Onsite Sewage Management in New Mexico

New Mexico Environment Department
Liquid Waste Program

October 11, 2006

Introduction

- The increase in New Mexico's population as measured by household units, and concurrent improvement in domestic sanitation, are shown in Figure 1.
- Public sewer service is now provided to approximately 71% of the households in New Mexico (Figure 2, Appendix A). Approximately 29% of New Mexico residents use on-site sewage systems, including an estimated 215,000 septic systems (septic tanks and cesspools), 2400 advanced wastewater treatment systems, and 24,000 privies or other systems (Figure 2). More than 50% of the households in Catron, Harding, Mora, Rio Arriba, Taos, Torrance, and Valencia Counties use onstite systems (Appendix A). Thirty percent of the households in McKinley County use a privy or other sewage disposal system (Appendix A).

Figure 1. Population and Household Sanitation in New Mexico. (Source: U.S. Census Bureau)

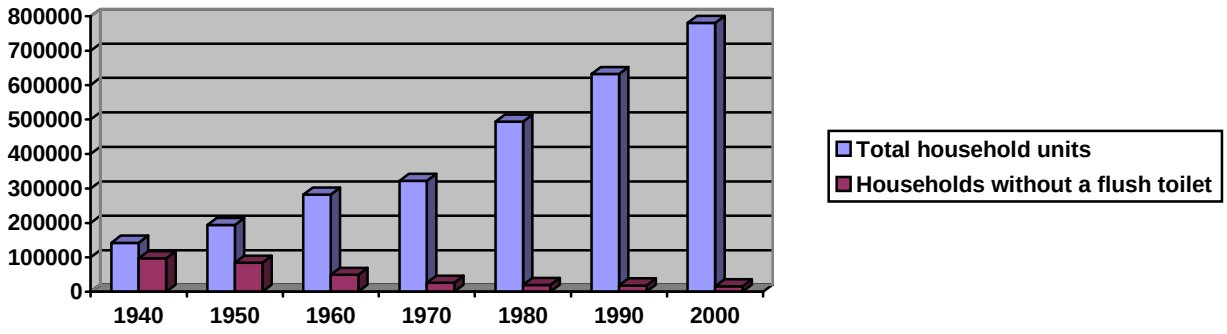
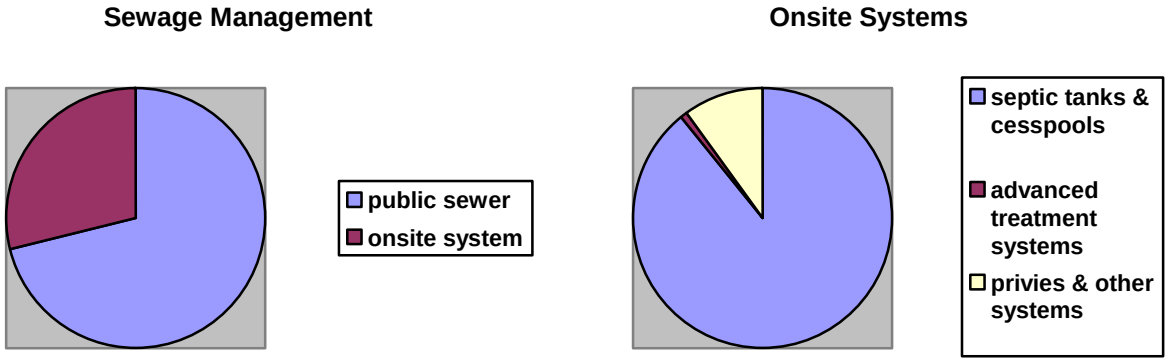


Figure 2. Sewage Management and Onsite Systems in New Mexico, 2004. (Source: U.S. Census Bureau)



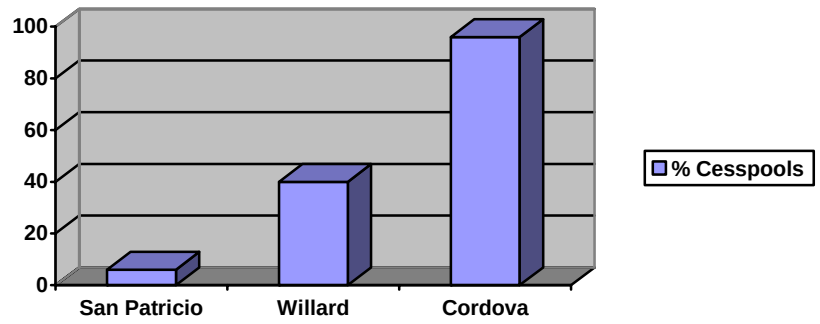
Wastewater Treatment Basics

- Conventional septic systems provide primary wastewater treatment which consists of physical separation of sludge and scum, and anaerobic digestion. Septic tank effluent is typically discharged to an underground drainfield.
- Advanced treatment systems provide secondary, tertiary or disinfection treatment. Secondary treatment reduces organic matter, as measured by biochemical oxygen demand (BOD). Tertiary treatment reduces total nitrogen content. Secondary and tertiary treatment involve biological processes, often with aeration of the wastewater. Disinfection reduces microbiological content.

Cesspools

- A cesspool is defined as "an excavation or non-water tight unit that receives untreated water-carried liquid waste allowing direct discharge to the soil."
- Cesspools have been categorically illegal since 1973.
- Prior to 1973, however, cesspools were a recognized method of sewage disposal. Many cesspools remain in use in the state (Figure 3).

Figure 3. Percent of Households Using Illegal Cesspools. Based on community-wide field surveys. A public sewer system has been constructed in Willard, and one is now being constructed in Cordova.



Suitability of Conventional Septic Systems

- Conventional septic systems are an appropriate means of wastewater treatment and disposal when site conditions (lot size, soil, setbacks to wells and streams and clearance to bedrock and ground water) are adequate for natural attenuation.
- Unsuitable site conditions (small lot size, wells and streams too close, bedrock and ground water too shallow), however, can result in hazards to public health, welfare and to the environment. These hazards can include surfacing sewage, water quality degradation, and pollution of drinking water sources.
- In 1959, the N.M. Board of Public Health made the following observation,
    - "The development of fringe areas and subdivisions that do not have access to municipal water and sewage facilities is creating a continuously growing problem in proper protection of the public health in these areas. ... Septic tanks and leaching systems were never intended for use in closely built-up areas."
- This statement is just as valid today as it was 47 years ago.

Ground-Water Pollution by On-Site Septic Systems

- Approximately 90% of New Mexico's population depends on ground water for its drinking water.
- In densely developed areas, insufficient setback between wells and septic systems can cause ground-water and drinking-water pollution (Figure 4).
- The N.M. Water Quality Control Commission, in its biennial reports to U.S. Congress on water quality in the state from 1988 to present, has stated,
    - "Household septic tanks and cesspools constitute the single largest source of ground water contamination in the state."
- In New Mexico, onsite septic systems have polluted 1294 public and private water supply wells with contaminant levels exceeding established limits (Figure 5). Areas of documented ground-water contamination from septic systems (Appendix B) are shown in Figure 6. A bibliography of ground-water contamination caused by septic systems in New Mexico is contained in Appendix C.
- Onsite septic systems have contaminated ground water in New Mexico with disease causing organisms, nitrate, anoxic conditions (iron, manganese, hydrogen sulfide gas), salt from water softeners, chemicals used to manufacture methamphetamine, and with dichlorobenzene, a constituent of household toilet deodorizer blocks (Appendix B).
- Source-water assessments, conducted on approximately 1250 public water supply systems in New Mexico, identified septic systems as the single greatest threat to wellhead areas (Figure 7).

Figure 4. Pollution of Drinking-Water Wells by Onsite Septic Systems.

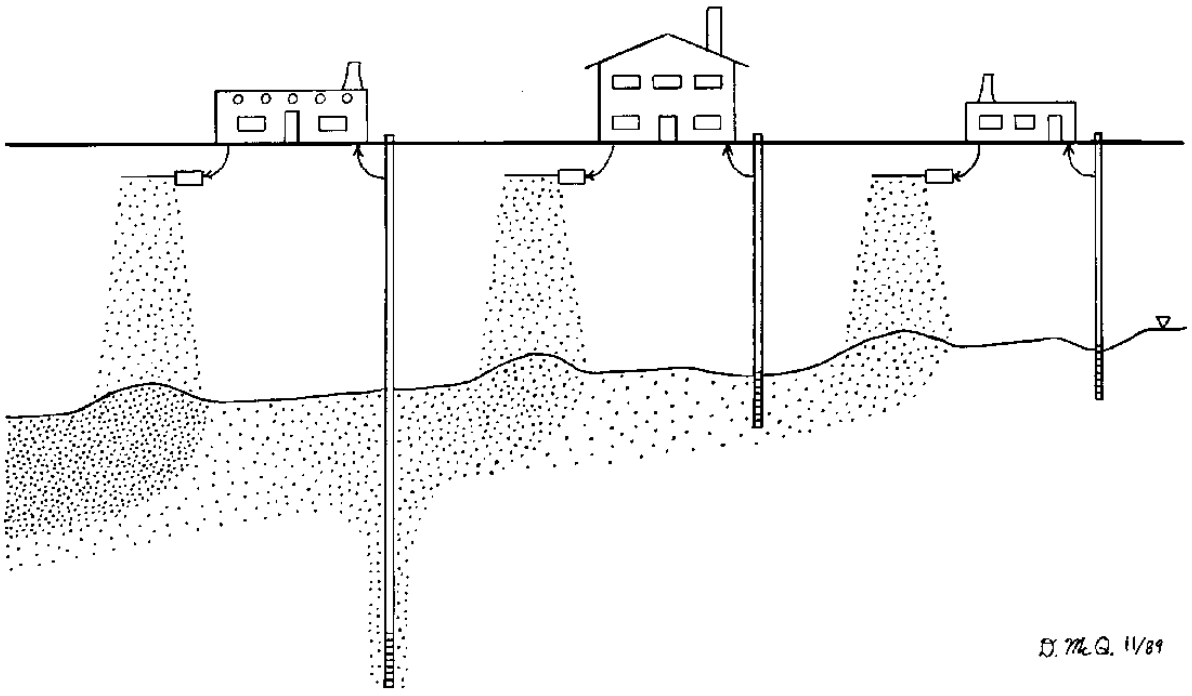


Figure 5. Sources of Water-Supply Well Pollution in New Mexico.

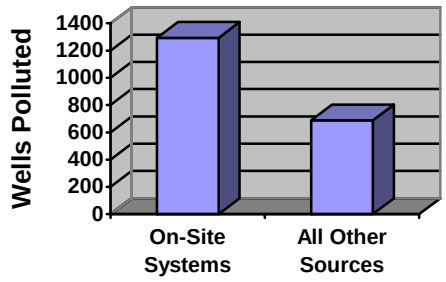


Figure 6. Ground-Water Pollution by Onsite Septic Systems.

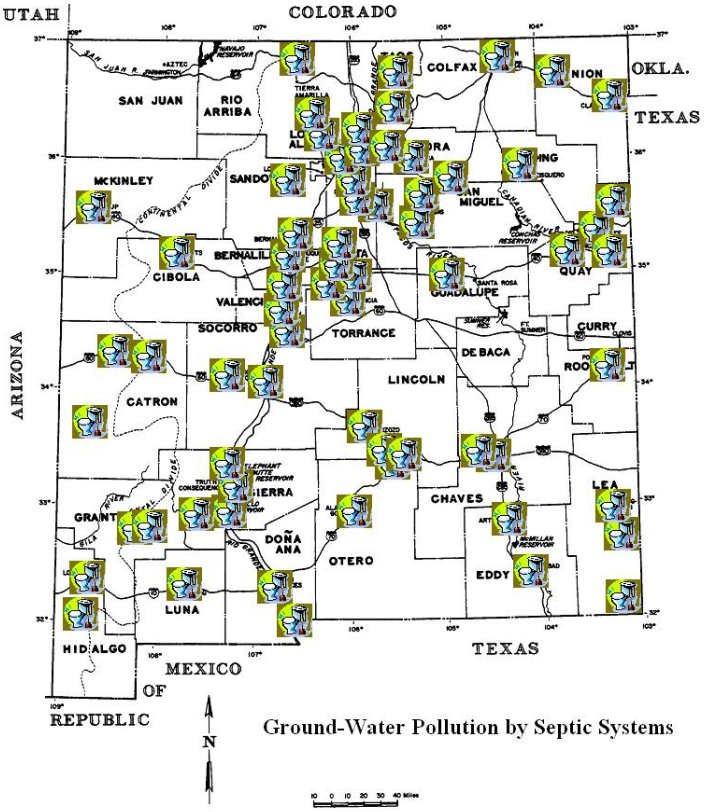
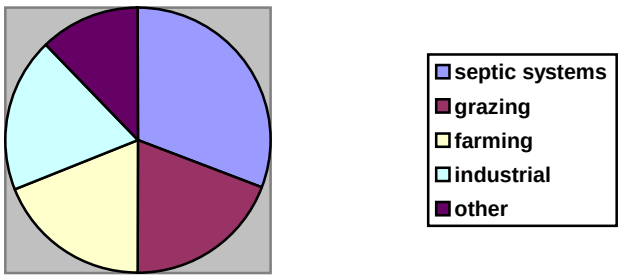


Figure 7. Contamination Risk Summary for 1250 Public Water-Supply Systems in New Mexico. Based on source water assessments performed on all public water systems in New Mexico by the NMED Drinking Water Bureau.



Surface-Water Contamination by Septic Systems

- Ground water can flow into gaining streams (Figure 8).
- Ground water impacted by septic system effluent can transport contaminants into gaining streams (Figure 9).
- Twenty stream segments, totalling 355 river miles, in the state have been adversely impacted by nutrients originating from septic systems (Figure 10; Appendix D).
- Excessive levels of nutrients in streams can cause algae blooms (Figure 11) which can be harmful to fish.

Figure 8. Gaining Stream.

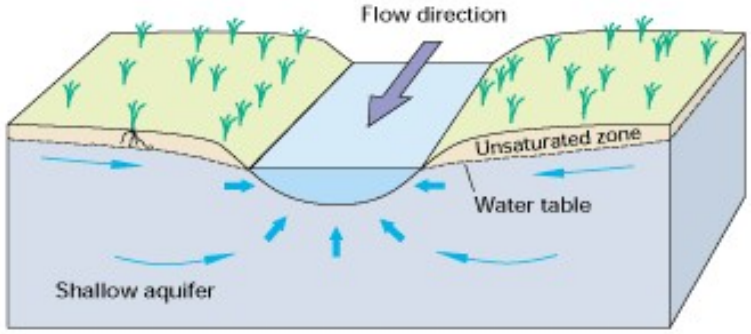


Figure 9. Contaminated Ground Water Discharging into a Gaining Stream.

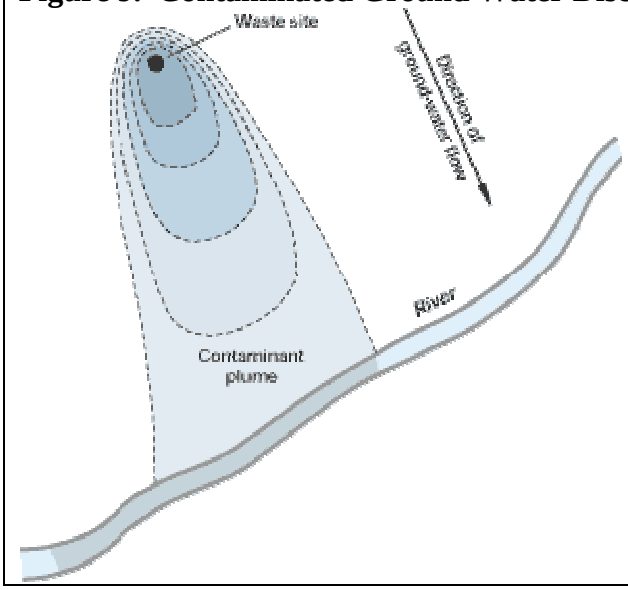


Figure 10. Surface-Water Contamination by Onsite Septic Systems.

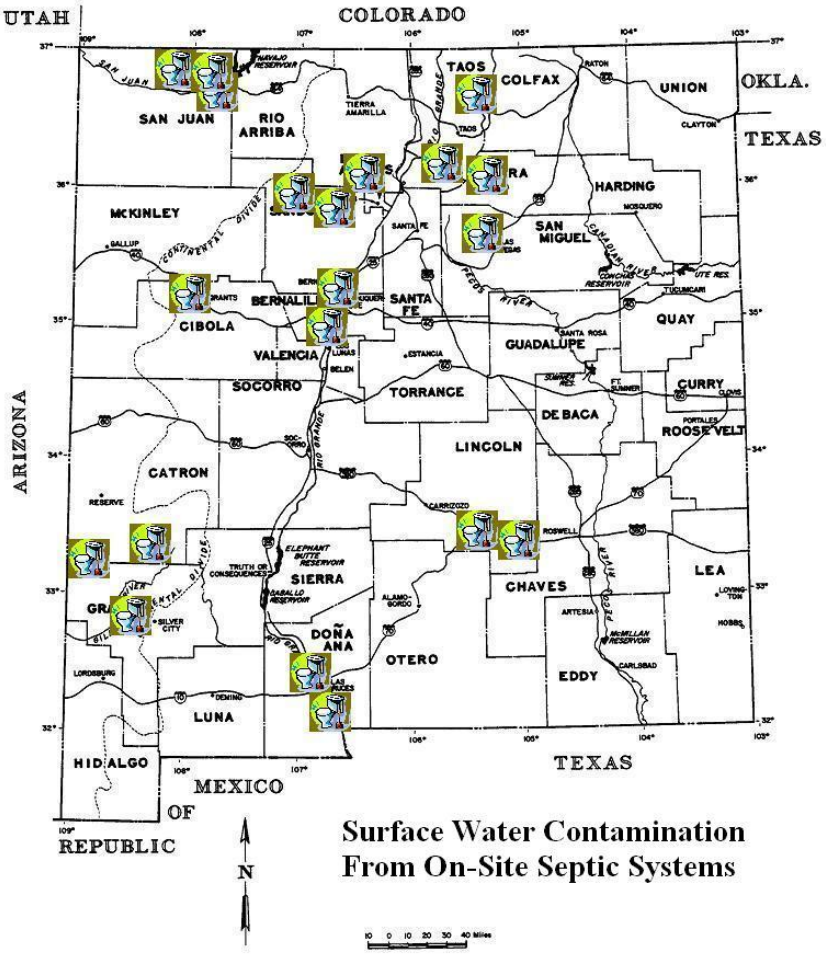


Figure 11. Algae Bloom in the Rio Ruidoso Caused, in Part, by On-Site Septic Systems.

Health Hazards

- Outbreaks of waterborne disease in New Mexico have been traced to drinking water supplies contaminated by sewage and to swimming in surface water contaminated by sewage.
- Ground water nitrate pollution has caused the "blue baby syndrome" in New Mexico.
- Ground water manganese levels in some anoxic ground waters in New Mexico are up to ten times greater than the level considered to be protective against neurological disease.

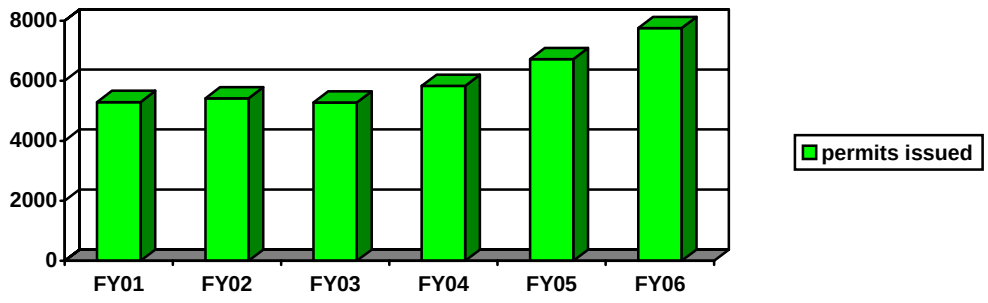
Liquid Waste Program History

- The N.M. Laws of 1937 provided authority for sanitation regulations.
- The N.M. Board of Public Health adopted "Insanitary Toilets" Regulations in 1937.
- The N.M. Board of Public Health issued a "Policy for Individual Water Supplies and Sewage Disposal Systems" in 1959.
- The Environmental Improvement Act was enacted in 1971 and created the Environmental Improvement Board (EIB).
- The EIB adopted Liquid Waste Regulations in 1973, 1979, 1985, 1989, 1997, 2003, and in 2005 pursuant to the Act.
- NMED began issuing Liquid Waste Permits in 1973.
- The Construction Industries Division issued construction permits for septic systems, in parallel with NMED permits, until 1997.
- Liquid waste systems still must comply with the Uniform Plumbing Code.

Current Liquid Waste Program

- NMED is responsible for administering the Liquid Waste Regulations, except in Bernalillo County where the program is administered by the County Environmental Health Department. Liquid Waste Regulations do not apply to sovereign Tribal lands.
- A permit is required to install, modify or replace an onsite liquid waste system. NMED has issued Liquid Waste Permits to about half of the estimated 241,000 onsite liquid waste systems currently used in the state.
- Property transfer inspections are required for all conventional and advanced systems.
- The number of liquid waste permits issued by NMED has been increasing since 2003 (Figure 12), and 7,755 permits were issued in Fiscal Year 2006 (July 1, 2005 to June 30, 2006).

Figure 12. Annual Liquid Waste Permits Issued by NMED. Permits are totalled for each fiscal year (July 1 to June 30).



Septage Disposal

- Septage is a mixture of sludge, scum and wastewater that is periodically pumped out of septic tanks as part of proper maintenance. Septage is a high-strength waste, containing levels of nitrogen and organic matter that are greater than typically found in raw wastewater. New requirements for property transfer inspections have increased septage pumping statewide.
- Some municipal wastewater treatment plants, and several permitted disposal facilities are authorized to accept septage (Figure 13). Septage disposal at wastewater treatment plants, however, is problematic because the high strength waste can upset biological treatment, especially in smaller plants, and because toxic substances may be present.
- Many areas of the state do not have a local septage disposal facility. Consequently, illegal septage dumping has been a long-standing and continuing problem (Figure 14).

Figure 13. Existing Septage Disposal Facilities in New Mexico.

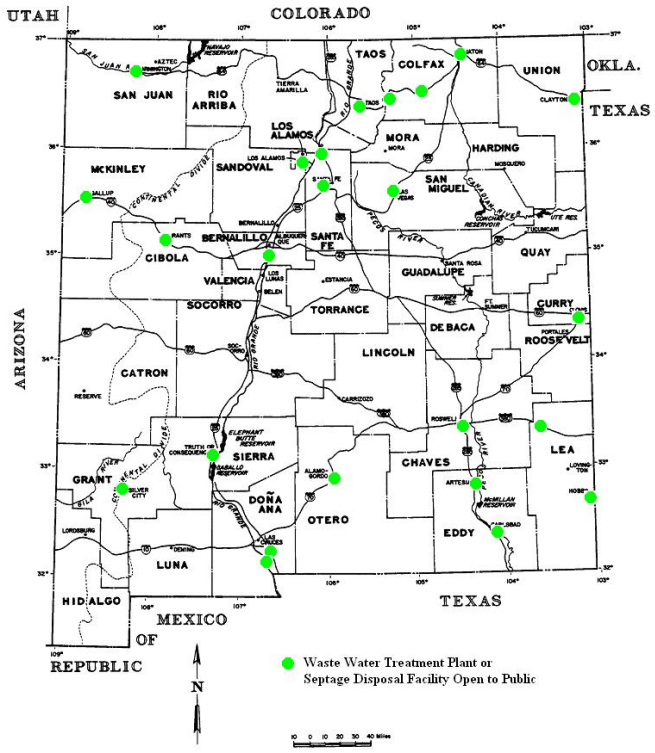
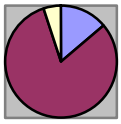
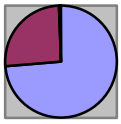
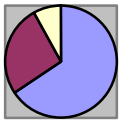
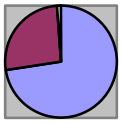
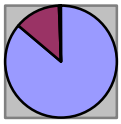
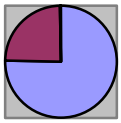
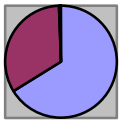
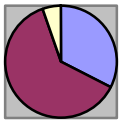
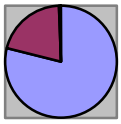
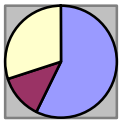
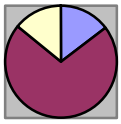
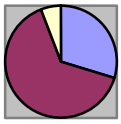
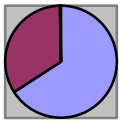


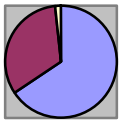
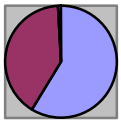
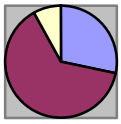
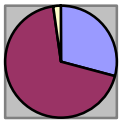
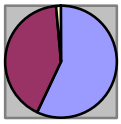
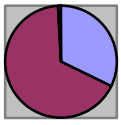
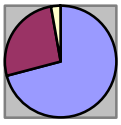
Figure 14. Septage Dumped Illegally into the Acequia de Alcalde Irrigation Canal.

Appendix A - Sewage Disposal in New Mexico, 2004. (Source: U.S. Census Bureau)

County	Housing Units	Public Sewer	septic, cesspool, advanced	privy or other	Total On-Site Systems	public sewer septic, cesspool, advanced privy, other
Bernalillo	259,500	235,950 (90.9%)	22,634 (8.7%)	916 (0.4%)	23,537 (9.1%)	
Catron	2,837	393 (13.8%)	2,305 (81.2%)	139 (5.0%)	2,444 86.2%)	
Chaves	25,911	20,965 (80.9%)	4,809 (18.6%)	137 (0.5%)	4,946 (19.1%)	
Cibola	10,665	6,989 (65.5%)	2,814 (26.4%)	863 (8.1%)	3,676 (34.5%)	
Colfax	9,272	6,715 (72.4%)	2,458 (26.5%)	99 (1.1%)	2,556 (27.6%)	
Curry	19,683	16,949 (86.1%)	2,603 (13.2%)	130 (0.7%)	2,734 (13.9%)	
De Baca	1,406	762 (54.2%)	634 (45.0%)	11 (0.8%)	644 (45.9%)	
Dona Ana	70,400	45,684 (64.9%)	24,354 (34.6%)	362 (0.5%)	24,717 (35.1%)	

Eddy	22,618	17,015 (75.2%)	5,530 (24.5%)	73 (0.3%)	5,602 (24.8%)	
Grant	14,442	8,996 (62.3%)	5,160 (35.7%)	286 (2.0%)	5,446 (37.7%)	
Guadalupe	2,294	1,518 (66.2%)	764 (33.3%)	12 (0.5%)	776 (33.8%)	
Harding	624	202 (32.4%)	389 (62.4%)	33 (5.2%)	422 (67.6%)	
Hidalgo	3,017	1,905 (63.1%)	1,064 (35.3%)	48 (1.6%)	1,111 (36.8%)	
Lea	23,745	18,709 (78.8%)	4,903 (20.6%)	133 0.6%)	5,036 (21.2%)	
Lincoln	16,277	10,206 (62.7%)	5,861 (36.0%)	210 (1.3%)	6,071 (37.3%)	
Los Alamos	8,520	8,306 (97.5%)	206 (2.4%)	8 (0.1%)	214 (2.5%)	
Luna	11,688	6,815 (58.3%)	4,748 (40.6%)	125 (1.1%)	4,873 (41.7%)	

McKinley	27,540	15,732 (57.1%)	3,557 (12.9%)	8,250 (30.0%)	11,806 (42.9%)	
Mora	3,087	454 (14.7%)	2,193 (71.0%)	440 (14.3%)	2,633 85.3%)	
Otero	30,169	20,406 (67.6%)	9,178 (30.4%)	584 (2.0%)	9,763 (32.4%)	
Quay	5,847	3,620 (61.9%)	2,205 (37.7%)	22 (0.4%)	2,227 (38.1%)	
Rio Arriba	18,547	5,537 (29.9%)	11,934 (64.3%)	1,076 (5.8%)	13,011 (70.2%)	
Roosevelt	7,981	5,245 (65.7%)	2,714 (34.0%)	22 (0.3%)	2,736 (34.3%)	
Sandoval	38,631	24,389 (63.1%)	12,353 (32.0%)	1,889 (4.9%)	14,243 (36.9%)	
San Juan	44,359	25,797 (58.2%)	14,273 (32.2%)	4,289 (9.6%)	18,560 (41.8%)	
San Miguel	14,664	8,567 (58.4%)	5,403 (36.9%)	694 (4.7%)	6,097 (41.6%)	

Santa Fe	60,278	39,552 (65.6%)	19,769 (32.8%)	957 (1.6%)	20,724 (34.4%)	
Sierra	9,070	5,304 (58.5%)	3,683 (40.6%)	83 (0.9%)	3,766 (41.5%)	
Socorro	8,171	4,710 (57.6%)	3,161 (38.7%)	300 (3.7%)	3,461 (42.4%)	
Taos	18,207	5,139 (28.2%)	11,603 (63.7%)	1,465 (8.1%)	13,067 (71.8%)	
Torrance	7,548	2,196 (29.1%)	5,185 (68.7%)	167 (2.2%)	5,352 (70.9%)	
Union	2,383	1,356 (56.9%)	997 (41.8%)	30 (1.3%)	1,027 (43.1%)	
Valencia	26,159	8,461 (32.4%)	17,459 (66.7%)	239 (0.9%)	17,697 (67.6%)	
N.M. Total	**825,540**	**584,545 (70.8%)**	**216,905 (26.3%)**	**24,090 (2.9%)**	**240,977 (29.2%)**	

Appendix B – Ground-Water Contamination from Septic Systems in New Mexico.

Ground-water contamination is defined as a ground-water quality impact caused by septic system effluent, and includes multiple-source cases where septic systems have contributed to the contamination. Public and private water supply wells are deemed to be contaminated based on a chemical analysis that detected nitrate-N, iron, manganese or chloride at concentrations greater than 10 mg/L, 0.3 mg/L, 0.2 mg/L, or 250 mg/L respectively, or based on the detection of meth lab chemicals or dichlorobenzene (DCB) at any concentration. Iron and manganese occur in anoxic ground-water contamination conditions.

COUNTY	CASE	CONTAMINANT	PUBLIC WELLS CONTAMINATED	PRIVATE WELLS CONTAMINATED
BERNALILLO	CARNUEL	NITRATE	0	32
BERNALILLO	CEDAR CREST	NITRATE	0	1
BERNALILLO	CHILILI	NITRATE	1	3
BERNALILLO	ISLETA PUEBLO	ANOXIC	0	10
BERNALILLO	MOUNTAINVIEW	NITRATE	2	69
BERNALILLO	NORTH VALLEY ANOXIC	ANOXIC	0	58
BERNALILLO	EAST MOUNTAIN SALT	SALT	0	8
BERNALILLO	PLACITAS	NITRATE	0	1
BERNALILLO	SANDIA HEIGHTS	NITRATE	0	0
BERNALILLO	SOUTH VALLEY ANOXIC	ANOXIC	3	182
BERNALILLO	SOUTH VALLEY DCB	DCB	0	1
BERNALILLO	TIJERAS	NITRATE	0	3
BERNALILLO	WEST MESA NITRATE	NITRATE	0	56
CATRON	PIE TOWN	NITRATE	0	1
CATRON	QUEMADO	NITRATE	0	10
CATRON	RESERVE	NITRATE	0	9
CHAVEZ	ROSWELL	NITRATE	0	6
CIBOLA	GRANTS	NITRATE	0	4
COLFAX	RATON	NITRATE	0	1
DONA ANA	ANTHONY	NITRATE	0	2
DONA ANA	LAS CRUCES	ANOXIC	0	2
DONA ANA	LAS CRUCES E ORGAN RD	ANOXIC	0	5
EDDY	ARTESIA	NITRATE	0	1
EDDY	CARLSBAD	NITRATE	3	3
EDDY	CARLSBAD STANDPIPE RD	NITRATE	0	20
GRANT	ARENAS VALLEY	NITRATE	0	3
GRANT	SILVER CITY	NITRATE	0	13
GUADALUPE	ANTON CHICO	NITRATE	2	0
HARDING	ROY	NITRATE	0	1
HIDALGO	COTTON CITY	NITRATE	0	5
HIDALGO	LORDSBURG	NITRATE	4	1
LEA	HOBBS	NITRATE	0	59
LEA	JAL	NITRATE	0	6
LEA	LEA CO RURAL	NITRATE	0	26
LEA	LOVINGTON	NITRATE	0	16
LINCOLN	ALTO	METH LAB	0	1
LINCOLN	CARRIZOZO	NITRATE	0	1
LINCOLN	HONDO	NITRATE	0	1
LINCOLN	PALO VERDE	NITRATE	2	2
LUNA	DEMING NORTH	NITRATE	0	6
MCKINLEY	GALLUP	NITRATE	0	1

MORA	HOLMAN	NITRATE	1	1
MORA	WATRUOUS	NITRATE	2	0
OTERO	ALAMOGORDO	NITRATE	1	4
QUAY	BARD	NITRATE	0	1
QUAY	LOGAN	NITRATE	0	1
QUAY	NARA VISA	NITRATE	1	3
QUAY	TUCUMCARI	NITRATE	0	7
RIO ARRIBA	ALCALDE	NITRATE	1	38
RIO ARRIBA	CAMINO SIN NOMBRE	NITRATE	0	5
RIO ARRIBA	CEBOLLA	NITRATE	0	1
RIO ARRIBA	CHAMA	NITRATE	0	1
RIO ARRIBA	CHAMITA	NITRATE	0	50
RIO ARRIBA	CHILILI	NITRATE	0	1
RIO ARRIBA	CORDOVA	NITRATE	0	1
RIO ARRIBA	DIXON	NITRATE	0	1
RIO ARRIBA	EL LLANO	NITRATE	1	2
RIO ARRIBA	EL RITO	NITRATE	0	1
RIO ARRIBA	FAIRVIEW	NITRATE	0	2
RIO ARRIBA	HERNANDEZ-GUACHE WF	NITRATE	0	76
RIO ARRIBA	LAS PLACITAS	NITRATE	1	1
RIO ARRIBA	MEDANALES	NITRATE	0	13
RIO ARRIBA	PILAR	NITRATE	0	1
RIO ARRIBA	RANCHITOS	NITRATE	1	2
RIO ARRIBA	SAN JUAN PUEBLO	NITRATE	0	7
RIO ARRIBA	SANTA CRUZ	NITRATE	0	1
RIO ARRIBA	SANTO NINO	ANOXIC	0	8
RIO ARRIBA	VALLEY ESTATES	NITRATE	1	0
RIO ARRIBA	VELARDE	NITRATE	0	1
ROOSEVELT	PORTALES	NITRATE	0	8
SANDOVAL	CORRALES	ANOXIC	1	79
SANDOVAL	JEMEZ SPRINGS	ANOXIC	0	5
SAN MIGUEL	GABALDON	NITRATE	1	0
SAN MIGUEL	RIBERA	NITRATE	0	1
SAN MIGUEL	SAN JOSE	NITRATE	0	1
SAN MIGUEL	SAPELLO	NITRATE	0	3
SANTA FE	AGUA FRIA	NITRATE	0	5
SANTA FE	ARROYO HONDO NITRATE	NITRATE	2	4
SANTA FE	ARROYO HONDO SALT	SALT	0	1
SANTA FE	CHIMAYO	NITRATE	0	2
SANTA FE	CUYAMUNGE	ANOXIC	0	1
SANTA FE	EDGEWOOD	NITRATE	0	1
SANTA FE	EL RANCHO	ANOXIC	0	7
SANTA FE	EL RANCHO	NITRATE	0	1
SANTA FE	GLORIETTA	NITRATE	0	1
SANTA FE	GOLDEN	NITRATE	1	4
SANTA FE	GOLDEN	ANOXIC	0	2
SANTA FE	JACONA	ANOXIC	0	11
SANTA FE	LAMY JUNCTION	NITRATE	0	1
SANTA FE	LA PUEBLA	NITRATE	0	2
SANTA FE	NAMBE	NITRATE	0	2
SANTA FE	POJOAQUE	ANOXIC	0	6
SANTA FE	QUARTALES	ANOXIC	0	5
SANTA FE	QUARTALES	NITRATE	0	1

SANTA FE	RANCHEROS DE SANTA FE	NITRATE	1	0
SANTA FE	SANTA FE	NITRATE	1	30
SANTA FE	TESUQUE	NITRATE	0	3
SANTA FE	VISTA REDONDA	NITRATE	1	0
SIERRA	CABALLO ESTATES	NITRATE	1	0
SIERRA	ELEPHANT BUTTE	NITRATE	0	1
SIERRA	HILLSBORO	NITRATE	0	1
SIERRA	MONTICELLO	NITRATE	0	8
SIERRA	T OR C	NITRATE	0	3
SOCORRO	MAGDALENA	NITRATE	0	1
SOCORRO	SOCORRO	NITRATE	0	2
SOCORRO	VEGUITA	NITRATE	0	30
TAOS	QUESTA	NITRATE	0	2
TAOS	TAOS	NITRATE	0	2
TORRANCE	ESTANCIA	NITRATE	0	1
TORRANCE	MCINTOSH	NITRATE	0	1
TORRANCE	MORIARITY	NITRATE	0	2
UNION	CAPULIN	NITRATE	1	1
UNION	CLAYTON	NITRATE	0	3
UNION	DES MOINES	NITRATE	1	0
VALENCIA	BELEN	ANOXIC	0	2
VALENCIA	BOSQUE FARMS	ANOXIC	0	102
VALENCIA	LOS LUNAS	ANOXIC	0	46
VALENCIA	LOS LUNAS	METH LAB	0	0
VALENCIA	TOME	ANOXIC	0	1
TOTAL WELLS CONTAMINATED			**38**	**1256**

Septic systems are being investigated as a potential source of contamination at the following cases.

COUNTY	**CASE**	**CONTAMINANT**	**PUBLIC WELLS CONTAMINATED**	**PRIVATE WELLS CONTAMINATED**
CHAVEZ	DEXTER	NITRATE	0	2
DONA ANA	MESILLA	NITRATE	0	1
SAN JUAN	AZTEC	NITRATE	0	1
SAN JUAN	BLANCO	NITRATE	0	1
SIERRA	ARREY	NITRATE	0	1
SIERRA	CUCHILLO	NITRATE	0	2
SIERRA	DERRY	NITRATE	0	1
UNION	FOLSOM	NITRATE	0	2
UNION	GRENVILLE	NITRATE	0	2
UNION	SENECA	NITRATE	0	2
VALENCIA	JARALES	NITRATE	0	2
TOTAL WELLS CONTAMINATED			**0**	**17**

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Appendix D – Surface-Water Contamination from Septic Systems in New Mexico.

Contamination is defined as the occurrence of eutrophic (algae bloom) conditions or elevated nutrient levels.

Affected Stream	River Miles Affected	Watershed
Rio Grande (Texas border to Leasburg Dam)	63	El Paso-Las Cruces
Rio Grande (Alameda Bridge to Santa Ana Pueblo boundary)	12	Rio Grande-Albuquerque
Jemez River (Rio Guadalupe to HWY 4 near Jemez Springs)	10	Jemez
Rio Grande (Isleta Pueblo boundary to Alameda Street Bridge)	20	Rio Grande-Albuquerque
Fenton Lake	24	Jemez
Bluewater Creek (Rio San Jose to Navajo Nation boundary)	2	Rio San Jose
San Pablo Canyon (Rio Puerco to headwaters)	12	Rio Puerco
Abiquiu Creek (Rio Chama to headwaters)	13	Rio Chama
Rio Ruidoso (Rio Bonito to Seeping Springs Lake)	20	Rio Hondo
Rio Ruidoso (Seeping Springs Lake to Mescalero Apache boundary)	12	Rio Hondo
Gallinas River (San Augustin to Las Vegas Diversion)	16	Pecos Headwaters
Mora River (USGS gage east of Shoemaker to HWY 434)	52	Mora
Little Coyote Creek (Black Lake to headwaters)	2	Mora
San Juan River (Animas River to Cañon Largo)	21	Upper San Juan
La Plata River (San Juan River to McDermott Arroyo)	17	Middle San Juan
La Plata River (McDermott Arroyo to CO border)	7	Middle San Juan
Animas River (San Juan River to Estes Arroyo)	17	Animas
Mangas Creek (Gila River to Mangas Springs)	6	Upper Gila-Mangas
Canyon Creek (Middle Fork Gila River to headwaters)	14	Upper Gila
San Francisco River (Centerfire Creek to AZ border)	15	San Francisco
Total River Miles Affected	**355**	