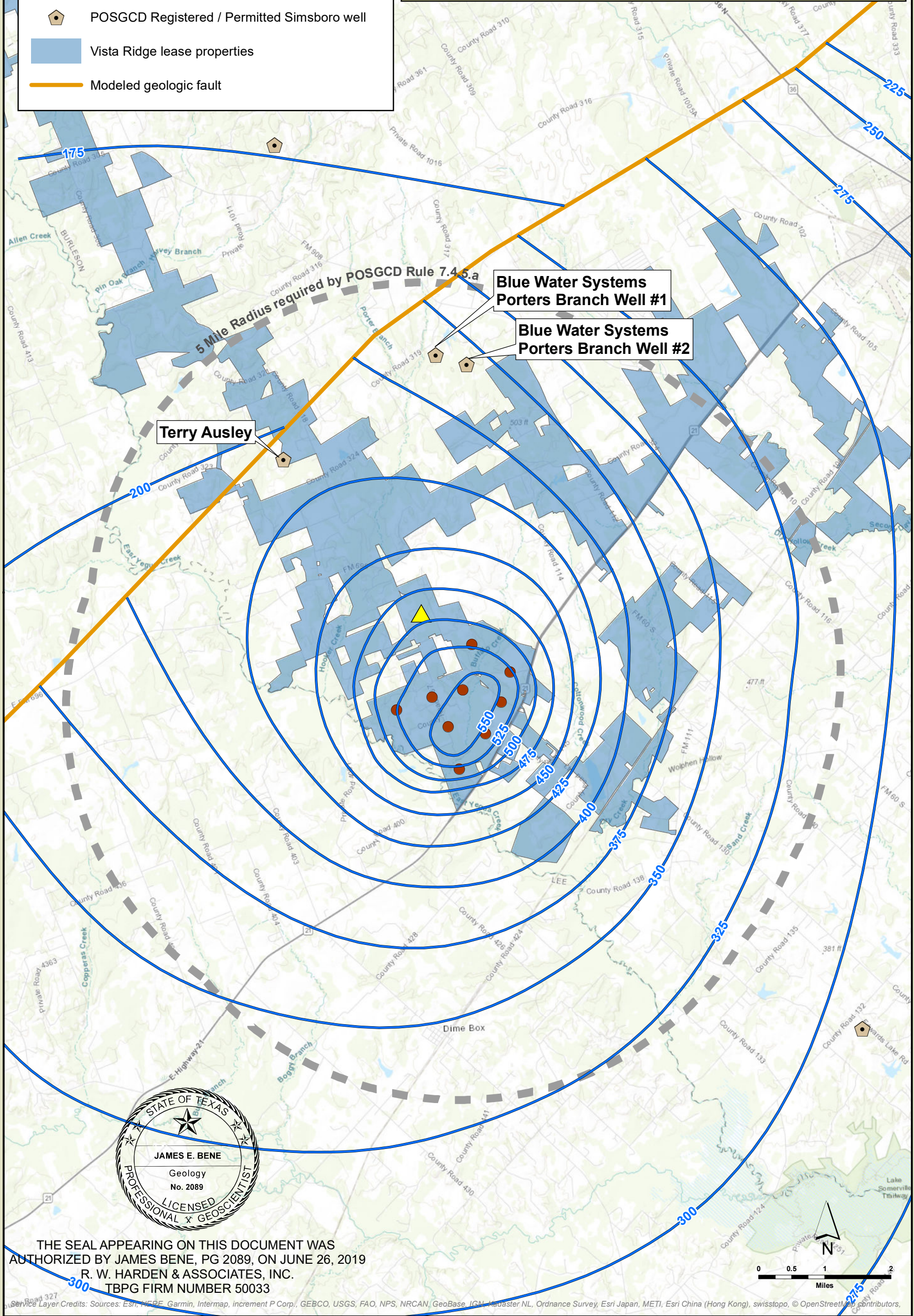


Plate 21 - GAM: Additional Drawdown due to Reinstating 3,000 GPM
Instantaneous Production for PW-12, PW-13 and PW-16

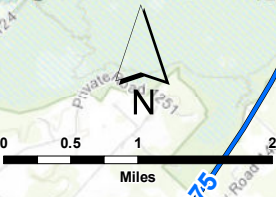


- Obsolete GAM Simulated Simsboro drawdown (feet) due to 40,835 ac-ft/yr Vista Ridge pumpage
- Proposed PW-18 location
- Existing Vista Ridge Simsboro well
- POSGCD Registered / Permitted Simsboro well
- Vista Ridge lease properties
- Modeled geologic fault

Note: The results shown on this plate were generated using a now-obsolete version of the Central Carrizo-Wilcox-Queen City-Sparta Groundwater Availability Model (GAM). The hydraulic parameters assigned to the obsolete GAM in the Vista Ridge area are not consistent with pump test results recorded during construction and testing of Vista Ridge production wells and, consequently, the results shown are not accurate.



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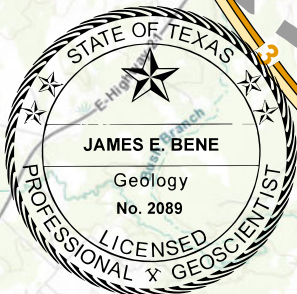
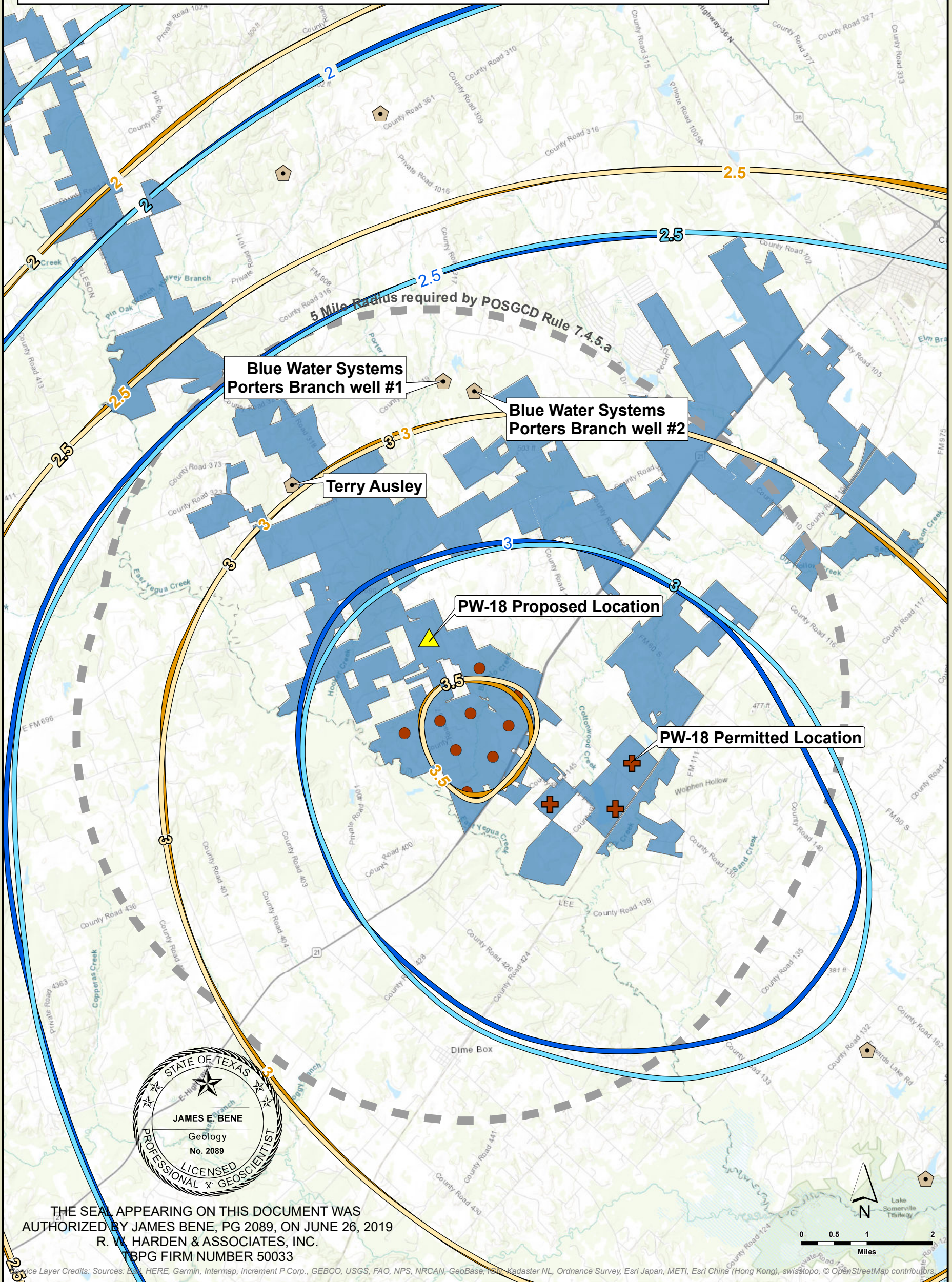
MODGAM Simulated subsidence (feet) due to Vista Ridge pumpage (35,993 ac-ft/yr Simsboro plus 15,000 ac-ft/yr Carrizo)

- Including permitted PW-18 location
- Including proposed PW-18 location

GAM Simulated subsidence (feet) due to Vista Ridge pumpage (35,993 ac-ft/yr Simsboro plus 15,000 ac-ft/yr Carrizo)

- Including permitted PW-18 location
- Including proposed PW-18 location

- Proposed PW-18 location
- Existing Vista Ridge Simsboro well
- Permitted Simsboro well locations
- POSGCD Registered / Permitted Simsboro well
- Vista Ridge lease properties



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TBPGE FIRM NUMBER 50033



**Plate 23 - Comparison of Simulated Subsidence
Vista Ridge 50,993 ac-ft/yr (2020-2050)**



TAB

3

GROUNDWATER LEASES ASSOCIATED WITH REQUESTED ADDITIONAL
SIMSBORO PRODUCTION OF 4,842 AC-FT/YR

Lease Schedule for Blue Water Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
090-015m	6	6	Alden D. Crowe and wife, Paula Crowe	12/22/2000* (26)	837/686 M.C.O.R.
146-007m	165.246	165.246	John Andrew Isaacs and wife, Rita Kay Isaacs	2/14/2005	965/856 M.C.O.R.
146-009m	47.09	47.09	Phillip M. Oliver and wife, Anne Marie Oliver	3/12/2005	968/364 M.C.O.R.
146-010m	82.5294	82.5294	Charles Howard Helmer	8/23/2003* (58)	924/843 M.C.O.R.
146-011m	192.825	192.825	S & V Partnership	1/19/2005	963/537 M.C.O.R.
191-001m	27.755	27.755	Richard Lunsford and wife, Shirley Jean Lunsford	2/6/2005	965/888 M.C.O.R.
191-003m	13.878	13.878	Glenn D. Downey and wife, Phyllis R. Downey	2/6/2005	966/257 M.C.O.R.
191-004m	78.09	78.09	Joyce Lange	2/6/2005	965/880 M.C.O.R.
191-007m	29.256	29.256	John T. Voyles and wife, Patricia Voyles	3/11/2006	1003/756 M.C.O.R.
191-008m	28.138	28.138	Jimmy W. Voyles and wife, Judy Voyles	3/20/2006	1006/237 M.C.O.R.
191-014m	95.048	95.048	William A. Casario and wife, Diana M. Casario	4/5/2006	1006/273 M.C.O.R.
191-015m	50	50	Harry Vowell, d/b/a S & V Operating Co.	8/16/2005	983/650 M.C.O.R.
191-016m	77.291	77.291	Thomas D. Schultea and wife, Marian E. Schultea	2/24/2007	1038/561 M.C.O.R.
191-018m	36.701	36.701	Carl R. Alexander, Jr. and wife, Martha D. Alexander	3/20/2006	1003/760 M.C.O.R.
191-019m	9	9	Jimmy W. Voyles and wife, Judy Voyles	3/20/2006	1005/166 M.C.O.R.
191-020m	36.702	36.702	Milton E. Frei, Jr. and wife, Laura R. Frei	3/20/2006	1005/150 M.C.O.R.
191-022m	50	50	Jo Blackwell	4/6/2005	971/725 M.C.O.R.
			Leonard F. Roberts	3/14/2005	968/898 M.C.O.R.
			Maurine Lay	4/6/2005	971/721 M.C.O.R.
191-025m	9.5	9.5	Bruce Edward Hall	3/20/2006	1005/114 M.C.O.R.
191-027m	11.2	11.2	Rodrigo Mancillas and wife, Dora Mancillas	3/20/2006	1007/169 M.C.O.R.
191-028m	10.167	10.167	Steve T. Pruett	3/20/2006	1005/162 M.C.O.R.
191-029m	7.84	7.84	David G. Winkler	4/10/2006	1007/161 M.C.O.R.
191-030m	9.134	9.134	Ruth B. Voyles	3/20/2006	1003/728 M.C.O.R.
191-031m	9.95	9.95	Carl R. Alexander, Sr. and wife, Elaine V. Alexander	3/20/2006	1003/724 M.C.O.R.
191-032m	9.55	9.55	John T. Voyles and wife, Patricia Voyles	3/11/2006	1003/752 M.C.O.R.
191-033m	9.39	9.39	John T. Voyles and wife, Patricia Voyles	3/11/2006	1003/748 M.C.O.R.
191-034m	30.229	30.229	Shane Silvey	3/20/2006	1005/118 M.C.O.R.
191-039m	45.6	45.6	Lillie Virginia Morton Johnson	4/3/2006	1008/316 M.C.O.R.
191-040m	466	466	The Linwood C. and Pauline G. Mehaffey Trust, Dated April 26, 1993	12/18/2007	1063/741 M.C.O.R.
191-041m	43.75	43.75	Lillie Virginia Morton Johnson	4/3/2006	1009/126 M.C.O.R.
191-042m	50	50	Lillie Virginia Morton Johnson	4/3/2006	1008/320 M.C.O.R.
191-043m	50	50	Lillie Virginia Morton Johnson	4/3/2006	1008/324 M.C.O.R.
191-044m	122.667	122.667	Joseph Slusher and wife, Judith Slusher	10/16/2009	1006/217 M.C.O.R.
191-046m	49	49	Arnold J. Prazak and wife, Gerlane B. Prazak	3/11/2006	1003/740 M.C.O.R.
191-048m	1	1	Lillie Virginia Morton Johnson	4/3/2006	1009/395 M.C.O.R.
191-049m	3	3	Sammie Lee Johnson, Jr.	4/3/2006	1008/328 M.C.O.R.
191-051m	100	100	B.M. Drinkard and wife, Tiny B. Drinkard	5/5/2006	1009/102 M.C.O.R.
191-053m	174.594	109.1212	Brian Keith Stark	12/14/2001* (39)	862/118 M.C.O.R.

*Groundwater lease currently held by production payment clause including all leases expired prior to 6/30/2019. (Production Amendment Number)

Lease Schedule for Blue Water Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
191-053m	174.594	109.1212	Carolyn Stark Bradshaw	12/17/2001* (39)	862/130 M.C.O.R.
			Linda Kay Furr	12/16/2001* (39)	862/110 M.C.O.R.
			Patricia Darlene Powell	8/14/2001* (34)	853/252 M.C.O.R.
191-055m	41.98	41.98	Amanda Lee Colbert	6/9/2003* (56)	910/756 M.C.O.R.
			Jack Colbert	6/3/2003* (56)	910/740 M.C.O.R.
210-059m	98.589	61.6181	Brian Keith Stark	12/14/2001* (39)	862/122 M.C.O.R.
			Carolyn Stark Bradshaw	12/17/2001* (39)	862/126 M.C.O.R.
			Linda Kay Furr	12/16/2001* (39)	862/114 M.C.O.R.
			Patricia Darlene Powell	8/22/2001* (34)	853/248 M.C.O.R.
210-060m	200	200	William D. Payne and wife, Christine L. Payne	3/2/2006	1002/810 M.C.O.R.
			William Dwain Payne	3/2/2006	1003/668 M.C.O.R.
210-061m	4.805	4.805	William Dwain Payne	3/2/2006	1003/672 M.C.O.R.
210-063m	263.551	263.551	Vaughn E. Owens "Pud" and wife, Wilma Owens	12/10/2004	960/311 M.C.O.R.
210-064m	87.276	87.276	Michael B. Brooks and wife, Carol A. Brooks	3/5/2005	968/902 M.C.O.R.
288-043m	176.171	176.171	Joseph Slusher and wife, Judith Slusher	10/16/2009	1005/082 M.C.O.R.
323-002m	35.5	35.5	Jo Blackwell	4/6/2005	971/725 M.C.O.R.
			Leonard F. Roberts	3/14/2005	968/898 M.C.O.R.
			Maurine Lay	4/6/2005	971/721 M.C.O.R.
323-003m	122.08	122.08	Clarence R. Sims	2/24/2005	966/253 M.C.O.R.
			Ronald A. Wall and wife, Karen D. Wall	2/9/2005	966/261 M.C.O.R.
323-004.1m	96.097	96.097	Paul A. Zabor	2/19/2005	966/635 M.C.O.R.
323-004.2m	6.42	6.42	Paul A. Zabor	4/7/2005	971/143 M.C.O.R.
323-005m	82.85	41.425	R. Stephen Rhodes	6/11/2009	1102/643 M.C.O.R.
323-006m	14.363	14.363	R. Stephen Rhodes	6/11/2009	1102/639 M.C.O.R.
323-024m	103.26	103.26	Clarence Theo Krenek and Lillian M. Krenek, as Trustees of The Clarence Theo Krenek and Lillian M. Krenek Revocable Living Trust	3/10/2005	968/339 M.C.O.R.

Total Net Acres: 3,427.1937

GROUNDWATER LEASES ASSOCIATED WITH CURRENTLY-PERMITTED
ANNUAL PRODUCTION OF 50,993 AC-FT/YR

Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
002-018	52.842	52.842	Clint J. Luksa	11/5/2004	644/778 B.C.O.P.R.
002-025	58.8	58.8	Adell Paukert Mikula	10/29/2004	644/216 B.C.O.P.R.
002-027	5	5	Steve Payne and wife, Patricia May Payne	9/6/2004	640/148 B.C.O.P.R.
002-028.1	2.357	2.357	M. Dwayne Hill	9/6/2004	640/726 B.C.O.P.R.
002-028.2	3.444	3.444	M. Dwayne Hill	9/7/2004	640/730 B.C.O.P.R.
002-029	5.76	5.76	Clint J. Luksa	11/7/2004	644/792 B.C.O.P.R.
002-030	5.76	5.76	William V. Roskey and wife, Mary J. Roskey	10/15/2007	736/463 B.C.O.P.R.
002-031	5.76	5.76	William V. Roskey and wife, Mary J. Roskey	12/4/2007	736/455 B.C.O.P.R.
002-033	4.9	4.9	Mildred Horak	10/5/2004	643/829 B.C.O.P.R.
002-034	3	3	Isreal T. Rodriguez and wife, Marie Ruth O. Rodriguez	11/2/2004	644/414 B.C.O.P.R.
002-035	1.7178	1.7178	Jerry Glynn Busby, Sr. and wife, Christine B. Landrum Busby	12/19/2004	650/165 B.C.O.P.R.
002-036	3.736	3.736	Jerry Albert Kacer, Jr.	11/3/2004	645/721 B.C.O.P.R.
002-037	45.6	45.6	Allen Ray Horak	10/13/2004	643/825 B.C.O.P.R.
			L.J. Horak	10/14/2004	644/220 B.C.O.P.R.
			Ella Horak	10/13/2004	643/821 B.C.O.P.R.
			Frank Horak	11/2/2004	644/418 B.C.O.P.R.
002-038	10.766	10.766	Phyllis J. Urban	11/19/2004	646/398 B.C.O.P.R.
002-042	60.89	60.89	Frank Horak	10/11/2004	643/817 B.C.O.P.R.
002-043	24.352	24.352	Clint J. Luksa	11/9/2004	644/783 B.C.O.P.R.
002-050	2	2	Martha Jo Lambrecht	12/15/2004	650/161 B.C.O.P.R.
002-051	5	5	David Dennis	11/26/2004	647/662 B.C.O.P.R.
002-056	4.985	4.985	Wayne A. Moore and wife, Margaret L. Moore	11/16/2004	650/112 B.C.O.P.R.
002-061	1	1	Richard J. Hogan and wife, Lillian Hogan	1/3/2005	650/618 B.C.O.P.R.
002-062	49	49	Richard J. Hogan and wife, Lillian Hogan	1/3/2005	650/618 B.C.O.P.R.
002-063.1	15.69	15.69	Cary Dane Balcar	1/7/2005	651/720 B.C.O.P.R.
002-063.2	46.31	46.31	Bradly Balcar	1/12/2005	651/716 B.C.O.P.R.
002-064	50	50	Joseph Louis Salvato	1/7/2005	652/761 B.C.O.P.R.
002-065	61.221	61.221	Edward Zgabay	2/17/2005	654/873 B.C.O.P.R.
002-067	25.979	25.979	Renny J. Kocurek	4/19/2007	715/756 B.C.O.P.R.
002-069	51.83	51.83	William V. Roskey and wife, Mary J. Roskey	11/5/2007	736/107 B.C.O.P.R.
002-070	20.31	20.31	Sandra Jodene Balcar	1/13/2005	652/749 B.C.O.P.R.
002-071.1	19.97	19.97	Suzanne J. Lindke, being one and the same person as Susan J. Balcar	1/13/2005	652/757 B.C.O.P.R.
002-072	29.94	29.94	Suzanne J. Lindke, being one and the same person as Susan J. Balcar	1/12/2005	652/753 B.C.O.P.R.
002-073	29.94	29.94	Sandra Jodene Balcar	1/12/2005	652/745 B.C.O.P.R.
002-074	50	50	Leona B. Salvato	2/21/2005	655/001 B.C.O.P.R.
002-077	132.06	132.06	Marie P. Campbell	12/18/2004	649/560 B.C.O.P.R.
			Barry Ray Helweg	12/1/2004	649/564 B.C.O.P.R.

*Groundwater lease currently held by production payment clause including, but not limited to, all leases expired prior to 6/30/2019. (Production Amendment Number)

Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
002-077	132.06	132.06	Iris M. Piwetz, Agent and Attorney-in-Fact for Byron J. Piwetz	12/28/2004	650/153 B.C.O.P.R.
002-083.1	85.43	85.43	Kevin L. Billig and wife, Kathleen M. Billig	11/4/2008	764/724 B.C.O.P.R.
002-083.2	91.726	91.726	Kevin L. Billig and wife, Kathleen M. Billig	11/4/2008	764/728 B.C.O.P.R.
002-083.3	61.08	61.08	Kevin L. Billig and wife, Kathleen M. Billig	11/4/2008	764/732 B.C.O.P.R.
002-083.4	111.08	111.08	Kevin L. Billig and wife, Kathleen M. Billig	11/4/2008	764/736 B.C.O.P.R.
002-087	103.582	103.582	Ernest Zboril and wife, Carylton Zboril	10/26/2007	733/197 B.C.O.P.R.
002-092	47	47	Jack Kocurek and wife, Rebecca Kocurek	4/17/2007	715/764 B.C.O.P.
002-116	52	52	Ernest Zboril and wife, Carylton Zboril	10/26/2007	735/170 B.C.O.P.R.
011-019	136.5303	136.5303	Harold E. Monical and wife, Barbara Monical	3/2/2005	658/570 B.C.O.P.R.
011-020	70	70	Mildred G. Piwonka, Trustee of the Mildred G. Piwonka Living Trust dated December 15, 1999	5/7/2007	716/694 B.C.O.P.R.
011-021	72.11	72.11	Leroy J. Kubelka and wife, Barbara A. Kubelka	1/3/2004* (63)	621/604 B.C.O.P.R.
011-022	61.4	61.4	Larry Ted Marek	5/5/2007	717/472 B.C.O.P.R.
011-024	20	20	Charles Chovanec, Jr. and wife, Kristal Chovanec	2/3/2004* (64)	624/859 B.C.O.P.R.
011-025	45.257	45.257	Leroy J. Kubelka and wife, Barbara A. Kubelka	1/4/2004* (63)	621/600 B.C.O.P.R.
011-027.1	10.71	10.71	Mark Skrabanek	2/12/2008	717/508 B.C.O.P.R.
011-027.2	72.11	72.11	Mark Skrabanek	2/12/2008	719/330 B.C.O.P.R.
011-027.3	47.9144	47.9144	Mark Skrabanek	2/12/2008	718/552 B.C.O.P.R.
011-027.4	2	2	Mark Skrabanek	2/12/2008	716/698 B.C.O.P.R.
011-029	71.1487	71.1487	Janette M. Hall	5/5/2007	716/686 B.C.O.P.R.
			Larry Ted Marek	5/5/2007	718/612 B.C.O.P.R.
011-033	2.997	2.997	Thomas L. Norsworthy and wife, Sherri L. Norsworthy	5/10/2007	718/540 B.C.O.P.R.
011-035	66.67	66.67	Alfons A. Beran	3/19/2004* (65)	626/005 B.C.O.P.R.
011-039	61.263	61.263	James I. Swigert and wife, Patricia B. Swigert	3/6/2004* (65)	628/287 B.C.O.P.R.
011-044	121.58	121.58	Ronald Wayne Schielack and wife, Anna L. Schielack	6/19/2007	726/218 B.C.O.P.R.
011-046	99	99	Donnie S. Victorick	3/16/2004* (65)	626/009 B.C.O.P.R.
011-047	73	24.3333	Donnie S. Victorick	3/19/2004* (65)	626/013 B.C.O.P.R.
011-072	107	24.9666	Alfons A. Beran	3/20/2004* (65)	626/001 B.C.O.P.R.
			Theresa Ann DeMarco	10/1/2004	643/841 B.C.O.P.R.
			Dorothy Marie Kaminski	8/7/2004	639/844 B.C.O.P.R.
021-001	26.395	26.395	Silva G. Favor	8/21/2003* (58)	608/686 B.C.O.P.R.
021-002	9.626	9.626	James H. Bray	9/1/2003* (59)	615/473 B.C.O.P.R.
021-003	45.494	45.494	Clyde Cain and wife, Billie Cain	12/27/1999* (10)	532/423 B.C.O.P.R.
021-022	3.05	3.05	Nathan Charles Ausley	1/14/2005	652/733 B.C.O.P.R.
021-023	196.95	196.95	B.J. Ausley and wife, Mary Louise Stegmiller Ausley	1/14/2005	652/737 B.C.O.P.R.
			Nathan Charles Ausley	1/4/2005	652/729 B.C.O.P.R.
021-027	2.34	2.34	Jody Lee Ausley	3/14/2005	657/337 B.C.O.P.R.
026-018	13.33	13.33	Johnnie A. Love and wife, Lynne A. Love	6/22/2007	720/497 B.C.O.P.R.
026-022	128.85	128.85	Donna L. Beran, Formerly Known As Donna L. Yanez	10/8/2009	787/337 B.C.O.P.R.

*Groundwater lease currently held by production payment clause including, but not limited to, all leases expired prior to 6/30/2019. (Production Amendment Number)

Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
026-025	45.0793	45.0793	Stifflemire, Jack W. And wife, Nita J. Stifflemire	6/19/2007	724/305 B.C.O.P.R.
026-031	11.95	11.95	Hugh Jeffery Davis	1/9/2004* (63)	619/805 B.C.O.P.R.
026-041	84	84	Jack W. Stifflemire and wife, Nita J. Stifflemire	6/19/2007	723/046 B.C.O.P.R.
026-043	83	83	Richard J. Zgabay	6/21/2007	720/493 B.C.O.P.R.
026-051.1	50	50	Edith Frances Luksa	3/25/2006	683/834 B.C.O.P.R.
026-051.2	75	75	Edith Frances Luksa	3/25/2006	683/838 B.C.O.P.R.
026-052.1	50	50	Clint J. Luksa	2/4/2006	680/569 B.C.O.P.R.
026-052.2	60.5	60.5	Clint J. Luksa	2/4/2006	680/577 B.C.O.P.R.
026-052.3	60	60	Clint J. Luksa	2/4/2006	680/573 B.C.O.P.R.
026-052.4	4	4	Clint J. Luksa	2/4/2006	680/537 B.C.O.P.R.
026-058	12	12	Clint J. Luksa	2/4/2006	680/561 B.C.O.P.R.
026-059	2	2	Trinidad Rubio and wife, Rosa Rubio	6/26/2002* (45)	577/479 B.C.O.P.R.
026-062	2	2	Clint J. Luksa	2/4/2006	680/521 B.C.O.P.R.
026-063	2	2	Clint J. Luksa	2/4/2006	680/525 B.C.O.P.R.
058-003.1	18.7	18.7	Billie B. Beran	11/20/2003* (61)	617/159 B.C.O.P.R.
058-003.2	32	32	Billie B. Beran	11/21/2003* (61)	617/163 B.C.O.P.R.
058-004	56.291	56.291	Cheryl Danford	2/20/2004* (64)	625/345 B.C.O.P.R.
			Randy Howry	10/10/2003* (60)	613/533 B.C.O.P.R.
			Cindy Howry	2/21/2004* (64)	628/315 B.C.O.P.R.
058-005	56.291	56.291	Franklin J. Beran	10/18/2003* (60)	614/088 B.C.O.P.R.
058-020	47.296	47.296	Joe Don Brymer and wife, Martha J. Brymer	11/12/2003* (9)	615/784 B.C.O.P.R.
058-021	12.48	12.48	Keith Alan Weeber	1/16/2004* (9)	632/791 B.C.O.P.R.
058-022	8	8	John C. Hoffman	1/10/2004* (9)	620/732 B.C.O.P.R.
058-023	4.4007	4.4007	Johnny C. Brewer, Jr. and wife, Shantee L. Brewer	2/4/2004* (9)	622/756 B.C.O.P.R.
058-025	8	8	Cheryl Lynn Hoffman	1/9/2004* (9)	620/740 B.C.O.P.R.
058-027.1	10.0689	10.0689	Cullen Tittle and wife, Debra Tittle	1/25/2004* (9)	622/327 B.C.O.P.R.
058-027.2	7	7	Cullen Dustin Tittle and wife, Debra Marie Tittle	1/26/2004* (9)	622/323 B.C.O.P.R.
058-030.1	25.5	25.5	Joe Don Brymer and wife, Martha J. Brymer	11/8/2003* (9)	615/788 B.C.O.P.R.
058-030.2	20	20	Joe Don Brymer and wife, Martha J. Brymer	11/9/2003* (9)	615/792 B.C.O.P.R.
058-030.3	17.05	17.05	Joe Don Brymer and wife, Martha J. Brymer	11/11/2003* (9)	615/796 B.C.O.P.R.
058-030.4	7.0126	7.0126	Joe Don Brymer and wife, Martha J. Brymer	11/10/2003* (9)	615/800 B.C.O.P.R.
058-031	101.3	101.3	Keith Alan Weeber	1/13/2004* (9)	620/720 B.C.O.P.R.
058-032	5	5	John Kucera and wife, Therese Kucera	1/27/2004* (9)	622/335 B.C.O.P.R.
058-034.2	4.5	4.5	Shirley Jean Sanchez	1/24/2004* (63)	621/616 B.C.O.P.R.
058-035	4	4	Randy Hall and wife, Linda Witt Hall	1/27/2004* (63)	623/692 B.C.O.P.R.
058-036	93.407	93.407	Steve Ray Schoeneman	1/15/2004* (63)	622/331 B.C.O.P.R.
058-037	76.39	76.39	Lonneida P. Alexander	2/8/2004* (64)	624/246 B.C.O.P.R.
058-038	198.2	198.2	James L. Smith and wife, Bonnie L. Smith	1/15/2004* (63)	621/596 B.C.O.P.R.
058-039.2	7.81	7.81	Mauricio Silos, Trustee For Margarito Silos	5/10/2007	718/548 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
058-039.3	5	5	Mauricio Silos, Trustee For Margarito Silos	5/10/2007	719/314 B.C.O.P.R.
058-059	44.1425	44.1425	Raymond W. Hlavaty, Jr.	3/15/2000* (12)	532/665 B.C.O.P.R.
058-075	49.9	49.9	Charles G. Maddox	3/25/2004* (65)	626/293 B.C.O.P.R.
058-076	3.37	3.37	Charlie W. Maddox and wife, Eunice M. Maddox	3/25/2004* (65)	626/289 B.C.O.P.R.
058-086	55.8575	55.8575	Raymond W. Hlavaty, Jr.	3/15/2000* (12)	532/665 B.C.O.P.R.
058-090	37	37	Henry E. Gaas and wife, Laura J. Gaas	3/6/2004* (65)	628/295 B.C.O.P.R.
058-091	50.225	50.225	Terry O. Myers and wife, Barbara A. Myers	3/6/2004* (65)	626/501 B.C.O.P.R.
058-092	121	80.6663	Franklin J. Beran	10/17/2003* (60)	614/080 B.C.O.P.R.
			Franklin J. Beran	10/20/2003* (60)	614/084 B.C.O.P.R.
			Randy Howry	10/11/2003* (60)	613/537 B.C.O.P.R.
			Georgia Howry	2/25/2004* (64)	624/258 B.C.O.P.R.
			Frank P. Janacek	2/26/2004* (64)	624/250 B.C.O.P.R.
058-093	4.0113	4.0113	Ronald Batiste	2/15/2004* (64)	623/688 B.C.O.P.R.
058-094	5.41	5.41	Timothy Owens and wife, Lori Owens	2/15/2004* (64)	624/346 B.C.O.P.R.
060-001	128.67	128.67	Richard B. Terral and wife, Ann R. Terral	10/25/2003* (60)	617/490 B.C.O.P.R.
060-005	2	2	Joe Manuel, Successor in Interest to Ethel Heslip	8/3/2009	781/791 B.C.O.P.R.
060-006	9.125	4.6382	Gentry Cooper, Jr.	1/28/2011	824/808 B.C.O.P.R.
			Leon Cooper	1/28/2011	824/812 B.C.O.P.R.
			Donald Cooper	1/18/2011	825/390 B.C.O.P.R.
			Eldrick Cooper	2/23/2011	831/342 B.C.O.P.R.
			Lesia Cooper Crenshaw	1/28/2011	824/816 B.C.O.P.R.
			Versie Freeman	9/3/2009	784/741 B.C.O.P.R.
			Nola Cooper Hamilton	1/18/2011	824/193 B.C.O.P.R.
			Laredo Marion	8/10/2009	782/730 B.C.O.P.R.
			Ollie Cooper McDowell	1/28/2011	824/804 B.C.O.P.R.
			Carrie Menton	8/10/2009	782/294 B.C.O.P.R.
			Robert Lee Scott	8/10/2009	782/734 B.C.O.P.R.
			Maggie Lene Menton Williams	8/10/2009	782/426 B.C.O.P.R.
060-007	1	1	Joe Manuel, Successor in Interest to Ethel Heslip	5/28/2010	807/459 B.C.O.P.R.
060-011	62.5	62.5	Eugene R. Bartosh, Trustee for the James L. Perry Farm Trust Agreement	9/24/2009	786/685 B.C.O.P.R.
060-012	81	40.5	Ray W. Wotipka	11/23/2003* (61)	617/155 B.C.O.P.R.
060-014	204	49.9999	Ray W. Wotipka	11/24/2003* (61)	617/151 B.C.O.P.R.
060-015.1	98.597	98.597	Irene E. Perry	9/24/2009	786/167 B.C.O.P.R.
060-015.2	98.597	98.597	Irene E. Perry	9/24/2009	786/171 B.C.O.P.R.
062-009	17.836	17.836	Bradley Paul Sanders	4/11/2007	716/365 B.C.O.P.R.
062-010	28.647	28.647	Calvin G. Kocurek and wife, Judy Kocurek	4/11/2007	715/760 B.C.O.P.R.
			Scarlette M. Pivonka, being on and the same person as Scarlette G. Pivonka	4/9/2007	716/361 B.C.O.P.
062-011	80	80	Calvin G. Kocurek and wife, Judy Kocurek	4/11/2007	716/353 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
062-011	80	80	Renny J. Kocurek and wife, Margaret Kocurek	4/19/2007	716/357 B.C.O.P.R.
			Jack Kocurek and wife, Rebecca Kocurek	4/11/2007	716/349 B.C.O.P.R.
			Scarlette M. Pivonka, being on and the same person as Scarlette G. Pivonka	4/9/2007	715/752 B.C.O.P.R.
062-012	113.6358	113.6358	Blanche L. Stern; Ronald H. Stern and Carol Ann Stern Christian	9/21/2007	731/024 B.C.O.P.R.
062-016.1	10	10	Clint J. Luksa	2/4/2006	680/549 B.C.O.P.R.
062-016.2	12.384	12.384	Clint J. Luksa	2/4/2006	680/553 B.C.O.P.R.
062-016.3	16.7571	16.7571	Clint J. Luksa	2/4/2006	680/557 B.C.O.P.R.
062-017.1	64.25	64.25	Barry Ray Helweg	4/1/2006	686/009 B.C.O.P.R.
062-017.2	68	68	Barry Ray Helweg	4/1/2006	686/005 B.C.O.P.R.
062-018	120	120	Dyonis Kubelka	1/31/2008	715/232 B.C.O.P.R.
062-020	62.3	62.3	Gordon W. Zavodney	2/7/2006	681/551 B.C.O.P.R.
062-021	197.19	197.19	William Paul Harper	5/5/2006	688/022 B.C.O.P.R.
062-023	104.28	104.28	Kelly Jean Pampell	8/6/2008	719/302 B.C.O.P.R.
062-036.1	2.805	2.805	Clint J. Luksa	2/4/2006	680/529 B.C.O.P.R.
062-036.2	2.149	2.149	Clint J. Luksa	2/4/2006	680/533 B.C.O.P.R.
062-036.3	1.058	1.058	Clint J. Luksa	2/4/2006	680/517 B.C.O.P.R.
062-036.4	1	1	Clint J. Luksa	2/4/2006	680/505 B.C.O.P.R.
062-036.5	1	1	Clint J. Luksa	2/4/2006	680/509 B.C.O.P.R.
062-036.6	1	1	Clint J. Luksa	2/4/2006	680/497 B.C.O.P.R.
062-036.7	1	1	Clint J. Luksa	2/4/2006	680/513 B.C.O.P.R.
062-036.8	1	1	Clint J. Luksa	2/4/2006	680/501 B.C.O.P.R.
062-041	1.7	1.7	Ysmaela Bautista	1/2/2007	707/313 B.C.O.P.R.
062-042	3.354	3.354	Cristian Bautista	1/2/2007	707/317 B.C.O.P.R.
062-043	5	5	Cristian Bautista and wife, Xochitl Bautista	1/2/2007	707/321 B.C.O.P.R.
062-044	6.49	6.49	Clint J. Luksa	2/4/2006	680/541 B.C.O.P.R.
062-045	35.71	35.71	Clint J. Luksa	2/4/2006	680/565 B.C.O.P.R.
062-046	8.15	8.15	Clint J. Luksa	2/4/2006	680/545 B.C.O.P.R.
062-060	76.407	76.407	Marshellet Cleveland	1/9/2007	708/839 B.C.O.P.R.
			George Jackson	1/9/2007	708/843 B.C.O.P.R.
077-004	23.735	23.735	John C. Graves and wife, Melba J. Graves	10/16/2003* (60)	614/096 B.C.O.P.R.
077-005	47	47	John H. Brown and wife, Nehoma Brown	10/16/2003* (60)	614/273 B.C.O.P.R.
077-006	1.5	0.9999	John H. Brown	11/1/2003* (61)	615/257 B.C.O.P.R.
077-007	0.5	0.5	Linda D. Brown	1/8/2004* (63)	621/620 B.C.O.P.R.
077-008	28	24.5	Leroy Freeman	10/5/2015	1026/133 B.C.O.P.R.
			Larry L. Freeman	10/8/2015	1023/790 B.C.O.P.R.
			Maggie B. Freeman	9/20/2015	1022/223 B.C.O.P.R.
			Redick Freeman	9/19/2000* (30)	549/273 B.C.O.P.R.
077-009	92.692	92.692	Anton M. Lehmann	9/27/2003* (59)	613/336 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
077-010	4	4	Rosetta Manual	10/11/2003* (60)	613/529 B.C.O.P.R.
077-011	17	17	Karl O. Wyler, III, Trustee of the Jean H. Wyler Credit Shelter Trust	12/30/2003* (62)	624/262 B.C.O.P.R.
077-012	3.098	3.098	David Paul Lehmann and wife, Mary Evelyn Lehmann	10/11/2003* (60)	613/340 B.C.O.P.R.
077-014	50	50	Mike Allen Palermo	10/27/2003* (60)	617/329 B.C.O.P.R.
077-015	50	50	Dowdy O. Cook and wife, Randie M. Cook	7/14/2004	636/102 B.C.O.P.R.
077-016	35	26.2499	Valerie M. Adams	12/31/2004	650/626 B.C.O.P.R.
			Dorothy Bookman	1/25/2005	653/315 B.C.O.P.R.
			Hubert Errol Fisher	9/16/2004	648/272 B.C.O.P.R.
			Estate of Rose Fisher, Deceased	6/14/2000* (16)	532/553 B.C.O.P.R.
			Leon Fisher	1/23/2005	653/311 B.C.O.P.R.
			Ivra Mae Gilbert	9/14/2004	640/742 B.C.O.P.R.
			Bruce E. Maxwell	1/1/2005	650/630 B.C.O.P.R.
			Charlotte M. Stanley	12/23/2004	650/169 B.C.O.P.R.
077-017	35	35	Dowdy O. Cook and wife, Randie M. Cook	7/13/2004	636/110 B.C.O.P.R.
077-018	40	40	Dowdy O. Cook and wife, Randie M. Cook	7/15/2004	636/106 B.C.O.P.R.
078-002	135.4598	122.9171	Laura Cox	11/1/2003* (9)	618/117 B.C.O.P.R.
			Dawn Hoover Haynes	2/7/2000* (9)	532/649 B.C.O.P.R.
			Steve Hughes	9/23/2003* (9)	619/310 B.C.O.P.R.
			Kathryn Hutcheson	9/25/2003* (9)	618/125 B.C.O.P.R.
			Florence Plasek	9/18/2003* (9)	611/415 B.C.O.P.R.
			Edward Plasek	1/18/2000* (9)	532/841 B.C.O.P.R.
			Alice Thompson	9/18/2003* (9)	611/403 B.C.O.P.R.
			W.J. Valigura	2/7/2000* (9)	533/041 B.C.O.P.R.
078-003	26.566	26.566	June Heath	9/7/2003* (59)	611/395 B.C.O.P.R.
078-004	28.7	28.7	Michael J. Kutach	9/28/2003* (59)	612/606 B.C.O.P.R.
078-005	28.718	28.718	Larry Weichert and wife, Cherly Weichert	10/5/2003* (60)	613/328 B.C.O.P.R.
078-006	54.731	54.731	Santiago Jaime De Los Santos, Jr. and wife, January W. De Los Santos	10/5/2003* (60)	612/833 B.C.O.P.R.
082-006	223.261	223.261	Paul J. Batista	3/24/2005	658/580 B.C.O.P.R.
			Douglas F. Batista	7/4/2007	721/796 B.C.O.P.R.
			Dorothy Perkins Batista	3/24/2005	658/584 B.C.O.P.R.
			Dena B. Haenchen	3/25/2005	658/588 B.C.O.P.R.
082-007	10.751	10.751	Kenneth Hariel Weaver	11/6/2004	645/114 B.C.O.P.R.
082-008	2.276	2.276	Clint J. Luksa	11/10/2004	644/796 B.C.O.P.R.
082-011.1	88.628	88.628	Dorothy M. Lange Marital Trust and the Dorothy M. Lange Family Trust	12/1/2004	648/284 B.C.O.P.R.
			Dorothy M. Lange Marital Trust and the Dorothy M. Lange Family Trust	12/1/2004	649/572 B.C.O.P.R.
			Dorothy M. Lange Marital Trust and the Dorothy M. Lange Family Trust	12/1/2004	650/145 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

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082-011.1	88.628	88.628	William A. Lange, Sr., Individually and as Independent Executor of the Estate of Dorothy M. Lange, Deceased	11/5/2004	645/106 B.C.O.P.R.
082-011.2	88.725	88.725	Dorothy M. Lange Marital Trust and the Dorothy M. Lange Family Trust	12/1/2004	650/149 B.C.O.P.R.
			Dorothy M. Lange Marital Trust and the Dorothy M. Lange Family Trust	12/1/2004	649/576 B.C.O.P.R.
			William A. Lange, Sr., Individually and as Independent Executor of the Estate of Dorothy M. Lange, Deceased	11/6/2004	645/110 B.C.O.P.R.
			Dorothy M. Lange Marital Trust and the Dorothy M. Lange Family Trust	12/1/2004	648/280 B.C.O.P.R.
082-012	50	50	Ilene Alice Hejtmancik Gentry	8/4/2004	639/832 B.C.O.P.R.
			Dennis Ray Hejtmancik	8/2/2004	639/828 B.C.O.P.R.
			Lloyd Anton Hejtmancik	8/9/2004	639/836 B.C.O.P.R.
			Marvis Allen Hejtmancik	8/9/2004	639/840 B.C.O.P.R.
			Lynwood Dale Hejtmancik	8/9/2004	640/156 B.C.O.P.R.
			Lavelle Joyce Hejtmancik Leinweber	8/23/2004	640/144 B.C.O.P.R.
082-015	12.939	12.939	Julius L. Dawson	11/5/2007	733/205 B.C.O.P.R.
082-017	50	50	Dorothy Lee Burks	8/12/2004	640/140 B.C.O.P.R.
082-018	10	5.8333	Frankie Lee Bell	11/28/2004	646/406 B.C.O.P.R.
			Willie M. Harvey	5/17/2007	719/310 B.C.O.P.R.
			Carris Jones Hawkins	7/4/2004	636/561 B.C.O.P.R.
			Cheryl J. Jones	5/10/2004* (67)	630/064 B.C.O.P.R.
			Joyce L. Jones	5/8/2004* (67)	630/060 B.C.O.P.R.
			George A. Jones, Sr.	5/2/2004* (67)	630/426 B.C.O.P.R.
			Danny V. Jones, Sr.	5/1/2004* (67)	629/135 B.C.O.P.R.
			Johnnie Jones Jr.	8/3/2004	639/852 B.C.O.P.R.
			Pearlie M. Mack	5/16/2007	719/318 B.C.O.P.R.
082-019	11	7.3333	Ray Jewell Bell	11/1/2015	1016/676 B.C.O.P.R.
082-022	56.7	56.7	Bill C. Barnett	10/21/2006	703/162 B.C.O.P.R.
082-023	60	60	Curtis Lee Barnett, L.P.	10/21/2006	703/166 B.C.O.P.R.
082-024.1	30	21.4285	Pinkie Jo Jeffries	5/22/2004* (67)	635/240 B.C.O.P.R.
			George Wendell Johnson	5/25/2004* (67)	635/232 B.C.O.P.R.
			Henry Earl Johnson	5/11/2004* (67)	635/220 B.C.O.P.R.
			Charlie Mae Jones	5/23/2004* (67)	636/130 B.C.O.P.R.
			Lon Arthur Williams	10/3/2004	644/228 B.C.O.P.R.
082-024.2	30	21.4285	Pinkie Jo Jeffries	5/23/2004* (67)	635/236 B.C.O.P.R.
			Henry Earl Johnson	5/12/2004* (67)	635/224 B.C.O.P.R.
			George Wendell Johnson	5/26/2004* (67)	635/228 B.C.O.P.R.
			Charlie Mae Jones	5/24/2004* (67)	636/126 B.C.O.P.R.
			Lon Arthur Williams	10/2/2004	644/224 B.C.O.P.R.
082-025	1.86	1.86	Edward Harrison, Jr.	5/29/2004* (67)	636/134 B.C.O.P.R.
082-026	40.593	40.593	Patricia Ball	5/30/2007	718/544 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

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082-027	513.018	513.018	Jay Don Watston Trust; and the DeAnn Watson Keilberg Trust	8/28/2007	688/017 B.C.O.P.R.
082-033	0.5	0.5	Gary A. Watson	1/4/2005	650/622 B.C.O.P.R.
082-034	79.55	79.55	Johnnie Cooper, Jr. and wife, Nellie Cooper	5/13/2004* (67)	630/752 B.C.O.P.R.
082-034.1	1.5	1.5	Sulphur Springs Cemetery of the Sulphur Springs Community	11/27/2007	736/099 B.C.O.P.R.
082-037	5	5	Glennett Allen	7/31/2004	637/603 B.C.O.P.R.
082-039	6.118	6.118	Husie L. Middleton	6/21/2000* (16)	532/773 B.C.O.P.R.
082-042	32.3351	32.3351	Husie L. Middleton	6/21/2000* (16)	532/773 B.C.O.P.R.
082-044	2	2	Clement Washington	11/1/2004	644/406 B.C.O.P.R.
082-045	2	0.8572	John Crockett	6/18/2008	752/657 B.C.O.P.R.
			Ruthie Ellison	9/7/2004	640/738 B.C.O.P.R.
			Chester Odele Pollard	3/24/2005	658/592 B.C.O.P.R.
082-046	2	2	Bonzell Jones	5/14/2004* (67)	630/418 B.C.O.P.R.
082-047	71.5122	71.5122	Darren Keith Broesche	3/13/2004* (65)	628/311 B.C.O.P.R.
082-048	3	3	Thelma L. McIntosh, formerly known as Thelma Cain	12/1/2004	647/666 B.C.O.P.R.
082-049	3.5	3.5	St. Paul Methodist Church, Successor in Interest to Ame Methodist Church and Bell Town Ame African Methodist Episcopal Cemetery	11/27/2007	735/182 B.C.O.P.R.
082-050	2.8903	2.8903	Hazel E. Robbins	8/2/2004	637/599 B.C.O.P.R.
082-051	48.25	48.25	Vauline Fisher	9/1/2015	1017/178 B.C.O.P.R.
			Woodrow Heslip, II	1/22/2008	740/579 B.C.O.P.R.
			Early L. Knox, Jr.	12/5/2004	648/276 B.C.O.P.R.
082-052	1.75	1.75	The Providence Baptist Church	11/27/2007	735/178 B.C.O.P.R.
082-053	2.4	0.5417	Sandra Johnson Guillory	6/7/2004* (68)	636/517 B.C.O.P.R.
			Cedric Shawn Johnson	7/3/2004	636/545 B.C.O.P.R.
			Darryl E. Johnson	6/2/2004* (68)	632/866 B.C.O.P.R.
			Jerome K. Johnson	6/2/2004* (68)	633/037 B.C.O.P.R.
			Ruby Johnson	6/2/2004* (68)	633/005 B.C.O.P.R.
			Willie Lois Jones	5/30/2004* (67)	633/021 B.C.O.P.R.
			Willie Lois Jones	6/2/2004* (68)	633/013 B.C.O.P.R.
082-054	5.927	5.927	Lonnie Clinard and wife, Ruby M. Clinard	9/11/2004	640/734 B.C.O.P.R.
082-055.1	47.1097	40.1307	Gaynella Lemons	9/7/2004	640/373 B.C.O.P.R.
			Olean Lemons	10/1/2004	643/855 B.C.O.P.R.
			Ernestine Moore Maxwell	9/7/2004	640/368 B.C.O.P.R.
			Tomeka Moore	9/7/2004	640/378 B.C.O.P.R.
			Josephine Moore	8/13/2005	669/406 B.C.O.P.R.
			Johnny B. Moore, Jr.	9/7/2004	640/363 B.C.O.P.R.
			Roger R. Moore	10/1/2004	643/845 B.C.O.P.R.
			Hardy G. Moore	10/8/2004	643/850 B.C.O.P.R.
			Elnora Moore	9/7/2004	640/383 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
082-055.1	47.1097	40.1307	Ruby Jean Moore Williams	6/9/2004* (68)	635/207 B.C.O.P.R.
082-055.2	4.642	3.9543	Olean Lemons	10/1/2004	643/855 B.C.O.P.R.
			Gaynella Lemons	9/7/2004	640/373 B.C.O.P.R.
			Ernestine Moore Maxwell	9/7/2004	640/368 B.C.O.P.R.
			Tomeka Moore	9/7/2004	640/378 B.C.O.P.R.
			Roger R. Moore	10/1/2004	643/845 B.C.O.P.R.
			Johnny B. Moore, Jr.	9/7/2004	640/363 B.C.O.P.R.
			Hardy G. Moore	10/8/2004	643/850 B.C.O.P.R.
			Josephine Moore	8/13/2005	669/406 B.C.O.P.R.
			Elnora Moore	9/7/2004	640/383 B.C.O.P.R.
			Ruby Jean Moore Williams	6/9/2004* (68)	635/207 B.C.O.P.R.
082-056	2	2	Mary Delois Jones	12/11/2007	736/123 B.C.O.P.R.
082-057	1	1	Lucinda M. Hargers	11/1/2007	733/201 B.C.O.P.R.
082-058	1	1	Michael Canterberry	12/19/2007	738/038 B.C.O.P.R.
082-059.1	1	1	Charles Guyton	11/1/2007	735/174 B.C.O.P.R.
082-059.2	1.678	1.678	Charles E. Guyton	11/1/2007	733/845 B.C.O.P.R.
082-060	6.025	6.025	Eugene L. Williams and wife, Lucille E. Williams	5/18/2004* (67)	630/438 B.C.O.P.R.
			Lucille Williams	5/17/2004* (67)	630/430 B.C.O.P.R.
082-061	16.125	16.125	Lucille Williams	5/15/2004* (67)	630/414 B.C.O.P.R.
			Eugene L. Williams and wife, Lucille E. Williams	5/16/2004* (67)	630/434 B.C.O.P.R.
082-062	16.625	16.625	Mrs. Robbie M. Williams	5/18/2004* (67)	635/212 B.C.O.P.R.
082-063	1	1	Bennie Lee Williams, II	7/19/2004	636/713 B.C.O.P.R.
082-064.1	1	1	Darren Keith Broesche	7/20/2004	636/790 B.C.O.P.R.
082-064.2	0.47	0.47	Darren Keith Broesche	7/21/2004	636/794 B.C.O.P.R.
082-065	0.943	0.943	James A. McBride	7/19/2004	637/267 B.C.O.P.R.
082-066	14.15	14.15	Raymond J. Laslie and wife, Ann Laslie	7/15/2004	636/549 B.C.O.P.R.
			Johnnie Laslie	7/15/2004	636/553 B.C.O.P.R.
082-067	3.77	3.77	Sandra Johnson Guillory	6/7/2004* (68)	636/513 B.C.O.P.R.
			Derrick Holcombe	6/15/2008	752/653 B.C.O.P.R.
			Carven Holcombe	6/20/2009	780/272 B.C.O.P.R.
			Stephanie Holcombe	6/15/2008	752/605 B.C.O.P.R.
			Maggie Lee Sweeney Houston	4/8/2008	749/332 B.C.O.P.R.
			Cedric Shawn Johnson	7/2/2004	636/537 B.C.O.P.R.
			Ruby Johnson	5/31/2004* (67)	633/9 B.C.O.P.R.
			Jerome K. Johnson	5/31/2004* (67)	633/033 B.C.O.P.R.
			Darryl E. Johnson	5/31/2004* (67)	632/870 B.C.O.P.R.
			Willie Lois Jones	5/31/2004* (67)	633/025 B.C.O.P.R.
			Edith Moore	6/15/2008	752/609 B.C.O.P.R.
			Palmer Lee Moore	6/5/2008	752/665 B.C.O.P.R.
			Margaret Moore Woodard	6/15/2008	752/585 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
082-068	3.77	3.77	Joe Baldwin	9/1/2016	1090/625 B.C.O.P.R.
			Ransom Craddock	8/14/2008	733/841 B.C.O.P.R.
082-069	3.77	3.77	Joe Baldwin	9/1/2016	1090/629 B.C.O.P.R.
			Willie Lois Jones, Successor in Interest to Helen Dukes, Deceased	12/7/2007	736/115 B.C.O.P.R.
082-070	16.832	16.832	Arthur Trull	7/16/2004	636/118 B.C.O.P.R.
082-071	9.08	9.08	Sandra Johnson Guillory	6/6/2004* (68)	636/529 B.C.O.P.R.
			Derrick Holcombe	6/15/2008	752/649 B.C.O.P.R.
			Carven Holcombe	6/20/2009	780/669 B.C.O.P.R.
			Stephanie Holcombe	6/15/2008	752/601 B.C.O.P.R.
			Maggie Lee Sweeney Houston	4/8/2008	749/328 B.C.O.P.R.
			Cedric Shawn Johnson	7/1/2004	636/541 B.C.O.P.R.
			Ruby Johnson	6/1/2004* (68)	633/001 B.C.O.P.R.
			Jerome K. Johnson	6/1/2004* (68)	633/029 B.C.O.P.R.
			Darryl E. Johnson	6/1/2004* (68)	632/874 B.C.O.P.R.
			Willie Lois Jones	6/1/2004* (68)	633/017 B.C.O.P.R.
			Palmer Lee Moore	6/5/2008	752/661 B.C.O.P.R.
			Edith Moore	6/15/2008	752/613 B.C.O.P.R.
			Margaret Moore Woodard	6/15/2008	752/589 B.C.O.P.R.
082-073	2.33	2.33	Sandra Johnson Guillory	6/5/2004* (68)	636/521 B.C.O.P.R.
			Cedric Shawn Johnson	5/23/2004* (67)	632/827 B.C.O.P.R.
			Darryl E. Johnson	5/21/2004* (67)	630/776 B.C.O.P.R.
			Ruby Johnson	5/11/2004* (67)	630/764 B.C.O.P.R.
			Jerome K. Johnson	5/18/2004* (67)	630/756 B.C.O.P.R.
082-074.1	6.42	6.42	Willie Lois Jones	5/15/2004* (67)	632/807 B.C.O.P.R.
082-074.2	0.5	0.5	Willie Lois Jones	5/28/2004* (67)	632/811 B.C.O.P.R.
082-075	12.51	12.51	Johnnie Laslie	7/16/2004	636/557 B.C.O.P.R.
082-076.1	18.42	18.42	Sandra Johnson Guillory	6/5/2004* (68)	636/525 B.C.O.P.R.
			Jerome K. Johnson	5/19/2004* (67)	630/760 B.C.O.P.R.
			Darryl E. Johnson	5/22/2004* (67)	630/772 B.C.O.P.R.
			Ruby Johnson	5/12/2004* (67)	630/768 B.C.O.P.R.
			Cedric Shawn Johnson	5/24/2004* (67)	632/831 B.C.O.P.R.
082-076.2	0.5	0.5	Sandra Johnson Guillory	6/6/2004* (68)	636/533 B.C.O.P.R.
			Jerome K. Johnson	5/29/2004* (67)	632/819 B.C.O.P.R.
			Darryl E. Johnson	5/29/2004* (67)	632/823 B.C.O.P.R.
			Ruby Johnson	5/29/2004* (67)	632/815 B.C.O.P.R.
			Cedric Shawn Johnson	5/22/2004* (67)	632/835 B.C.O.P.R.
082-077	39.333	39.333	Clement Washington	11/1/2004	644/410 B.C.O.P.R.
082-078	80	80	Hubert Bell, Jr.	12/3/2007	736/103 B.C.O.P.R.
			Harold L. Gamble	3/21/2004* (65)	626/309 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

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082-078	80	80	L.C. Gamble Jr.	3/13/2004* (65)	625/572 B.C.O.P.R.
			Marvin W. Gamble	3/14/2004* (65)	626/317 B.C.O.P.R.
			Willie Eva Gamble	3/10/2004* (65)	625/564 B.C.O.P.R.
			Bessie Louise Hodrick	3/14/2004* (65)	625/560 B.C.O.P.R.
			Erma Morris	3/26/2004* (65)	626/305 B.C.O.P.R.
			Hazel E. Robbins	8/2/2004	637/599 B.C.O.P.R.
			Curlin Roberson, Sr., Successor in Interest to Arlene Roberson, Deceased	1/10/2008	739/164 B.C.O.P.R.
			Merilyn Bell Rucker	12/3/2007	736/471 B.C.O.P.R.
082-079	211.606	211.606	Clint J. Luksa	11/6/2004	644/774 B.C.O.P.R.
082-081	68.59	68.59	Lyndon Brymer and wife, Edna Brymer	7/21/2004	637/255 B.C.O.P.R.
082-082	1	1	Alvin R. McNiel and wife, Nancy J. McNiel	9/7/2004	640/152 B.C.O.P.R.
082-085	80.816	60.612	Jason Royall	11/1/2007	733/193 B.C.O.P.R.
			Joshua Royall	10/29/2007	735/166 B.C.O.P.R.
082-086	99.604	99.604	John E. Krenek and wife, Mary Krenek	7/22/2004	637/587 B.C.O.P.R.
082-088	0.5	0.5	Kathlyn Bailey Bell	11/26/2007	736/111 B.C.O.P.R.
082-089	69.919	69.919	Lyndon Brymer and wife, Edna Brymer	7/22/2004	637/259 B.C.O.P.R.
082-090	50	50	Billy Neal Barnett	11/30/2006	705/133 B.C.O.P.R.
091-001	155	155	Michael Lina and wife, Ginger Lina	12/24/2003* (62)	619/586 B.C.O.P.R.
091-003	135.2	135.2	Mike R. Grohosky	3/30/2004* (65)	628/299 B.C.O.P.R.
095-001	230	230	Lenora Ruth Crawford	10/23/2003* (60)	615/245 B.C.O.P.R.
			William E. Crawford, II	1/1/2004* (63)	619/282 B.C.O.P.R.
			Dana Ann Crawford	10/23/2003* (60)	615/249 B.C.O.P.R.
102-001	101.175	101.175	Robert Livitz	12/10/2003* (62)	619/801 B.C.O.P.R.
102-002	18.33	18.33	Jearld Bronson Willard	12/4/2003* (62)	618/360 B.C.O.P.R.
102-003	18.33	18.33	Bronson Lee Willard	12/14/2003* (62)	618/401 B.C.O.P.R.
102-004	18.33	15.275	Jearld Bronson Willard	12/13/2003* (62)	618/364 B.C.O.P.R.
			Jearld Bronson Willard	12/5/2003* (62)	618/077 B.C.O.P.R.
			Jearld Bronson Willard	12/6/2003* (62)	618/081 B.C.O.P.R.
			Jearld Bronson Willard	12/7/2003* (62)	618/085 B.C.O.P.R.
102-005	18.33	18.33	Jearld Bronson Willard	12/8/2003* (62)	618/089 B.C.O.P.R.
102-006	18.33	18.33	Brent Edward Willard	12/18/2003* (62)	618/397 B.C.O.P.R.
102-007	21	21	Jearld Bronson Willard	12/10/2003* (62)	618/093 B.C.O.P.R.
102-008	100	100	Jearld Bronson Willard	11/11/2003* (61)	618/069 B.C.O.P.R.
102-009	191.344	191.344	Clarence R. Creger	6/30/2009	780/264 B.C.O.P.R.
			Max M. Stratton, II and wife, Shawn Stratton	6/30/2009	779/160 B.C.O.P.R.
102-013	46.58	46.58	Marvin E. Willard	7/21/2000* (20)	533/057 B.C.O.P.R.
102-016	39	39	Cecil Lee Denmon	5/8/2004* (67)	630/072 B.C.O.P.R.
			Thelma Dibbles	5/9/2004* (67)	630/068 B.C.O.P.R.
			Edward Harrison, Jr.	5/26/2004* (67)	636/798 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

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102-016	39	39	Jimmie Roy Harrison	5/4/2004* (67)	629/568 B.C.O.P.R.
			George Harrison	6/10/2004* (68)	635/216 B.C.O.P.R.
			Dorothy Menton	7/1/2004	636/138 B.C.O.P.R.
			Betty Jean Moore	7/4/2004	636/122 B.C.O.P.R.
102-017	19	19	Titus Henry Bell	7/20/2004	637/591 B.C.O.P.R.
			Elijah Bell	9/1/2004	640/160 B.C.O.P.R.
102-020	15.605	15.605	Willie Matthews	12/20/2003* (62)	621/612 B.C.O.P.R.
102-021	3.107	3.107	Brenda Thornton	4/15/2004* (66)	629/055 B.C.O.P.R.
102-022	235	137.973	Frankie Lee Bell	11/28/2004	646/402 B.C.O.P.R.
			Patricia E. Garcia	12/30/2003* (62)	619/302 B.C.O.P.R.
			Willie M. Harvey	5/17/2007	718/560 B.C.O.P.R.
			Carris Jones Hawkins	3/6/2004* (65)	628/656 B.C.O.P.R.
			Danny V. Jones, Sr.	4/30/2004* (66)	629/131 B.C.O.P.R.
			Cheryl J. Jones	12/29/2003* (62)	619/294 B.C.O.P.R.
			Joyce L. Jones	12/31/2003* (62)	619/298 B.C.O.P.R.
			George A. Jones, Sr.	4/29/2004* (66)	630/422 B.C.O.P.R.
			Johnnie Jones Jr.	8/3/2004	639/848 B.C.O.P.R.
			Pearlie M. Mack	5/16/2007	718/556 B.C.O.P.R.
102-023	18.25	18.25	Jearld Bronson Willard and wife, Gayle T. Willard	11/12/2003* (61)	618/073 B.C.O.P.R.
102-025	32.0375	32.0375	Douglas A. Maddox	12/19/2003* (62)	620/143 B.C.O.P.R.
102-026	100	100	Jearld Bronson Willard	11/10/2003* (61)	618/065 B.C.O.P.R.
102-027	4.348	4.348	Jearld Bronson Willard	12/12/2003* (62)	618/356 B.C.O.P.R.
104-001	50.39	50.39	Stanley A. Kutty	8/13/2003* (58)	609/338 B.C.O.P.R.
104-002	30	30	Lewis S. Vallette, Jr. and wife, Anne W. Vallette	9/3/2003* (59)	610/583 B.C.O.P.R.
104-003	44.99	14.9966	Djuana Malota	1/5/2000* (10)	532/717 B.C.O.P.
104-005	24.234	24.234	GRE XI, LLC	9/7/2003* (59)	610/248 B.C.O.P.R.
104-006	6	6	James Lofton and wife, Mari-Lisa Lofton	8/27/2003* (58)	609/254 B.C.O.P.R.
112-002	231	231	Billie E. Wolff, Trustee of the Charles W. Wolff and Billie E. Wolff Family Trust, under Article IV of the Charles W. and Billie E. Wolff Revocable Living Trust dated July 20, 1995, as amended July 14, 1998	5/14/2004* (9)	630/748 B.C.O.P.R.
112-003	142.833	142.833	Robert E. Sebesta and wife, Frances Sebesta	12/10/2003* (62)	618/061 B.C.O.P.R.
114-006	4.369	4.369	Fred D. Ellis, Jr.	8/12/2003* (58)	609/721 B.C.O.P.R.
114-007	6	6	Warren Lee Titel and wife, Jessie M. Titel	8/11/2003* (58)	609/258 B.C.O.P.R.
114-008	12.59	12.59	Richard E. Odom	8/11/2003* (58)	611/082 B.C.O.P.R.
114-009	19.56	19.56	James Houston	12/18/2003* (62)	618/613 B.C.O.P.R.
114-014	34.55	34.55	Alice Anderson	5/3/2004* (67)	629/127 B.C.O.P.R.
114-016	22.07	22.07	Darrell Perrard and wife, Shawn Perrard	9/5/2003* (59)	611/078 B.C.O.P.R.
114-019	47.54	47.54	Arthur Behrends, Jr. and wife, Eloise Behrends	1/23/2000* (10)	532/391 B.C.O.P.R.
114-021	1355.4383	1355.4383	Linda Lou Garrison and husband Tommy Garrison	7/7/2000* (19)	532/597 B.C.O.P.R.; 866/202 L.C.R.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
115-001	160.33	13.8747	Neal Barron	7/15/2004	637/263 B.C.O.P.R.
			Thomas Pusateri	12/9/2004	648/264 B.C.O.P.R.
124-010	64.687	64.687	James Michael Moratto	4/28/2004* (66)	632/799 B.C.O.P.R.
			Dawn Marie Moratto	4/28/2004* (66)	632/795 B.C.O.P.R.
124-011	84.319	84.319	GRE XI, LLC	9/20/2003* (59)	611/391 B.C.O.P.R.
126-002	634.927	39.9959	Lisa Dawn Russell	2/10/2005	654/039 B.C.O.P.R.
126-003	295.52	295.52	John Edward Siptak, Jr.	1/27/2004* (9)	621/588 B.C.O.P.R.
			James Franklin Siptak	1/25/2004* (9)	621/592 B.C.O.P.R.
			Steven Charles Siptak	1/26/2004* (9)	622/752 B.C.O.P.R.
			Bettye Carolyn Siptak Tolar	1/29/2004* (9)	622/740 B.C.O.P.R.
130-001	20	10	Elvie Mae Benson Harris	10/2/2006	700/060 B.C.O.P.R.
130-002	108	68.1438	Elvie Benson Harris, Independent Executrix of the Estate of Norma Benson Shelton, Deceased	10/27/2008	770/373 B.C.O.P.R.
			A.C. Jackson and wife, Gloria Jackson	11/26/2003* (9)	618/105 B.C.O.P.R.
			Vernon R. Coburn Lee	10/27/2003* (9)	618/837 B.C.O.P.R.
			Elma Rayford	11/26/2003* (9)	618/109 B.C.O.P.R.
130-005	46	28.9149	Elvie Benson Harris, Independent Executrix of the Estate of Norma Benson Shelton, Deceased	10/27/2008	770/377 B.C.O.P.R.
			A.C. Jackson and wife, Gloria Jackson	11/26/2003* (9)	618/105 B.C.O.P.R.
			Vernon R. Colburn Lee	9/17/2006	699/425 B.C.O.P.R.
			Elma Rayford	11/26/2003* (9)	618/109 B.C.O.P.R.
132-001	60	60	Alpha Ann Morris	7/31/2007	728/227 B.C.O.P.R.
			James Harmon Morton, A-K-A Buddy Morton	8/14/2007	732/077 B.C.O.P.R.
			Gerald Eugene Morton	8/10/2007	726/210 B.C.O.P.R.
			John Wayne Morton	8/10/2007	728/504 B.C.O.P.R.
132-006	134.2375	134.2375	Lora Christine Beard	1/7/2006	678/509 B.C.O.P.R.
			Glenn Marie Cotton	1/7/2006	678/776 B.C.O.P.R.
			Dale Bert Cotton	1/2/2006	679/328 B.C.O.P.R.
			Condale Cotton	1/2/2006	678/489 B.C.O.P.R.
			Clara Mae Cotton, by and through her duly appointed Agent and Attorney-in-Fact, Condale Cotton	1/7/2006	678/501 B.C.O.P.R.
			Lowene Morgan	1/7/2006	679/661 B.C.O.P.R.
			Edward Dean Ray, being one and the same person as Deaner Ray	1/7/2006	678/768 B.C.O.P.R.
132-007	19.849	19.849	Clara Estelle Wampler	1/7/2006	679/336 B.C.O.P.R.
			Ronnie Burrough	1/11/2006	679/673 B.C.O.P.R.
132-008	8	8	John D. Kovar and wife, Madeline Kovar	1/11/2006	678/792 B.C.O.P.R.
132-013m	85	85	Milton R. Currey, also known as Jim Currey	1/9/2006	679/364 B.C.O.P.R.; 996/662 M.C.O.R.
132-014m	49.992	49.992	Jim F. Brooks	1/24/2006	683/822 B.C.O.P.R.; 999/461 M.C.O.R.
132-017	57.467	57.467	Charles W. Holt, III, also known as Charles Whitfield Holt, III	5/28/2008	681/535 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
142-002	30	30	Michael Ruben Rivera and wife, Eoma Noreene Rivera	10/30/2009	788/470 B.C.O.P.R.
142-020	25	25	Caleb Pennie and wife, Ethyl Pennie	12/2/2004	647/658 B.C.O.P.R.
142-024	20.58	20.58	Jason Wade Schmidt and Michelle Llana Carr	12/18/2003* (62)	622/748 B.C.O.P.R.
142-025	20	20	Howard E. Chapman, Jr. and wife, Shelly L. Chapman	8/26/2003* (58)	608/694 B.C.O.P.R.
157-001	78.74	26.2466	Vance D. McManus	2/23/2005	655/013 B.C.O.P.R.
157-002	230.921	230.921	Clint J. Luksa	2/4/2004* (64)	622/760 B.C.O.P.R.
171-001	151	151	James F. Siptak	1/24/2004* (63)	621/584 B.C.O.P.R.
			Carolyn Siptak Tolar	1/28/2004* (63)	622/744 B.C.O.P.R.
171-003	10.01	10.01	Howard E. Chapman, Jr. and wife, Shelly L. Chapman	8/25/2003* (58)	608/690 B.C.O.P.R.
171-004.1	15.97	15.97	Wayne D. Oliver	2/10/2004* (64)	625/349 B.C.O.P.R.
171-004.2	4	4	Wayne D. Oliver	2/11/2004* (64)	625/353 B.C.O.P.R.
171-005	12.5	12.5	Don Ourada	5/10/2004* (67)	635/203 B.C.O.P.R.
171-007	8.04	8.04	Michael Prigmore and wife, Barbara Prigmore	2/11/2004* (64)	623/684 B.C.O.P.R.
171-008	2	2	Michael Prigmore and wife, Barbara Prigmore	2/12/2004* (64)	623/680 B.C.O.P.R.
171-010	41.675	41.675	Michael Ray Blaha	2/11/2004* (64)	623/676 B.C.O.P.R.
171-013	1	1	Trinidad Gonzales	7/18/2004	636/717 B.C.O.P.R.
171-021	64.576	64.576	Clint J. Luksa	2/8/2004* (64)	622/764 B.C.O.P.R.
171-023	3	3	Clint J. Luksa	2/12/2004* (64)	623/267 B.C.O.P.R.
171-024	15.146	15.146	Pamela Blaha Jackson	2/13/2004* (64)	624/254 B.C.O.P.R.
171-027	113.5	113.5	Carris Jones Hawkins	2/14/2004* (64)	628/652 B.C.O.P.R.
171-028	39.05	39.05	James Lockhart, Individually and doing business as Lockhart Apiaries	5/1/2004* (67)	630/410 B.C.O.P.R.
			John Lockhart, Individually and doing business as Lockhart Apiaries	5/1/2004* (67)	630/406 B.C.O.P.R.
171-032.1	46.651	46.651	S & V Partnership	6/11/2008	752/641 B.C.O.P.R.
171-032.2	19.259	19.259	S & V Partnership	6/11/2008	752/637 B.C.O.P.R.
171-032.3	19.259	19.259	S & V Partnership	6/11/2008	752/633 B.C.O.P.R.
171-032.4	19.259	19.259	S & V Partnership	6/11/2008	752/629 B.C.O.P.R.
171-032.5	19.259	19.259	S & V Partnership	6/11/2008	752/625 B.C.O.P.R.
171-032.6	19.266	19.266	S & V Partnership	6/11/2008	752/621 B.C.O.P.R.
171-035	170	56.6666	Sheila Blaha Vybiral	5/6/2004* (67)	629/564 B.C.O.P.R.
171-038	16.091	16.091	Horace Bell	8/31/2000* (22)	532/395 B.C.O.P.R.
171-041	16.091	16.091	John B. Bell	9/1/2015	1017/190 B.C.O.P.R.
			Ray J. Bell	9/1/2015	1017/174 B.C.O.P.R.
171-043	34.3112	34.3112	Husie L. Middleton	6/21/2000* (16)	532/773 B.C.O.P.R.
171-047	71.5122	71.5122	Roger Alan Broesche	3/18/2004* (65)	628/307 B.C.O.P.R.
171-048	45.5	45.5	Vauline Fisher	9/1/2015	1016/664 B.C.O.P.R.
171-049	13.6	13.6	Derrick Holcombe	6/15/2008	752/645 B.C.O.P.R.
			Stephanie Holcombe	6/15/2008	752/597 B.C.O.P.R.
			Carven Holcombe	6/20/2009	779/168 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
171-049	13.6	13.6	Bonzell Jones	12/7/2007	736/119 B.C.O.P.R.
			Edith Moore	6/15/2008	752/617 B.C.O.P.R.
			Margaret Moore Woodard	6/15/2008	752/593 B.C.O.P.R.
171-050	16.995	16.995	Gary M. Dominy	11/28/2007	735/157 B.C.O.R.
171-051	214.8	214.8	Billy Neal Barnett, L.P.	11/7/2006	703/174 B.C.O.P.R.
171-053	144.673	144.673	William C. (Bill) Barnett	11/7/2006	703/170 B.C.O.P.R.
176-011	125	20.8332	Greg Garbs, being one and the same person as Gregory L. Garbs and Gregory Lynn Garbs	3/24/2000* (12)	532/581 B.C.O.P.R.
			Jeffrey Jerry Garbs	6/9/2000* (16)	532/593 B.C.O.P.R.
185-004m	30.098	30.098	Vaughn E. Owens "Pud" and wife, Wilma Owens	11/25/2005	992/779 M.C.O.R.
185-005m	16.617	16.617	John D. Fishero and wife, Diane W. Fishero	2/25/2006	1000/745 M.C.O.R.
185-014m	113.133	113.133	Robert Keith Luetge	4/4/2006	1006/253 M.C.O.R.
			James Edward Luetge	3/30/2006	1005/130 M.C.O.R.
185-015m	255.3498	255.3498	Willrancho, Inc.	4/2/2008	1002/195 M.C.O.R.
185-016m	49	49	Willrancho, Inc.	4/2/2008	1002/175 M.C.O.R.
185-017m	51.5	51.5	Willrancho, Inc.	4/2/2008	1002/190 M.C.O.R.
185-018m	28	28	William D. Payne and wife, Christine L. Payne	3/2/2006	1002/818 M.C.O.R.
185-019m	44	44	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1009/391 M.C.O.R.
185-020m	50.6	50.6	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1009/387 M.C.O.R.
185-021m	28.75	28.75	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1010/188 M.C.O.R.
185-022m	28.75	28.75	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1010/184 M.C.O.R.
185-023m	60	60	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1009/383 M.C.O.R.
185-027m	159.5	159.5	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1009/379 M.C.O.R.
185-028m	54.9487	54.9487	William D. Payne and wife, Christine L. Payne	3/2/2006	1002/822 M.C.O.R.
185-029m	22.75	22.75	William D. Payne and wife, Christine L. Payne	3/2/2006	1002/814 M.C.O.R.
185-030m	27	27	Dennis W. Payne	3/2/2006	1002/830 M.C.O.P.
185-031m	112.37	112.37	William D. Payne and wife, Christine L. Payne	3/2/2006	1002/826 M.C.O.R.
185-032m	11.6502	11.6502	Edward P. Williams and wife, Mozell W. Williams	4/2/2008	1002/157 M.C.O.R.
185-033m	3.362	3.362	Ronald W. Hudson	2/5/2006	1000/238 M.C.O.R.
185-034m	36.74	36.74	Ronald W. Hudson	2/1/2006	999/457 M.C.O.R.
185-035m	37.94	37.94	Ronald W. Hudson	2/1/2006	999/449 M.C.O.R.
185-036m	1.2	1.2	Ronald W. Hudson	2/5/2006	1000/242 M.C.O.R.
185-038m	80.991	80.991	Debra Duncum Jackson	4/24/2006	1007/197 M.C.O.R.
185-040m	4.05	4.05	William D. Payne and wife, Christine L. Payne	4/26/2006	1008/356 M.C.O.R.
185-041m	2.75	2.75	William D. Payne and wife, Christine L. Payne	4/26/2006	1009/110 M.C.O.R.
185-043m	53.7789	53.7789	Doris M. Hicks	2/22/2006	1002/145 M.C.O.R.

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Lease Schedule for Vista Ridge LLC

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185-043m	53.7789	53.7789	John W. Hicks	3/13/2006	1003/716 M.C.O.R.
			Cynthia Velde	2/21/2006	1000/749 M.C.O.R.
185-044m	66.722	66.722	Ruth Edna Bachler	1/14/2006	997/356 M.C.O.R.
185-045m	120.3678	120.3678	Ascenia P. Underwood	2/25/2006	1000/737 M.C.O.R.
185-046m	34.75	34.75	Ascenia P. Underwood	2/25/2006	1000/741 M.C.O.R.
185-052m	50.778	50.778	Carol S. Janak	1/14/2006	996/674 M.C.O.R.
185-053m	28.717	28.717	Mark K. Hull	2/4/2006	1000/307 M.C.O.R.
185-055m	26.141	26.141	Virginia Wells Judkins	3/12/2006	1003/692 M.C.O.R.
185-056m	25	25	Virginia Wells Judkins	3/12/2006	1003/696 M.C.O.R.
185-057m	25	25	Richard D. Dunn and wife, Debra Dunn	2/4/2006	1002/123 M.C.O.R.
185-059m	17.582	17.582	Vernon Ferguson	2/4/2006	1002/119 M.C.O.R.
195-001	4.3013	4.3013	John C. North	2/4/2004* (64)	623/279 B.C.O.P.R.
195-002	2.9943	2.9943	Jose Onesimo Luna, Sr. and wife, Modesta Lopez Luna	11/13/2003* (61)	615/820 B.C.O.P.R.
195-004.1	54.3249	54.3249	Ronnie L. Albright and wife, Ethel Ruth Albright	12/30/2003* (62)	619/278 B.C.O.P.R.
195-004.2	32.7321	32.7321	Ronnie L. Albright and wife, Ethel Ruth Albright	12/31/2003* (62)	619/274 B.C.O.P.R.
195-005	62.538	62.538	David Paul Lehmann and wife, Mary Evelyn Lehmann	10/12/2003* (60)	613/817 B.C.O.P.R.
195-006	113.546	113.546	Richard Kretzer	10/28/2003* (60)	615/237 B.C.O.P.R.
195-007	35.25	35.25	Dana Ann Crawford	10/23/2003* (60)	615/249 B.C.O.P.R.
			Lenora Ruth Crawford	10/23/2003* (60)	615/245 B.C.O.P.R.
			William E. Crawford, II	1/1/2004* (63)	619/282 B.C.O.P.R.
195-013	47.132	47.132	Ray W. Wotipka	7/14/2005	666/748 B.C.O.P.R.
195-014	64.234	64.234	Franklin J. Beran	10/16/2003* (60)	614/092 B.C.O.P.R.
195-020	372.735	372.735	Harold E. Monical and wife, Barbara Monical	3/2/2005	658/570 B.C.O.P.R.
195-023	197.484	197.484	Lynn Dennis Monical and wife, Deanna Monical	3/2/2005	658/575 B.C.O.P.R.
195-024	46.63	46.63	Lynn Dennis Monical and wife, Deanna Monical	3/2/2005	658/575 B.C.O.P.R.
195-025	2	2	Pauline W. Jones	4/11/2001* (9)	545/160 B.C.O.P.R.
195-026	618.57	618.57	Sally Flosi	6/5/2000* (9)	532/557 B.C.O.P.R.
			Helen L. Lewis	9/19/2003* (9)	613/332 B.C.O.P.R.
203-001	31.2571	31.2571	Grace E. Ekman	11/7/2003* (61)	615/812 B.C.O.P.R.
203-002	8.5	8.5	John Larry Faust	11/7/2003* (61)	615/816 B.C.O.P.R.
203-003	7.65	7.65	Ray W. Wotipka	11/3/2005	676/843 B.C.O.P.R.
203-005	92	92	Billie Louise Kretzer Lauderdale	10/29/2003* (60)	615/233 B.C.O.P.R.
203-007	40	40	Ernest L. Faust and wife, Carolyn Faust	11/13/2003* (61)	615/804 B.C.O.P.R.
203-008	40	40	David Theuber	11/13/2003* (61)	615/808 B.C.O.P.R.
203-009.1	70	70	Kenneth W. Lauderdale and wife, Kathy A. Lauderdale	10/28/2003* (60)	615/213 B.C.O.P.R.
203-009.2	30.005	30.005	Kenneth W. Lauderdale and wife, Kathy A. Lauderdale	10/30/2003* (60)	615/225 B.C.O.P.R.
203-009.3	10.001	10.001	Kenneth W. Lauderdale and wife, Kathy A. Lauderdale	2/10/2004* (64)	623/672 B.C.O.P.R.
203-009.4	33.45	33.45	Kenneth W. Lauderdale and wife, Kathy A. Lauderdale	10/29/2003* (60)	615/221 B.C.O.P.R.
203-010	79.85	79.85	Joe F. Baldwin and wife, Junice K. Baldwin	11/12/2003* (61)	615/716 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
203-011	100	100	Kenneth W. Lauderdale and wife, Emily Lauderdale	2/23/2011	826/696 B.C.O.P.R.
203-012	2.22	2.22	Carolyn Wine	5/7/2007	717/504 B.C.O.P.R.
203-036	37.518	37.518	Eugene P. Emory	1/11/2004* (63)	620/728 B.C.O.P.R.
203-037	37.518	37.518	Kenneth W. Lauderdale and wife, Kathy A. Lauderdale	10/29/2003* (60)	615/217 B.C.O.P.R.
203-038	101.9	101.9	Donald Snider and wife, Nancy J. Snider	11/6/2003* (61)	615/469 B.C.O.P.R.
203-039	69.5	69.5	Joe Don Brymer and wife, Martha J. Brymer	11/6/2003* (61)	615/465 B.C.O.P.R.
203-040	14.9462	14.9462	Dianne Corvin	7/19/2004	636/721 B.C.O.P.R.
209-046	14.62	14.62	Mike R. Grohosky	3/29/2004* (65)	628/303 B.C.O.P.R.
209-051	107.819	107.819	Frederick A. Jackson and wife, Debra A. Jackson	11/7/2004	645/717 B.C.O.P.R.
209-052	136.49	136.49	Frederick A. Jackson and wife, Debra A. Jackson	11/8/2004	645/713 B.C.O.P.R.
210-015	10	10	James D. Stewart	12/21/2005	677/794 B.C.O.P.R.
210-018	10	10	Dorothy Wong	2/23/2006	682/419 B.C.O.P.R.
210-029	10	10	Mack A. Carson and wife, Cheryl A. Carson	1/11/2006	678/784 B.C.O.P.R.
210-030	10	10	Sharon Vaughn	1/7/2006	678/521 B.C.O.P.R.
210-032	10	10	Charles R. Walters	1/11/2006	678/796 B.C.O.P.R.
210-033.1	10	10	Oscar Fernandez	1/21/2006	679/348 B.C.O.P.R.
			Angela Fernandez	1/21/2006	679/360 B.C.O.P.R.
			A. Javier Martinez	1/21/2006	679/340 B.C.O.P.R.
			Alicia Martinez	1/21/2006	679/344 B.C.O.P.R.
			Maria Martinez	1/21/2006	680/585 B.C.O.P.R.
			Mario Martinez	1/21/2006	680/581 B.C.O.P.R.
			Ana Patricia Sierra	1/21/2006	679/356 B.C.O.P.R.
			Juan Manuel Sierra	1/21/2006	679/352 B.C.O.P.R.
210-033.2	10	10	Oscar Fernandez	1/21/2006	679/689 B.C.O.P.R.; 997/416 M.C.O.R.
			Angela Fernandez	1/21/2006	679/701 B.C.O.P.R.; 997/428 M.C.O.R.
			Alicia Martinez	1/21/2006	679/693 B.C.O.P.R.; 997/420 M.C.O.R.
			Maria Martinez	1/21/2006	683/810 B.C.O.P.R.; 999/441 M.C.O.R.
			Mario Martinez	1/21/2006	683/814 B.C.O.P.R.; 999/421 M.C.O.R.
			A. Javier Martinez	1/21/2006	679/697 B.C.O.P.R.; 997/424 M.C.O.R.
			Juan Manuel Sierra	1/21/2006	679/685 B.C.O.P.R.; 997/412 M.C.O.R.
			Ana Patricia Sierra	1/21/2006	679/681 B.C.O.P.R.; 997/408 M.C.O.R.
210-033.3	10	10	Angela Fernandez	1/21/2006	681/571 B.C.O.P.R.; 998/146 M.C.O.R.
			Oscar Fernandez	1/21/2006	681/575 B.C.O.P.R.; 998/142 M.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

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210-033.3	10	10	A. Javier Martinez	1/21/2006	681/567 B.C.O.P.R.; 998/158 M.C.O.R.
			Alicia Martinez	1/21/2006	681/563 B.C.O.P.R.; 998/154 M.C.O.R.
			Maria Martinez	1/21/2006	683/806 B.C.O.P.R.; 999/429 M.C.O.R.
			Mario Martinez	1/21/2006	683/818 B.C.O.P.R.; 999/425 M.C.O.R.
			Ana Patricia Sierra	1/21/2006	681/559 B.C.O.P.R.; 998/134 M.C.O.R.
			Juan Manuel Sierra	1/21/2006	681/555 B.C.O.P.R.; 998/138 M.C.O.R.
210-035	10	10	Richard E. Wheeler and wife, Mary S. Wheeler	1/7/2006	678/517 B.C.O.P.R.; 1094/601 M.C.O.R.
210-036m	10	10	Jessie E. Jeffcoat and wife, Priscilla J. Jeffcoat	1/4/2006	996/552 M.C.O.R.
210-037.1	10	10	Stacey L. Luecken Campbell	1/18/2006	1000/218 M.C.O.R.; 683/830 B.C.O.P.R.
			James L. Luecken and wife, Sharon M. Luecken	1/18/2006	681/583 B.C.O.P.R.; 998/150 M.C.O.R.
210-037.2	10	10	Stacey L. Luecken Campbell	1/18/2006	1000/222 M.C.O.R.; 683/826 B.C.O.P.R.
			James L. Luecken and wife, Sharon M. Luecken	1/18/2006	681/579 B.C.O.P.R.; 998/126 M.C.O.R.
210-046.2	31.881	31.881	Doris J. Allen	3/25/2006	1005/086 M.C.O.R.
219-001m	11.4167	11.4167	Velma Young Trust	8/26/2008	1000/286 M.C.O.R.
219-002m	69.965	69.965	Velma Young Trust	8/26/2008	1000/282 M.C.O.R.
219-003m	177.512	177.512	Douglas Wayne Young, Agent and Attorney-in-Fact for Velma Young	8/26/2008	1000/254 M.C.O.R.
219-004m	10.003	10.003	Velma Young Trust	8/26/2008	1000/262 M.C.O.R.
245-001	126.459	126.459	Ryal Harmon and wife, Linda Harmon	3/18/2004* (65)	626/297 B.C.O.P.R.
245-002	100	50	Gerald Fritze and Ray Fritze	3/6/2005	658/685 B.C.O.P.R.
			Miranda Sue Wilha	3/6/2005	659/491 B.C.O.P.R.
245-005	250.873	250.873	David J. Koch and Pat D. Koch, Trustees of The David and Patricia Koch Family Trust	3/2/2005	656/012 B.C.O.P.R.
245-006	177.96	177.96	Jon F. Koch and wife, Mary Jane Koch	3/2/2005	656/016 B.C.O.P.R.
245-007	354.241	354.241	David H. Nichols and wife, Kay Nichols	7/1/2000* (18)	532/821 B.C.O.P.R.
245-008	65.007	65.007	Frank Burrough, Jr. and wife, Evelyn Burrough	1/17/2006	679/669 B.C.O.P.R.
245-009	65.007	65.007	Delores Woolverton	1/23/2006	679/665 B.C.O.P.R.
245-011	3.1829	3.1829	Condale Cotton and wife, Christine Cotton	1/2/2006	678/493 B.C.O.P.R.
245-012	26.8171	26.8171	Lora Christine Beard	1/7/2006	678/513 B.C.O.P.R.
			Clara Mae Cotton, by and through her duly appointed Agent and Attorney-in-Fact, Condale Cotton	1/7/2006	678/505 B.C.O.P.R.
			Glenn Marie Cotton	1/7/2006	678/780 B.C.O.P.R.
			Dale Bert Cotton	1/2/2006	679/324 B.C.O.P.R.
			Condale Cotton and wife, Christine Cotton	1/2/2006	678/497 B.C.O.P.R.

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Lease Schedule for Vista Ridge LLC

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245-012	26.8171	26.8171	Lowene Morgan	1/7/2006	679/657 B.C.O.P.R.
			Edward Dean Ray, being one and the same person as Deaner Ray	1/7/2006	678/772 B.C.O.P.R.
			Clara Estelle Wampler	1/7/2006	679/332 B.C.O.P.R.
245-039	10.05	10.05	Millie Caywood	4/21/2004* (66)	629/139 B.C.O.P.R.
245-040	10.467	10.467	Pam K. Ross and husband, Walt Ross	4/23/2004* (66)	628/664 B.C.O.P.R.
250-003.1	227.1	227.1	Delia L. Orlopp	7/1/2000* (18)	532/829 B.C.O.P.R.
250-003.2	135	135	Delia L. Orlopp	7/1/2000* (18)	549/616 B.C.O.P.R.
250-004	28.393	28.393	Leroy Freeman	6/14/2000* (16)	532/573 B.C.O.P.R.
250-005	21.343	21.343	Cruz Pineda	10/10/2003* (60)	613/521 B.C.O.P.R.
250-009	5.011	5.011	Larry H. Champion	10/10/2003* (60)	613/525 B.C.O.P.R.
250-010.1	5	5	Harry Vowell	9/25/2004	644/422 B.C.O.P.R.
250-010.2	5	5	Harry Vowell	9/26/2004	644/426 B.C.O.P.R.
250-010.3	5	5	Harry Vowell	9/27/2004	644/430 B.C.O.P.R.
250-011	5	5	Lena D. Pivonka	5/9/2007	716/690 B.C.O.P.R.
250-012	4.993	4.993	Kenneth W. Lauderdale and wife, Kathy A. Lauderdale	10/30/2003* (60)	615/229 B.C.O.P.R.
250-013	4.992	4.992	William Daniel Condon, Custodian for Christopher Daniel Condon; Sara Danielle Condon; and James Michael Condon	10/19/2003* (60)	614/100 B.C.O.P.R.
250-014	4.993	4.993	Edward T. Newton	7/31/2000* (18)	532/805 B.C.O.P.R.
250-015	5	5	Ernesto Valenzuela and wife, Benigna R. Valenzuela	10/10/2003* (60)	613/348 B.C.O.P.R.
250-016	5	5	James B. Hardin, Jr.	10/11/2003* (60)	614/277 B.C.O.P.R.
250-017	5	5	Ruby Salas	10/11/2003* (60)	613/829 B.C.O.P.R.
250-018	25.547	25.547	John A. Lopez, Jr.	10/10/2003* (60)	613/517 B.C.O.P.R.
250-019	11.402	11.402	Lee Canon and wife, Debra L. Canon	10/16/2003* (60)	614/705 B.C.O.P.R.
250-024.2	2.0216	2.0216	Patrick A. Bradshaw and Vala J. Mondey	10/15/2003* (60)	615/477 B.C.O.P.R.
250-025	5	5	Daniel W. Condon and wife, Sarah Louise Condon	10/16/2003* (60)	613/825 B.C.O.P.R.
250-026	14.979	14.979	Donald K. Stephenson and wife, Doris L. Stephenson	10/13/2003* (60)	614/104 B.C.O.P.R.
250-027	5	5	Robert Peschel and wife, Glenda Peschel	10/15/2003* (60)	613/833 B.C.O.P.R.
250-028	5	5	Julian Bautista and wife, Maria S. Bautista	10/13/2003* (60)	613/837 B.C.O.P.R.
250-029	5	5	Jerame Earl Aly	10/13/2003* (60)	615/253 B.C.O.P.R.
250-030	5	5	James C. Holladay and wife, Goldie Holladay	10/20/2003* (60)	614/466 B.C.O.P.R.
250-033	5	5	Otis Harris and wife, Nancy Kay Holladay Harris	10/27/2003* (60)	614/470 B.C.O.P.R.
250-035	5	5	George Roy Magee, III and wife, Yolanda C. Oliver Magee	6/28/2007	722/557 B.C.O.P.R.
250-036	5	5	Billie R. Knesek	5/9/2007	719/306 B.C.O.P.R.
250-037	19.38	19.38	Tommy J. Wetterman and wife, Betty L. Wetterman	10/12/2003* (60)	613/821 B.C.O.P.R.
250-038	5	5	Ronald Pinter and wife, Stephanie Pinter	10/20/2003* (60)	614/709 B.C.O.P.R.
254-1-1-089	0.2611	0.2611	Clint J. Luksa	2/1/2004* (64)	622/775 B.C.O.P.R.
254-1-1-090	0.2611	0.2611	Clint J. Luksa	2/1/2004* (64)	622/775 B.C.O.P.R.
254-1-1-091	0.2611	0.2611	Clint J. Luksa	2/1/2004* (64)	622/775 B.C.O.P.R.

*Groundwater lease currently held by production payment clause including, but not limited to, all leases expired prior to 6/30/2019. (Production Amendment Number)

Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
288-014m	131.328	131.328	Willard L. Ferguson, being one and the same person as Will Ferguson, and W.L. Ferguson and wife, Betty Margaret Ferguson	2/15/2006	1000/697 M.C.O.R.
288-021m	96.6508	96.6508	Bill Foster	1/3/2006	996/536 M.C.O.R.
288-023m	65.4	65.4	Willard L. Ferguson, being one and the same person as Will Ferguson, and W.L. Ferguson and wife, Betty Margaret Ferguson	2/15/2006	1000/709 M.C.O.R.
288-024m	40	40	Willard L. Ferguson, being one and the same person as Will Ferguson, and W.L. Ferguson and wife, Betty Margaret Ferguson	2/15/2006	1000/705 M.C.O.R.
288-025m	12	12	Willard L. Ferguson, being one and the same person as Will Ferguson, and W.L. Ferguson and wife, Betty Margaret Ferguson	2/15/2006	1000/701 M.C.O.R.
288-026m	113	113	The Robert C. & Marjorie M. Orr Trust dated April 7, 1993	2/15/2006	1000/753 M.C.O.R.
288-027.1m	91	12.025	Esperanza Tovar Mendez	6/1/2006	1012/534 M.C.O.R.
			Albert Tovar	1/8/2006	998/102 M.C.O.R.
288-027.2m	91	21.125	Esperanza Tovar Mendez	6/1/2006	1012/029 M.C.O.R.
			Albert Tovar	1/8/2006	998/106 M.C.O.R.
288-036m	5	5	Carol S. Janak	1/3/2006	996/670 M.C.O.R.
288-037m	119.789	119.789	Charlie J. Janak	1/3/2006	996/666 M.C.O.R.
288-038m	36.9	36.9	H & W Land and Cattle, L.P.	12/23/2005	995/169 M.C.O.R.
288-040m	77.501	77.501	Willard L. Ferguson, being one and the same person as Will Ferguson, and W.L. Ferguson and wife, Betty Margaret Ferguson	2/15/2006	1000/713 M.C.O.R.
288-049m	1	1	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1010/196 M.C.O.R.
288-050m	1	1	Citizens National Bank, Trustee of the Curtis Foster Irrevocable Trust	5/15/2006	1010/192 M.C.O.R.
288-051m	50	50	Skinner Family Trust	1/7/2006	998/098 M.C.O.R.
288-052m	10.28	10.28	Thomas W. Grabener and wife, Doris Grabener	2/4/2006	1000/725 M.C.O.R.
288-053m	10.25	10.25	Thomas W. Grabener and wife, Doris Grabener	2/4/2006	1000/729 M.C.O.R.
288-054m	10.28	10.28	Thomas W. Grabener and wife, Doris Grabener	2/4/2006	1000/721 M.C.O.R.
288-055m	10.27	10.27	Jackie W. Threadgill	2/4/2006	1000/319 M.C.O.R.
288-059m	10.93	10.93	Thomas W. Grabener and wife, Doris Grabener	2/4/2006	1000/717 M.C.O.R.
288-060m	10.12	10.12	John Santellano	3/2/2006	1002/216 M.C.O.R.
288-061m	138	138	Willrancho, Inc.	4/2/2008	1002/170 M.C.O.R.
288-062m	48	48	Willrancho, Inc.	4/2/2008	1002/185 M.C.O.R.
288-065m	139	139	Willrancho, Inc.	4/2/2008	1002/180 M.C.O.R.
288-066m	33.375	33.375	Della Fay Coleman	3/6/2006	1002/842 M.C.O.R.
291-004m	60.3	60.3	Rudolph Kenneth Schneebeli	12/12/2010	994/699 M.C.O.R.
291-005m	43	43	Rudolph Kenneth Schneebeli	12/12/2010	994/703 M.C.O.R.
291-006m	32.6	32.6	Rudolph Kenneth Schneebeli	12/12/2010	994/707 M.C.O.R.
291-020m	75	75	Howard E. Ryan and wife, Joyce M. Ryan	4/5/2003* (54)	903/084 M.C.O.R.

*Groundwater lease currently held by production payment clause including, but not limited to, all leases expired prior to 6/30/2019. (Production Amendment Number)

Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
291-021m	3.45	3.45	Howard E. Ryan	4/6/2003* (54)	903/080 M.C.O.R.
291-022m	150	150	Thomas Michael Butler and wife, Patricia Ann Butler	6/28/2008	1003/712 M.C.O.R.
291-023m	5.2	5.2	Glenna Keen Lynn	4/5/2003* (54)	903/064 M.C.O.R.
291-024m	176.48	176.48	Della May Keen	4/4/2003* (54)	903/056 M.C.O.R.
291-025m	5	5	Linda Keen Platt	4/6/2003* (54)	903/068 M.C.O.R.
291-026m	101	101	Della May Keen	4/3/2003* (54)	903/060 M.C.O.R.
291-027m	48.66	48.66	Della May Keen	4/2/2003* (54)	903/048 M.C.O.R.
291-028m	46.375	46.375	Della May Keen	4/1/2003* (54)	903/052 M.C.O.R.
291-029m	53.625	53.625	Curtis D. Kornegay and wife, Billie Jean Kornegay	6/13/2002* (45)	878/797 M.C.O.R.
291-031m	51.223	51.223	Rudolph Kenneth Schneebeli	12/12/2010	994/711 M.C.O.R.
291-032m	26.4	26.4	Kirby Randolph Simmons, being one and the same person as Randy Simmons	12/24/2005	995/189 M.C.O.R.
291-033m	66.2	66.2	Kirby Randolph Simmons, being one and the same person as Randy Simmons	12/24/2005	995/193 M.C.O.R.
291-034m	50	50	Kirby Randolph Simmons, being one and the same person as Randy Simmons	12/25/2005	995/197 M.C.O.R.
291-035m	18.67	18.67	Kirby Randolph Simmons, being one and the same person as Randy Simmons	12/25/2005	995/201 M.C.O.R.
291-036m	73.75	73.75	Kirby Randolph Simmons, being one and the same person as Randy Simmons	12/26/2005	995/205 M.C.O.R.
291-037m	50	50	Kirby Randolph Simmons, being one and the same person as Randy Simmons	12/26/2005	995/209 M.C.O.R.
291-039m	117.773	117.773	Judith A. Matula	11/25/2005	992/767 M.C.O.R.
291-040m	19.332	19.332	Judith A. Matula	11/25/2005	992/763 M.C.O.R.
291-041.1m	168.37	168.37	Judith A. Matula	11/25/2005	992/771 M.C.O.R.
291-041.2m	1.56	1.56	Judith A. Matula	11/24/2005	992/775 M.C.O.R.
291-041.3m	10.86	10.86	Judith A. Matula	11/24/2005	992/759 M.C.O.R.
291-041.4m	0.113	0.113	Judith A. Matula	12/18/2005	994/731 M.C.O.R.
291-045m	6.056	6.056	Joe Hatcher and wife, Ida L. Hatcher	12/13/2005	994/691 M.C.O.R.
291-046m	7.491	7.491	Joe Hatcher and wife, Ida L. Hatcher	12/13/2005	994/695 M.C.O.R.
291-063m	19.2	19.2	Michael Skrhak	12/18/2005	994/727 M.C.O.R.
291-064m	57.293	57.293	Allen D. Wallace and wife, Cynthia Wallace	4/3/2006	1006/249 M.C.O.R.
291-065m	126.143	121.717	Michael A. Carter	5/22/2006	1011/076 M.C.O.R.
			Myrtis Crayton	3/21/2006	1005/126 M.C.O.R.
			Mary Esta Crayton	4/15/2006	1007/181 M.C.O.R.
			Annie G. Croom	5/19/2006	1010/208 M.C.O.R.
			Frank Pierson	3/2/2006	1002/834 M.C.O.R.
			Helen Crayton Rhem	3/8/2006	1003/664 M.C.O.R.
			Lawrence Cecil Richards	2/10/2006	1000/677 M.C.O.R.
			Lawrence Cecil Richards, Trustee	2/10/2006	1000/681 M.C.O.R.
			Sarah F. Shilow	5/19/2006	1010/204 M.C.O.R.
			Annie Williams	3/8/2006	1005/090 M.C.O.R.

*Groundwater lease currently held by production payment clause including, but not limited to, all leases expired prior to 6/30/2019. (Production Amendment Number)

Lease Schedule for Vista Ridge LLC

Tract	Tract Acres	Net Acres	Lessee	Lease Date	Recording Data
291-067m	2	2	Michael Skrhak and wife, Jodi Michelle Young Skrhak	12/20/2005	995/165 M.C.O.R.
291-070m	48	48	Velma Young Trust	8/26/2008	1000/278 M.C.O.R.
291-071m	46.6	46.6	Velma Young Trust	8/26/2008	1000/274 M.C.O.R.
291-072m	69.9	69.9	Velma Young Trust	8/26/2008	1000/270 M.C.O.R.
291-078m	49.71	49.71	Robert Keith Luetge	4/3/2006	1007/193 M.C.O.R.
291-081m	32.568	32.568	Curtis D. Kornegay and wife, Billie Jean Kornegay	6/14/2002* (45)	878/801 M.C.O.R.
303-001m	12.161	12.161	Hondo Land and Cattle Company, Ltd.	9/13/2005	986/109 M.C.O.R.
303-002m	293	293	Hondo Land and Cattle Company, Ltd.	9/15/2005	986/113 M.C.O.R.
303-003m	136	136	Hondo Land and Cattle Company, Ltd.	9/14/2005	986/105 M.C.O.R.
303-064m	14.87	14.87	Harry Vowell and Caleb J. Hildebrand	6/22/2006	1014/278 M.C.O.R.
303-065m	4.089	4.089	Harry Vowell and Caleb J. Hildebrand	6/22/2006	1014/875 M.C.O.R.
331-003m	97.6796	97.6796	Velma Young Trust	8/26/2008	1000/266 M.C.O.R.
331-004m	17.997	17.997	Velma Young Trust	8/26/2008	1000/258 M.C.O.R.

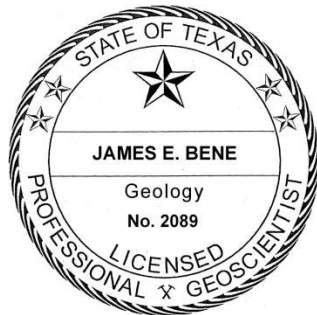
Total Net Acres: 25,578.7425

TAB

4

Groundwater Modeling Technical Memorandum

Prepared by:



A handwritten signature in black ink, appearing to read "James E. Bene".

The seal appearing on this document was authorized by
James E. Bené, P.G. 2089 on July 1st, 2019. R.W.
Harden & Associates, Inc. TBPG Firm No. 50033.

TABLE OF CONTENTS

TABLE OF CONTENTS.....	2
INTRODUCTION	3
VISTA RIDGE MODGAM MODEL MODIFICATIONS AND CALIBRATION	3
MODGAM Simsboro Transmissivity	4
Regional Aquifer Transmissivity.....	6
GAM - MODGAM Comparison	7
Hydrographs of Measured and Modeled Water Levels.....	9
DFC/MAG PUMPAGE DISTRIBUTION ASSUMPTIONS AND TECHNIQUES.....	11
PREDICTIVE MODELING	13
Amendment 1 – Relocation of VR PW-18	13
Pumpage Modifications.....	13
Calculation of Amendment 1 Aquifer Response.....	14
Amendment 2 – Increase Total Annual Simsboro Well Field Production.....	15
Pumpage Modifications.....	15
Calculation of Amendment 2 Aquifer Response.....	16
Amendment 3 – Reinstate 3,000 gpm Well Production Rate	17
Pumpage Modifications.....	17
Aquifer Response	18
Modeling Using Obsolete GAM.....	19
REFERENCES	20

INTRODUCTION

Blue Water Vista Ridge LLC (Blue Water), as permit administrator for Vista Ridge LLC (Vista Ridge), is requesting three amendments to Post Oak Savannah Groundwater Conservation District (POSGCD or District) Drilling & Operating Permit No. POS-D&O/A&M-0001d that require groundwater modeling to assess the aquifer response to the proposed changes. Vista Ridge requests: 1) relocation of one permitted well location (PW-18), 2) an increase in permitted wellfield production of 4,842 acre feet per year (ac-ft/yr), and 3) reinstatement of instantaneous permitted well rates for three wells (PW-12, PW-13, and PW-16), all in the Simsboro Formation (Simsboro).

Three models were used to evaluate the aquifer response to the requested amendments:

- 1) **GAM** – recently-updated Central Carrizo-Wilcox Groundwater Availability Model developed by the Texas Water Development Board (TWDB)
- 2) **MODGAM** – Modified version of the GAM in which the transmissivity of the model layer representing the Simsboro Formation (Simsboro) was set to values documented during testing of Vista Ridge production wells.
- 3) **Obsolete GAM** – Now-obsolete version of the GAM used during the development of the Desired Future Conditions\Modeled Available Groundwater (DFC/MAG) that were adopted in 2016

To assess impacts from groundwater production by other users in the region, pumpage inputs for the model simulations were derived from the pumpage dataset included in the current Desired Future Conditions\Modeled Available Groundwater (DFC/MAG) Predictive Scenario 12 (DFC PS-12). Because the DFC PS-12 dataset was designed for the Obsolete GAM, which utilizes different cell structures, layers, and simulation times, reassignment of the pumpage to the GAM and MODGAM was necessary.

The following sections discuss: a) the MODGAM creation and calibration check process, b) the methods and assumptions used to incorporate the DFC PS-12 pumpage dataset into the GAM and MODGAM and, c) summaries of the simulations conducted, and d) the methods used to demonstrate aquifer impacts from requested permit modifications, as shown in various plates included under Tab 2 of the application document packet.

VISTA RIDGE MODGAM MODEL MODIFICATIONS AND CALIBRATION

In November 2015, long-term aquifer testing was initiated using the first Vista Ridge production well (Well PW-13) completed in the Simsboro. Continuous water level measurements were recorded while pumpage was maintained at 3,110 gallons per minute (gpm) over a period of 23.75 days followed by a 4-day recovery period. Eight additional Simsboro production wells were constructed in 2017 and 2018, each of which was tested for approximately 36 hours followed by an aquifer recovery period of about 12 hours. As expected, given the relative homogeneity of Simsboro sediments in the well field area and the regional extent of the aquifer, the results of these tests were relatively consistent. Using the Vista Ridge and neighboring Blue Water 130 Project testing data, the average (geometric mean)

Simsboro transmissivity was calculated to be approximately 110,000 gallons per day per foot (gal/day/ft).

Inspection of the GAM, which was recently updated and approved by the TWDB, revealed that the transmissivity values applied to the Simsboro layer (Layer 9) in the Vista Ridge well field area range from about 45,000 gal/day/ft to 55,000 gal/day/ft., or about one-half of the actual Simsboro transmissivity documented during field testing. This is significant because, all other factors being equal, simulated pumping from a modeled aquifer with 50% of the true transmissivity will result in predicted drawdowns that are approximately double the amount of drawdown that will occur in response to real-world pumping. Consequently, the GAM-predicted aquifer response to Vista Ridge pumpage will not accurately reflect real-world conditions in the Vista Ridge well field area.

To more accurately simulate the drawdown expected from Vista Ridge pumpage, a modified version of the GAM was created, which is herein referred to as the MODGAM. The MODGAM is identical to the GAM except that the transmissivity field applied to the Simsboro in the Vista Ridge region was set to approximately 110,000 gal/day/ft by adjusting the modeled horizontal hydraulic conductivity values. The following sections describe the methodology used to generate the MODGAM hydraulic property inputs and the process used to evaluate those modifications.

MODGAM Simsboro Transmissivity

As described above, the transmissivity of the MODGAM Simsboro layer near the Vista Ridge well field was modified to correspond to aquifer testing results. The areal extent of those modifications was determined through analysis of the aquifer test conducted at well PW-13, specifically, the area within the “radius of influence” of the cone of depression created by the PW-13 test. We defined the radius of influence as the distance from well PW-13 at which the Theis (1935) non-equilibrium, confined, radial flow equation predicts that one foot of drawdown will occur. The extent of the one-foot drawdown footprint was selected because previous experience with Simsboro pumping tests in Central Texas indicates that deflections in recorded well drawdown curves can be observed when about one foot of drawdown interacts with known hydraulic boundary conditions.

A well discharge rate of 3,110 gpm and an aquifer transmissivity of 114,000 gal/day/ft were applied to the Theis calculation, which correspond to the PW-13 discharge rate and the transmissivity calculated by applying the Cooper-Jacob (1946) method to the time-drawdown data measured during testing. A storativity value of 0.0002 was used for this calculation, which represents the average of the values calculated by applying the Cooper-Jacob method to the semi-log plots of time-drawdown recorded in Vista Ridge wells monitored during testing. Applying these values, the resulting radius of influence from PW-13 over the 23.75-day test period was estimated to be approximately 15 miles.

It should be noted that there are several methods that can be used to determine the area of an aquifer that is influenced by pumping stresses imposed during well testing. In general, the methods are empirical (formulated using real-world testing data instead of or in addition to purely mathematical derivations) and are dependent on the site-specific characteristics of the tested aquifer(s). As an alternative to the Theis calculation described above, a similar method described by Butler (1990) was also explored. Butler states:

“The portion of the aquifer controlling changes in drawdown at any given time during a pumping test is essentially a concentric ring of material that continually increases in width as it moves away from a well in an infinite aquifer. This ring is designated here as the front of the cone of drawdown (depression).”

Referencing a previous author (Streltsova, 1988), Butler calculates the inner and outer radii of the ring representing the front of the cone of depression with two equations:

$$\text{Inner Radius} = (0.1Tt/S)^{0.5} \qquad \text{Outer Radius} = (14.8Tt/S)^{0.5}$$

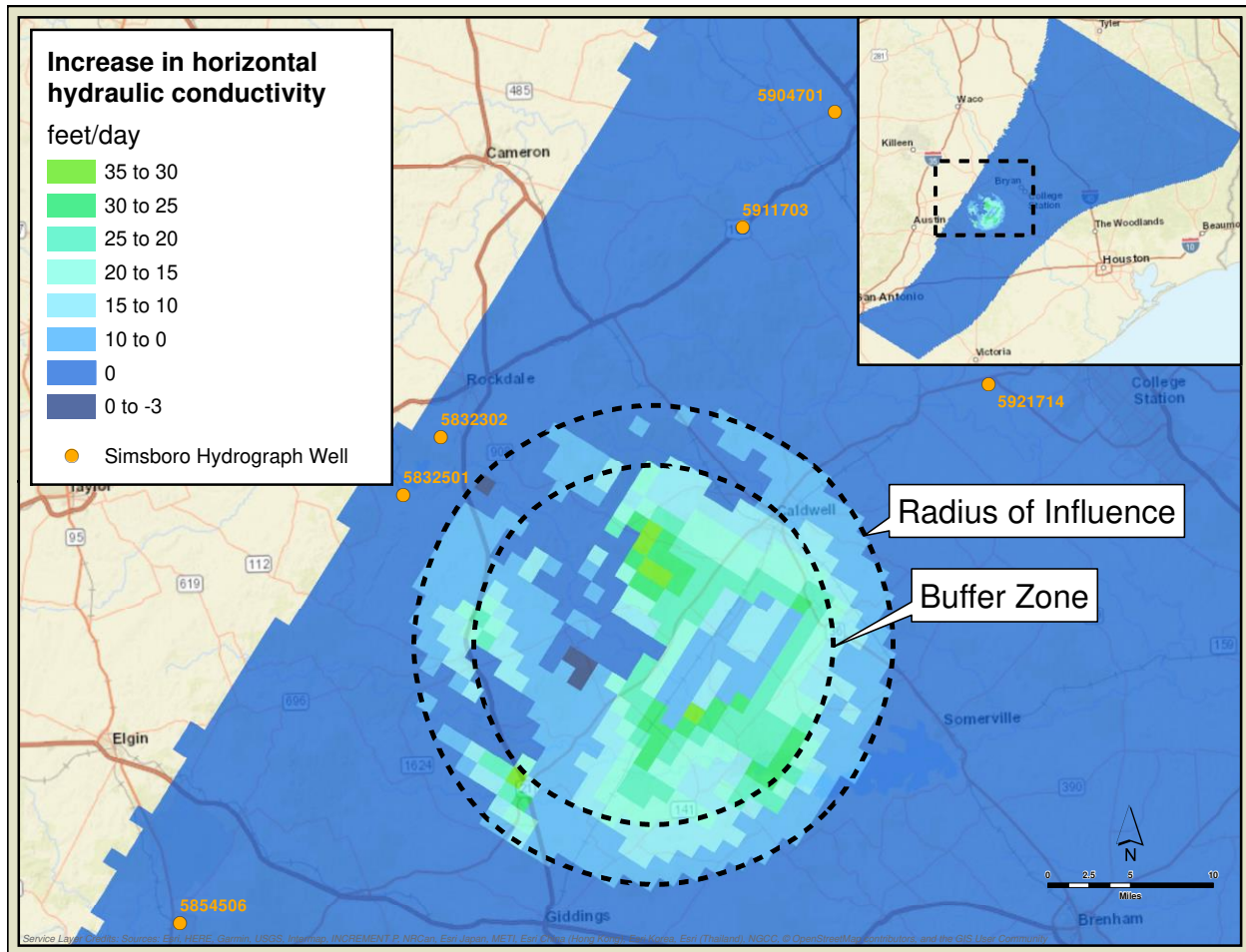
Where T is transmissivity, t is duration of pumpage, and S is aquifer storativity. Applying the PW-13 testing parameters and duration described above, values of about 2.5 miles and 31 miles are found for the inner and outer radii, respectively. However, the PW-13 test data strongly suggest that the outer radius of influence could not have extended to 31 miles because the Simsboro outcrops approximately 20 miles northwest of the Vista Ridge well field, and deflections in the later-time drawdown measurements should have been observed in the PW-13 test data if the drawdown cone extended to the outcrop (no significant deflections were recorded). Consequently, the Butler calculation provides perspective with regard to the Theis method described above but was disregarded for the MODGAM modification process described herein.

The testing conducted using Vista Ridge production wells indicates that the hydraulic characteristics of the Simsboro are relatively consistent in the well field area; however, significant variations in Simsboro thickness and sediment properties are known to exist in the Central Texas region. While these aquifer heterogeneities result in some preferential regional flow paths that are not reproduced by the circular drawdown cone derived from the Theis calculation described above, the area of influence produced by the Theis method reasonably represents the general area affecting shorter-term Vista Ridge drawdown in the GAM. A buffer zone inside the perimeter of the 1-foot radius of influence was used to create a smooth transition zone from the area that was modified in the MODGAM and the unmodified regional transmissivity. The buffer zone was defined as the annulus between the outer (1-foot drawdown) radius of influence and the radial distance from well PW-13 at which two feet of drawdown is predicted by the Theis non-equilibrium equation.

The geometric mean of the transmissivity values obtained from Vista Ridge production well testing was calculated and applied within the area between Well 13 and the buffer zone by modifying the horizontal hydraulic conductivity values applied to Layer 9. Within the buffer zone annulus, Layer 9 hydraulic conductivity values were calculated by interpolating between the modified transmissivity values in the Vista Ridge area and the unmodified, regional hydraulic conductivity values.

Figure 1 presents the changes made to the Layer 9 hydraulic conductivity field needed to reproduce the appropriate transmissivity for the Simsboro in the model. As shown, the hydraulic conductivity modifications are not constant over the radius of influence/buffer zone but correspond to the varying formation thickness in the area as reflected in the model grid structure.

Figure 1: Difference between GAM and MODGAM Horizontal Hydraulic Conductivity Values for Layer 9 (Simsboro Formation)



Regional Aquifer Transmissivity

In addition to incorporating the hydraulic characteristics documented during testing of PW-13, the transmissivity applied to the Simsboro layer in the MODGAM is generally consistent with the results of other aquifer tests conducted in the area of influence applied to the transmissivity modifications described above.

Table 1 lists Simsboro pump test results as reported in Appendices A & B of the GAM Report (Young et al, 2018) for wells within the PW-13 area of influence described above (approximately 15 miles from PW-13). As compared to the GAM, the MODGAM more-accurately matches the pump test transmissivities listed in the GAM report for Vista Ridge PW-13 (AT-42C), BW 130 Project PW-1 (AT-43C), BW 130 Project PW-2 (AT-19C), and Forestar Well 8 (AT-76C).

The transmissivities input into the MODGAM are greater than the Simsboro transmissivities that were calculated from pump tests conducted using Forestar Well 5 (AT-73C) and Forestar Well 7 (AT-75C). However, given the greater transmissivity calculated at Forestar Well 8, it is likely that negative hydraulic boundary effects have resulted in apparent/calculated transmissivities that are not representative of the thickness of the Simsboro sediments at those locations. Forestar Well 5 & 7 both

screen more than 350 feet of Simsboro but are located near a portion of the Milano fault zone that has experienced several hundred feet of displacement (GAM Report, Figure 3.1.2.3a, Section D-D'). These wells' proximity to the Milano faults (and associated negative hydraulic boundary effects) likely resulted in increased rate of pump test drawdown and subsequently reduced apparent/calculated transmissivity.

Table 1: Approximate Simsboro Transmissivity (Gal/Day/Ft) in PW-13 Area of Influence

<i>Area/Site</i>	<i>GAM Report Test ID</i>	<i>GAM Report Pump Test Average</i>	<i>GAM</i>	<i>MODGAM</i>
Vista Ridge PW-13	AT-42C	125,000	45,000	110,000
BW 130 Project PW-1	AT-43C	177,000	32,000	110,000
BW 130 Project PW-2	AT-19C	103,000	34,000	110,000
Forestar Well 5	AT-73C	74,000	60,000	110,000
Forestar Well 7	AT-75C	8,000	77,000	110,000
Forestar Well 8	AT-76C	109,000	47,000	110,000

GAM - MODGAM Comparison

To gauge the effects of the transmissivity modifications on the overall model performance, we evaluated the calibration statistics for the MODGAM using the calibration target values provided in the GAM report and other deliverables distributed by the TWDB. The transient calibration statistics for the GAM and MODGAM are provided below in Table 2 for the entire model domain and in Table 3 for the Simsboro Formation (Layer 9).

Table 2: Transient Calibration Results: Whole Model Domain

	<i>GAM</i>	<i>MODGAM</i>	<i>Difference</i>
<i>Mean Error (ft)</i>	-4.45	-4.51	-0.06
<i>Mean Absolute Error (ft)</i>	14.71	14.74	0.03
<i>Root Mean Square Error (ft)</i>	22.64	22.67	0.03
<i>Range (ft)</i>	844.64	844.64	N/A
<i>RMSE/Range</i>	2.68%	2.68%	0%

Table 3: Transient Calibration Results: Simsboro Formation (Layer 9)

	<i>GAM</i>	<i>MODGAM</i>	<i>Difference</i>
<i>Mean Error (ft)</i>	-13.12	-14.1	0.98
<i>Mean Absolute Error (ft)</i>	20.25	20.5	0.25
<i>Root Mean Square Error (ft)</i>	24.89	25.14	0.25
<i>Range (ft)</i>	520	520	N/A
<i>RMSE/Range</i>	4.79%	4.83%	0.04%

As shown in Table 2, the differences in calibration statistics between the two models are minimal over the whole model domain. Table 3 shows that, for the Simsboro, the mean error increased by 0.98 feet, while both the mean absolute and root mean squared errors increased by 0.25 feet. However, it should be noted that these differences are relatively insignificant and both the MODGAM and the GAM are well within the 10% RMSE/Range limit applied to groundwater availability model calibration targets by the TWDB.

A scatter plot of the observed versus computed values for the transient calibration targets for the Simsboro Aquifer (Layer 9) is presented in Figure 2 below. As shown, the computed values at the calibration targets are almost identical for both the MODGAM and the GAM.

Figure 2: Observed vs. Simulated Heads (Simsboro Layer 9))

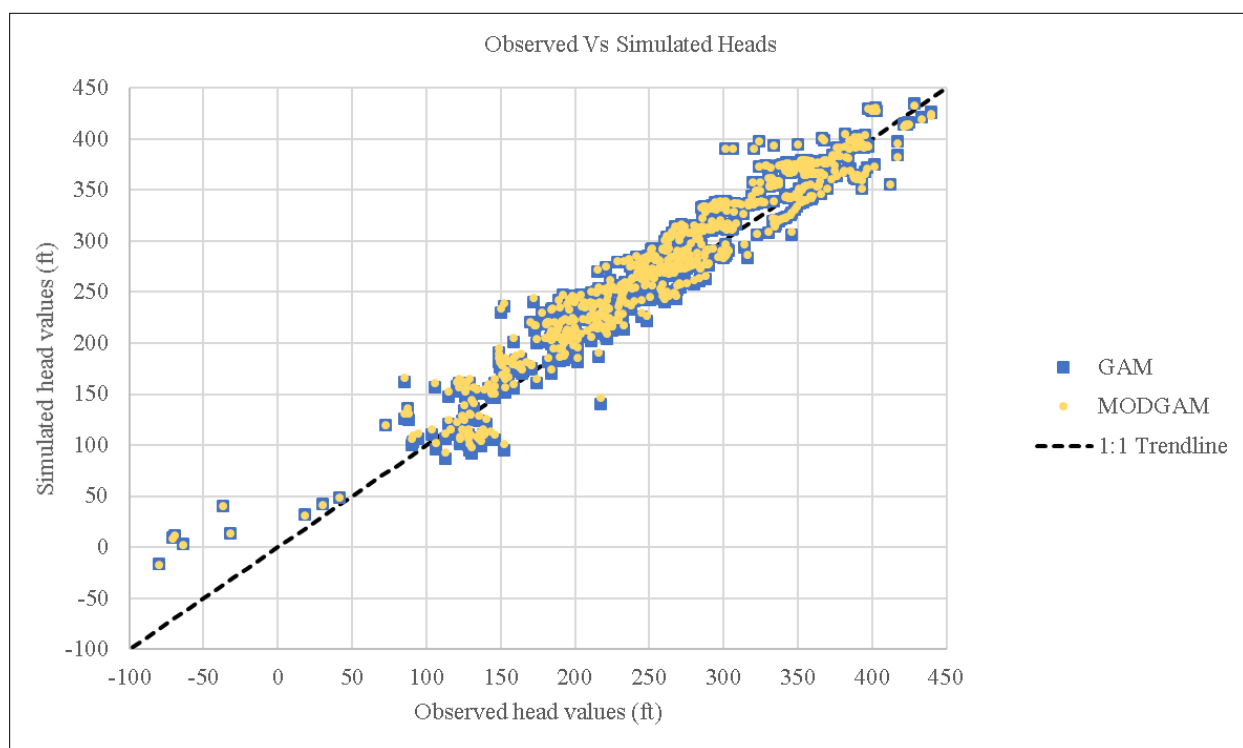
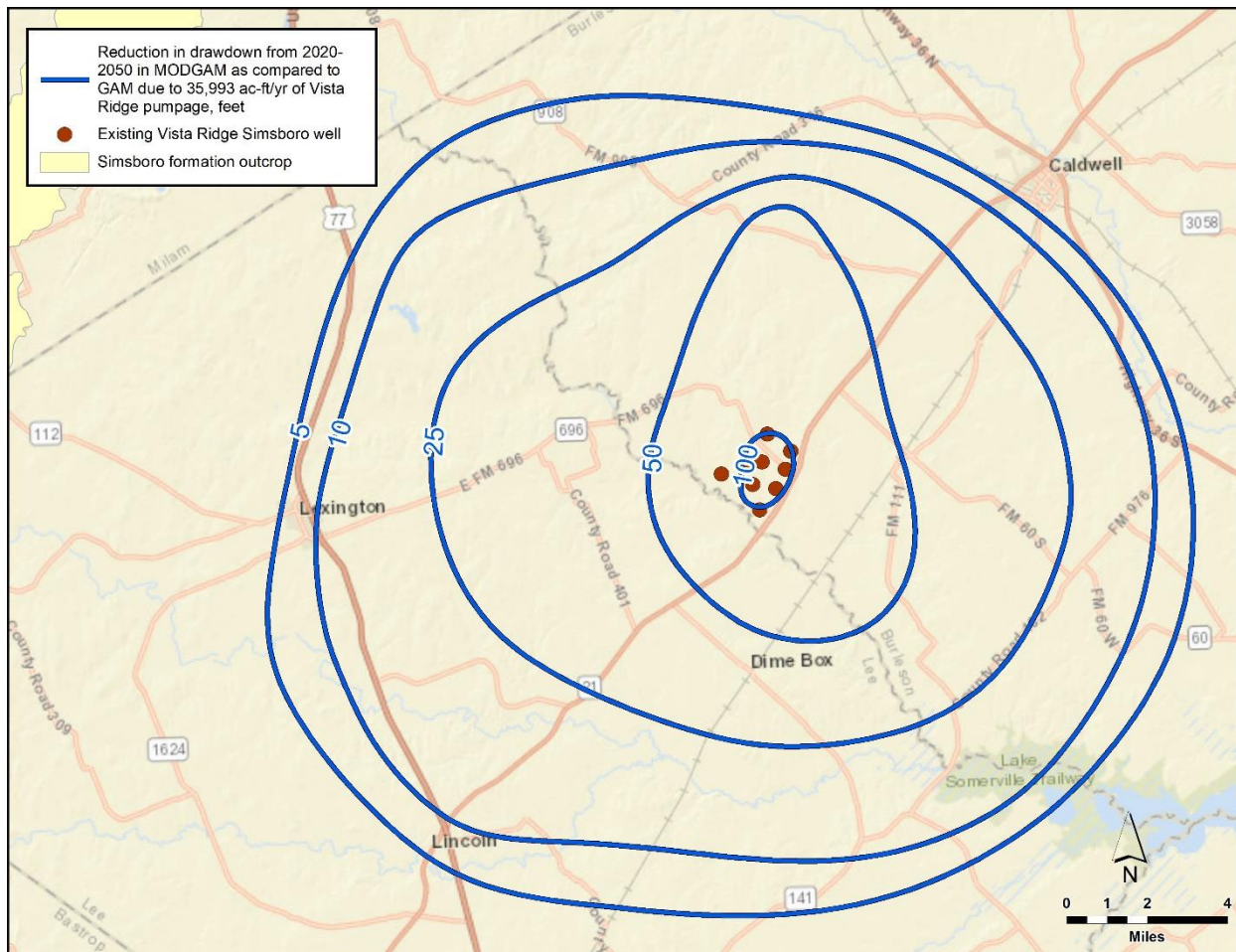


Plate 1, included with this memorandum under Tab 4, presents contours of head levels simulated by the GAM and MODGAM at the end of the calibrated model period (2010). The groundwater head values were plotted for both the GAM and MODGAM to visualize the model differences qualitatively. As shown in Plate 1, the heads produced by the models are similar, with relatively minor differences in the Vista Ridge well field area where the distance between the 250-foot and 300-foot contours is greater in MODGAM than generated by the unmodified GAM.

The MODGAM incorporates the results of Simsboro aquifer testing using high-capacity production wells, improving the accuracy of simulated aquifer responses in the Vista Ridge well field area. To gauge the potential magnitude of the improvement, identical future pumping scenarios were run using both the GAM and the MODGAM. Figure 3 presents the reduction in simulated Simsboro drawdown

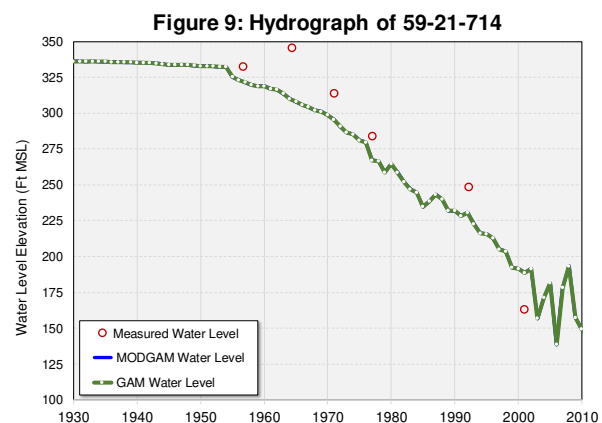
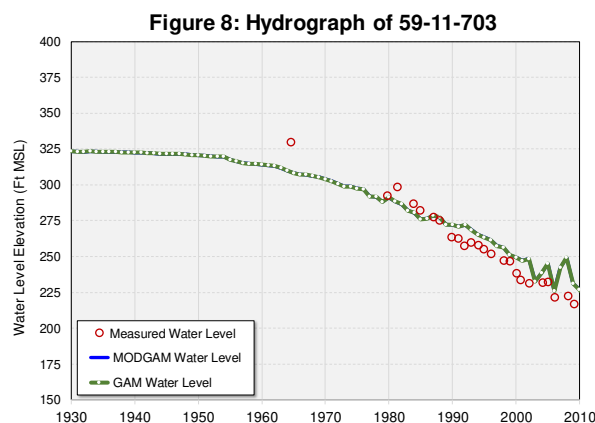
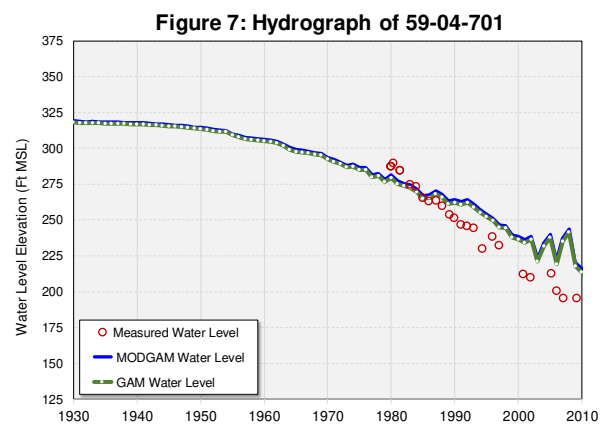
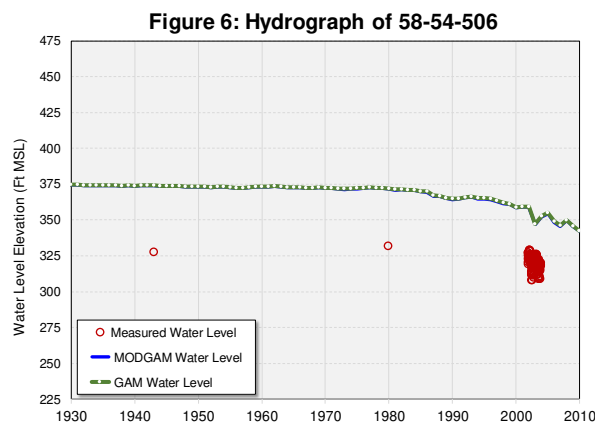
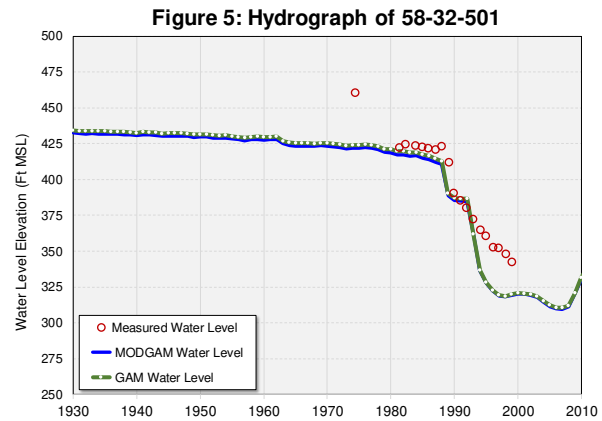
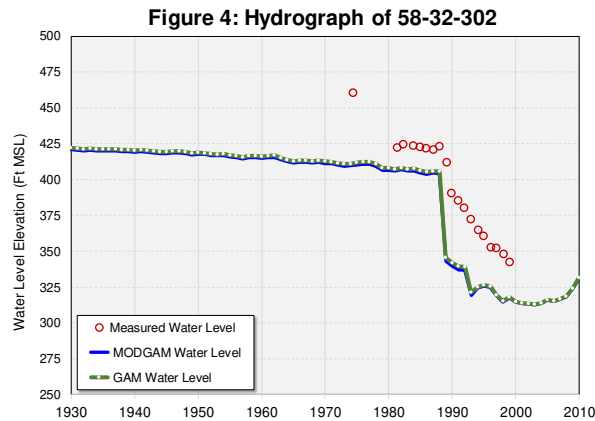
predicted by the MODGAM as compared to the unmodified GAM. The contours shown on Figure 3 reflect the difference in drawdown resulting from all regional groundwater use included in the DFC PS-12 pumpage dataset in addition to the 35,993 ac-ft/yr Vista Ridge pumpage assigned to appropriate model cells between the years 2020 and 2050. As shown, the drawdown simulated by the MODGAM is approximately 100 feet less than that predicted by the GAM in the Vista Ridge well field area.

Figure 3: Reduction in Simulated Drawdown



Hydrographs of Measured and Modeled Water Levels

In addition to the regional comparisons discussed above, the performance of the MODGAM at several monitoring well sites was also explored. Pages 253-262 of the GAM Report include hydrographs that plot the measured water levels versus GAM-simulated water levels for numerous wells within the GAM footprint. Figures 4 through 9 show the water levels output by the MODGAM in relation to measured and GAM water levels for selected wells included in the GAM Report that are nearest the area that was modified during development of the MODGAM. The locations of these wells are shown on Figure 1.



As shown, the water levels output by the MODGAM are nearly identical to GAM-simulated water levels. The correlation between the MODGAM and the GAM is expected during the calibration timeframe because there was little Simsboro pumpage in the area modified for the MODGAM during that interval. However, as shown on Figure 3 and on the plates depicting the results of the predictive scenarios performed for this evaluation (Tab 2), the erroneously low Simsboro transmissivities included in the GAM result in significant over-prediction of Vista Ridge drawdown.

DFC/MAG PUMPAGE DISTRIBUTION ASSUMPTIONS AND TECHNIQUES

Several predictive simulations were performed to assess the potential aquifer response to the requested permit amendments. The model pumpage inputs used for this process were derived from the DFC PS-12 pumpage dataset.

During the last DFC/MAG planning cycle, DFC PS-12 was run using an earlier version of the GAM that simulated groundwater flow with eight layers, employed a structured grid cell layout, and ended the simulation in 2060. The currently-approved model is an updated version that incorporates ten layers, an unstructured model cell architecture, and extends the simulation time to 2070. Because the DFC PS-12 pumpage inputs were designed for the original version of the GAM, reassignment of the data to the appropriate model cells, layers, and time periods was necessary to perform simulations using the updated GAM. The following discussions address the methods and assumptions used to reformat DFC PS-12 pumpage for use with the new, updated version of the GAM.

1. **Pumpage distribution in the model layers:** The current GAM utilizes ten model layers instead of the eight layers that comprised the previous GAM. Table 4 lists the previous and current layer assignments:

Table 4: Model Layers and Corresponding Hydrostratigraphic Unit

<i>Layer</i>	<i>Hydrostratigraphic Unit</i>	
	<i>Previous GAM</i>	<i>Current GAM</i>
1	Sparta	Alluvium
2	Weches	Transition Layer
3	Queen City	Sparta
4	Reklaw	Weches
5	Carrizo	Queen City
6	Calvert Bluff	Reklaw
7	Simsboro	Carrizo
8	Hooper	Calvert Bluff
9	-	Simsboro
10	-	Hooper

DFC PS-12 pumpage previously assigned to Layers 1 through 8 in the previous GAM was reassigned to the Layers 3 through 10 in the current GAM.

2. **Pumpage distribution within model cells:** The current GAM employs finer grid resolution compared to the previous GAM in the vicinity of some surface water features. As a result, there are model cells in the previous GAM that overlay more than one model cell in the current GAM. In other words, there is a one-to-many correlation between the previous and the current GAM in some model cells. Pumpage in these model cells was incorporated into the current GAM with the assumption that pumping from the larger model cell (in previous GAM) would be applied to the smaller model cell (of the current GAM) containing the centroid of the larger model cell.

3. **Boundary conditions:** Other boundary conditions such as general head boundary, rivers, drains, evapotranspiration, and recharge were extended from 2010 in the calibrated model to 2070 in the predictive model using the conditions in the last simulation year (2010) of the calibrated model.

PREDICTIVE MODELING

Groundwater modeling using the GAM and MODGAM was conducted to estimate the Simsboro Formation (Simsboro) response to the requested permit amendments. The following provides a discussion of the simulations performed for each amendment and the results of those simulations.

Within this document “hydraulic head” or “head” describes the output potentiometric surface of a simulation, and “drawdown” represents the change in head through time. Note that simulated head surfaces are reported as elevations in feet above mean sea level (AMSL). In outcrop areas the head surfaces describe the water table level within portions of the aquifer under unconfined hydraulic conditions, while in southeastern, downdip portions of the aquifer the head levels represent artesian pressure associated with confined hydraulic conditions.

Amendment 1 – Relocation of VR PW-18

Amendment 1 requests relocation of the currently-permitted location of Well PW-18 to a site near the pump station that services the well field. To estimate potential impacts resulting from the proposed addition of PW-18 pumpage, three simulations were performed using modifications of DFC PS-12 pumpage inputs:

- 1) **Simulation A1-1:** DFC PS-12 pumpage with no Vista Ridge Simsboro production (all pumpage associated with Vista Ridge was removed from model input files).
- 2) **Simulation A1-2:** DFC PS-12 pumpage with the Vista Ridge Simsboro pumpage amount of 35,993 ac-ft/yr withdrawn from 12 currently-permitted Simsboro well locations applied to the appropriate model cells.
- 3) **Simulation A1-3:** DFC PS-12 pumpage with the Vista Ridge Simsboro pumpage amount of 35,993 ac-ft/yr withdrawn from 11 currently-permitted well sites plus PW-18 production from the proposed, relocated site applied to the appropriate model cells.

The following sections describe the specific modifications made to each pumpage file for each simulation and a description of the method used to calculate the aquifers response.

Pumpage Modifications

For Simulation A1-1, all Simsboro (model Layer 9) production associated with the Vista Ridge project was removed from the eight model nodes listed in Table 5. Using Simulation A1-1 pumpage inputs as a foundation, pumpage input files for Simulations A1-2 and A1-3 were created by adding Vista Ridge production to the appropriate model cells. The total production was applied to nine model cells listed in Table 5 that correspond to the twelve permitted Vista Ridge Simsboro well sites and the proposed location of PW-18.

Table 5. Amendment 1 – Modified Model Nodes and Production Amounts

<i>Vista Ridge Well</i>	<i>Model Cell ID</i>	<i>Simulation A1-2 VR Production Amounts (ac-ft/yr)</i>	<i>Simulation A1-3 VR Production Amounts (ac-ft/yr)</i>
PW-9, PW-18 ^a	471831	3,999.2	7,198.6
PW-10, PW-11, PW-17	472227	11,997.7	10,797.9
PW-12	472226	3,999.2	3,599.3
PW-13	472224	3,999.2	3,599.3
PW-14	472225	3,999.2	3,599.3
PW-15	471827	3,999.2	3,599.3
PW-16	471830	3,999.2	3,599.3
PW-18 ^b , PW-19	472938	5,998.8	2,999.4
PW-20	472598	2,999.4	2,999.4
N/A	471832	Production removed	Production removed

a) PW-18 proposed location

b) PW-18 permitted location

Calculation of Amendment 1 Aquifer Response

Plates 5 and 12, under Tab 2, compares the 30-year Simsboro drawdown contours associated with: 1) production from the twelve currently-permitted Simsboro wells and 2) the same production from eleven currently-permitted Simsboro wells plus production from PW-18 at the proposed location. The drawdown contours resulting from the currently-permitted well locations were generated by subtracting the stress period 122 (year 2050) outputs from Simulation A1-2 from the stress period 122 outputs from Simulation A1-1. Similarly, the contours reflecting production from the proposed PW-18 location were generated by subtracting the stress period 122 outputs from Simulation A1-3 from the stress period 122 outputs from Simulation A1-1.

Amendment 2 – Increase Total Annual Simsboro Well Field Production

Vista Ridge requests an increase in permitted Simsboro production of 4,842 acre-feet per year (ac-ft/yr) for a total Simsboro withdrawal of 40,835 ac-ft/yr. This increase is requested to ensure full water system production capacity with potential losses due to normal cooling tower operation and transmission system leakage. To estimate potential impacts resulting from the proposed increase in annual production, RWH&A performed three simulations using model pumpage inputs derived from the DFC PS-12:

- 4) **Simulation A2-1:** DFC PS-12 pumpage with no Vista Ridge pumpage from the Simsboro (all pumpage associated with Vista Ridge was removed from model input files). For reference, this simulation is identical to Simulation A1-1 described above.
- 5) **Simulation A2-2:** DFC PS-12 pumpage with the currently-permitted Vista Ridge Simsboro pumpage of 35,993 ac-ft/yr from ten wells applied to the appropriate model cells.
- 6) **Simulation A2-3:** DFC PS-12 pumpage with the requested Vista Ridge Simsboro pumpage of 40,835 ac-ft/yr from ten wells applied to the appropriate model cells.

The following sections describe the specific modifications made to DFC PS-12 pumpage dataset to create the pumpage inputs for each simulation.

Pumpage Modifications

For Simulation A2-1, all Simsboro (model Layer 9) production associated with the Vista Ridge project was removed from the eight model nodes listed in Table 6. Using Simulation A2-1 pumpage inputs as a foundation, pumpage input files for Simulations A2-2 and A2-3 were created by adding Vista Ridge production to the appropriate model cells. The total production was allocated among seven model cells listed in Table 6 that correspond to the nine existing Vista Ridge Simsboro wells and the proposed location of PW-18. Production amounts within the eight nodes were modified in stress periods 92 through 122, corresponding to the 30-year interval between 2020 and 2050, and was equally distributed among the Vista Ridge Simsboro wells for each simulation.

Table 6. Amendment 2 – Modified Model Nodes and Production Amounts

<i>Vista Ridge Well</i>	<i>Model Cell ID</i>	<i>Simulation A2-2 VR Production Amounts (ac-ft/yr)</i>	<i>Simulation A2-3 VR Production Amounts (ac-ft/yr)</i>
PW-9, PW-18 ^a	471831	7,198.6	8,167
PW-10, PW-11, PW-17	472227	10,797.9	12,250.5
PW-12	472226	3,599.3	4,083.5
PW-13	472224	3,599.3	4,083.5
PW-14	472225	3,599.3	4,083.5
PW-15	471827	3,599.3	4,083.5
PW-16	471830	3,599.3	4,083.5
N/A	471832	Production removed	Production removed

a) PW-18 proposed location

Calculation of Amendment 2 Aquifer Response

A combination of the outputs from the three simulations described above allows for the calculation of the aquifer response attributable to: a) only the proposed additional pumpage of 4,842 ac-ft/yr, b) only the proposed total Simsboro pumpage of 40,835 ac-ft/yr, and c) all regional pumpage plus the proposed total Simsboro pumpage of 40,835 ac-ft/yr. As described below, the Layer 9 hydraulic head surfaces generated at the end of stress periods 91 and 122 were used to estimate the aquifer's response over a 30-year period.

- **Drawdown due to only 4,842 ac-ft/yr of Vista Ridge production (Tab 2, Plates 6 and 13):** The aquifer response due only to the requested additional Vista Ridge Simsboro pumpage was found by subtracting the stress period 122 head surface output by Simulation A2-3 from the stress period 122 head surface output by Simulation A2-2. The resulting surface represents the drawdown attributable to 4,842 ac-ft/yr production over a 30-year interval.
- **Drawdown due to only 40,835 ac-ft/yr of VR production (Tab 2, Plates 7 and 14):** The aquifer response due only to the total proposed Vista Ridge Simsboro production was found by subtracting the stress period 122 head surface output by Simulation A2-3 from the stress period 122 head surface output by Simulation A2-1. The resulting surface represents the Simsboro drawdown resulting from Vista Ridge production of 40,835 ac-ft/yr over a 30-year interval.
- **Contours of the sum of the Simsboro saturated thickness plus artesian pressure following 40,835 ac-ft/yr of Vista Ridge production for 30 years (Tab 2, Plates 8 and 15):** The contours represent the sum of the total modeled Simsboro saturated thickness plus artesian pressure in the Vista Ridge well field area following 30 years of production of 40,835 ac-ft/yr. These contours are included to provide perspective with respect to the magnitude of the drawdowns depicted in Plates 7 and 14.
- **Drawdown resulting from all regional production including 40,835 ac-ft/yr of Vista Ridge production (Tab 2, Plates 9 and 16):** The aquifer response to all regional pumpage in addition to the total proposed Vista Ridge Simsboro production was found by subtracting the stress period 122 head surface output by Simulation A2-3 from the stress period 91 head surface output by Simulation A2-3. The resulting surface represents the 30-year Simsboro drawdown resulting from all regional pumpage including Vista Ridge production of 40,835 ac-ft/yr.
- **Contours of the sum of the Simsboro saturated thickness plus artesian pressure following all regional production including 40,835 ac-ft/yr of Vista Ridge production (Tab 2, Plates 10 and 17):** The contours represent the sum of the total modeled Simsboro saturated thickness plus artesian pressure following 30 years of all regional pumpage including 40,835 ac-ft/yr of Vista Ridge production. These contours are included to provide perspective with respect to the magnitude of the drawdowns depicted in Plate 9 and 16.
- **Cross-Section Diagram (Plates 11 and 18):** The location of the cross-sectional diagram is shown on Plate 1. The Simsboro structure and artesian pressure levels corresponding

to the simulations described above are included to compliment the contour plots included under Tab 2.

Amendment 3 – Reinstate 3,000 gpm Well Production Rate

The maximum instantaneous production rates assigned to wells PW-12, PW-13, and PW-16 were lowered from their originally-permitted value of 3,000 gpm during the permit amendment process concluded in 2017. Amendment 3 requests restoration of the instantaneous production rates for wells PW-12, PW-13, and PW-16 to 3,000 gpm. To estimate additional potential impacts associated with reinstating the maximum instantaneous rates of Wells PW-12, PW-13, and PW-16, three simulations were performed using modifications of DFC PS-12 pumpage inputs:

- 1) **Simulation A3-1:** DFC PS-12 pumpage with no Vista Ridge Simsboro production (all pumpage associated with Vista Ridge was removed from model input files). This simulation is identical to Simulation A1-1 and Simulation A2-1.
- 2) **Simulation A3-1:** DFC PS-12 pumpage with the currently-permitted Vista Ridge Simsboro pumpage amount of 35,993 ac-ft/yr withdrawn from nine currently-constructed wells applied to the appropriate model cells. Wells PW-12, PW-13, and PW-16 wells are assigned pumpage corresponding to the lowered instantaneous production rates.
- 3) **Simulation A3-2:** DFC PS-12 pumpage with the currently-permitted Vista Ridge Simsboro pumpage amount of 35,993 ac-ft/yr withdrawn from nine currently-constructed wells applied to the appropriate model cells. Wells PW-12, PW-13, and PW-16 wells are assigned pumpage corresponding to a 3,000 gpm instantaneous production rate.

The following sections describe the specific modifications made to each pumpage file for each simulation and a description of the method used to calculate the aquifers response.

Pumpage Modifications

For Simulation A3-1, all Simsboro (model Layer 9) production associated with the Vista Ridge project was removed from the eight model nodes listed in Table 7. Using Simulation A3-1 pumpage inputs as a foundation, pumpage input files for Simulations A3-2 and A3-3 were created by adding Vista Ridge production to the appropriate model cells. The total production was applied to seven model cells listed in Table 7 that correspond to the nine existing Vista Ridge Simsboro well sites.

Table 7. Amendment 3 – Modified Model Cells and Production Amounts

<i>Vista Ridge Well</i>	<i>Model Cell ID</i>	<i>Simulation A3-2 VR Production Amounts (gpm)</i>	<i>Simulation A3-2 VR Production Amounts (ac-ft/yr)</i>	<i>Simulation A3-3 VR Production Amounts (gpm)</i>	<i>Simulation A3-3 VR Production Amounts (ac-ft/yr)</i>
PW-9	471831	2,431	3,924	2,216	3,578
PW-10	472227	2,431	3,924	2,216	3,578
PW-11		2,431	3,924	2,216	3,578
PW-17		2,431	3,924	2,216	3,578
PW-12	472226	2,617	4,224	3,000	4,842
PW-13	472224	2,685	4,334	3,000	4,842
PW-14	472225	2,431	3,924	2,216	3,578
PW-15	471827	2,431	3,924	2,216	3,578
PW-16	471830	2,412	3,893	3,000	4,842
N/A	471832	Production removed from cell			

Aquifer Response

Plates 20 and 21 under Tab 2 show the 30-year difference in Simsboro drawdown associated with utilizing the currently permitted instantaneous production limits at wells PW-12, PW-13, and PW-16 versus utilizing the proposed instantaneous rates of 3,000 gpm at those wells, maintaining a total wellfield production of 35,993 ac-ft/yr. The drawdown contours were generated by subtracting the stress period 122 outputs from Simulation A3-2 from the stress period 122 outputs from Simulation A3-3. As shown, a maximum of about two feet of additional drawdown on any neighboring property is predicted to occur as a result of the proposed amendment. Over a 30-year period, this amount of drawdown is, for all practical purposes, unmeasurable and represents an insignificant portion of the sum of the Simsboro saturated thickness and artesian pressure (approximately 2,200 feet) in the Vista Ridge area.

Modeling Using Obsolete GAM

In addition to the MODGAM and GAM model runs described above, the simulated aquifer response output by the now-obsolete version of the GAM (Obsolete GAM) that was used during preparation of the current DFC/MAG (adopted in April 2016) is presented herein. It should be stressed that various improvements were made to the Obsolete GAM inputs during development of the GAM, which are discussed in Young et al, 2018. It should also be noted that, like the GAM, the hydraulic parameters assigned to the obsolete GAM in the Vista Ridge area are not consistent with pump test results recorded during construction and testing of Vista Ridge production wells. Consequently, the results produced by the GAM and the Obsolete GAM are not accurate in the Vista Ridge well field area. Regardless, POSGCD rules state that these model results must be included with all permit applications involving wells that will produce more than 500 GPM:

Rule 7.4.5.c: *If a MAG exists for the pumped aquifer, then the predictions will include results based on using the Groundwater Availability Model run used to establish the MAG for the aquifer.*

Like the Amendment 2 simulations described above, the pumpage assigned to model cells in the Vista Ridge well field in the DFC pumpage data set was set to values corresponding to the currently-permitted and proposed additional Vista Ridge Simsboro production. Table 8 lists the Vista Ridge model cell pumpage assignments.

Table 8. Amendment 2 – Modified Model Nodes and Production Amounts

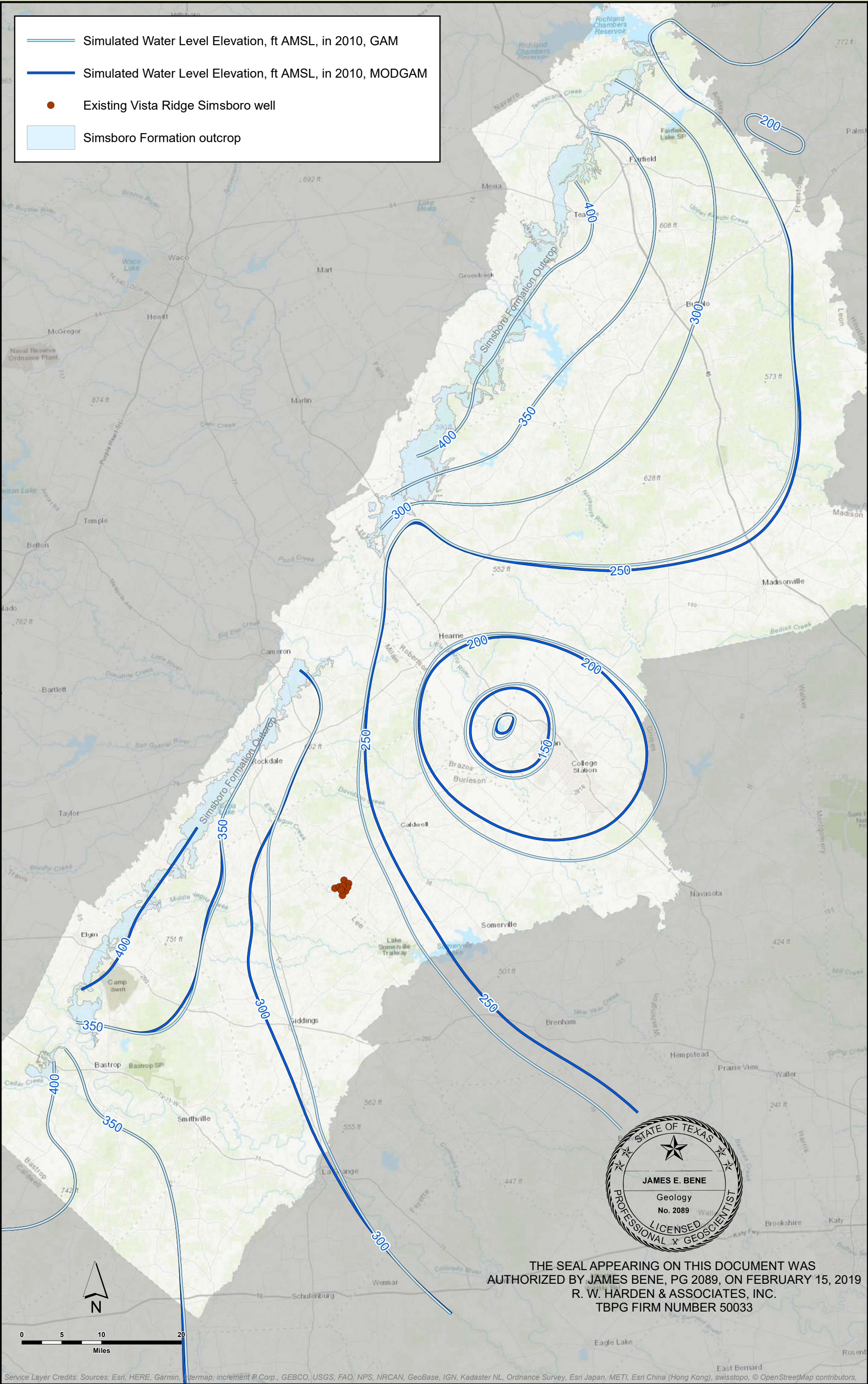
<i>Vista Ridge Well</i>	<i>Col</i>	<i>Row</i>	<i>Production Amount (ac-ft/yr)</i>
PW-9, PW-18 ^a	123	44	8,167
PW-10, PW-11, PW-17	123	45	12,250.5
PW-12, PW-13, PW-14	122	45	12,250.5
PW-15, PW-16	122	44	8,167

a) PW-18 proposed location

The drawdown output by the obsolete GAM due to 40,835 ac-ft/yr of Vista Ridge Simsboro production is shown on Plate 22 under Tab 2. The aquifer response to all regional pumpage in addition to the total proposed Vista Ridge Simsboro production was determined by finding the difference between the heads output at the end of stress period 76 (the year 2050 in the Obsolete GAM) and the heads produced by a model run that included Vista Ridge pumpage from a run that did not include Vista Ridge pumpage.

REFERENCES

- Butler, James J., 1990. The Role of Pumping Tests in Site Characterization: Some Theoretical Considerations. *Ground Water*, Vol 28, #3. Pg. 394-402.
- Cooper, H. H. Jr., & Jacob, C. E. 1946. A Generalized Graphical Method for Evaluating Formation Constants and Summarizing Well Field History. *Transactions, American Geophysical Union* 27:526-34.
- Streitsova, T. D. 1988. *Well Testing in Heterogeneous Formations*. Wiley, New York. 413 pp.
- Theis, Charles V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using ground-water storage. *Transactions, American Geophysical Union* 16: 519–524.
- Young, S., et al., 2018. Final Report: Groundwater Availability Model for the Central Portion of the Sparta, Queen City, and Carrizo-Wilcox Aquifers. TWDB Unnumbered Report.

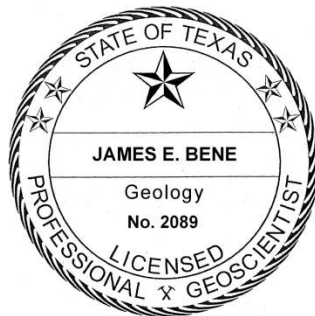


TAB

5

Subsidence Technical Memorandum

Prepared by:



A handwritten signature in black ink, appearing to read "James E. Bene".

The seal appearing on this document was authorized by
James E. Bené, P.G. 2089 on July 1st, 2019. R.W.
Harden & Associates, Inc. TBPG Firm No. 50033.

INTRODUCTION

Blue Water Vista Ridge, LLC (“Blue Water”), as permit administrator for Vista Ridge, LLC (“Vista Ridge”), requests amendments to Post Oak Savannah Groundwater Conservation District (POSGCD or District) Operating Permit No. POS-D&O/A&M-0001d and Transport Permit No. POS-T-0001d. Per POSGCD Rule 8.1.5(b):

“In reviewing an application for a transport permit, the District shall consider: . . . b) the projected effect of the proposed transport on aquifer conditions, depletion, and subsidence and effects on existing permit holders or other groundwater users within the District.”

In this document, Vista Ridge provides information regarding the potential for subsidence associated with the requested permit amendments.

Subsidence occurs where reductions in potentiometric head levels (artesian pressure and/or water table levels) result in compaction of clay layers that are in hydraulic contact with aquifer sediments. This compaction reduces the thickness of clay beds, causing a lowering of the land surface. In general, subsidence may be a significant concern where:

- Lowering of the land surface allows unwanted or unmanageable flooding to occur, such as in low-lying, coastal lands.
- Differential subsidence over short distances may disrupt and damage infrastructure including roads, pipelines, and rail lines.

Conversely, subsidence is unlikely to be a concern where:

- Lowering of the land surface is negligible or even undetectable.
- Lowering of the land surface does not occur in areas such as low-lying coastal lands, where significant subsidence can result in flooding or inundation.
- Subsidence is spread evenly over larger areas, thereby avoiding differential subsidence.

The amount of subsidence is primarily a function of the thickness and constitution of clay beds that are exposed to potentiometric head declines. All other factors being equal, the greater the total thickness of clay layers subjected to reductions in artesian pressure or water table levels, the greater the amount of potential subsidence. Conversely, less subsidence will occur where clay beds have previously undergone compaction associated with prior reductions in head from pumpage and/or geologic burial and consolidation.

The proposed permit amendments pertain to production from the Simsboro Formation (Simsboro), which is comprised chiefly of quartz sand grains with relatively thin interbeds of clay-rich sediments. Geophysical logs recorded at each of the nine completed Vista Ridge wells indicate that, on average, about 5% of the total thickness of the Simsboro beneath the Vista Ridge well field is comprised of clay. The formations above and below the Simsboro in the Vista Ridge well field area (Hooper, Calvert Bluff, Carrizo, Reklaw, Queen City, Weches, and Sparta) generally contain greater proportions

of clay beds and were also evaluated for their potential contribution to subsidence using the models and tools described below.

It is important to note that the groundwater models used to estimate the head declines in the Vista Ridge well field area simulate each formation as a homogenous layer, which over-predicts the amount of vertical hydraulic communication between the units. This is because these formations are not homogenous. Instead, it is well documented that these formations are comprised of alternating beds of clay, silt, and sand, which limit the drawdown that is transmitted vertically from aquifer zones through confining units. This layered (stratified) structure inhibits vertical flow in two ways: 1) vertical transmission of head declines is impeded by multiple, relatively-impermeable clay beds; and 2) the head declines that are conducted through clay beds to sandy layers are preferentially transmitted horizontally, attenuating the continued vertical migration of the declines.

The net effect of this stratification is that head declines within an aquifer are not uniformly transmitted through confining units but are largely limited to the clay-silt-sand layers near the aquifer/confining unit boundaries. This can significantly impact subsidence calculations within thick, heavily-stratified formations such as the Calvert Bluff, which overlies and hydraulically confines the Simsboro. The models used for this evaluation simulate average head declines uniformly throughout the more than 1,000-foot thickness of the Calvert Bluff. Consequently, all of the clay layers within the Calvert Bluff are assumed to undergo subsidence when, in fact, the majority of the head declines are restricted to the upper and lower portions of the formation experiencing head changes from production of the overlying and underlying aquifers, which results in a much smaller thickness of clay that could undergo compaction. Put in simple terms, by incorrectly assuming uniformity over the 1,000-foot thickness of the Calvert Bluff Formation, the model over-predicts the amount of subsidence that may result from production from the Simsboro.

POTENTIAL FUTURE SUBSIDENCE

In order to estimate the amount of subsidence that may occur beneath the Vista Ridge well field in the future, the information and calculation tools contained in the recently-published Texas Water Development Board (TWDB) report (Subsidence Report) and spreadsheet calculator (Subsidence Prediction Tool) were utilized:

Furnans, J., et al, Final Report: Identification of the Vulnerability of the Major and Minor Aquifers of Texas to Subsidence with Regard to Groundwater Pumping; TWDB Contract No. 1648302062, March 2017.

Hydrogeologic Parameters

As a first step in the calculation process, numerous aquifer structure and hydrogeologic parameters associated with potential compaction of clay beds within the Simsboro and overlying formations were compiled from data recorded during construction and testing of nine Vista Ridge Simsboro wells. The thickness and composition of the underlying Hooper Formation was estimated from geophysical logs recorded in petroleum test holes in the Vista Ridge area. These data were then averaged and input into the Subsidence Prediction Tool.

The amount of subsidence that may occur in the Vista Ridge area is dependent on the amount of artesian pressure and/or water table declines within the column of formations affected by Vista Ridge and other regional pumping. Groundwater modeling was performed to estimate the potential drawdown over the lifespan of the Vista Ridge project, which incorporates pumpage included in the current Desired Future Conditions\Modeled Available Groundwater (DFC/MAG) Predictive Scenario 12 (DFC PS-12). Because the DFC PS-12 model inputs were created prior to finalization of the Vista Ridge well locations, it contains pumpage intended to represent Vista Ridge that is not correctly located within the model domain. Therefore, in order to accurately simulate the aquifer response to Vista Ridge production, pumpage assigned to Vista Ridge in DFC PS-12 pumpage dataset was removed and replaced with values representing the actual permitted and proposed Vista Ridge pumpage.

As described in the groundwater modeling technical memorandum included under Tab 4, the results of three models were used to quantify potential, long-term aquifer response to the proposed permit amendments: 1) the recently-updated Central Carrizo-Wilcox Groundwater Availability Model (GAM), developed by the TWDB, 2) the MODGAM, which is modified version of the GAM that incorporates improvements to the Simsboro transmissivity in the Vista Ridge wellfield region, and 3) the now-obsolete GAM (Obsolete GAM) that was used during development of the DFC/MAG adopted in 2016.

The amount of potential subsidence in the Vista Ridge area is dependent on the aquifer response to Vista Ridge pumpage and by other groundwater users in the region. To provide perspective regarding the potential subsidence attributable to Vista Ridge, several model scenarios were considered:

- 1) **GAM: All pumpage in DFC PS-12 but with no Vista Ridge pumpage.** The results of this scenario allow for the calculation of potential subsidence resulting from other (non-Vista Ridge) groundwater users in the region.
- 2) **GAM: All DFC PS-12 pumpage with all permitted and proposed Vista Ridge Pumpage (Simsboro and Carrizo).** The results of this scenario allow for the calculation of the potential subsidence resulting from all pumpage in the region. However, it should be noted that the erroneously-low Simsboro transmissivities utilized by the GAM result in over-prediction of the drawdown associated with Vista Ridge pumpage.
- 3) **MODGAM: All pumpage in DFC PS-12 but with no Vista Ridge pumpage.** The results of this scenario allow for the calculation of potential subsidence resulting from other (non-Vista Ridge) groundwater users in the region.
- 4) **MODGAM: All DFC PS-12 pumpage with all permitted and proposed Vista Ridge Pumpage (Simsboro and Carrizo).** The results of this scenario allow for the calculation of the potential subsidence resulting from all pumpage in the region.
- 5) **Obsolete GAM: All pumpage in DFC PS-12 but with no Vista Ridge pumpage.** The results of this scenario allow for the calculation of potential subsidence resulting from other (non-Vista Ridge) groundwater users in the region.
- 6) **Obsolete GAM: All DFC PS-12 pumpage with all permitted and proposed Vista Ridge Pumpage (Simsboro and Carrizo).** The results of this scenario allow for the calculation of

the potential subsidence resulting from all pumpage in the region. However, it should be noted that the erroneously-low Simsboro transmissivities and conservative hydraulic boundary assumptions utilized by the Obsolete GAM result in over-prediction of the drawdown associated with Vista Ridge pumpage.

RESULTS AND CONCLUSIONS

Table 1 lists the parameters input into the Subsidence Prediction Tool, while Table 2 lists the range in potential subsidence within the Vista Ridge well field area associated with the long-term groundwater use by both Vista Ridge and other landowners in the region. Plates 23 through 25 show contours of the maximum potential subsidence in the Vista Ridge well field area.

As shown in Table 2, the subsidence associated with Vista Ridge pumpage ranges from 1.36 to 2.73 feet over the 30-year lifespan of the project, which accounts for approximately sixty percent of the total potential subsidence that is predicted to result from all groundwater users in the region.

Three important qualifications are germane when considering these predicted results. First, as noted above, the subsidence associated with heavily stratified formations is over-predicted because of the coarse vertical discretization of the GAM. Second, even taking the over-predicted results at face value, the amounts (1.36 to 2.73 feet over the 30-year lifespan) are relatively insignificant, and are not in areas of concern, such as low-lying coastal areas. Third, significant pumping from the Simsboro by the cities of Bryan and College Station over the past several decades has not resulted in reported subsidence or any subsidence-related concerns associated with that long-term production.

As a further note, as discussed in the modeling technical memo included under Tab 4, the hydraulic parameters applied to the GAM and Obsolete GAM are not representative of the Simsboro aquifer characteristics documented during well testing and, consequently, over-predict the amount of drawdown (and corresponding subsidence) resulting from Vista Ridge production.

As shown in Plates 23 through 25, the relatively-small amount of potential subsidence is expected to decrease with distance from the well field and is smoothly distributed throughout the region. Consequently, the subsidence associated with Vista Ridge groundwater pumpage and transport is not expected to significantly affect the topography, drainage characteristics, subsurface structure, or hydrogeologic conditions within the District.

Table 1. Hydrogeologic Parameters Applied to the Subsidence Tool

<i>Parameter</i>	<i>Sparta</i>	<i>Weches</i>	<i>Queen City</i>	<i>Reklaw</i>	<i>Carrizo</i>	<i>Calvert Bluff</i>	<i>Simsboro</i>	<i>Hooper</i>
Land Surface Elevation (Ft-MSL)	350	349.6	349.6	349.6	350	350	350	402
Aquifer Top Elevation (Ft-MSL)	350	162	64.9	-373.9	-563	-861	-1951	-2448
Aquifer Thickness (Ft)	193	90.7	438.8	188.7	298	1091	408	1250
Clay Thickness within Aquifer (Ft)	2	25.1	52.3	30.6	11	328	22	500
Groundwater Temperature (°C)	22	25	24	25	25	25	25	25
Groundwater Total Dissolved Solids (mg/L)	612	725	699	725	725	725	725	725
Predevelopment Water Level Elevation (Ft-MSL)	350	375	400	388	375	378	380	380
Current Water Level Elevation (Ft-MSL)*	310/310/307	314/314/305	320/298/303	298/298/298	267/266/291	271/271/245	189/187/122	266/265/209
Unsaturated Thickness (Ft)*	40/40/43	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0
Deepest Historical Water Level Elevation (Ft-MSL)*	310/310/307	314/314/305	320/298/303	298/298/298	267/266/291	271/271/245	189/187/122	266/265/209
Base Water Level Elevation (Ft-MSL)*	310/310/307	314/314/305	320/298/303	298/298/298	267/266/291	271/271/245	189/187/122	266/265/209
Future Water Level Elev. (MODGAM with DFC pumpage no Vista Ridge) (Ft-MSL)	304	306	309	264	217	197	50	138
Future Water Level Elev. (MODGAM with DFC pumpage plus Vista Ridge) (Ft-MSL)	304	305	307	168	-89	65	-287	28
Future Water Level Elev. (GAM with DFC pumpage no Vista Ridge) (Ft-MSL)	304	306	309	263	215	192	38	132
Future Water Level Elev. (GAM with DFC pumpage plus Vista Ridge) (Ft-MSL)	303	305	307	167	-92	57	-367	28
Future Water Level Elev. (Obsolete GAM with DFC pumpage no Vista Ridge) (Ft-MSL)	301	296	291	272	252	158	-119	93
Future Water Level Elev. (Obsolete GAM with DFC pumpage plus Vista Ridge) (Ft-MSL)	294	276	256	160	27	48	-672	-13

*MODGAM/GAM/Obsolete GAM

Table 2. Potential Subsidence Predicted by TWDB Subsidence Tool

<i>Simulation</i>	<i>Feet of Potential Subsidence (Min/Max)</i>								
	<i>Sparta</i>	<i>Weches</i>	<i>Queen City</i>	<i>Reklaw</i>	<i>Carrizo</i>	<i>Calvert Bluff</i>	<i>Simsboro</i>	<i>Hooper</i>	<i>Total</i>
MODGAM with DFC pumpage no Vista Ridge	0/0	0.01/0.02	0.02/0.04	0.04/0.07	0.02/0.03	0.42/0.8	0.04/0.07	0.41/0.77	1.01/1.93
MODGAM with DFC pumpage plus Vista Ridge	0/0	0.01/0.02	0.03/0.05	0.15/0.28	0.12/0.23	1.18/2.25	0.13/0.26	0.75/1.43	2.37/4.52
<i>MODGAM Subsidence from Vista Ridge Pumpage only</i>	0/0	0/0	0/0.01	0.11/0.21	0.1/0.19	0.76/1.44	0.09/0.18	0.35/0.66	1.36/2.59
GAM with DFC pumpage no Vista Ridge	0/0	0.01/0.02	0.02/0.04	0.04/0.08	0.02/0.03	0.45/0.86	0.04/0.08	0.42/0.8	1.01/1.92
GAM with DFC pumpage plus Vista Ridge	0/0	0.01/0.02	0.03/0.05	0.15/0.28	0.12/0.23	1.22/2.32	0.16/0.3	0.75/1.43	2.43/4.64
<i>GAM Subsidence from Vista Ridge Pumpage only</i>	0/0	0/0	0/0.01	0.11/0.21	0.1/0.19	0.77/1.47	0.11/0.22	0.33/0.63	1.43/2.73
Obsolete GAM with DFC pumpage no Vista Ridge	0/0	0.01/0.02	0.03/0.05	0.03/0.06	0.01/0.02	0.5/0.94	0.07/0.13	0.37/0.7	1.01/1.93
Obsolete GAM with DFC pumpage plus Vista Ridge	0/0	0.04/0.08	0.1/0.19	0.16/0.3	0.09/0.17	1.12/2.14	0.22/0.43	0.71/1.34	2.43/4.64
<i>Obsolete GAM Subsidence from Vista Ridge Pumpage only</i>	0/0	0.03/0.05	0.07/0.14	0.13/0.24	0.07/0.14	0.63/1.19	0.15/0.3	0.34/0.64	1.42/2.71

TAB

6

**Amended and Restated Drilling & Operating Permit
Issued By Direction of the Board of Directors of the
Post Oak Savannah Groundwater Conservation District**

This Amended and Restated Drilling and Operating Permit ("Amended Permit") is granted to Vista Ridge, LLC, ("Permittee"), the assignee of and successor to Abengoa Vista Ridge, LLC ("Abengoa"), successor to Blue Water Vista Ridge LLC ("BWVR"), the successor to Blue Water Systems, L.P. ("Blue Water") the successor to Layne Water Development of Texas, LLC ("Layne"), to authorize Permittee to drill and operate thirty-three (33) water wells within the Post Oak Savannah Groundwater Conservation District ("District"), for the purpose of producing water for Municipal Use. The name, location, maximum annual production and maximum gallons of production permitted per minute for each of the thirty-three wells is listed in Exhibit "A". The individual wells listed in Exhibit "A" are referred to herein as the "Well" or "Wells" and the thirty-three Wells are collectively referred to as the "Well System". This Amended Permit is conditioned upon and subject to Permittee complying with the Rules of the District ("Rules"), the orders of the Board, the Management Plan of the District, as amended, and the laws, rules and regulations of the State of Texas, as amended, applicable to drilling, operating and maintaining water wells within the District. This Amended Permit confers only the right to drill and operate the Wells and Well System in compliance with and subject to the Rules and requirements of this Amended Permit. The terms, conditions and authorizations of this Amended Permit may be modified or amended under the Rules.

The Wells are registered with the District and the State of Texas. The Wells are approved for production in the aggregate as a Well System. The Permittee is authorized to drill and operate the Wells at the locations and maximum GPM production set forth in Exhibit "A", and the maximum annual production of the Well System shall not exceed 50,993 acre feet per year.

The Rules are incorporated herein in their entirety by reference, as if set forth herein verbatim, including but not limited to the Rules providing for reducing permitted production. The Permittee shall comply with the Rules and each requirement thereof in operating, maintaining, repairing and altering each of the Wells and the Well System. All application(s) pursuant to which the related original permits and prior amended permits, and this Amended Permit, have been issued, and all written agreements and acknowledgments executed by the Permittee, and/or by BWVR, Blue Water, or Layne, are incorporated into this Amended Permit. This Amended Permit is granted on the basis of, and contingent upon, the accuracy of the information supplied in the application(s), agreements and acknowledgments on file with the District. A finding that false information was supplied to the District in the permitting process for the Wells is grounds for revocation of this Amended Permit.


The issuance of this Amended Permit does not grant Permittee the right to use any public or private property, interfere with any personal or property rights, or violate any federal, state, or local law, rule or regulation. The District makes no representations and has no responsibility with respect to the availability or quality of the water authorized to be produced under this Amended Permit.

The term of the Amended Permit, both the Drilling and the Operating Permit, is for a period of forty years from the original issuance date of the original Permit on September 11, 2004, subject to review every fifth year and modification during any such review to conform this Permit with intervening changes in the Management Plan or state law. Unless waived by the Board of the District for a specific review period, applications for review shall be submitted to the District 90 days prior to the fifth anniversary of the issuance date and each subsequent scheduled review date following the fifth anniversary date, until the date of expiration of this Amended Permit. The Board may waive any review if no material change has been made to the Management Plan, or if the changes made do not require modification of this Amended Permit.

This Amended Permit is executed and effective as of the 18th day of April, 2017.

Post Oak Savannah Groundwater Conservation District

By:



Name: Gary Westbrook

Title: General Manager

Permit No. POS-D&O/A&M-0001d



Vista Ridge, LLC Drilling and Operating Permit, Exhibit A

Site	Latitude	Longitude	Formation	Max GPM	Permit Status
CW-1	30.44211	-96.81383	Carrizo	1200	Relocation requested
CW-2	30.43564	-96.80366	Carrizo	1200	Originally permitted location
CW-3	30.42930	-96.80682	Carrizo	1200	Relocation requested
CW-4	30.43169	-96.81623	Carrizo	1200	Originally permitted location
CW-5	30.43101	-96.82404	Carrizo	1200	Relocation requested
CW-6	30.42843	-96.83313	Carrizo	1200	Relocation requested
CW-7	30.41497	-96.81718	Carrizo	1200	Relocation requested
CW-8	30.42325	-96.81969	Carrizo	1200	Originally permitted location
CW-9	30.42184	-96.81010	Carrizo	975	Relocation requested
CW-10	30.41916	-96.80507	Carrizo	750	Originally permitted location
CW-11	30.41392	-96.79280	Carrizo	750	Originally permitted location
CW-12	30.41116	-96.79682	Carrizo	750	Originally permitted location
CW-13	30.44583	-96.76865	Carrizo	1200	Originally permitted location
CW-14	30.40421	-96.77860	Carrizo	750	Originally permitted location
CW-15	30.41001	-96.78026	Carrizo	750	Originally permitted location
CW-16	30.40794	-96.77606	Carrizo	750	Originally permitted location
CW-17	30.41709	-96.77139	Carrizo	750	Originally permitted location
CW-18	30.42121	-96.77545	Carrizo	975	Originally permitted location
CW-19	30.41838	-96.76680	Carrizo	750	Originally permitted location
CW-20	30.43605	-96.76393	Carrizo	1200	Originally permitted location
CW-21	30.43899	-96.77173	Carrizo	1200	Originally permitted location
PW-9	30.44189	-96.81334	Simsboro	3000	Relocation requested
PW-10	30.43638	-96.80358	Simsboro	3000	Originally permitted location
PW-11	30.42851	-96.80668	Simsboro	3000	Originally permitted location
PW-12	30.42220	-96.81065	Simsboro	2617	Relocation requested
PW-13	30.42394	-96.82004	Simsboro	2685	Originally permitted location
PW-14	30.41469	-96.81752	Simsboro	2500	Relocation requested
PW-15	30.42798	-96.83298	Simsboro	3000	Relocation requested
PW-16	30.43054	-96.82385	Simsboro	2412	Relocation requested
PW-17	30.43181	-96.81635	Simsboro	3000	Originally permitted location
PW-18	30.41998	-96.77520	Simsboro	3000	Originally permitted location
PW-19	30.41001	-96.77979	Simsboro	3000	Originally permitted location
PW-20	30.41145	-96.79644	Simsboro	1800	Originally permitted location

**Amended and Restated Transport Permit Issued by the
Post Oak Savannah Groundwater Conservation District
Of the State of Texas**

By Direction of the Board of Directors of the
Post Oak Savannah Groundwater Conservation District

This Amended and Restated Transport Permit ("Amended Permit") is granted to Vista Ridge, LLC ("Permittee"), the assignee of and successor to Abengoa Vista Ridge, LLC ("Abengoa"), successor to Blue Water Vista Ridge LLC ("BWVR"), the successor to Blue Water Systems LP, ("Blue Water"), the successor to Layne Water Development of Texas, LLC ("Layne"), to authorize transporting groundwater from a system of thirty-three (33) water wells ("Wells") within the Post Oak Savannah Groundwater Conservation District ("District"), to locations outside the District for the non-wasteful purposes of Municipal Use in the counties of Bastrop, Bell, Burnet, Caldwell, Hays, Lee, Travis, Williamson, Comal, Guadalupe, and Bexar, in the State of Texas. The groundwater permitted herein must be put to beneficial use at all times.

The location of each well from which water is authorized to be transported under this Amended Permit is listed in Exhibit "A". The Permittee has leased the water rights that will be produced. In addition, the names and mailing addresses of the owners of the land from which the wells are authorized to produce water are set forth in the applications filed by Permittee for this Amended Permit, and otherwise in the records of the District.

Upon issuance of this Amended Permit, the Permittee agrees to abide by the Rules, orders of the Board and Management Plan of the District, as amended, and the laws and rules of the State of Texas, as amended, in transporting groundwater from the water wells to locations outside the District. This permit confers only the right to use the permit under the provisions of the District rules and according to its terms. The permit terms may be modified or amended as provided in the District rules.

These wells are registered with the District and the State of Texas. During any 24 hour period, the amount of groundwater to be transported from the District shall not exceed the aggregate maximum gallons per minute for the wells identified in Exhibit A. The total amount of groundwater to be transported from the District on an annual basis shall not exceed 50,993 acre feet.

This Amended Permit confers only the right to transport groundwater and its terms may be modified or amended. The operation of the wells for the authorized withdrawal must be conducted in a non-wasteful manner. All transport and storage facilities must be accessible to District representatives for inspection, and the Permittee agrees to cooperate fully in any reasonable inspection of these facilities by the District representatives. All application(s) pursuant to which the related original permits and the prior amended permits, and this Amended Permit, have been issued, and all written agreements and acknowledgments executed by the Permittee, Abengoa, BWVR, and/or by Blue Water or Layne, are incorporated into this Amended Permit, which is granted on the basis of, and contingent upon, the accuracy of the information supplied in the application(s). A finding that false information has been supplied is grounds for revocation of this Amended Permit, and a violation of the terms, conditions, requirements, or special provisions of this Amended Permit is punishable by civil penalties as provided by the District Rules and by law.

On or before February 15 of each year, the owner of this Amended Permit must submit an annual report to the District describing the amount of groundwater transported under this Amended Permit. This report shall be filed on a form provided by the District, stating the following: (1) the name of the Permittee; (2) the well numbers of each well for which the Permittee holds a transport permit; (3) the total amount of groundwater transported from each well and well system during the immediately preceding calendar year; (4) the total amount of groundwater transported from each well and well system during each month of the immediately

preceding calendar year; (5) the purpose for which the water was transported; (6) any other information related to the operation and production of the wells or transport of water requested by the District.

The issuance of this Amended Permit does not grant to the Permittee the right to use private property, or public property, for the production or conveyance of water. Neither does this Amended Permit authorize the invasion of any personal rights nor the violation of federal, state, or local laws, or any regulations. The District makes no representations and shall have no responsibility with respect to the availability or quality of water authorized to be transported under this Amended Permit.

This Amended Permit expires on September 15, 2034, and is subject to review every fifth year, and during any such review may be modified to conform with intervening changes in the Management Plan of the District or state law. Permittee shall submit to the District 90 days prior to the fifth anniversary of the issuance and each subsequent review, and the date of expiration of the operating permit a full and complete report describing its groundwater transportation system, volumes of water delivered by customer, and the delivery points of groundwater transported, together with such other information that will assist the District's review. The Board may waive any five year review if no material change has been made to the Management Plan, or if the changes made do not require modification of such permits. Despite the term of duration listed in this Amended Permit, the Permittee is authorized to transport groundwater under this Amended Permit only as long as the Permittee holds a valid operating permit issued by the District for the wells listed in this Amended Permit.

The permit issued September 14, 2004, amended January 13, 2009, and amended June 22, 2015, is hereby amended and in effect as of the 18th day of April, 2017.

Post Oak Savannah Groundwater
Conservation District


Gary Westbrook - General Manager

No. POS-T-0001b



Vista Ridge, LLC Transport Permit, Exhibit A

Site	Latitude	Longitude	Formation	Max GPM	Permit Status
CW-1	30.44211	-96.81383	Carrizo	1200	Relocation requested
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PW-13	30.42394	-96.82004	Simsboro	2685	Originally permitted location
PW-14	30.41469	-96.81752	Simsboro	2500	Relocation requested
PW-15	30.42798	-96.83298	Simsboro	3000	Relocation requested
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