Appendix 4 – Water Resource Analysis

Search Results - PLSS Water Column Report - Lea County
PLSS Summary - Water Wells, Section 4, Twn 12S Rng 33E, Lea County
Point of Diversion Reports:

- **Permit 02981**
- **Permit 05009**
- **Permit 06521**

Extract – Lea County Water Supply Plan 2016
Map – Surface Water locations

New Mexico Office of the State Engineer

Water Column/Average Depth to Water

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest)

(NAD83 UTM in meters)

(In feet)

POD Number	Code	POD Sub-basin	County	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	Distance	Depth Well	Depth Water	Water Column
L 05009		L	LE		3	2	04	12S	33E	628741	3686462*	286	110	40	70
L 06521		L	LE	1	1	2	04	12S	33E	628634	3686964*	718	130	60	70
L 02981		L	LE	2	2	2	04	12S	33E	629237	3686969*	995	143	70	73
L 06668		L	LE	3	3	3	03	12S	33E	629457	3685365*	1139	130	55	75
L 01151 POD1		L	LE		4	4	33	11S	33E	629132	3687276*	1180	130	50	80
L 06319		L	LE		2	2	05	12S	33E	627528	3686850*	1182	120	80	40
L 06789		L	LE	1	1	1	10	12S	33E	629462	3685363*	1275	124	65	59
L 06738		L	LE	4	2	2	09	12S	33E	629259	3685158*	1304	125	58	67
L 01241		L	LE		2	3	03	12S	33E	629955	3686075*	1418	119	50	69
L 01233 POD1		L	LE		4	1	03	12S	33E	629949	3686478*	1420	130	45	85
L 00624 S		L	LE	3	1	3	33	11S	33E	627819	3687562*	1499	120		
L 01331		L	LE		2	1	03	12S	33E	629943	3686880*	1531	125	68	57
L 03450		L	LE	3	4	1	33	11S	33E	628215	3687969*	1749	136	55	81
L 03890		L	LE	3	4	2	33	11S	33E	629019	3687979*	1791	137	75	62
L 01125 POD1		L	LE		3	4	03	12S	33E	630365	3685679*	1905	90	50	40
L 06877		L	LE	4	2	4	09	12S	33E	629269	3684353*	2030	140	80	60
L 00624		L	LE	3	1	1	33	11S	33E	627807	3688366*	2240	135	60	75
L 05110 POD2		L	LE				32	11S	33E	626920	3687843*	2276	99	66	33
L 06451		L	LE	1	1	3	05	12S	33E	626233	3686127*	2317	133	80	53
L 02165		L	LE	3	1	1	02	12S	33E	631049	3686799*	2561	114		
L 09545		L	LE		2	4	34	11S	33E	630735	3687698*	2623	154	70	84
L 14214 POD1		L	LE	2	1	3	02	12S	33E	631190	3686119	2646	59		
L 06890		L	LE	1	1	1	15	12S	33E	629483	3683753*	2667	145	80	65
L 03368		L	LE		3	3	28	11S	33E	627902	3688869*	2696	143	70	73
L 01327		L	LE		3	3	35	11S	33E	631143	3687301*	2800	115	55	60
L 06571		L	LE	2	2	4	31	11S	33E	626008	3687736*	2941	120	70	50
L 06435		L	LE		2	4	31	11S	33E	625909	3687637*	2979	100	70	30
L 06248		L	LE		1	4	28	11S	33E	628700	3689281*	3033	110	55	55
L 01396		L	LE		2	1	02	12S	33E	631552	3686905*	3075	126	45	81
L 06279		L	LE		1	2	15	12S	33E	630390	3683666*	3174	135	80	55
L 03411		L	LE	2	2	1	02	12S	33E	631651	3687004*	3194	121	50	71
L 10291		L	LE	1	3	2	02	12S	33E	631860	3686607*	3332	134	42	92
L 06949		L	LE	1	1	1	35	11S	33E	631025	3688607*	3419	133	80	55

L 01282		L	LE		3	2	02	12S	33E	631961	3686508*	3423	122	55	67
L 10187		L	LE		1	1	35	11S	33E	631126	3688508*	3427	90		
L 06092		L	LE		3	2	28	11S	33E	628694	3689684*	3436	125	55	70
L 06371		L	LE		3	1	28	11S	33E	627890	3689674*	3485	110	60	50
L 06082		L	LE		2	3	29	11S	33E	626689	3689255*	3532	126	70	56
L 01287		L	LE		1	2	11	12S	33E	631979	3685300*	3561	130	65	65
L 01330		L	LE		3	4	35	11S	33E	631947	3687312*	3561	115	55	60
L 01129 POD1		L	LE		4	4	02	12S	33E	632375	3685708*	3866	130	55	75
L 01470		L	LE		2	2	02	12S	33E	632356	3686915*	3866	110	45	65
L 06147		L	LE		2	2	28	11S	33E	629091	3690090*	3877	115	50	65
L 06267		L	LE		4	1	29	11S	33E	626683	3689657*	3882	105	65	40
L 06467		L	LE	3	4	1	31	11S	33E	624997	3687929*	3926		65	
L 05109		L	LE		3	1	29	11S	33E	626281	3689652*	4086	80	64	16
L 03257		L	LE	1	1	1	01	12S	33E	632657	3687020*	4181	155	55	100
L 06111		L	LE	3	3	3	21	11S	33E	627777	3690378*	4198	120	70	50
L 06775		L	LE	1	1	1	22	12S	33E	629503	3682143*	4217	142	85	57
L 02073		L	LE	1	4	4	11	12S	33E	632295	3684197*	4273	130	49	81
L 01291		L	LE		3	1	12	12S	33E	632787	3684908*	4447	90	55	35
L 04168		L	LE		4	3	22	11S	33E	629890	3690503*	4459	70	40	30
L 00659 S2		L	LE				30	11S	33E	625292	3689434*	4552	138	65	73
L 06165		L	LE				26	11S	33E	631723	3689514*	4553	56	36	20
L 05488		L	LE	2	2	2	27	11S	33E	630799	3690211*	4555	65	65	0
L 05091		L	LE			2	30	11S	33E	625678	3689845*	4598	140	65	75
L 06259		L	LE			2	30	11S	33E	625678	3689845*	4598	135	80	55
L 10185		L	LE		2	4	21	11S	33E	629079	3690895*	4674	85		
L 03361		L	LE		3	3	20	11S	33E	626269	3690456*	4782	120	70	50
L 03134 S		L	LE	3	3	3	25	11S	33E	632631	3688829*	4829	98	40	58
L 04919		L	LE				21	11S	33E	628481	3691082*	4831	70	55	15
L 06466		L	LE		1	4	20	11S	33E	627067	3690870*	4850	110	70	40
L 03134		L	LE	1	3	3	25	11S	33E	632631	3689029*	4939	94	35	59
L 03134	R	L	LE	1	3	3	25	11S	33E	632631	3689029*	4939	94	35	59
L 06241		L	LE		1	2	01	12S	33E	633562	3686931*	5060	122	46	76
L 02651		L	LE	4	2	4	25	11S	32E	624381	3689128*	5062	111	60	51
L 10718		L	LE			3	18	12S	33E	624968	3682590*	5119	120	70	50
L 05470		L	LE			2	26	11S	33E	632116	3689925*	5122	65	48	17
L 10188		L	LE			2	26	11S	33E	632116	3689925*	5122	90	40	50
L 00659 S		L	LE			1	30	11S	33E	624880	3689837*	5128	125		
L 06278		L	LE		4	2	26	11S	33E	632318	3689729*	5130	95	50	45
L 09079		L	LE	2	2	1	30	11S	33E	625167	3690141*	5153	110	69	41
L 02499 POD2		L	LE	1	1	3	25	11S	33E	632625	3689431*	5171	100	32	68
L 09080		L	LE	3	3	4	19	11S	33E	625364	3690348*	5188	119	69	50
L 04220		L	LE		3	4	19	11S	33E	625465	3690449*	5207	100	54	46

L 06198		L	LE		1	4	36	11S	33E	633551	3687735*	5219	102	40	62
L 10186		L	LE		1	4	36	11S	33E	633551	3687735*	5219	90	40	50
L 05092		L	LE			4	25	11S	32E	624086	3689023*	5252	135	65	70
L 05748		L	LE			1	21	11S	33E	628067	3691484*	5254	70	50	20
L 04990		L	LE		1	3	23	11S	33E	631092	3690922*	5319	80	40	40
L 00774		L	LE	4	1	1	21	11S	33E	627959	3691585*	5366	138	55	83
L 06016		L	LE	3	4	2	22	11S	33E	630583	3691217*	5367	120	50	70
L 10634		L	LE		4	4	14	12S	33E	632417	3682487*	5398	145	55	90
L 00215 POD5		L	LE	2	4	2	25	11S	32E	624376	3689731*	5432	132	84	48
L 05945		L	LE		2	1	21	11S	33E	628262	3691690*	5446	90	52	38
L 05760		L	LE		2	2	21	11S	33E	629067	3691699*	5472	73	50	23
L 05236		L	LE		4	2	22	11S	33E	630684	3691318*	5499	84	39	45
L 06363		L	LE		4	4	20	12S	33E	627608	3680813*	5518	154	95	59
L 05603		L	LE		1	1	22	11S	33E	629470	3691704*	5530	90	40	50
L 03989		L	LE	2	1	4	19	11S	33E	625558	3690950*	5569	124	65	59
L 04169		L	LE		3	1	23	11S	33E	631086	3691324*	5672	60	30	30
L 06207		L	LE		4	4	23	11S	33E	632307	3690533*	5698	90	45	45
L 01255		L	LE	1	4	4	22	12S	33E	630726	3680952*	5729	140	92	48
L 04543		L	LE		1	2	22	11S	33E	630275	3691715*	5730	90	60	30
L 05568 POD4		L	LE	2	2	1	28	12S	33E	628516	3680519*	5732	182	95	87
L 05908		L	LE	4	4	4	16	11S	33E	629161	3692001*	5782	133	60	73
L 00659		L	LE				19	11S	33E	625271	3691044*	5805	133	61	72
L 04070		L	LE		4	3	16	11S	33E	628256	3692093*	5849	100	70	30
L 00278		L	LE	2	1	2	25	11S	32E	623968	3690129*	6000	135		
L 02120		L	LE		1	2	25	11S	32E	623869	3690030*	6013	105	105	0
L 02257		L	LE		4	1	25	11S	32E	623472	3689623*	6093	130	50	80
L 07092		L	LE		4	1	25	11S	32E	623472	3689623*	6093	150	60	90
L 03990		L	LE	1	2	2	19	11S	33E	625748	3691758*	6177	136	56	80
L 05465	R	L	LE	1	3	4	15	11S	33E	630169	3692216*	6181	168	35	133
L 05465 POD2	R	L	LE	1	3	4	15	11S	33E	630169	3692216*	6181	175	40	135
L 05465 POD3		L	LE	1	3	4	15	11S	33E	630169	3692216*	6181	170	48	122
L 01781 POD1		L	LE		3	2	02	12S	32E	622305	3686382*	6243	116		
L 04858		L	LE		4	4	15	11S	33E	630673	3692122*	6244	125	55	70
L 00215 POD4		L	LE			4	24	11S	32E	624065	3690633*	6268	153	70	83
L 09754		L	LE			4	24	11S	32E	624065	3690633*	6268	122		
L 06266		L	LE		4	2	23	11S	33E	632296	3691337*	6318	85	40	45
L 05465 X		L	LE		1	3	15	11S	33E	629458	3692508*	6322	140	50	90
L 02043		L	LE	1	1	2	19	11S	33E	625346	3691755*	6367	140	60	80
L 00215 POD6		L	LE	4	1	4	24	11S	32E	623958	3690733*	6414	128	115	13
L 02164		L	LE	1	3	2	11	12S	32E	622222	3684871*	6473	127		
L 09565		L	LE		2	3	24	11S	33E	633106	3690944*	6542	155	48	107

L 09615 S2		L	LE	2	1	4	24	11S	32E	623958	3690933*	6555	141	65	76
L 05113		L	LE				15	11S	33E	630067	3692709*	6634	105	45	60
L 06174		L	LE		2	2	25	11S	33E	633920	3690150*	6638	85	55	30
L 01936		L	LE		2	3	02	12S	32E	621906	3685975*	6646	164	60	104
L 01638 POD1		L	LE		1	1	25	11S	32E	623065	3690021*	6653	86		
L 06060		L	LE		4	2	16	11S	33E	629050	3692906*	6673	95	45	50
L 09615 S3		L	LE	1	1	4	24	11S	32E	623758	3690933*	6697	150	70	80
L 05479 EXPL	O		LE	4	2	1	26	12S	33E	631736	3680361*	6697	157		
L 02774		L	LE		2	1	18	12S	34E	634776	3683724*	6722	117	60	57
L 03765	R	L	LE	3	2	4	18	11S	33E	625737	3692363	6727	120	50	70
L 03765 POD3	R	L	LE	3	2	4	18	11S	33E	625737	3692363	6727	160	83	77
L 01934		L	LE	3	3	2	24	11S	32E	623753	3691136*	6844	115	65	50
L 03765 S		L	LE	3	1	4	18	11S	33E	625334	3692360*	6902	120	51	69
L 06112		L	LE			4	29	12S	33E	627429	3679399*	6942	120	80	40
L 09506		L	LE		1	4	18	11S	33E	625435	3692461*	6946	120	50	70
L 03762	R	L	LE	3	3	3	18	11S	33E	624546	3691950*	6963	120	58	62
L 03762 POD2		L	LE	3	3	3	18	11S	33E	624546	3691950*	6963	122	58	64
L 06362		L	LE		3	1	17	11S	33E	626234	3692870*	7011	95	60	35
L 12006 POD2		L	LE	4	1	1	18	11S	33E	625386	3692537	7036	155	60	95
L 06098		L	LE		2	1	16	11S	33E	628239	3693300*	7055	100	55	45
L 06559		L	LE		4	4	29	12S	33E	627629	3679203*	7107	95	28	67
L 06173		L	LE		1	1	15	11S	33E	629447	3693313*	7119	85	55	30
L 09615 S		L	LE		4	1	24	11S	32E	623452	3691232*	7125	124	68	56
L 07471		L	LE		1	1	19	12S	34E	634429	3682111*	7192	125	49	76
L 05672		L	LE	3	3	3	05	12S	34E	635852	3685648*	7329	98	45	53
L 06242		L	LE	3	3	3	09	11S	33E	627729	3693597*	7391	100	60	40
L 09615		L	LE		2	1	24	11S	32E	623447	3691635*	7416	125	70	55
L 02000		L	LE		2	3	14	12S	32E	621945	3682756*	7470	125	85	40
L 02023		L	LE		2	3	14	12S	32E	621945	3682756*	7470	96	35	61
L 09539		L	LE		2	3	14	12S	32E	621945	3682756*	7470	95		
L 06235		L	LE		3	3	09	11S	33E	627830	3693698*	7481	90	50	40
L 06303		L	LE		1	1	14	11S	33E	631059	3693334*	7515	80	45	35
L 08642		L	LE	4	1	1	24	11S	32E	623144	3691529*	7553	110	64	46
L 04701		L	LE	1	1	3	13	11S	33E	632580	3692646*	7560	100	30	70
L 06139		L	LE			3	09	11S	33E	628031	3693899*	7665	80	40	40
L 05345		L	LE		1	1	32	11S	34E	635912	3688568*	7720	70	40	30
L 08187		L	LE		2	3	23	12S	32E	622362	3681552	7767		30	
L 04703		L	LE	3	1	4	13	11S	33E	633384	3692455*	7866	100	30	70
L 05393		L	LE		2	4	09	11S	33E	629032	3694113*	7876	105	70	35
L 10225		L	LE		1	3	09	11S	33E	627824	3694100*	7882	115	45	70
L 00348	R	L	LE		2	2	31	12S	33E	626027	3678780*	7884	115		
L 00348 POD2		L	LE	1	2	1	35	12S	33E	631556	3678951	7895	115		

L 05479 POD2		L	LE	3	1	1	35	12S	33E	631154	3678745*	7945	202		
L 06133		L	LE		1	1	19	11S	34E	634300	3691762*	7966	90	45	45
L 06860		L	LE	2	2	4	09	11S	33E	629131	3694212*	7982	85	49	36
L 02174		L	LE		3	3	13	11S	32E	623040	3692033*	7984	102	92	10
L 10790		L	LE			2	23	11S	32E	622447	3691419*	7994	113	52	61
L 01201 POD1		L	LE				19	12S	34E	635048	3681506*	8048	90	55	35
L 04052		L	LE				19	12S	34E	635048	3681506*	8048	140	65	75
L 10817		L	LE		3	4	07	11S	33E	625418	3693669*	8050	125	60	65
L 01640 POD1		L	LE				13	11S	32E	623643	3692636*	8050	120		
L 06249		L	LE		2	3	08	11S	33E	626618	3694083*	8066	105	48	57
L 04700		L	LE	3	1	1	13	11S	33E	632569	3693249*	8071	100	35	65
L 10567		L	LE	1	1	4	08	11S	33E	626919	3694188*	8102	130	58	72
L 01964 POD2		L	LE	4	3	1	17	12S	34E	636087	3683229*	8123	109	45	64
L 02024		L	LE			1	23	12S	32E	621757	3681745*	8149	98	30	68
L 02039		L	LE			1	23	12S	32E	621757	3681745*	8149	100	58	42
L 02040		L	LE			1	23	12S	32E	621757	3681745*	8149	95	55	40
L 06273		L	LE		2	2	13	11S	32E	624230	3693254*	8226	150	60	90
L 01964		L	LE	2	2	1	17	12S	34E	636484	3683837*	8295	100		
L 01964	R	L	LE	2	2	1	17	12S	34E	636484	3683837*	8295	100		
L 08146		L	LE		3	2	13	11S	33E	633480	3692958*	8325	60	35	25
L 08188		L	LE		2	3	23	12S	32E	621964	3681146*	8330	77	30	47
L 03796		L	LE	4	3	1	23	12S	32E	621655	3681443*	8403	132	40	92
L 06148		L	LE		2	3	10	12S	32E	620314	3684347*	8450	101	81	20
L 03470		L	LE	1	4	1	10	11S	33E	629731	3694624*	8456	116		
L 03483		L	LE	1	4	1	10	11S	33E	629731	3694624*	8456	140	50	90
L 05479		L	LE	3	4	1	35	12S	33E	631561	3678349*	8457	157		
L 10196		L	LE		4	1	29	11S	34E	636297	3689779*	8515	60		
P 03981			RO	1	2	2	05	12S	34E	637041	3687071*	8533	106	90	16
L 03338		L	LE	3	2	4	34	12S	33E	630762	3677935*	8605	138	90	48
L 09759		L	LE		4	4	05	12S	34E	637160	3685760*	8626	135	28	107
L 06103		L	LE		2	2	08	12S	34E	637166	3685358*	8665	112	43	69
L 05899	R	L	LE		4	4	33	12S	33E	629260	3677614*	8666	136	100	36
L 04702		L	LE	1	1	2	13	11S	33E	633373	3693458*	8673	100	25	75
L 01005 POD1		L	LE	4	4	3	12	11S	33E	633165	3693656*	8726	60		
L 02090		L	LE	3	1	3	12	11S	33E	632556	3694053*	8771	85	35	50
L 05493		L	LE	2	2	2	09	11S	33E	629119	3695017*	8784	160	45	115
L 02747		L	LE	3	4	1	30	12S	34E	634726	3680000*	8789	115	65	50
L 09328		L	LE	3	4	4	19	12S	34E	635519	3680809*	8844	150	50	100
L 05741		L	LE			4	12	11S	32E	624024	3693853*	8845	152		
L 05613		L	LE		4	4	25	12S	33E	634065	3679288*	8884	152	78	74
L 01680 POD1		L	LE		1	2	22	12S	32E	620747	3681936*	8913	85	53	32

L 06588		L	LE	1	1	1	13	11S	32E	622924	3693339*	9047	120	65	55
L 07031		L	LE		2	3	12	11S	33E	633060	3694159*	9105	122	50	72
L 12920 POD1		L	LE		2	2	05	11S	33E	627404	3695302	9122	75	40	35
L 03559		L	LE	3	3	1	12	11S	33E	632550	3694455*	9128	150	30	120
L 05743		L	LE		3	3	30	12S	34E	634466	3679293*	9135	100	68	32
L 04415	R	L	LE		3	1	15	12S	32E	619927	3683134*	9166	200	60	140
L 04699		L	LE	3	1	4	12	11S	33E	633361	3694062*	9175	100	25	75
L 01642 POD1		L	LE	3	3	3	12	11S	32E	622918	3693541*	9210	132		
L 05001		L	LE			4	12	11S	33E	633669	3693962*	9257	50	25	25
L 00158		L	LE	1	1	1	16	12S	34E	637491	3683852*	9260	105	50	55
L 06445		L	LE		3	2	18	11S	34E	635041	3692978*	9350	95	60	35
L 10200		L	LE		3	3	17	11S	34E	635858	3692185*	9416	60	40	20
L 10794		L	LE	3	3	2	12	11S	32E	623711	3694356*	9438	60	50	10
L 02818		L	LE		4	1	09	12S	34E	637976	3684966*	9516	120	60	60
L 02091		L	LE	3	3	2	12	11S	33E	633355	3694464*	9516	100	27	73
L 02092		L	LE	4	1	1	12	11S	33E	632744	3694857*	9574	69	37	32
L 06615		L	LE	3	3	3	31	12S	33E	624723	3677457*	9589	135		
L 03801		L	LE	4	3	2	12	11S	33E	633555	3694464*	9619	120	25	95
L 03801	R	L	LE	4	3	2	12	11S	33E	633555	3694464*	9619	120	25	95
L 02128		L	LE		1	3	16	12S	34E	637604	3682947*	9640	115	45	70
L 05024		L	LE		4	3	28	11S	34E	637918	3688997*	9765	90	30	60
L 04989		L	LE		3	4	20	12S	34E	636828	3680926*	9845	113	98	15
L 06122		L	LE		3	1	17	11S	34E	635844	3692990*	9932	73	43	30
L 05077 POD1		L	LE		3	3	01	11S	33E	632638	3695359*	9984	70	25	45
L 05077 POD1	R	L	LE		3	3	01	11S	33E	632638	3695359*	9984	70	25	45
L 10201		L	LE		2	3	07	11S	34E	634623	3694178*	9987	80	50	30
L 00147	R	L	LE		1	2	12	11S	33E	633450	3694966*	9999	55	51	4

Average Depth to Water: **55 feet**

Minimum Depth: **25 feet**

Maximum Depth: **115 feet**

Record Count: 226

UTMNAD83 Radius Search (in meters):

Easting (X): 628547 **Northing (Y):** 3686251 **Radius:** 10000

***UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer

Water Column/Average Depth to Water

(A CLW##### in the POD suffix indicates the POD has been replaced & no longer serves a water right file.)

(R=POD has been replaced, O=orphaned, C=the file is closed)

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters) (In feet)

POD Number	Code	POD Sub-basin	County	Q 64	Q 16	Q 4	Sec	Tws	Rng	X	Y	DepthWell	DepthWater	Water Column
L 02981		L	LE	2	2	2	04	12S	33E	629237	3686969*	143	70	73
L 05009		L	LE		3	2	04	12S	33E	628741	3686462*	110	40	70
L 06521		L	LE	1	1	2	04	12S	33E	628634	3686964*	130	60	70

Average Depth to Water: **56 feet**

Minimum Depth: **40 feet**

Maximum Depth: **70 feet**

Record Count: 3

Basin/County Search:

County: Lea

PLSS Search:

Section(s): 4 **Township:** 12S **Range:** 33E

***UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer

Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

POD Number	Q64	Q16	Q4	Sec	Tws	Rng	X	Y
L 02981	2	2	2	04	12S	33E	629237	3686969*

Driller License:	116	**Driller Company:**	MATTHEWS DRILLING CO.		
Driller Name:	JAMES WILLIAM MATTHEWS				
Drill Start Date:	09/30/1955	**Drill Finish Date:**	09/30/1955	**Plug Date:**	09/26/1956
Log File Date:	10/01/1956	**PCW Rcv Date:**		**Source:**	Shallow
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	
Casing Size:		**Depth Well:**	143 feet	**Depth Water:**	70 feet

***UTM location was derived from PLSS - see Help**

3/20/17 12:36 PM POINT OF DIVERSION SUMMARY

New Mexico Office of the State Engineer

Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

POD Number	Q64	Q16	Q4	Sec	Tws	Rng	X	Y
L 05009		3	2	04	12S	33E	628741	3686462*

Driller License: 274 **Driller Company:** BAKER, E.B. DRILLING COMPANY

Driller Name:

Drill Start Date:	12/04/1962	**Drill Finish Date:**	12/04/1962	**Plug Date:**	04/30/1963
Log File Date:	01/11/1963	**PCW Rcv Date:**		**Source:**	Shallow
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	
Casing Size:		**Depth Well:**	110 feet	**Depth Water:**	40 feet

Water Bearing Stratifications:	Top	Bottom	Description
	50	108	Sandstone/Gravel/Conglomerate

***UTM location was derived from PLSS - see Help**

New Mexico Office of the State Engineer

Point of Diversion Summary

(quarters are 1=NW 2=NE 3=SW 4=SE)
(quarters are smallest to largest) (NAD83 UTM in meters)

POD Number	Q64	Q16	Q4	Sec	Tws	Rng	X	Y
L 06521	1	1	2	04	12S	33E	628634	3686964*

Driller License: 46 **Driller Company:** ABBOTT BROTHERS COMPANY

Driller Name: MURRELL ABBOTT

Drill Start Date:	05/07/1969	**Drill Finish Date:**	05/08/1969	**Plug Date:**	01/18/1973
Log File Date:	05/21/1969	**PCW Rcv Date:**		**Source:**	Shallow
Pump Type:		**Pipe Discharge Size:**		**Estimated Yield:**	
Casing Size:		**Depth Well:**	130 feet	**Depth Water:**	60 feet

Water Bearing Stratifications:

Top	Bottom	Description
60	81	Sandstone/Gravel/Conglomerate
103	130	Sandstone/Gravel/Conglomerate

Casing Perforations:

Top	Bottom
85	127

***UTM location was derived from PLSS - see Help**

1. Water Supply

This section provides an overview of the water supply in the Lea County Water Planning Region, including climate conditions (Section 5.1), surface water and groundwater resources (Sections 5.2 and 5.3), water quality (Section 5.4), and the administrative water supply used for planning purposes in this regional water plan update (Section 5.5). Additional quantitative assessment of water supplies is included in Section 7, Identified Gaps between Supply and Demand.

The *Updated Regional Water Planning Handbook* (NMISC, 2013) specifies that each of the 16 regional water plans briefly summarize water supply information from the previously accepted plan and provide key new or revised information that has become available since submittal of the accepted regional water plan. The information in this section regarding surface and groundwater supply and water quality is thus drawn largely from the accepted *Lea County Regional Water Plan* (Leedshill-Herkenhoff, Inc. et al., 2000) and where appropriate, updated with more recent information and data from a number of sources, as referenced throughout this section.

Currently some of key water supply updates and issues impacting the Lea County region are:

- The primary source of water is the Ogallala Aquifer, which is being rapidly depleted in certain areas. Before intense groundwater pumping began, groundwater in the High Plains Aquifer generally flowed to the southeast. Due to intensive groundwater pumping in both New Mexico and Texas, water levels have declined and the direction of groundwater flow has shifted. In Lea County, groundwater levels have declined 50 to 100 feet (McGuire, 2014), with rates of decline up to 4 feet per year and averaging 0.59 feet per year for wells in Lea County (USGS, 2013).

- The High Plains Aquifer extends into Texas, which has a different approach for managing this aquifer than New Mexico's. Interstate cooperation would improve monitoring and research and possibly address aquifer decline.

- The alluvial sediments in the Jal UWB also extend into Texas. The City of Midland, Texas constructed the T-Bar Ranch well field just south of the New Mexico-Texas boundary near the Jal UWB. The well field includes 45 wells capable of delivering about 20 million gallons per day (22,400 acre-feet per year). According to the Texas Water Development Board website, the city pumped 6,831 acre-fee in 2014 from its T-Bar Ranch well field. Concerns have been raised about the impacts of these diversions. Whereas water level declines in the basin prior to the pumping of the T-Bar well field ranged up to 2.4 feet per year, U.S. Geological Survey (USGS) measurements in 2014 indicate that water levels are declining about 6.6 feet per year in the southern portion of the Jal UWB.

- Due to the limited and diminishing groundwater supply within the Lea County and Jal

UWBs, the NMOSE is no longer accepting applications for new appropriations except for domestic, stock, and temporary construction applications filed under Section 72-12-1 NMSA. OSE is accepting applications for new appropriations in the Capitan and Carlsbad UWBs in Lea County.

- The many small rural drinking water systems within the region face challenges in financing infrastructure maintenance and upgrades and complying with water quality monitoring and training standards. Though the source water for these systems is generally good-quality groundwater, the maintenance, upgrades, training, operation, and monitoring that is required to ensure delivery of water that meets drinking water quality standards is a financial and logistical challenge for these small systems.
- Significant transfers of water out of the Lea County UWB are currently taking place. The City of Carlsbad, in the Lower Pecos Valley Water Planning Region, has water rights of more than 18,000 acre-feet per year from the Lea County UWB for consumption in Eddy County; this water is pumped out of the Double Eagle well field in Lea County and delivered by pipeline to industrial and commercial customers.
- Water rights in the planning region have not yet been adjudicated.
- Water availability in the formations beneath the High Plains Aquifer is poorly understood. For the most part, aquifers immediately below the High Plains Aquifer are expected to have relatively low yields and poor water quality. Deep water pumping may provide an alternative supply but could cause depletions of the High Plains Aquifer.
- More than 19,000 active oil and gas wells produce from numerous oil fields throughout Lea County (OCD, 2015). Concerns have been raised over water quality impacts and the use of high quality fresh water for hydraulic fracturing and other commercial and industrial operations.

5.1 Summary of Climate Conditions

The accepted regional water plan (Leedshill-Herkenhoff, Inc. et al., 2000) included an analysis of historical temperature and precipitation in the region. This section provides an updated summary of temperature, precipitation, snowpack conditions, and drought indices pertinent to the region (Section 5.1.1). Studies relevant to climate change and its potential impacts to water resourc es in New Mexico and the Lea County region are discussed in Section 5.1.2.

5.1.1 Temperature, Precipitation, and Drought Indices

Table 5-1 lists the periods of record for weather stations in Lea County and identifies two stations that were used for detailed analysis of weather trends. These stations were selected based on location, how well they represented conditions in their respective counties, and completeness of their historical records. The locations of the climate stations for which additional data were analyzed are shown in Figure 5-1.

Long-term minimum, maximum, and average temperatures for the two representative climate stations are detailed in Table 5-2, and average summer and winter temperatures for each year are shown on Figure 5-2.

The average precipitation distribution across the entire region is shown on Figure 5-3, and Table 5-2 lists the minimum, maximum, and long-term average annual precipitation (rainfall and snowmelt) at the two representative stations in the planning region. Total annual precipitation for the selected climate stations is shown in Figure 5-4. Average annual precipitation is greater in the northern two-thirds of the region, ranging from 14 to 18 inches, compared to the averages of 12 to 14 inches in the southern third.

Another way to review long-term variations in climate conditions is through drought indices. A drought index consists of a ranking system derived from the assimilation of data—including rainfall, snowpack, streamflow, and other water supply indicators—for a given region. The Palmer Drought Severity Index (PDSI) was created by W.C. Palmer (1965) to measure the variations in the moisture supply and is calculated using precipitation and temperature data as well as the available water content of the soil. Because it provides a standard measure that allows comparisons among different locations and months, the index is widely used to assess the weather during any time period relative to historical conditions. The PDSI classifications for dry to wet periods are provided in Table 5-3.

There are considerable limitations when using the PDSI, as it may not describe rainfall and runoff that varies from location to location within a climate division and may also lag in indicating emerging droughts by several months. Also, the PDSI does not consider groundwater or reservoir storage, which can affect the availability of water supplies during drought conditions. However, even with its limitations, many states incorporate the PDSI into their drought monitoring systems, and it provides a good indication of long-term relative variations in drought conditions, as PDSI records are available for more than 100 years.

The PDSI is calculated for climate divisions throughout the United States. Lea County falls almost entirely within New Mexico Climate Division 7 (the Southeastern Plains Climate Division) with the exception of a small strip of Climate Division 3 in the northern portion of Lea County (Figure 5-1). Figure 5-6 shows the long-term PDSI for this division. Of interest are the large variations from year to year and the extremely dry conditions in recent years.

The chronological history of drought, as illustrated by the PDSI, indicates that the most severe droughts in the last century occurred in the early 1900s, the 1930's, the 1950s, the early 2000s, and in recent years (2011 to 2013) (Figure 5-6)

The likelihood of drought conditions developing in New Mexico is influenced by several weather patterns:

- *El Niño/La Niña:* El Niño and La Niña are characterized by a periodic warming and cooling, respectively, of sea surface temperatures across the central and east-central equatorial Pacific. Years in which El Niño is present are more likely to be wetter than average in New Mexico, and years with La Niña conditions are more likely to be drier than average, particularly during the cool seasons of winter and spring.
- *The Pacific Decadal Oscillation (PDO):* The PDO is a multi-decadal pattern of climate variability caused by shifting sea surface temperatures between the eastern and western Pacific Ocean that cycle approximately every 20 to 30 years. Warm phases of the PDO (shown as positive numbers on the PDO index) correspond to El Niño-like temperature and precipitation anomalies (i.e., wetter than average), while cool phases of the PDO (shown as negative numbers on the PDO index) correspond to La Niña-like climate patterns (drier than average). It is believed that since 1999 the planning region has been in the cool phase of the PDO.
- *The Atlantic Multidecadal Oscillation (AMO):* The AMO refers to variations in surface temperatures of the Atlantic Ocean which, similarly to the PDO, cycle on a multi-decade frequency. The pairing of a cool phase of the PDO with the warm phase of the AMO is typical of drought in the southwestern United States (McCabe et al., 2004; Stewart, 2009). The AMO has been in a warm phase since 1995. It is possible that the AMO may be shifting to a cool phase but the data are not yet conclusive.
- *The North American Monsoon* is characterized by a shift in wind patterns in summer, which occurs as Mexico and the southwest U.S. warm under intense solar heating. As this happens, the flow reverses from dryland areas to moist ocean areas. Low-level moisture is transported into the region primarily from the Gulf of California and eastern Pacific. Upper-level moisture is transported into the region from the Gulf of Mexico by easterly winds aloft. Once the forests of the Sierra Madre Occidental green up from the initial monsoon rains, evaporation and plant transpiration can add additional moisture to the atmosphere that will then flow into the region. If the Southern Plains of the U.S. are unusually wet and green during the early summer months, that area can also serve as a moisture source. This combination causes a distinct rainy season over large portions of western North America (NWS, 2015).

5.1.2 Recent Climate Studies

New Mexico's climate has historically exhibited a high range of variability. Periods of extended drought, interspersed with relatively short-term, wetter periods events, are common. Historical periods of high temperature and low precipitation have resulted in high demands for irrigation water and higher open water evaporation and riparian evapotranspiration. In addition to natural climatic cycles (i.e., el Niño/la Niña, PDO, AMO [Section 5.1.1]) that affect precipitation patterns in the southwestern United States, there has been considerable recent research on potential climate change scenarios and their impact on the Southwest and New Mexico in particular.

Climate variability has a significant impact on the Ogallala Aquifer. Age dating for water in the aquifer indicates that much of the water originally entered the aquifer during a wetter climate during the last ice age (McMahon, 2007). Thus, the more recent precipitation (in the last few thousand years) is not resulting in significant recharge to the aquifer. With higher temperatures and longer growing seasons, the amount of precipitation that can result in recharge will be even less than the recent past.

The consensus on global climate conditions is represented internationally by the work of the Intergovernmental Panel on Climate Change (IPCC), whose Fifth Assessment Report, released in September 2013, states, “Warming of the climate system is unequivocal, and since the 1950s many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased” (IPCC, 2013). Atmospheric concentrations of greenhouse gases are rising so quickly that all current climate models project significant warming trends over continental areas in the 21st century.

In the United States, regional assessments conducted by the U.S. Global Change Research Program (USGCRP) have found that temperatures in the southwestern United States have increased and are predicted to continue to increase, and serious water supply challenges are expected. Water supplies are projected to become increasingly scarce, calling for trade-offs among competing uses and potentially leading to conflict (USGCRP, 2009).

Although there is consensus among climate scientists that global temperatures are warming, there is considerable uncertainty regarding the specific spatial and temporal impacts that can be expected. To assess climate trends in New Mexico, the NMOSE and NMISC (2006) conducted a study of observed climate conditions over the past century and found that observed wintertime average temperatures had increased statewide by about 1.5°F since the 1950s. Predictions of annual precipitation are subject to greater uncertainty “given poor representation of the North American monsoon processes in most climate models” (NMOSE/NMISC, 2006).

A number of other studies predict temperature increases in New Mexico from 5° to 10°F by the end of the century (Forest Guild, 2008; Hurd and Coonrod, 2008; USBR, 2011). Predictions of annual precipitation are subject to greater uncertainty, particularly regarding precipitation during the summer monsoon season in the southwestern U.S.

Based on these studies, the effects of climate change that are likely to occur in New Mexico and the planning region include (NMOSE/NMISC, 2006):

- Temperature is expected to continue to rise.
- Higher temperatures will result in a longer and warmer growing season, resulting in increased water demand on irrigated lands and increased evapotranspiration from riparian areas, grasslands and forests, and thus less recharge to aquifers.
- Reservoir and other open water evaporation are expected to increase. Soil evaporation will also increase.
- Precipitation is expected to be more concentrated and intense leading to increased projected frequency and severity of flooding.
- Streamflows in major rivers across the Southwest are projected to decrease substantially during this century (e.g., Christensen et al., 2004; Hurd and Coonrod, 2008; USBR, 2011, 2013) due to a combination of diminished cold season snowpack in headwaters regions and higher evapotranspiration in the warm season. The seasonal distribution of streamflow is projected to change as well: flows could be somewhat higher than at present in late winter, but peak runoff will occur earlier and be diminished. Late spring/early summer flows are projected to be much lower than at present, given the combined effects of less snow, earlier melting, and higher evaporation rates after snowmelt.

To minimize the impact of these changes, it is imperative that New Mexico plan for dealing with variable water supplies, including focusing on drought planning and being prepared to maximize storage from extreme precipitation events while minimizing their adverse impacts.

5.2 Surface Water Resources

Surface water supplies only 0.04 percent of the water currently diverted in the Lea County Water Planning Region, with its primary use being for livestock watering. No major surface water supplies are available in Lea County, only intermittent streams, lakes, stock ponds, and small playas that collect runoff during thunderstorms. Intermittent streams that channel runoff include Lost Draw, Sulfur Springs Draw, and Monument-Seminole Draw in the northern half of Lea County, which is part of the Texas Gulf Basin, and Landreth-Monument Draw in the southern portion of the county, which flows to the Pecos River. The very western edge of the county also lies within the Pecos River drainage. The intermittent surface drainages, lakes, and watersheds in the planning region are shown on Figure 5-7.

Although no permanent stream gages are operated by USGS in Lea County, periodic measurements of peak flow rates at Monument Draw near Monument and Antelope Draw near Jal yield significant runoff:

- The accepted RWP (Leedshill-Herkenhoff, Inc. et al., 2000) reported historical peak flows of 1,280 cubic feet per second (cfs) on Monument Draw in June of 1972, but no additional measurements have made since 1982 (USGS, 2015).

- In 2001, recorded peak flow reached 686 cfs on Antelope Draw, far exceeding the previous high reported in the 2000 RWP of 53 cfs in 1994.

These flows indicate the magnitude of runoff that can occur in all intermittent streams in Lea County. The water is held in stock ponds throughout Lea County from these intermittent flows, and the quality is adequate for livestock uses, which is its primary use in the basin.

No lakes and reservoirs with storage capacities greater than 5,000 acre-feet, as reported in the NMOSE *Water Use by Categories* report (Longworth et al., 2013), are present in the planning region. Several smaller lakes and reservoirs are present in the region; information on these smaller reservoirs was included in the accepted plan (Leedshill-Herkenhoff, Inc. et al., 2000).

5.3 Groundwater Resources

Groundwater accounted for 99.96 percent of all water diversions in the year 2010 (Longworth et al., 2013). The primary source of supply is the High Plains Aquifer, which extends north to Wyoming, Colorado, Nebraska, Kansas, Oklahoma, and Texas. In New Mexico, the High Plains aquifer includes the Tertiary-age Ogallala Formation and unconsolidated alluvial and terrace deposits of Quaternary age. These units are discussed in Sections 5.3.1 and 5.3.2.

5.3.1 Regional Hydrogeology

The geology that controls groundwater occurrence and movement within the planning region was described in the accepted *Lea County Regional Water Plan* (Leedshill-Herkenhoff, Inc. et al., 2000), based on numerous studies, including early studies by Nye (1930), Nicholson and Clebsch (1961), and Hart and McAda, (1985). A map illustrating the surface geology of the planning region, derived from a geologic map of the entire state of New Mexico by the New Mexico Bureau of Geology & Mineral Resources (2003), is included as Figure 5–10.

Two physiographic regions exist within the planning region. From the west to the east, these are:

- Great Plains (Lower Pecos Valley Subsection)

- Great Plains (Llano Estacado)

Figure 5-10 shows the approximate extents of these areas within the planning region.

Geologic strata exposed in the planning region consist primarily of the Ogallala Formation and alluvial, aeolian, and piedmont deposits. The geologic formations present in the planning region include (from oldest to youngest):

- Triassic-age rock including the Upper Chinle Group, Garita Creek through Redonda Formations
- Tertiary- age rock of the Ogallala Formation
- Quaternary-age rock including alluvium, aeolian and piedmont deposits and lacustrine and playa deposits

The major and minor aquifers in the planning region consist of:

- The High Plains Aquifer in the northern half of the planning region is comprised of the Ogallala Formation and unconsolidated Quaternary deposits of sand, silt, and gravel. The High Plains Aquifer extends northward into eastern parts of New Mexico and Colorado and toward the east into Texas. The western portion of the Capitan UWB was found to contain isolated areas of saturated Ogallala Formation (up to 50 feet thick) in 1960 (Nicholson and Clebsch, 1961); these areas are not formally included in the High Plains Aquifer.
- The alluvial aquifer consists of discontinuous and unconfined saturated alluvial and aeolian deposits along intermittent streams in southern Lea County, such as Monument Draw, Querecho Plains, San Simon Swale, and Dogie Draw, and along the Mescalero Ridge. Alluvial sediments are also present in the Jal UWB, which provides water to the city of Jal, where the saturated thickness in their well field is between 200 to 300 feet and declining (Hoines, 2004) Significant groundwater pumping occurs across the border in Texas, and drawdowns of 6.6 feet per year have been observed in the Jal UWB (Myers, 2015).
- Dockum Group aquifers exist throughout Lea County with potential sources of groundwater that are mostly undeveloped due to the high cost of producing the deep water. The development that has occurred is limited specifically to the Santa Rosa Sandstone unit in the southwestern portion of the County; it was the principal aquifer for the City of Jal before 1954 (Leedshill-Herkenhoff, Inc. et al., 2000) and is currently used for domestic, livestock, and commercial purposes for oil and gas development.
- The Tucumcari Formation exists in a limited area of northeastern Lea County. Lithologically, the Tucumcari is characterized as a shale with lesser limestone and sandstone beds. Basal sandstone beds provide limited amounts of water from within the Tucumcari Formation, but only limited exploration of the unit's groundwater has occurred (Leedshill-Herkenhoff, Inc. et al., 2000).

- The Rustler Formation is believed to underlie all of Lea County at depth and produces brackish to saline water that is primarily used for stock watering and secondary recovery of oil.

- The Capitan Aquifer is part of the Capitan Reef Complex, an ancient reef of dolomite and limestone strata. The aquifer is relatively deep and the groundwater quality of the Capitan in Lea County is very poor.

5.3.2 Aquifer Conditions

As reported in the accepted regional water plan (Leedshill-Herkenhoff, Inc. et al., 2000), by far the most important aquifer is the High Plains Aquifer; this aquifer is within the Lea County UWB, which is a mined basin (i.e., a basin with declining water levels). The Ogallala Formation portion of the aquifer has been relied upon for most of the groundwater used in the basin; however, there are areas where it is not present or where the saturated thickness is too small to support large-scale groundwater production.

Other geologic units directly underlying the High Plains Aquifer in certain areas may contain some coarse-grained beds that are productive, and these have been used for irrigated agriculture, particularly in areas where the High Plains Aquifer is thin or non-existent. Although the NMOSE is limiting new appropriations within the the Lea County UWB to domestic, stock, and temporary construction applications, it is accepting applications to appropriate groundwater from the formations beneath the High Plains Aquifer. However, these units are relatively deep and the groundwater typically has high concentrations of dissolved solids.

Before intense groundwater pumping began, groundwater in the High Plains Aquifer generally flowed to the southeast. Due to intensive groundwater pumping in both New Mexico and Texas, water levels have declined and the direction of groundwater flow has shifted. In Lea County, groundwater levels have declined 50 to 100 feet (McGuire, 2014), with rates of decline up to 4 feet per year and averaging 0.59 feet per year (USGS, 2013). Presently, the saturated thickness ranges from zero along the western fringes of the basin to about 200 feet (Fischer et al., 2000; USGS, 2013).

Most water pumped from wells in the High Plains Aquifer is of good quality. Where problems with groundwater contamination exist, they are generally associated with one or more of the following: leaking underground storage tanks, nitrate from agricultural activities, dairy operations, septic tanks, public and private sewage treatment plants, and oil- and gas-field operations. Groundwater from the deeper formations is expected to be of poorer quality compared to the water from the High Plains Aquifer.

As stated above, the only applications for new appropriations accepted by NMOSE within the Lea County UWB are for domestic, stock, and temporary construction applications filed under

Section 72-12-1 NMSA. NMOSE accepts applications for transfers, replacement, and supplemental wells, but these are not new appropriations. The Lea Basin administrative guidelines adopted in 2009 provide consistent review procedures and are intended to prolong aquifer life and protect existing wells (Section 4). A drawdown allowance is provided in the guidelines and serves as a benchmark for evaluating well impacts from proposed water rights transfers. For regional-scale assessments, the effects predicted for each model cell are compared to the allowance established. In areas of the Lea County UWB that are predicted to have less than a 40-year supply, a drawdown allowance of 0.05 foot per year is being used when evaluating transfers (NMOSE, 2014b).

The other three UWBs in the planning region that contain groundwater supplies of any significance are:

- The *Capitan UWB* covers approximately 731,500 acres in the south-central portion of Lea County. It is located within a geologic province known as the Delaware Basin, a subdivision of the Permian Basin. The Capitan UWB is oriented in a northwest-southeast alignment above an arc-shaped section of a formation known as the Capitan Reef Complex. The Capitan aquifer occurs within dolomite and limestone strata deposited as an ancient reef. The groundwater quality of the Capitan in Lea County is very poor, with TDS ranging from 10,065 to 165,000 mg/L (Leedshill-Herkenhoff, Inc. et al., 2000). Other aquifers in the Capitan UWB are found in the overlying Rustler Formation, Santa Rosa Sandstone, Ogallala Formation, and Cenozoic alluvium and are important sources of groundwater in the Capitan UWB. The depth to the top of the Rustler Formation ranges from 900 to 1,100 feet (Leedshill-Herkenhoff, Inc. et al., 2000). Applications for new appropriations in the Capitan UWB are accepted by the NMOSE, although the high TDS and depth to water have restricted the use of the water.

- The *Jal UWB* is a mined basin of approximately 9,400 acres and is located in the southern part of Lea County between the Capitan and Carlsbad UWBs. The Cenozoic-aged alluvium is the primary source of groundwater in the Jal UWB. Triassic rocks underlie the alluvium and may be a source of groundwater supply. The Santa Rosa Sandstone is the principal producer of this unit and is present at a depth of approximately 900 feet near the well field owned by the City of Jal (Souder Miller & Associates, 2015). Two wells with available water level information in the NMOSE WATERS database have a water column of 286 and 390 feet, with an average of 338 feet (NMOSE, 2015). Water level declines for some of the wells owned by the City of Jal range from 0.8 to 2.4 feet per year with an average decline of 1.4 feet (Hoines, 2004). Recent increases in pumping in Texas adjacent to the Jal UWB are resulting in steep water level declines, up to 6.6 feet per year over an 18-month period (2014-2015). If the higher pumping rates continue, 100 percent of the wells will be impacted before 2060, and thus no groundwater will be available for the region. The NMOSE has determined that there is no groundwater available for appropriation and has closed the basin to new appropriations other than domestic, livestock, and temporary construction wells.

- The portion of the *Carlsbad UWB* located in southwestern Lea County is approximately 325,400 acres. The principal aquifer in the Carlsbad UWB is in the Santa Rosa Sandstone, which is approximately 200 feet thick in this area. In general, groundwater in the Carlsbad UWB flows in a southerly direction. Alluvial sediments serve as the principal aquifer for a number of wells in the Carlsbad UWB.

In order to evaluate changes in water levels over time, the USGS monitors groundwater wells throughout New Mexico (Figure 5-11). In 1986, Congress directed the USGS to measure water levels in the High Plains Aquifer every two years to track water level declines. Hydrographs illustrating groundwater levels versus time, as compiled by the USGS (2014b), were selected for six monitor wells with longer periods of record and are shown on Figure 5-12.

The median water column is estimated to be about 100 feet for more than 350 wells in the High Plains Aquifer in Lea County, based on water level data since 1998 listed in the OSE Waters database (NMOSE, 2015).

The aquifers in the planning region are generally recharged through seepage from ephemeral streams and arroyos and water retained in playas and lakes that infiltrates into the subsurface. Recharge rates vary with changes in precipitation, soil type, and the hydraulic properties of underlying sediments and rocks. Additional recharge can be expected from precipitation falling on small areas of the Llano Estacado outside County boundaries to the north and west. Also, a small amount of groundwater in the Ogallala Formation in adjacent parts of Roosevelt and Chaves counties flows southeasterly, and likely enters the area along the planning region's northern border.

The accepted regional water plan (Leedshill-Herkenhoff, Inc. et al., 2000) provided two published estimates of recharge in the region:

- 37,500 to 75,000 acre-feet per year, on average, to the Ogallala Aquifer in Lea County
- 29,000 to 58,000 acre-feet, on average, to the Lea County UWB

The major well fields in the planning region, along with the basins they draw from, are:

- Hobbs Municipal Water System (Lea County UWB)
- Lovington (Lea County UWB)
- Eunice Water Supply System (Lea County and Capitan UWBs)
- Jal (Jal UWB)

The City of Carlsbad, in the Lower Pecos Valley Water Planning Region, has water rights of more than 18,000 acre-feet per year from the Lea County UWB for consumption in Eddy County. In addition, 2 percent of the city's water comes from the city-owned and operated Double Eagle Water System, which obtains its water from the Ogallala Formation (City of Carlsbad, 2015). The accepted RWP (Leedshill-Herkenhoff, Inc. et al., 2000) reported that 1,600 acre-feet per year were diverted for the City of Carlsbad, but none is shown in the NMOSE's 2010 water use report.

5.4 Water Quality Assessment

Assurance of ability to meet future water demands requires not only water in sufficient quantity, but also water that is of sufficient quality for the intended use. This section summarizes the water quality assessment that was provided in the accepted regional water plan and updates it to reflect new studies of surface and groundwater quality and current databases of contaminant sources. The identified water quality concerns should be a consideration in the selection of potential projects, programs, and policies to address the region's water resource issues.

Surface water quality in the Lea County Water Planning Region is evaluated through periodic monitoring and comparison of sample results to pertinent water quality standards. In general, surface water quality is suitable for its only use in the region, livestock watering. No reaches within Lea County have been listed on the 2012-2014 New Mexico 303(d) list (NMED, 2014a). This list is prepared by NMED to comply with Section 303(d) of the federal Clean Water Act, which requires each state to identify surface waters within its boundaries that are not meeting or not expected to meet water quality standards.

Section 303(d) further requires the states to prioritize their listed waters for development of total maximum daily load (TMDL) management plans, which document the amount of a pollutant a waterbody can assimilate without violating a state water quality standard and allocates that load capacity to known point sources and nonpoint sources at a given flow. Figure 5-13 shows the locations of lakes and stream reaches that may be assessed in the future. Table 5-8 provides details regarding those reaches.

Generally the quality of groundwater in the planning region was excellent in the Ogallala and alluvial aquifers, but of poor quality in other geologic formations due to the presence of salt, gypsum, and other evaporite deposits. Oil and gas production in the region and past disposal practices have resulted in contamination of the aquifers. The presence of shallow saline water in Lea County prompted the New Mexico Oil Conservation Commission's Order No. R-3221, banning the surface disposal of produced water into unlined pits within the state (OCC, 1968). Lining of pits and better management of leaking oil and gas wells has improved the quality of water (Leedshill-Herkenhoff, Inc. et al., 2000).

On May 9, 2008, the New Mexico's Oil Conservation Division (OCD) signed an oil and gas waste pit rule that further strengthened the protection of groundwater by reinforcing the unlined pits ban, setting pit liner requirements, requiring closed loop (with no pit) operations when close to water resources and homes, and requiring permits from the OCD for all pits. The 2008 pit rule was overturned in 2012 to allow for the disposal of "low chloride" waste fluids (i.e., fluid containing 15,000 mg/L of salts and typically containing high concentrations of toxic chemicals such as benzene and arsenic) within 100 feet of perennial water courses, 200 feet from a lake, 300 feet from a residence or school, and 200 feet from a spring or water well. The 2008 pit rule generally required setbacks ranging from 500 to 1,000 feet and required wastes that exceeded New Mexico's health-based groundwater standards to be hauled to a properly licensed and monitored facility. Under the 2012 pit rules, oil and gas operators can now bury waste with very high concentrations of benzene, salt, arsenic, and mercury at almost any drill site. The new pit rule also no longer requires an operator to collect site-specific groundwater, surface water, or soil quality data before a pit is dug; thus it will be difficult to prove that contamination came from the pit (NMELC, 2013).

Specific sources that have the potential to impact either surface or groundwater quality in the future are discussed below. Sources of contamination are considered as one of two types: (1) point sources (Section 5.4.1), if they originate from a single location, or (2) nonpoint sources (Section 5.4.2), if they originate over a more widespread or unspecified location. Information on both types of sources is provided below.

5.4.1 Point Sources

Point source discharges to surface water must comply with the Clean Water Act and the New Mexico Water Quality Standards (20 NMAC 6.4.1) by obtaining a National Pollutant Discharge and Elimination System (NPDES) permit to discharge. No NPDES permits have been issued in Lea County.

The NMED Ground Water Bureau regulates facilities with wastewater discharges that have a potential to impact groundwater quality. A summary list of current discharge plans in the planning region is provided in Table 5-10; their locations are shown in Figure 5-14. These facilities must comply with the New Mexico Water Quality Act (NMSA 1978, §§ 74-6-1 through 74-6-17) and the New Mexico Water Quality Control Commission (NMWQCC) regulations (NMWQCC, 2002) and obtain approval of a discharge plan, which provides for measures needed to prevent and detect groundwater contamination. A variety of facilities fall under the discharge plan requirements, including mines, sewage dischargers, dairies, food processors, sludge and septage disposal facilities, and other industries. The NMWQCC regulations contain requirements for cleanup of any groundwater contamination detected under discharge plan monitoring requirements. Until such cleanup is complete, these facilities may impact the availability of water supplies of sufficient quality for intended uses. Details indicating the status, waste type, and treatment for individual discharge plans can be obtained from the NMED Ground Water Bureau website (http://www.nmenv.state.nm.us/gwb/). The accepted regional water plan (Leedshill-Herkenhoff, Inc. et al., 2000) identified two sites in the planning region that were listed by the U.S. EPA as Superfund sites. No sites in Lea County are currently listed as Superfund sites (U.S. EPA, 2014); therefore this updated RWP doesn't include Table 5-11 listing Superfund sites.

Leaking underground storage tank (UST) sites present a potential threat to groundwater, and the NMED maintains a database of registered USTs. Many of the facilities included in the NMED UST database are not leaking, and even leaking USTs may not necessarily have resulted in groundwater contamination or water supply well impacts. These USTs could, however, potentially impact groundwater quality in and near the population centers in the future. UST sites in the Lea County region are identified on Figure 5-14. Many of the UST sites listed in the NMED database require no further action and are not likely to pose a water quality threat. Sites that are being investigated or cleaned up by the state or a responsible party, as identified on Table 5-12, should be monitored for their potential impact on water resources. Additional details regarding any groundwater impacts and the status of site investigation and cleanup efforts for individual sites can be obtained from the NMED database, which is accessible on the NMED website (http://www.nmenv.state.nm.us/ust/ustbtop.html).

Landfills used for disposal of municipal and industrial solid waste can contain a variety of potential contaminants that may impact groundwater quality. Landfills operated since 1989 are regulated under the New Mexico Solid Waste Management Regulations. Many small landfills throughout New Mexico, including landfills in the planning region, closed before the1989 regulatory enactment to avoid more stringent final closure requirements. Other landfills have closed as new solid waste regulations became effective in 1991 and 1995. Within the planning region, there are six closed landfills and one operating landfill (Table 5-13, Figure 5-14).

5.4.2 Nonpoint Sources

A potential primary water quality concern in the planning region is groundwater contamination due to septic tanks. In areas with shallow water tables or in karst terrain, septic system discharges can percolate rapidly to the underlying aquifer and increase concentrations of (NMWQCC, 2002):

- Total dissolved solids (TDS)
- Iron, manganese, and sulfides (anoxic contamination)
- Nitrate
- Potentially toxic organic chemicals
- Bacteria, viruses, and parasites (microbiological contamination)

Because septic systems are generally spread out over rural areas, they are considered a nonpoint source. Collectively, septic tanks and other on-site domestic wastewater disposal systems constitute the single largest known source of groundwater contamination in New Mexico (NMWQCC, 2002), with many of these occurrences in areas with shallow water tables.

Other nonpoint sources of pollutants that are of concern for surface water quality in the planning region include irrigated agriculture and oil and gas wells A recent study by (McMahon et al., 2007) showed that irrigated cropland over the High Plains Aquifer was a direct or indirect source of nitrate, salts, and pesticides over the past five decades. This study explains how conversion of rangeland to irrigated cropland has the potential to mobilize salts in the unsaturated zone. In Lea County, nearly 49,000 acres were irrigated in 2010 (Longworth et al., 2013).

5.5 Administrative Water Supply

The *Updated Regional Water Planning Handbook* (NMISC, 2013) describes a common technical approach (referred to there as a *platform)* for analyzing the water supply in all 16 water planning regions in a consistent manner. As discussed in the handbook (NMISC, 2013), many methods can be used to account for supply and demand, but some of the tools for implementing these analyses are available for only parts of New Mexico, and resources for developing them for all regions are not currently available. Therefore, the state has developed a simple method that can be used consistently across all regions to assess supply and demand for planning purposes. The use of this consistent method will facilitate efficient development of a statewide overview of the balance between supply and demand in both normal and drought conditions, so that the state can move forward with planning and funding water projects and programs that will address the regions' and state's pressing water issues.

To assess the available water supply, the common technical approach considers legal and physical constraints on the supply and a range of conditions from severe drought to normal supply. The method to estimate this supply, hereafter referred to as *administrative water supply*, is based on recent diversions, which provide a measure of supply that considers both physical supply and legal restrictions (i.e., the diversion is physically available, permitted, and in compliance with water rights policies) and thus reflects the amount of water that can actually be used by a region.

5.5.1 2010 and 2060 Administrative Water Supply

The total diversions (i.e., administrative water supply) in 2010 for the Lea County region, as reported by Longworth et al. (2013), were 197,099 acre-feet. Of this total, 75 acre-feet were surface water diversions and 197,024 acre-feet were groundwater. Groundwater diversions were estimated to be 195,007 ac-ft/yr in the Lea County UWB and 692 ac-ft/yr in the Jal UWB (Longworth et al., 2008). The breakdown of these diversions among the various sectors of use detailed in the NMOSE water use report is discussed in Section 6.1.

However, for regions such as the Lea County planning region, where the aquifers (such as those in the Lea County and Jal UWBs) are being depleted, the administrative water supply may not be sustainable in the future. For the High Plains aquifer in the Lea County and Jal UWBs, the future available supply was estimated as described in the following subsections.

5.5.1.1 Model Predicted Decline

Non-stream connected groundwater basins with available NMOSE administrative models were used to predict the water level declines in the year 2060 based on estimated groundwater diversions. These declines were compared to the available water column to assess the potential impact on future pumping as outlined in Table 5-14a. The predicted drawdown in 2060 from a model cell in a heavily stressed area was selected and compared to the available water column in existing wells to calculate the percentage of wells impacted by the drawdown. This percentage of impacted wells was assumed to reflect a percentage reduction in the available supply.

Using this method, the administrative supply in the Lea County in decade 2060 was calculated to be about 143,500 ac-ft/yr in a normal (i.e., no drought) year, or 74 percent of the 2010 supply.

5.5.1.2 Observed Rate of Decline

Another method to predict the future decline of the saturated thickness and thus available supply is to use existing wells with water level hydrographs and compare the predicted decline from those hydrographs with the available saturated thickness in existing wells. Using the average rate of water level decline calculated from USGS monitor wells within the non-stream connected groundwater and assuming that this rate will continue, the water level decline to 2060 was predicted as shown in Table 5-14b. The percentage of impacted wells was estimated by comparing the predicted drawdown to the available water column in existing wells, and the percentage of impacted wells was assumed to represent the reduction in supply by 2060.

The predicted water level decline in the High Plains Aquifer of the Lea County UWB is about 30 feet in 2060, assuming an average water level decline rate of 0.59 feet per year. A decline of 30 feet would impact about 20 percent of the wells. Assuming that the 20 percent of impacted wells results in an equal impact on water supply, then the estimated supply in 2060 is 156,533 acre-feet per year, about 10 percent more than the model-estimated method. In the Jal UWB, the predicted decline is 70 feet, impacting about 23 percent of the wells.

5.5.1.3 Other Considerations

Both of these approaches represent an approximation of the impact on existing wells by 2060. Factors that may affect the accuracy of these predictions include:

- The water columns may not represent the available supply because some existing wells could possibly be drilled deeper.

- The shallowest wells that are most impacted may not proportionally represent the distribution of pumping (the deeper wells most likely pump more than the shallow wells).
- New wells could be drilled in other parts of the aquifer, although doing so would require a water right permit.

The NMOSE's Lea County UWB model of the High Plains aquifer could be used to determine when specific water supply wells will lose the capacity to produce the projected demand for that community. Different scenarios could be run to optimize well field production and pumping schedules to produce the necessary quantities of water needed in the future. Individual water suppliers will need to develop options to address modeled shortages.

5.5.2 Drought Supply

The variability in surface water supply from year to year is an important factor in long-term planning for most of the regions in New Mexico, but in non-stream connected basins, the change in recharge during a drought may be more important. To estimate the vulnerability of the closed basins within a planning region to a prolonged drought, groundwater models are used, where available, to predict the potential impact by 2060 of a 20-year drought.

As discussed in Section 5.1.1, the PDSI is an indicator of whether drought conditions exist and if so, what the relative severity of those conditions is. For the climate division (7) present in the Lea County region, the PDSI classifications for 2010 were near normal (Figure 5-6).

There is no established method or single correct way of quantifying a drought supply given the complexity associated with varying levels of drought and constantly fluctuating water supplies. For purposes of having an estimate of drought supplies for regional and statewide water planning, the state has developed and applied a method for regions with both stream-connected and non-stream-connected aquifers. The method adopted for stream-connected aquifers is described below:

- The drought correction is applied only to the portion of the administrative water supply that derives water from the mined aquifer.
- In basins for which NMOSE has an administrative model, the simulation period is from 2010 to 2060 as described above, with no recharge from 2020 to 2040.
- For a conservative approximation, the drawdown predicted during the drought period is derived from a model cell in a heavily stressed area at the end of the simulation period (2060) to represent the water column that will be lost due to drought and pumping (Table 5-15). In basins where no model is available, the percentage impact on the water supply for the modeled area is applied.

- This adjusted predicted drawdown is then compared to the median available water column in 2010 (as described in Section 5.5.1.1) to determine the percentage of wells that are impacted by the 20-year drought and continued pumping.

- This percentage represents the reduction in supply due to drought. The drought supply is estimated by multiplying the percentage by the 2010 administrative supply.

For the Lea County and Jal UWBs, the estimated reduction in administrative supply due to continued pumping *and* one 20-year drought with no recharge over the 50-year planning period is as follows:

- In the High Plains Aquifer the adjusted predicted drawdown without the drought is 40 feet, and the additional drawdown due to drought is 11 feet, for a total decline of 51 feet. Comparing the predicted drawdown during a drought to the median available water column of 75 feet shows that the 34 percent of wells would be impacted (7 percent from the drought alone). Thus, the water supply in 2060 is estimated to be 34 percent less than the 2010 water use, or 128,860 ac-ft/yr for the Lea County UWB (Table 5-15).

- The water availability in the Jal UWB in 2060 with a 20-year drought is estimated using the modeled impact on the Lea County UWB of 7 percent, resulting in a supply of 484 ac-ft/yr, a 30 percent decline over the 2010 water use.

Thus, the total supply for the Lea County planning region in 2060 is projected to be 145,400 ac-ft/yr without a drought and 130,700 ac-ft/yr with a drought. Figure 7-1 indicates both the projected administrative supply in 2060 due to continued pumping and the supply due to a 20-year drought during which no recharge occurs.

Surface Water Locations
Lane Salt Lake - approx 10 mi. N
House Lake - approx 8 mi. NE
Legend
From Leases to surface water
Surface water locations
Lane Salt Lake - approximately 10 miles North of leases
House Lake - approx. 8 mile NE of leases
Google Earth
© 2016 Google
WELL - STATE AO #1
STATE AO 2
STATE C 1
STATE C 2
STATE C 2
4 mi
N