STATE OF NEW MEXICO
ENERGY MINERALS AND NATURAL RESOURCES DEPARTMENT
OIL CONSERVATION DIVISION

APPLICATION OF THE NEW MEXICO OIL CONSERVATION DIVISION THROUGH THE SUPERVISOR OF DISTRICT II FOR AN EMERGENCY ORDER SUSPENDING CERTAIN APPROVED APPLICATIONS FOR PERMITS TO DRILL, AND FOR ADOPTION OF SPECIAL RULES FOR DRILLING IN CERTAIN AREAS FOR THE PROTECTION OF FRESH WATER, CHAVES AND EDDY COUNTIES, NEW MEXICO

CASE NO. 15487

PECOS VALLEY ARTESIAN CONSERVANCY DISTRICT'S SECOND AMENDED PRE-HEARING STATEMENT

Pecos Valley Artesian Conservancy District (PVACD), submits its Amended Pre-Hearing Statement a required by the Oil Conservation Division.

I. PARTIES AND APPEARANCES

1.	**APPLICANT**	**ATTORNEY**
	Oil Conservation Division	David Brooks, Esq. Energy, Minerals and Natural Resources Department of the State of New Mexico 1220 S. St. Francis Drive Santa Fe, New Mexico 87505 (505) 476-3415 Davidk.Brooks@state.nm.us
2.	**INTERESTED PARTIES**	**ATTORNEYS**
	PVACD	A.J. Olsen, Esq. Alvin F. Jones, Esq. Olivia R. Mitchell, Esq. Hennighausen & Olsen, L.L.P. P.O. Box 1415 Roswell, New Mexico 88202-1415 (575) 624-2463 (575) 624-2878-Facsimile ajolsen@h2olawyers.com ajones@h2olawyers.com omitchell@h2olawyers.com

COG Operating, LLC OXY USA, Inc. Fasken Oil & Ranch, Ltd.	Michael H. Feldewert, Esq. Jordan L. Kessler, Esq. Holland & Hart, LLP P.O. Box 2208 Santa Fe, New Mexico 87504-2208 (505) 988-4421 (505) 983-6043-Facsimile mfelderwert@hollandhart.com jkessler@hollandhart.com
Mack Energy Corporation, Devon Energy Production Company, L.P.	James Bruce P.O. Box 1056 Santa Fe, New Mexico 87504 (505) 982-2043 jamesbruc@aol.com
EOG Y Resources, Inc., formerly known as Yates Petroleum Corporation, Lime Rock Resources II-A, L.P.	Gary W. Larson Hinkle Shanor LLP P.O. Box 2068 Santa Fe, New Mexico 87504 (505) 982-4554 (505) 982-8623-Facsimile glarson@hinklelawfirm.com
Independent Petroleum Association of New Mexico	Karin V. Foster Southwest Government Affairs, LLC 5805 Mariola Place NE Albuquerque, NM 87111 (505) 283-8385 karin@SWgovermentAffairs.com
New Mexico Oil and Gas Association	Ryan Flynn New Mexico Oil & Gas Association P.O. Box 1864 Santa Fe, NM 87504 (505) 982-2568 (505) 986-1094- Facsimile flynn@nmoga.org

II. STATEMENT OF CASE

The Oil Conservation Division seeks an order establishing minimum casing and cementing requirements that will adequately protect fresh water aquifers in the Designated Area in Chaves

and Eddy Counties, New Mexico in addition to the adoption of new rules under Section 19.15.39.11 NMAC. PVACD asserts that the proposed rules should comply with the provisions of 19.15.16.9 and 19.15.16.10 NMAC; and 19.27.4.29, 19.27.4.30 and 19.27.4.31 NMAC. PVACD agrees with and supports the proposed drilling, casing and cementing requirements as proposed by the Oil Conservation Division on October 24, 2016.

III. PROPOSED EVIDENCE

NAME	EST. TIME	EXHIBITS
Jack Atkins, P.E. *Atkins Engineering Associates, Inc.*	Approx. 1.0 Hour	*Geologic Sections of Aquifers in Roswell Basin *Roswell Groundwater Basin Map *Typical Oil and Gas Well Completion within Roswell Basin
Roger Peery, CPG, PG *John Shomaker & Associates, Inc.*	Approx. 1.0 Hour	*Resume – Roger Peery *JSAI Deep Well List *O&G Reservoir Database from NMBGMR *OCD Regulations Recent O&G Wells *OCD Regulations Recognized Oil and Gas Areas
Bill Netherlin	Approx. 15 minutes	None

IV. PROCEDURAL MATTERS

None at this time.

Respectfully submitted

HENNIGHAUSEN & OLSEN, L.L.P.

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CERTIFICATE OF SERVICE

I hereby certify that a true and correct copy of the above *Amended Pre-Hearing Statement* was served via electronic mail on November 21, 2016, to the following parties:

/s/ Olivia R. Mitchell
HENNIGHAUSEN & OLSEN, L.L.P.

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Roger Peery, CPG, PG

CEO/Principal Hydrogeologist

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Roger Peery has more than 25 years of experience, and is the CEO and a Principal Hydrogeologist at JSAI.

Water-Resource Development: Hydrogeologic characterization, well siting studies, development of strategies to maximize conjunctive use of surface and groundwater resources, strategies for wastewater reuse projects, evaluation of groundwater in storage for new subdivisions, and 40-Year Water Development Plans for municipalities, regions, and counties.

Aquifer Storage and Recovery (ASR): Hydrogeologic studies, evaluation of hydraulic effects during injection and recovery, and development of strategies to maximize quantity and quality of water stored and recovered.

Permitting: Assisted clients with various permit applications submitted to the New Mexico Office of the State Engineer (NMOSE) for new or replacement wells, proof of beneficial use, proof of completion of well, and monitoring and exploratory wells. Assisted clients with the permitting process related to development of water resources on Federal lands.

Water-Supply Well Projects: Developed detailed well drilling specifications (as technical support for Project Engineer) for more than 90 large-capacity water-supply well projects, and hundreds of small-capacity wells (diameters of 6-in. or less). Wells completed in unconfined aquifers had casing diameters as great as 20 inches completed to depths exceeding 3,000 ft. Wells completed in artesian aquifers had casing diameters of up to 16-in. and well depths exceeding 1,700 ft. Well drilling specifications included wells completed using casing-path methods, multiple casing strings, and liners. Developed pumping test procedures including long-term tests with multiple pumping wells and observation wells; and interpretation of data.

Geophysical Log Interpretation: Interpretation of geophysical logs from boreholes drilled through unconsolidated sediments, sedimentary rocks, and volcanic rocks.

Brine Injection Wells: Managed projects for wells that are used as injection wells and are completed to depths of over 4,000 ft. The injection wells are used to inject the concentrate from reverse-osmosis treatment plants used to treat water for municipal supplies.

Groundwater Monitoring: Directly involved with the completion and sampling of hundreds of groundwater monitoring wells including nested piezometers completed hundreds of feet deep with up to three casing strings in one borehole. Projects included mines, landfills, fuel service stations, refineries, municipalities, and other industries.

Expert Testimony: Mr. Peery has provided sworn expert witness testimony before the Nuclear Regulatory Commission-Atomic Safety and Licensing Board, New Mexico 2nd Judicial Court, and at various State of New Mexico administrative hearings including Office of the State Engineer, Oil Conservation Division, and Environment Department.

EDUCATION

M.S., Water Resources, 1992
University of New Mexico
Albuquerque, New Mexico

B.S., Geology, 1987
University of New Mexico
Albuquerque, New Mexico

REGISTRATIONS

Professional Geoscientist,
Texas, No. 2222

American Institute of Professional Geologists, CPG-9808

State of Wyoming Professional Geologist, PG-2363

State of New Mexico Regulation and Licensing Department Construction Industries Division, GS29 No. CQ064612

AFFILIATIONS

Association of Ground Water Scientists and Engineers

National Ground Water Association

American Water Resource Association, New Mexico Section, President 1998

TECHNICAL COMMITTEES

National Ground Water Association, Water Well Construction Standards 2011-2013

JSAI

PARTIAL LIST OF JSAI'S LARGE-CAPACITY WATER-WELL PROJECTS

John Shomaker & Associates, Inc. (JSAI) has carried out hydrogeologic studies, recommended well designs to clients' engineers, and provided construction observation for some 200 large-capacity water-supply wells since 1973, and John Shomaker's work related to deep wells goes back to 1965, as summarized in the table below.

JSAI Large-Capacity and Deep Well List

CLIENT	WELL NAME	DEPTH	YEAR
Agua Sana Water Users Assoc. (for Leedshill-Herkenhoff)	South Well 1*	1,290'	1998
confidential client (for Indian Health Service and Bohannan Huston, Inc.)	(several confidential wells - 15 in assoc. with Indian Health Service)	from 140' to 1,100'	from 2011 to 2015
confidential client (for Bohannan Huston, Inc.)	Well No. 2	2,180'	2014
confidential client (for Bohannan Huston, Inc.)	Well No. 3	2,241'	2014
Bureau of Reclamation	Cloudcroft Emer. Well	1,344'	2007
	Ruidoso Green Repl.	2,033'	2007
	Capitan Emer. Well	820'	2008
City of Albuquerque	Thomas 5 test hole*	3,376'	1989
	Thomas 5 production well	1,553'	1989
	Thomas 6	1,534'	1989
	Thomas 7	1,520'	1989
	Charles 5 test hole*	3,243'	1989
	Charles 5 production well	1,400'	1990
	Love 8 test hole*	3,337'	1990
	Love 8 production well	1,445'	1990
	Cerro Colorado Landfill	1,750'	1990
	Gonzales 2	1,382'	1990
	Burton 5	1,300'	1990
	Ridgecrest 5	1,600'	1990
	Zamora 1	1,050'	1992
	Gonzales Primary 1	1,800'	1992
	Gonzales 3	960'	1997
	Zamora 2	1,025'	1997
	Metropolitan Detention Center	1,965'	2000
	SAF-1*	2,428'	1988
	Double Eagle Airport	1,800'	1985

* discrete-interval zone sampling performed for water-quality and hydraulic analysis

JSAI Large-Capacity and Deep Well List

CLIENT	WELL NAME	DEPTH	YEAR
City of Alamogordo	Golf Course Repl. Well	498'	2005
	Mountain View	520'	2006
	Snake Tank Well 1	1,000'	2005
	Snake Tank Well 4	989'	2005
	Snake Tank Well 8	1,000'	2005
	La Luz Wells 2R	1000'	2012
	La Luz Wells 3R	885''	2008
	La Luz 5R	952'	2008
	Prather 1R	320'	2010
	Prather 2R	320'	2010
Town of Anthony	Replacement Well 3	500'	1998
	Replacement Well 6	520'	1998
City of Artesia	RA-820-S	1,075'	1998
City of Carlsbad	Sheeps Draw Replacement Well 6	801'	2016
Bernalillo County	BCTW-1*	1,500'	1997
	Bern. Co. Indus. Park Well	1,570'	2005
Village of Cuba	Cuba Expl. Well RG-82258	198'	2005
El Paso Natural Gas Co.	Burnham 1	5,200'	1974
El Paso Water Utilities	Well 47a	911'	2006
	Well 504a	924'	2006
	Well 507a	895'	2006
	Well 510a	913'	2006
	Well 512a	900'	2006
	Well 514a	908'	2006
	Well 524	840'	2006
	Well 98a	913'	2006
	Well 505a	940'	2006
	Well 509a	862'	2006
	Well 511a	920'	2006
	Well 513a	912'	2006
	Well 515a	917'	2006
	Well 505a	940'	2006
	Joint Desal. Facil. Well 1	4,019'	2006
	Joint Desal. Facil. Well 2	3,712'	2007
	Well 16c	821'	2011
	Well 208	1,171'	2011
	Well 25a	821'	2011
	Well 312	541'	2011
	Well 404b	422'	2011
	Well 417a	571'	2011
	Well 525	821'	2012
	Well 526	1,171'	2012
	Well 414A	420'	2012
	Well 416A	420'	2012

* discrete-interval zone sampling performed for water-quality and hydraulic analysis

JSAI Large-Capacity and Deep Well List

CLIENT	WELL NAME	DEPTH	YEAR
El Paso Water Utilities (continued)	Well 420A	480'	2012
	Well 421A	420'	2012
	Well 527	921'	2012
	Well 506A	850'	2013
	Well 503A	883'	2013
	Well 74A	900'	2013
	Well 97A	902'	2013
	Well 37A	927'	2013
	Well 529	940'	2013
	Well 519A	970'	2013
	Well 55A	1121'	2013
	Well 500A	720'	2014
	Well 67A	740'	2014
	Well 19B	820'	2014
	Well 75A	900'	2014
	Well 78A	950'	2014
	Well 89A	880'	2014
	Well 90A	780'	2014
	Well 91A	920'	2014
	Well 92A	860'	2014
ERS Consulting	San Augustine Test Hole	3,511'	2008
City of Española	RG-3067-S-12	670'	1997
	RG-3067-S-13	750'	1997
	Well 6 Replacement	340'	2001
	Well 9	340'	2003
City of Gallup	Munoz 1	3,200'	1968
	Lewis 1 North	3,306'	1983
	Colaianni 1	2,219'	1983
	Allan 1	3,494'	1986
	Galanis 1	2,014'	1995
	SF-17	2,330'	1999
Gallup Joint Utilities	Pena Well 1	2,523'	2002
City of Grants	Grants Well No. 4	558'	2006'
	Grants Well No. 5	320'	2011
Town of Hagerman	Well No. RA-4630-S-2	988'	1996
Intel Corporation	Well No. 2	2,000'	1994
	Well No. 1	2,000'	1995
	Well No. 3	2,000'	1995
Fort Wingate	Elementary School Well	470'	2003
Town of La Union	Town Well	500'	1998
City of Las Cruces	Well 40	2,010'	1989
	Well 60-C	700'	1994
	Well 46	1,300'	1995

* discrete-interval zone sampling performed for water-quality and hydraulic analysis

JSAI Large-Capacity and Deep Well List

CLIENT	WELL NAME	DEPTH	YEAR
City of Las Cruces (continued)	Well 61	1,100'	1995
	Well 66	1,030'	2012
	Well 62	685'	1995
	Well 63	1,506'	1996
	Well 64	1,330'	1996
	Well 65	828'	1997
	Well 72	1,120'	2012
La Mesa Water Cooperative	Well 4	855'	2005
	Well 5	765'	2006
	Well 6	840'	2012
Lower Rio Grande Public Water Works Authority	La Mesa Well No. 3	720'	2013
Los Alamos National Lab.	GR-1	2,000'	1998
	GR-2	2,000'	1998
	GR-3	2,000'	1998
	GR-4	2,000'	1998
Town of Mountainair	E-2382-S	300'	1998
Navajo Tribal Utility Authority	Standing Rock 1	2,657'	1980
NM-American Water Co.	Well No. 35a	410'	1995
	Well No. 47	410'	1996
	Well No. 48	412'	1996
	Well No. 49	410'	1998
	Well No. 50	410'	1998
	Well No. 51	370'	2000
	Well No. 52	370'	2001
	Well No. 58	415'	2005
New Mexico Interstate Stream Commission	Well G	637'	2005
	Well H	640'	2005
	Well I	692'	2005
	Well J	743'	2005
	Well B	808'	2006
	Well C	763'	2006
	Well E	1,004'	2006
	Well L	693'	2006
	Well K	803'	2006
	Well Q	992'	2006
NM Utilities, Inc.	Well 7	1,646'	2002
	Well 9	1,350'	2004
	Well 8	1,680'	2005
	Well 2	1,520'	2006
N. Ranchos de Placitas W&S Dist.	Well No. 4	802'	2005
Ohkay Owingeh (formerly San Juan Pueblo) (for DVC Engineer)	(confidential information)		
Philmont Scout Ranch	CR-900-Exp.-11	1,300'	1982
PNM	La Luz	820'	2014

* discrete-interval zone sampling performed for water-quality and hydraulic analysis

JSAI Large-Capacity and Deep Well List

CLIENT	WELL NAME	DEPTH	YEAR
Pegasus Gold Corp. – Ortiz Proj. JV	IV-TW 1	1,500'	1990
	LC-MW 1	640'	1990
Freeport McMoRan (Formerly Phelps Dodge Corporation)	M-4980 (Oak Grove)	700'	1989
	M-4978 (Oak Grove)	600'	1989
	M-4979 (Oak Grove)	665'	1989
	Baker 1	600'	1992
	Baker 2a	600'	1992
	Baker 4a	579'	1992
	Moody 7a	490'	1993
	Moody 8	600'	1993
	Moody 9a	573'	1993
	McCauley 3a	920'	1993
	McCauley 2a	881'	1995
	McCauley 5a	800'	1995
	McCauley 6b	803'	1997
	Warm Springs 12a	658'	1997
	Stark test well 1	620'	1997
	Stark test well 2	760'	1997
	Stark test well 3	810'	1997
	Stark test well 4	610'	1997
	Stark test well 5	510'	1997
	Stark test well 6	690'	1997
	PW-15	260'	1999
	PW-16	250'	1999
	PW-17	230'	1999
	PW-18	240'	1999
	PW-19	320'	1999
	PW-20	362'	1999
	PW-2R	245'	2005
	PW-7R	231'	2005
Pojoaque Valley School Dist.	Jacona Campus Well 3	630'	2005
Ranch Joint Venture	TW-1*	2,994'	1998
El Rito	RG-16306-Expl	600'	2004
Village of Ruidoso	High School Well	594'	2005
	Airport Expl. well H-3726	1,413'	2006
	River B Repl Well (H-1979-POD16)	1,204'	2015
San Juan Coal Co.	La Plata 1	7,219'	1986
Santa Ana Pueblo	Well 1*	665'	1998
	Well 2*	795'	1998
City of Santa Fe and Sangre de Cristo Water Company (formerly PNM Water Services)	Buckman 1	1108'	1978
	Buckman 2	1,470'	1978
	Buckman 7	1,415'	1990
	Buckman 8	940'	1990
	Buckman 3a	1,500'	1995

* discrete-interval zone sampling performed for water-quality and hydraulic analysis

JSAI Large-Capacity and Deep Well List

CLIENT	WELL NAME	DEPTH	YEAR
City of Santa Fe and Sangre de Cristo Water Company (formerly PNM Water Services) (continued)	Torreon 2	1,230'	1997
	Northwest	2,000'	1998
	Hickox replacement*	860'	1999
	Buckman 9	1,435'	2002
	Buckman 10*	2,010'	2003
	Buckman 11*	2,020'	2003
	Buckman 12*	1,924'	2003
	Buckman 13*	2,020'	2003
	Canada Expl.	2,500'	2010
Santa Fe Mining, Inc.	Star Lake 1	5,656'	1975
	Gallo Wash 1	5,690'	1975
	South Hospah 1	2,808'	1975
	Star Lake 2	2,435'	1978
	Gallo Wash 2	5,744'	1978
	Gallo Wash 3	5,747'	1978
	Gallo Wash 4	2,221'	1979
	Gallo Wash 5	2,648'	1980
	Lee Ranch 1	1,553'	1982
	Lee Ranch 2	1,521'	1983
Sandia Peak Utility	Love Well 4	800'	2011
Tajique MDWCA (for Smith Engineering)	Expl Well E-05561-S-4	400'	2002
Thoreau W. & S. D. (for Sullivan Design Group)	Well 3	1,370'	1986
	Well 4	1,120'	2012
City of Truth or Consequences	Well 7	610'	1998
	Well 8	620'	1998
Union Pacific Railroad	Strauss Well	690'	2006
U.S. Army, Ft. Wingate Army Depot	Well 340	1,945'	1968
U.S. Air Force, Holloman	San Andres 3	2,000'	1965

* discrete-interval zone sampling performed for water-quality and hydraulic analysis

NEW MEXICO STATE ENGINEER
SANTA FE, NEW MEXICO

PREPARED IN COOPERATION WITH
THE UNITED STATES GEOLOGICAL SURVEY

TECHNICAL REPORT 42
ROSWELL BASIN
NEW MEXICO

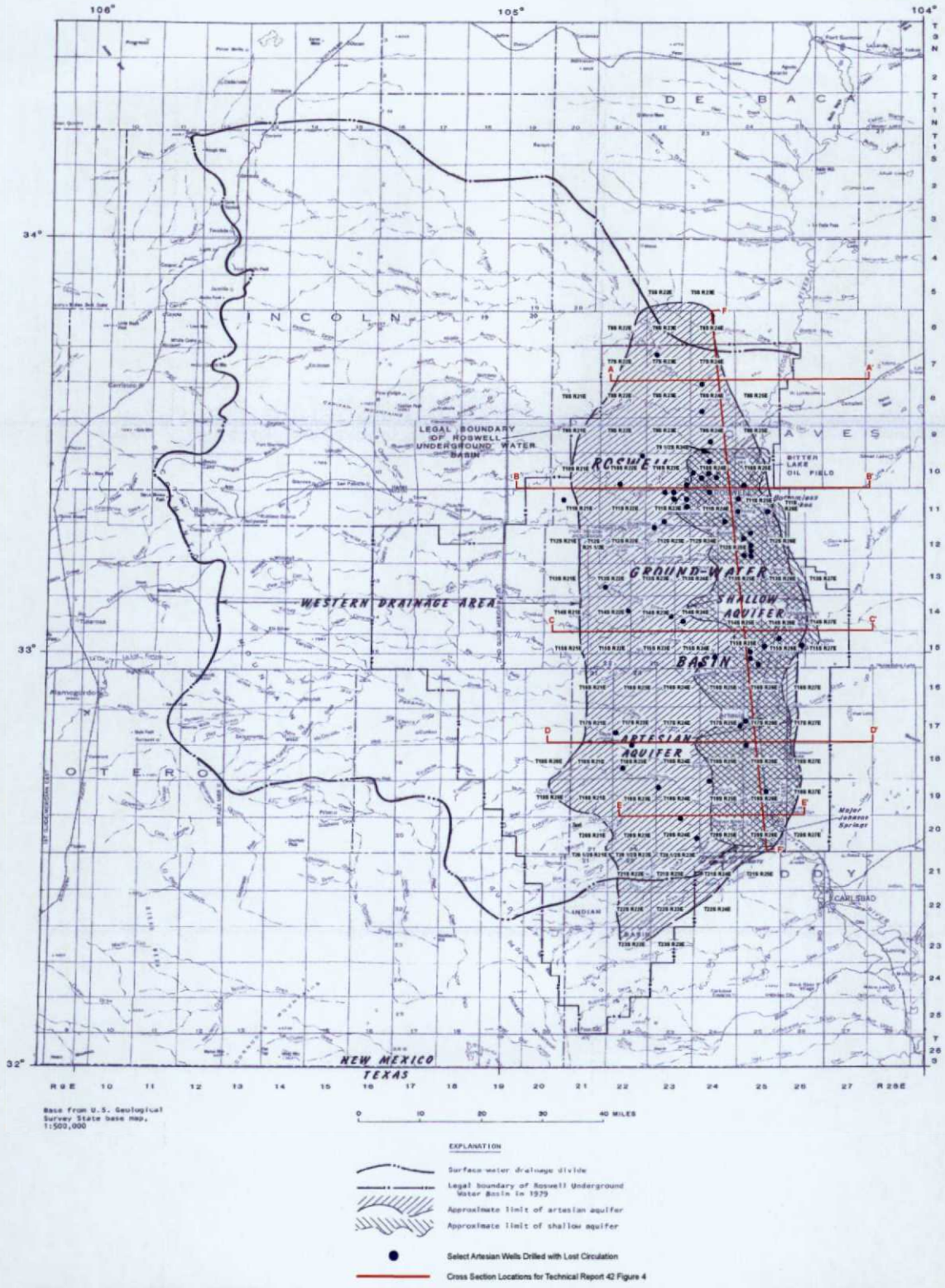
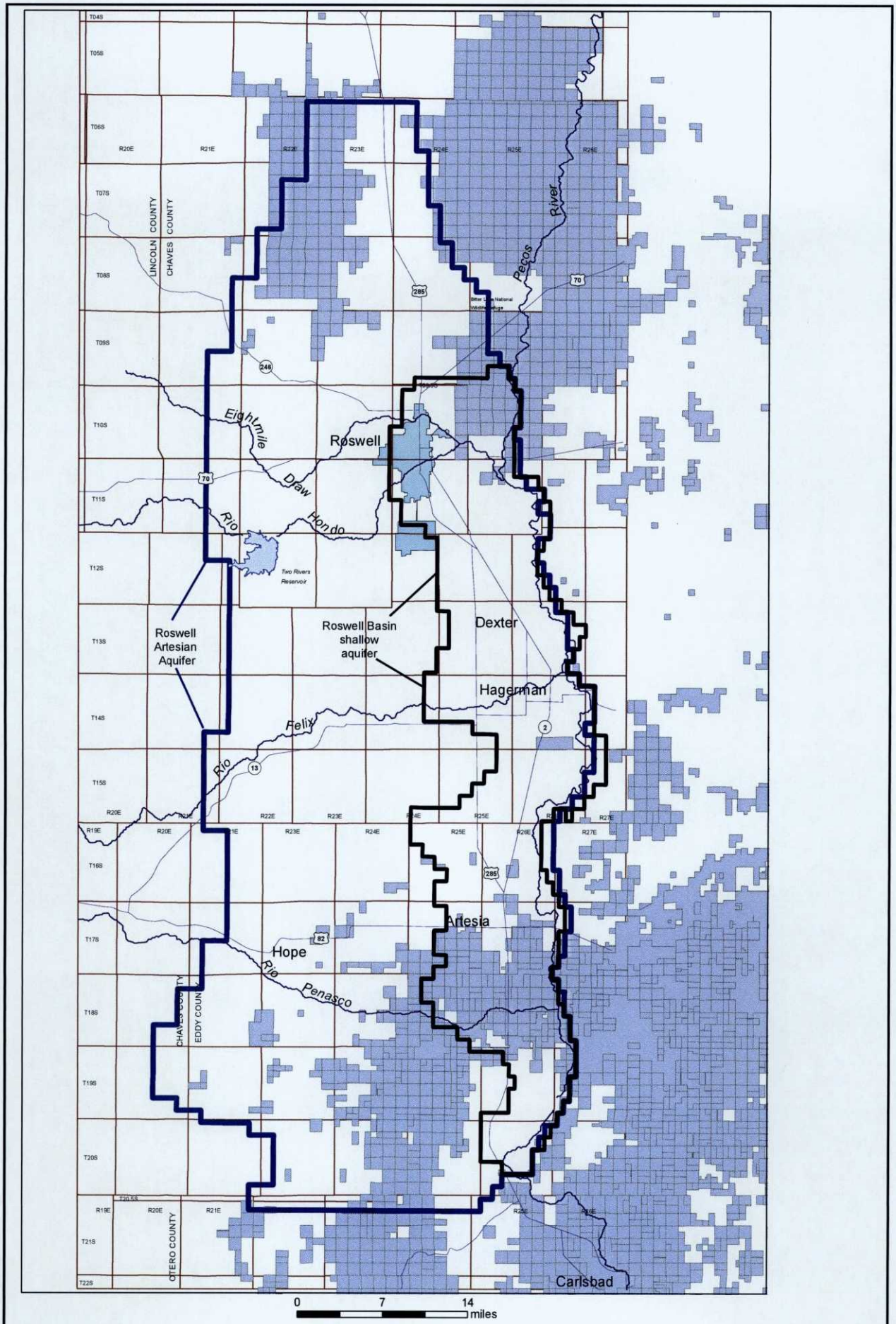


Figure 1 . Map showing the surface drainage, legal boundary, and aquifer limits of the Roswell ground-water basin, southeastern New Mexico.

Additions by Atkins Engineering Associates, Inc. - July 2016



Recognized oil and gas producing areas (shown in light blue) in and near areas of Roswell Artesian Aquifer and Roswell Basin shallow aquifer. Aquifer boundaries from State Engineer groundwater flow model. Oil and gas producing areas from NMBMMR Circular 209 (2000).

Example Oil and Gas Wells within Area of Roswell Basin Shallow Aquifer (Range 26 East)

API No.	Lease Name	Well No.	Unit Letter	Section	Datum elev., ft	Spud Date (year)	Bottom of shallow aquifer, elev., (approx.) ft	Depth to bottom, shallow aquifer, ft	Shallow-aquifer casing landed, ft	Artesian-aquifer casing landed, ft	Next string or production casing landed, ft	Top of cement, next string or productio n casing, ft
T. 13 S., R. 26 E.												
30-005-60355	Henry Wilson	1	J	26	3,511	1975	3,300	211	444	1,349	P&A	--
30-005-61411	Federal 24 Com	1	K	24	3,500	1982	3,300	200	250	1,350	P&A	--
T. 14 S., R. 26 E.												
30-005-61381	Reid	1Y	J	20	3,482	1982	3,300	182	400	1,350	P&A	--
30-005-61867	Drumm A Com	1	G	33	3,427	1983	3,260	167	370	1,368	6,902	6,050
30-005-63779	Affirmed	1	N	33	3,446	2006	3,280	166	307	1,307	9,250	?
30-005-63786	Seabiscuit	2	P	33	3,451	2006	3,250	201	335	1,303	9,427	838?
30-005-63782	Assault	1	D	27	3,424	2006	3,250	174	--	1,450	9,217	surface
30-005-63783	Bold Venture	1H	B	27	3,414	2006	3,240	174	--	1,405	4,875	surface
30-005-63839	Alysheba 1426-34	1	D	34	3,414	2006	3,250	164	--	1,435	9,389	1,362
30-005-63882	Riva Ridge 1426-36	1	M	16	3,463	2007	3,270	193	120	1,398	9,086	surface
T. 15 S., R. 26 E.												
30-005-63785	Dash for Cash	1	D	4	3,446	2006	3,300	146	321	1,304	9,015	?
T. 16 S., R. 26 E.												
30-015-32903	Funk 49	2	A	33	3,351	2005	3,090	261	484	1,410	8,072	?
30-015-34168	Clarence BCU	6	C	23	3,325	2005	3,200	125	423	1,223	8,060	surface
30-015-33700	San Remo 32	1	F	32	3,394	2005	3,160	234	422	1,237	8,027	surface
30-015-34027	Midnight 13 State	1	D	13	3,387	2006	3,250	137	--	1,435	6,180	901
T. 17 S., R. 26 E.												
30-015-27376	Caffall "FD"	2	I	15	3,330	1993	3,050	280	480	1,417	8,655	?
30-015-34892	Roberts B	1Y	G	13	3,306	2006	3,150	156	189	1,520	8,890	5,450
T. 18 S, R. 26 E.												
30-015-33038	Ribbon BDR	1	E	33	3,388	2003	3,210	178	550	1,212	9,488	1,300
30-015-35260	Orleans 25	1	B	25	3,280	2007	3,140	140	424	1,362	9,616	3,700
30-015-38568	Wabash 20 Fed Con	1H	A	20	3,398	2011	3,150	248	--	1,012	2,825	surface
30-015-39849	Rogers	3	H	23	3,310	2012	3,140	170	--	900	3,722	surface
30-015-40521	Everest Est. 15 P	1	P	15	3,329	2012	3,125	204	433	--	4,310	446
30-015-40488	Everest 14 N	8	N	14	3,319	2013	3,140	179	437	--	4,315	surface
30-015-41662	Tarpan 33	4H	N	33	3,378	2015	3,230	148	--	1,214	5,968	surface
T. 19 S., R. 26 E.												
30-015-33574	Lakewood 15	1	I	15	3,313	2004	3,180	133	500	1,082	7,822	surface
30-015-33973	Lakewood 14	2	E	14	3,332	2005	3,170	162	512	1,055	9,900	surface
30-015-33733	Clayton BFO State	1	I	16	3,354	2005	3,210	144	--	900	9,900	?
30-015-34954	Ivey BFV	1	P	4	3,345	2006	3,210	135	--	1,024	9,655	surface
30-015-38519	Long Branch	2	C	7	3,372	2011	3,210	162	--	1,005	2,915	surface
30-015-40717	Lakewood SWD	1	B	8	3,353	2012	3,240	113	--	1,229	8,434	surface
30-015-39640	Patton 5 Fee	7H	M	5	3,363	2014	3,250	113	--	1,197	7,332	surface
30-015-40718	Lakewood SWD	2	F	9	3,250	2015	3,220	30	--	1,220	8,400	surface
30-015-43006	Stonewall 9 Fee	7H	O	9	3,346	2015	3,220	126	--	1,208	7,777	surface
30-015-42978	Bradley 8 Fee	8H	P	8	3,364	2015	3,230	134	--	1,200	7,750	surface
30-015-43289	Sherman 4 Fee	15H	D	4	3,379	2015	3,230	149	--	1,220	7,698	surface
30-015-43004	Bradley 8 Fee	5H	M	8	3,373	2016	3,220	153	--	1,150	7,786	surface

Note: bottom of shallow aquifer is "BOT" elevation of layer 1, State Engineer Roswell Artesian Basin groundwater model.

Comparison of Roswell Artesian Aquifer and Shallow Aquifer Characteristics with Selected Oil and Gas Reservoirs in or Partly in Roswell Artesian Basin

Oil and Gas Reservoirs

Reservoir Code	Reservoir and geologic unit	County	Townships	Ranges	Producing zone	Net pay, ft	Porosity, mean	Horizontal permeability, mean, millidarcies	Horizontal permeability, min., millidarcies	Horizontal permeability, max., millidarcies	Flow capacity, millidarcy-feet, mean	Salinity (chloride), mg/L
NM-007165-ABO	Pecos Slope South (Abo)	Chaves	9S 11S	24E 27E	Abo Redbeds	30	0.13	0.0067			0.201	
NM-210463-STRN	Eagle Creek (Strawn)	Eddy	17S 18S	24E 26E		15	0.02					
NM-210463-PRMP	Eagle Creek (Permo Penn)	Eddy	17S 18S	24E 26E	Upper Pennsylvanian	20	0.04					
NM-029847-MRRW	Atoka West (Morrow)	Eddy	17S 18S	25E 26E		30	0.12					35,989
NM-210494-AKMR	Eagle Creek East (Atoka, Morrow)	Eddy	17S 18S	25E 26E	Lower Pennsylvanian	15	0.11					
NM-374817-MRRW	Kennedy Farms (Morrow)	Eddy	17S 18S	26E 26E		15	0.08					
NM-591111-PENN	Red Lake (Penn)	Eddy	17S 18S	26E 27E	Lower Pennsylvanian	15	0.12					
NM-591111-SADR	Red Lake (Queen, Grayburg, San Andres)	Eddy	17S 18S	26E 28E			0.1	2				
NM-224313-ABO	Empire (Abo)	Eddy	17S 18S	27E 29E	Abo Reef	726			0.1	1970		16,046
NM-026778-GRBG	Artesia (Queen, Grayburg, San Andres)	Eddy	17S 19S	27E 28E			0.21	90				113,866
NM-085558-MRRW	Boyd (Morrow)	Eddy	18S 19S	24E 25E		50	0.07					
NM-548909-MRRW	Penasco Draw (Morrow)	Eddy	18S 19S	24E 25E		20	0.11					36,000
NM-548909-PRMP	Penasco Draw (Permo Penn)	Eddy	18S 19S	24E 25E	Upper Pennsylvanian	10	0.04					
NM-029785-PDDK	Atoka (Glorieta, Yeso)	Eddy	18S 19S	26E 26E	Paddock Zone	125						109,000
NM-029785-PENN	Atoka (Penn)	Eddy	18S 18S	26E 26E	Lower Pennsylvanian	18	0.11	35			630	30,000
NM-029785-SADR	Atoka (San Andres)	Eddy	18S 18S	26E 26E	Slaughter Zone		0.09	1.4				130,000
NM-462204-UPRP	McMillan (Upper Penn)	Eddy	19S 19S	27E 27E	Upper Pennsylvanian	30	0.05					
NM-000210-UPRP	Springs (Upper Penn)	Eddy	20S 21S	25E 26E	Upper Pennsylvanian	30	0.1					15,000
NM-031304-MRRW	Avalon (Morrow)	Eddy	20S 21S	26E 27E		30	0.06	0.13			3.9	26,835
NM-106716-MRRW	Burton Flat (Morrow)	Eddy	20S 21S	26E 28E		40	0.08	2.03			81.2	23,791
NM-462204-MRRW	McMillan (Morrow)	Eddy	20S 20S	26E 27E		10	0.09					
NM-031304-STRN	Avalon (Strawn)	Eddy	20S 21S	26E 27E		22	0.07	0.5			11	

Excerpts from Reservoir Database for Atlas of Major Rocky Mountain Gas Reservoirs, 1993, from Ron Broadhead, NMBGMR, May 2016.

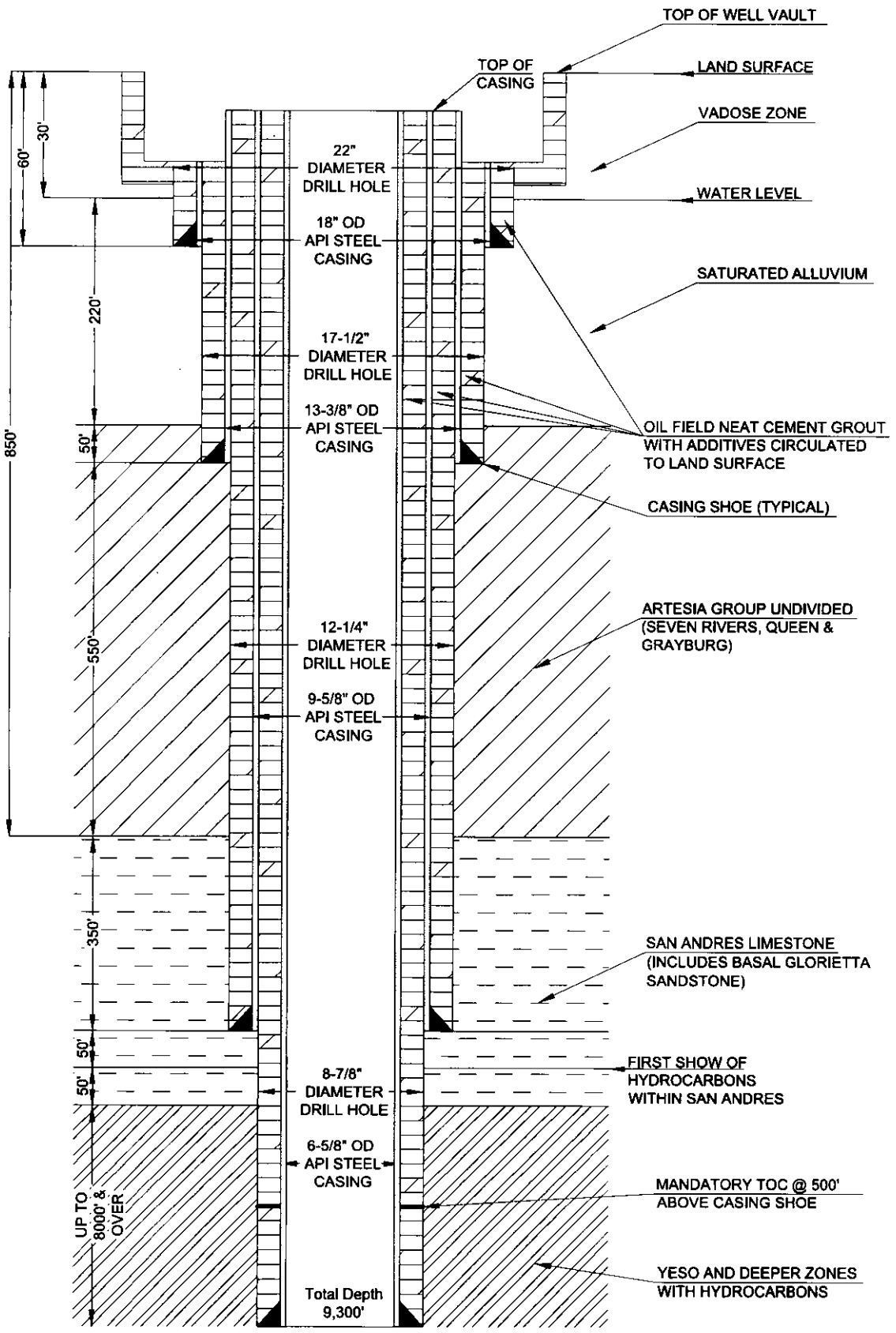
Artesian Aquifer within Area of Shallow Aquifer

County	Township	Range	Typical thickness, ft (Welder, Fig. 4, F-F')	Typical RAB model transmissivity, ft²/day	Horizontal permeability, ft/day	Flow capacity or transmissivity, millidarcy-feet (T/0.002835)	Salinity (chloride), mg/L (Welder, Fig. 26; *Italics are avgs. of PVACD samples, 2013*)
Chaves	10S	24E	150	380,000	2,533	134,000,000	*934*
Chaves	10S	25E	150	237,000	1,580	84,000,000	*1,565*
Chaves	11S	24E	230	174,000	757	61,000,000	*621*
Chaves	11S	25E	230	95,000	413	34,000,000	*497*
Chaves	12S	25E	225	27,000	120	9,500,000	*208*
Chaves	12S	26E	225	29,000	129	10,200,000	*675*
Chaves	13S	25E	250	17,000	68	6,000,000	<100
Chaves	13S	26E	250	18,000	72	6,300,000	*32*
Chaves	14S	25E	275	21,000	76	7,400,000	<500
Chaves	14S	26E	275	17,000	62	6,000,000	25 to >1,000
Chaves	15S	25E	300	19,000	63	6,700,000	<50
Chaves	15S	26E	300	17,000	57	6,000,000	<25 to >1,000
Eddy	16S	25E	300	14,000	47	4,900,000	<25
Eddy	16S	26E	300	17,000	57	6,000,000	<25 to >1,000
Eddy	17S	25E	375	16,000	43	5,600,000	<25
Eddy	17S	26E	375	24,000	64	8,500,000	<25 to >1,000
Eddy	18S	25E	475	23,000	48	8,100,000	<25
Eddy	18S	26E	475	35,000	74	12,345,679	<25 to >500
Eddy	19S	25E	400	35,000	88	12,300,000	<25
Eddy	19S	26E	400	28,000	70	9,900,000	<25 to >500

Shallow Aquifer

		Thickness range, ft				
all areas, except for southern T. 19 S., and T. 20 S.	0	250			121	0 - 10,700,000	<50 to >3,000

Transmissivity and permeability (hydraulic conductivity) data for aquifers from recent version of State Engineer Roswell Artesian Basin groundwater flow model.



TYPICAL OIL AND GAS WELL COMPLETION
WITHIN THE ROSWELL BASIN
(NOT TO SCALE)

ATKINS ENGINEERING ASSOCIATES, INC.
JULY 2016

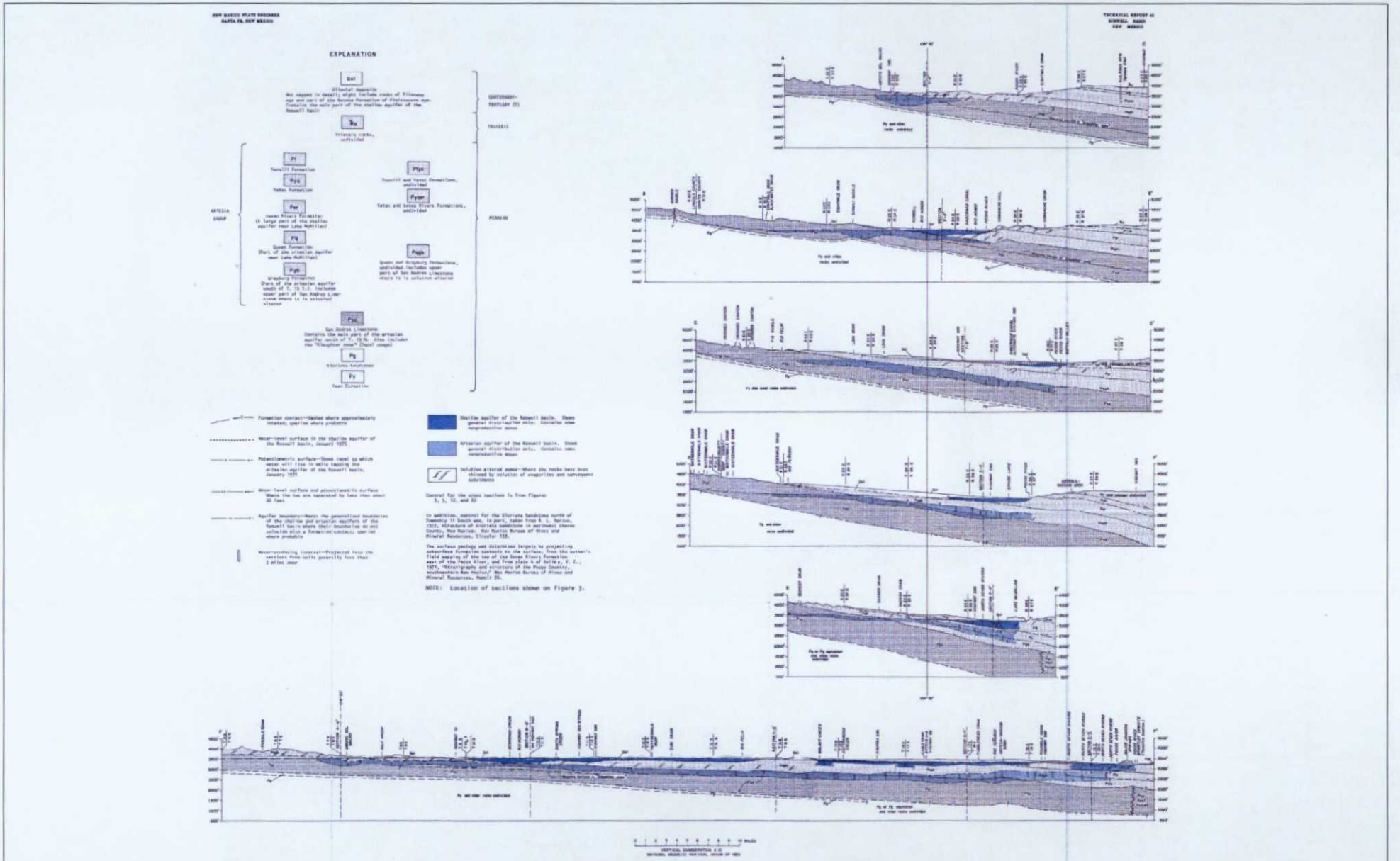


Figure 4. Geologic sections showing the shallow and artesian aquifers of the Roswell basin, Chaves and Eddy Counties, New Mexico.