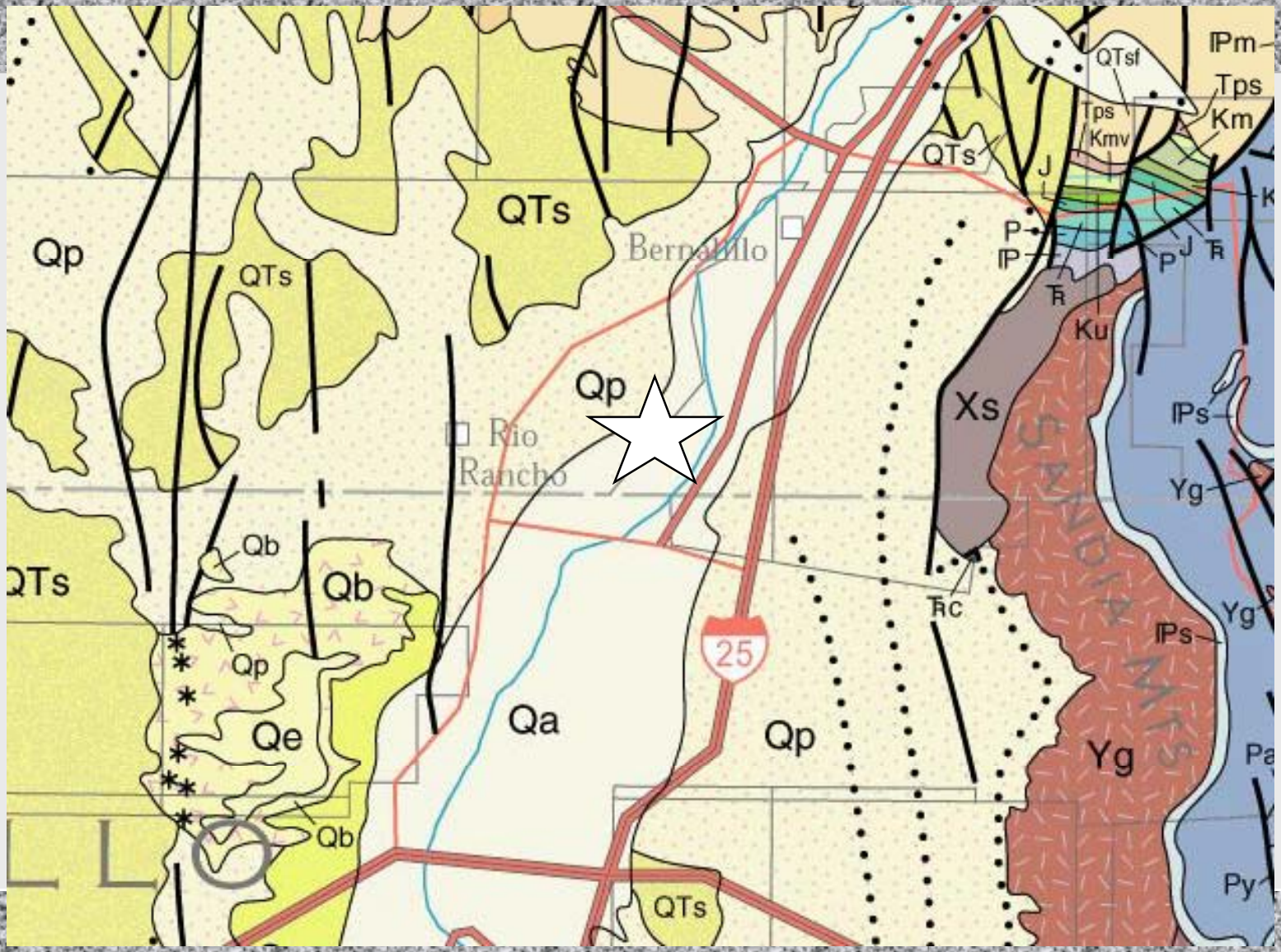
Ground-Water Quality in Corrales

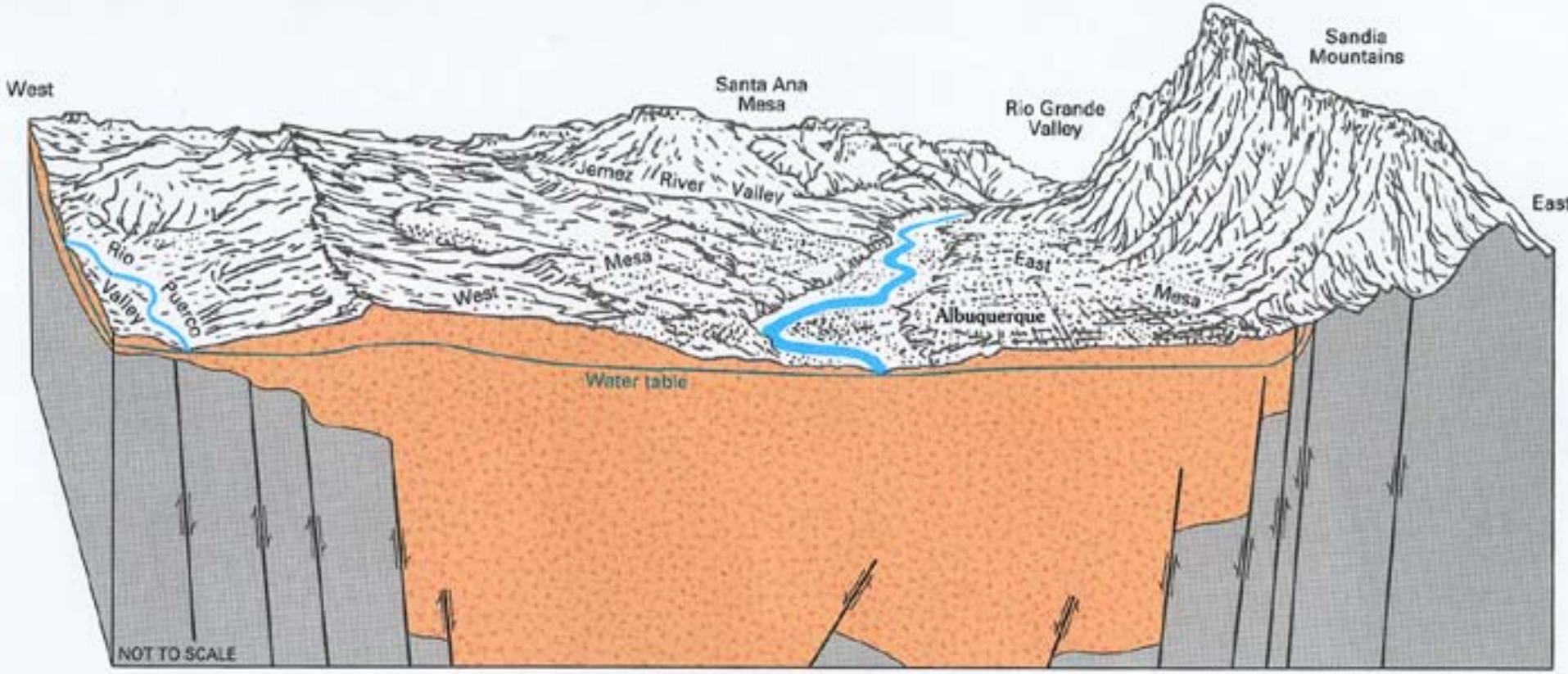
New Mexico Environment Department

December 6, 2005

Geologic Map



Rio Grande Basin Near ABQ



Modified from Bjorklund and Maxwell, 1961

Figure 56. *This diagram of the area near Albuquerque, N. Mex., shows the configuration of the land surface and its relation to the generalized subsurface geology.*

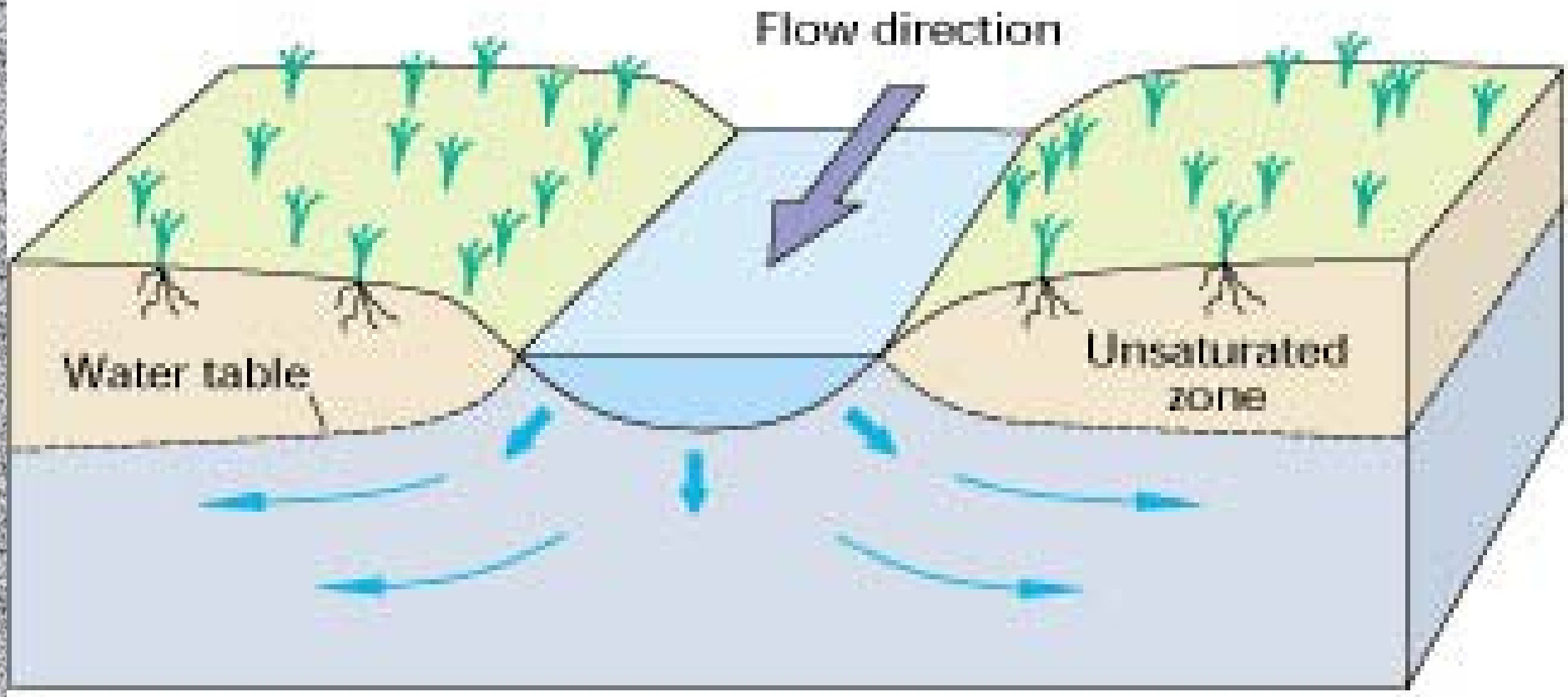
EXPLANATION

Basin-fill deposits

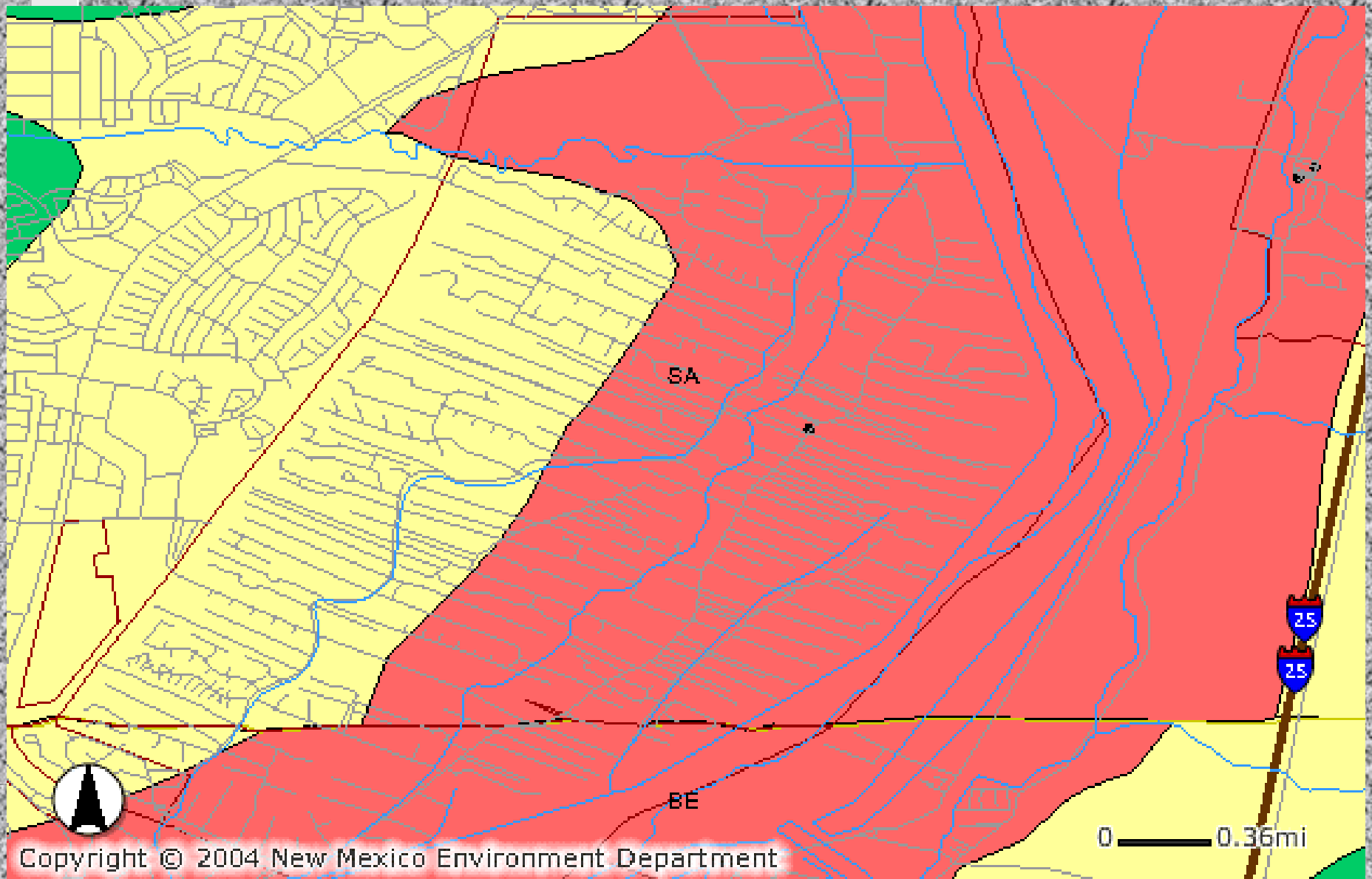
Bedrock

Fault—Arrows indicate relative vertical movement

Rio Grande – Losing Stream



Aquifer Vulnerability



Middle Rio Grande Basin GW

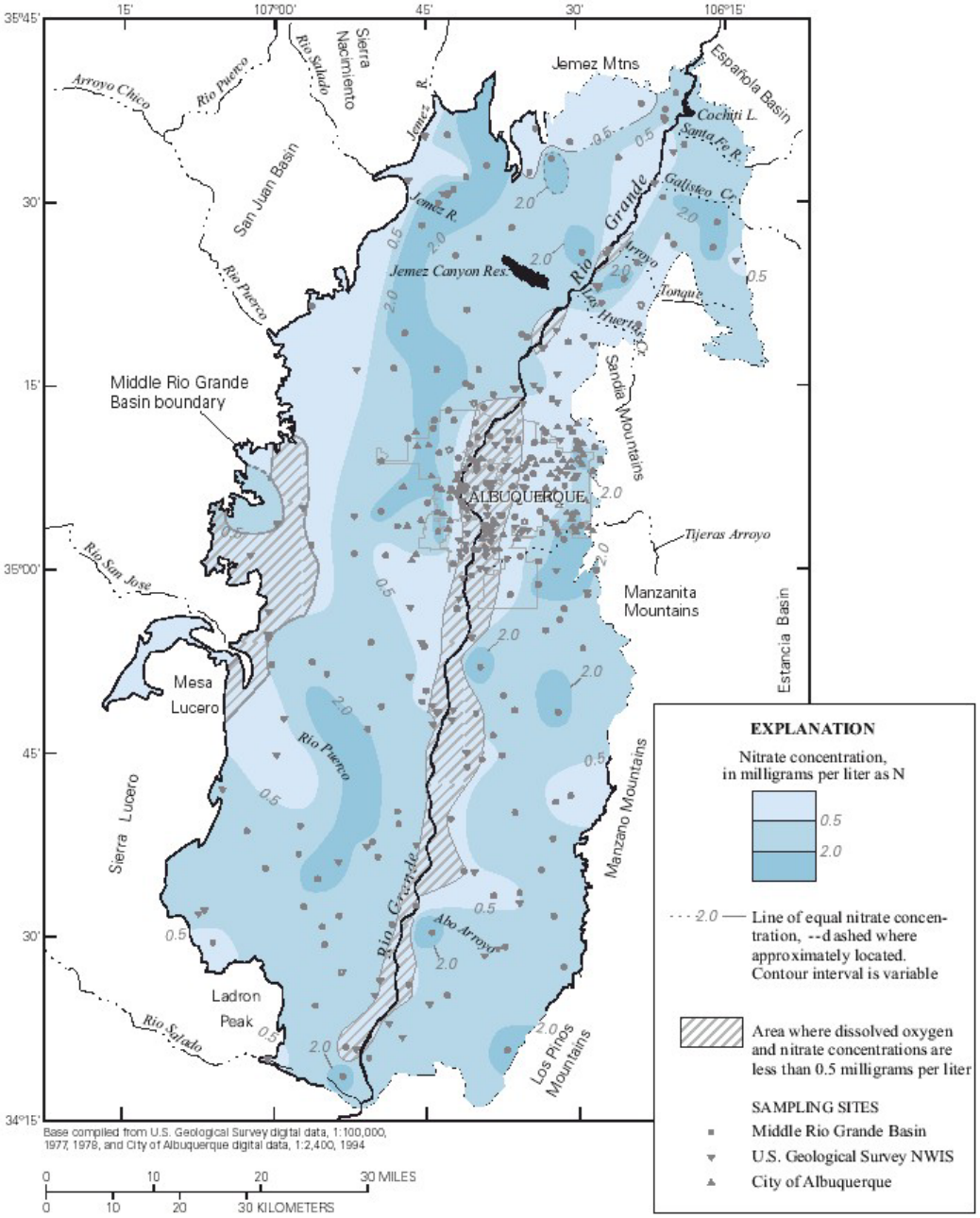


Figure 41. Nitrate concentration for ground water of the Middle Rio Grande Basin, New Mexico.

Nitrate and Iron in Corrales GW

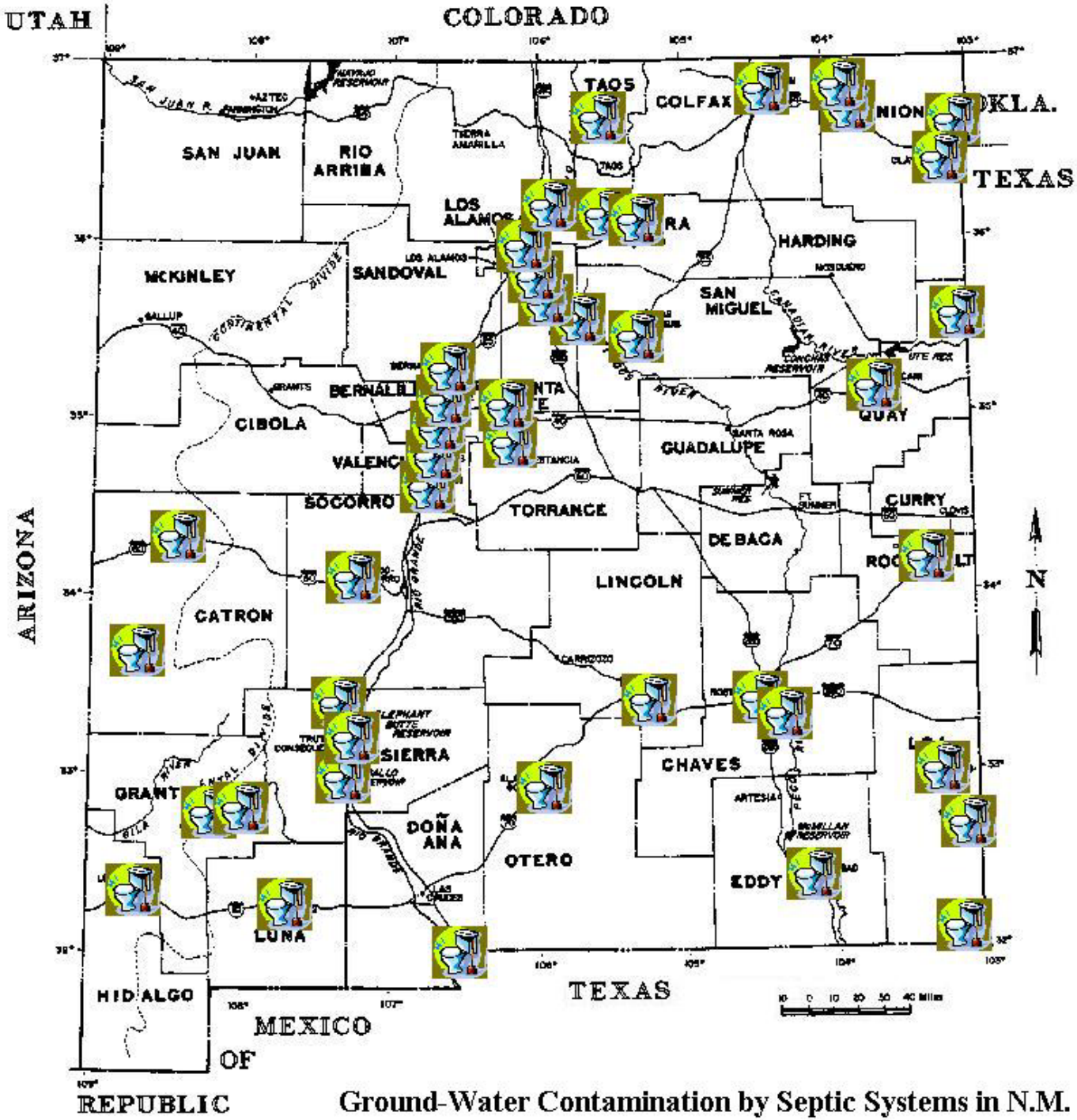
Nitrate-N greater than 2 mg/L

Iron greater than 0.3 mg/L

Redox Boundary

Common Sources of Ground Water Contamination

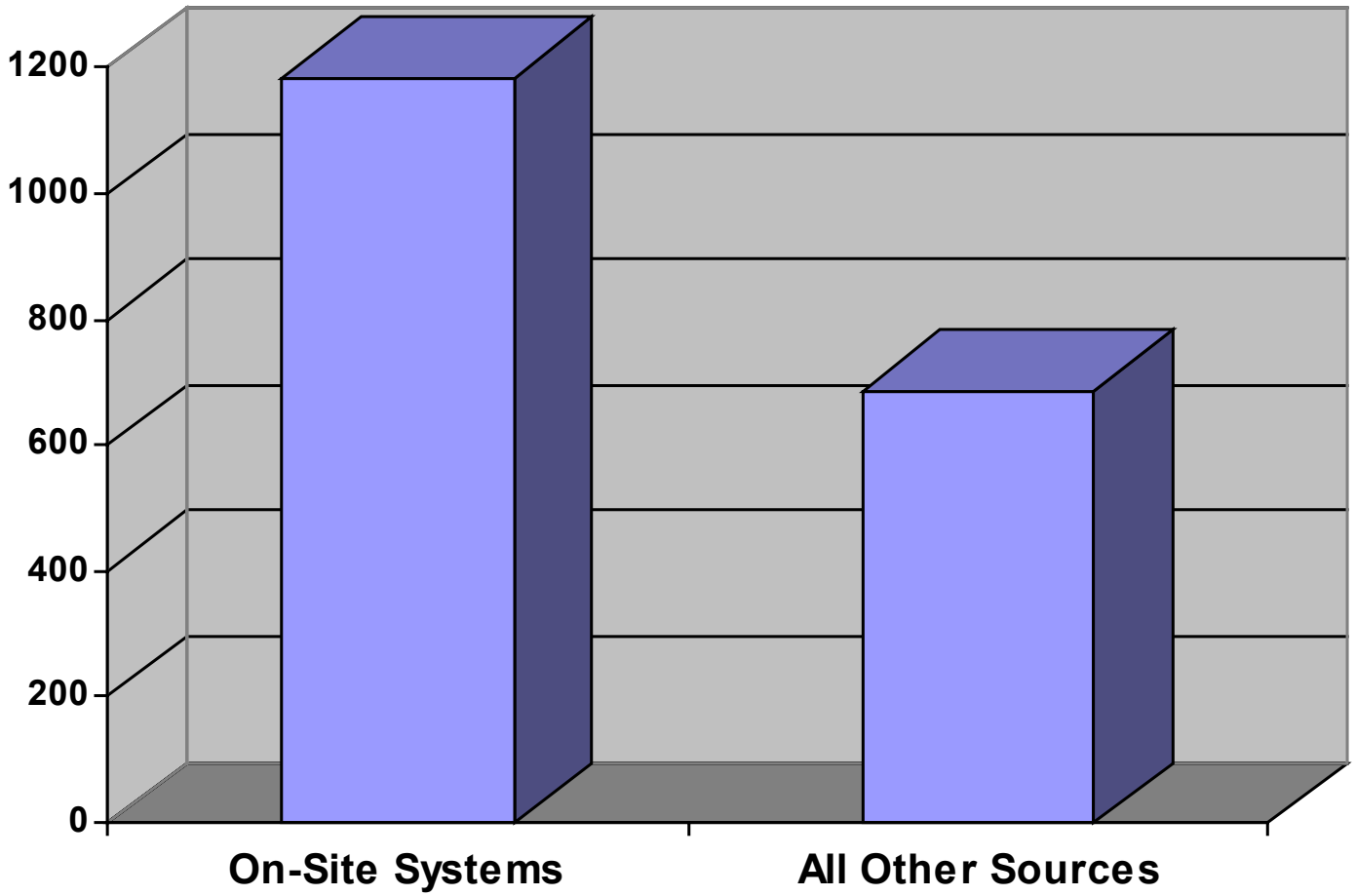
- Septic systems (largest source of GW pollution in NM)
- Sewage plants
- Fertilizers
- Dairies and feedlots
- Petroleum storage tanks and pipelines
- Landfills
- Factories



Ground-Water Contamination by Septic Systems in N.M.

Alamogordo, Albuquerque, Anthony, Arenas, Belen, Bernalillo, Bosque Farms, Caballo, Carlsbad, Carnuel, Chamita, Chilili, Chimayo, Clayton, Corralles, Cuyamungue, Deming, Des Moines, Dexter, Elephant Butte, El Rancho, Espanola, Folsom, Gabaldon, Glorieta, Hernandez, Hobbs, Holman, Hondo, Jacona, Jal, Jarales, Lamy, La Puebla, Las Placitas, Lordsburg, Los Lunas, Lovington, Magdalena, Medanales, Monticello, Nambe, Nara Visa, Pojoaque, Portales, Quartales, Quemado, Questa, Raton, Reserve, Roswell, Santa Cruz, Santa Fe, Sedillo, Seneca, Silver City, Tesuque, Tome, Tucumcari, Velarde

Contaminated Wells

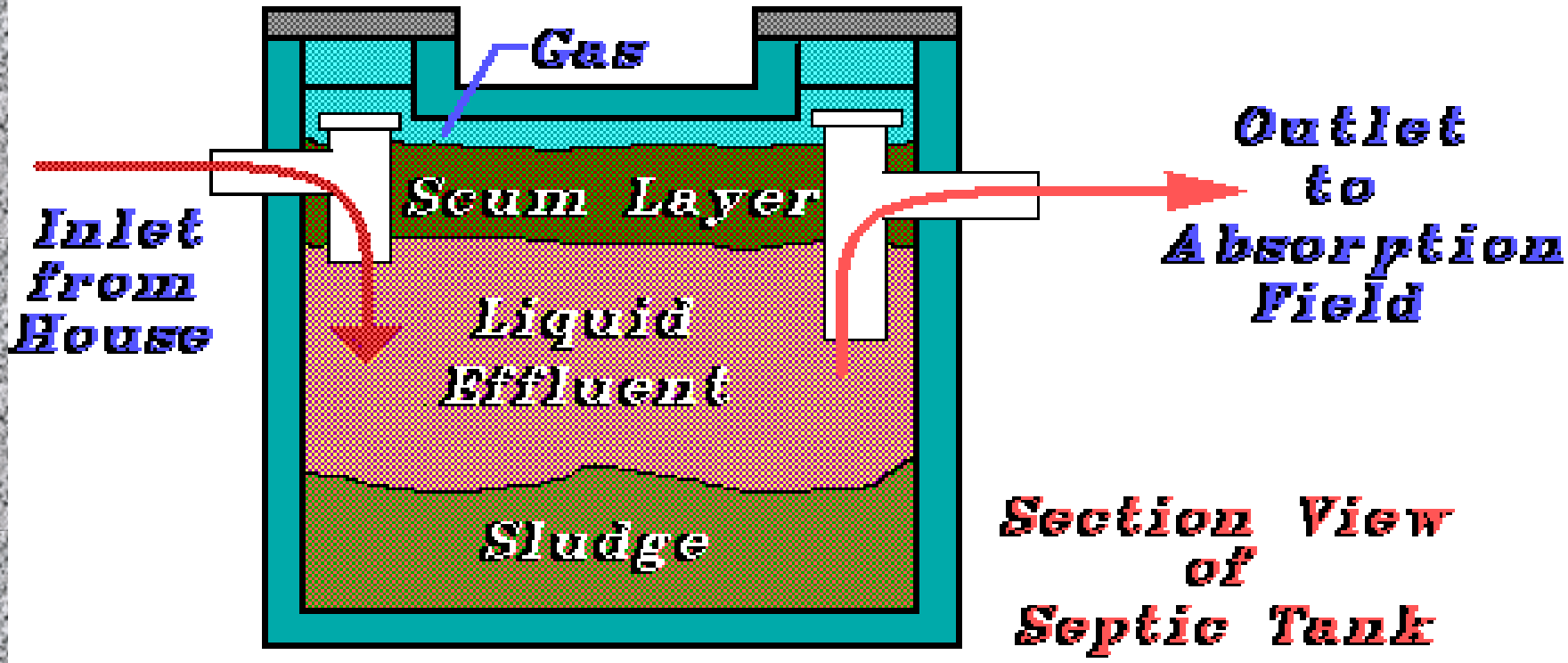


Septic Tanks

The purpose of a septic tank is to:

- **separate solids and oil/scum (sinkers and floaters) from the waste water;**
- **provide some degree of anaerobic digestion of organic matter; and**
- **deliver the waste water to the subsurface**

Septic Tank



Inside Tank: phase separation; digestion of organic matter; gas generation (methane and hydrogen sulfide)

This slide courtesy of New Jersey Department of Environmental Protection

Septic Systems

- Septic systems are a suitable means of waste treatment and disposal where lot sizes are large enough, and subsurface conditions are favorable, for contaminants to be naturally attenuated to acceptable levels.
- Non-biodegradable materials should not be disposed of to septic tanks.
- Septic tanks must be pumped periodically to remove solids and scum.

Septic Systems in NM

- ~225,000 household septic systems (septic tanks and cesspools), with ~6500 new systems/year
- ~75 million gallons per day of wastewater discharged to the subsurface
- most of this wastewater eventually percolates to ground water
- many areas using septic systems also rely on private wells for domestic supply

Illegal Septic System

Cesspools in NM

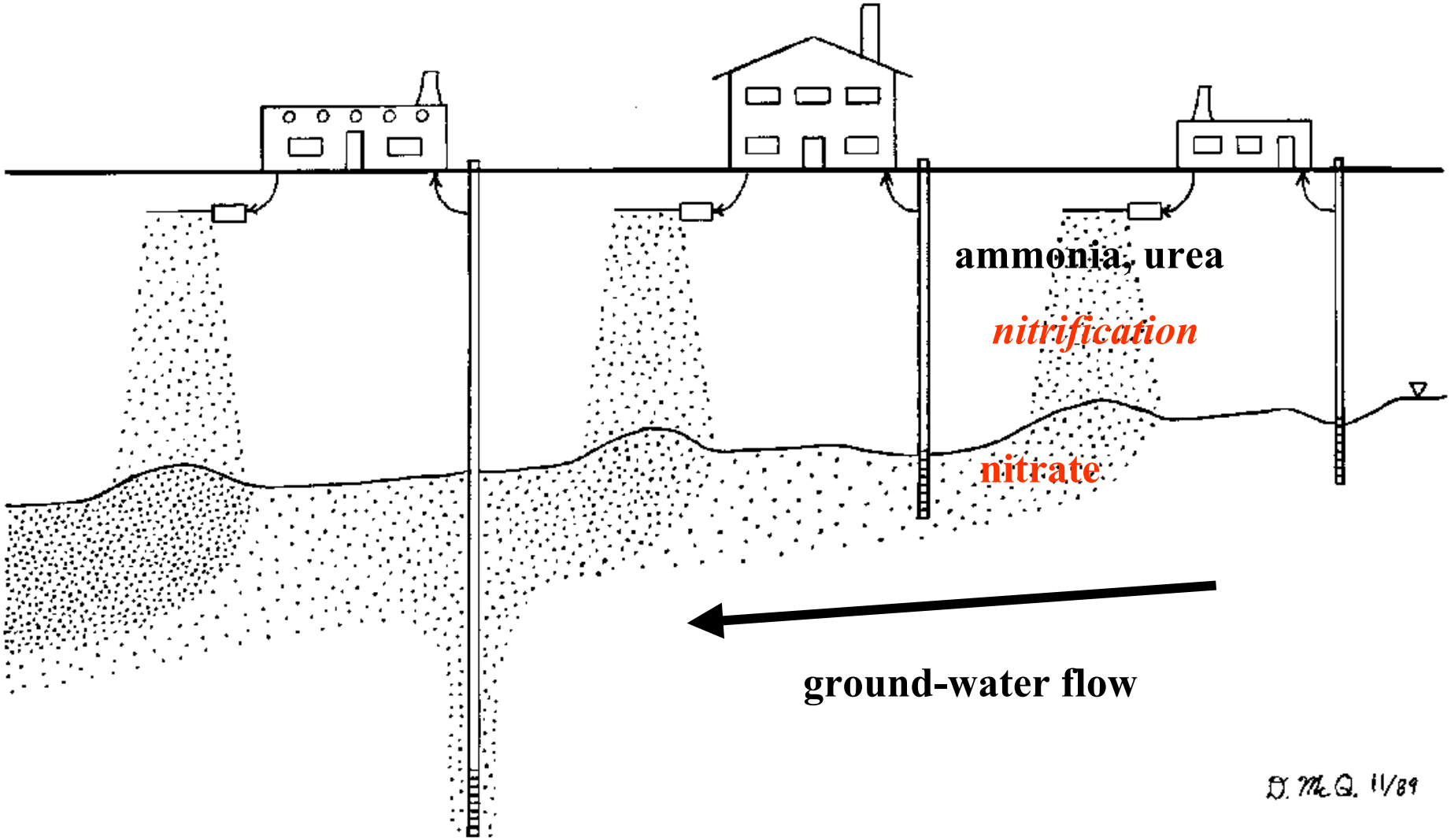
- Willard, 40% of on-site systems
- Cordova, 96% of on-site systems

Ground-Water Contaminants Caused by Septic Systems

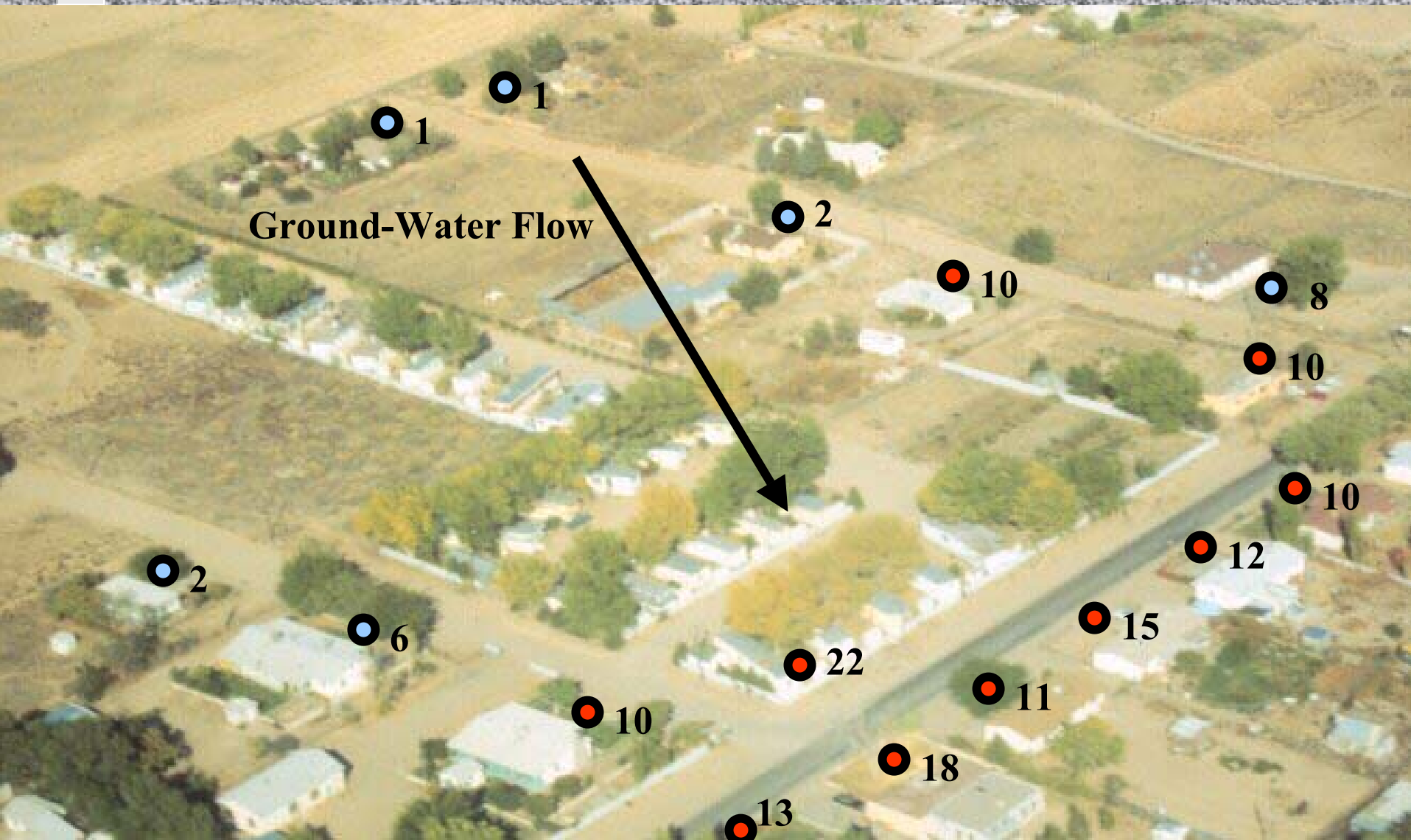
Contaminant	Oxidizing GW	Reducing GW
Chloride/TDS	X	X
Nitrate	X	
Anoxic (Fe, Mn, H_2S)		X
Solvents	X	X
Pathogens	X	X

Septic Tank Floating on GW

Drinking Your Neighbor's Sewage



ABQ West Mesa NO_3-N (mg/L)



Anoxic Ground-Water Conditions

- Oxygen deficiency
- Nitrate is chemically unstable, ammonia in sewage will not oxidize to nitrate
- Manganese, iron and hydrogen sulfide may be present, and can cause taste, odor and staining problems

Causes of Anoxic Conditions

- Biodegradation of natural humic materials
- Oxidation of natural minerals
- Biodegradation of discharges of sewage, petroleum, and other sources of organic carbon

REDOX Reactions

- Aerobic respiration
- Denitrification
- Manganese reduction
- Iron reduction
- Sulfate reduction
- Methanogenesis

Decreasing

Energy

Yield

(to ground-water bacteria)

Nitrate and Iron in Corrales GW

Nitrate-N greater than 2 mg/L

Iron greater than 0.3 mg/L

Redox Boundary

Health Effects

<u>Nitrate</u> – blue-baby case in Carnuel, concerns over increased cancer in adults

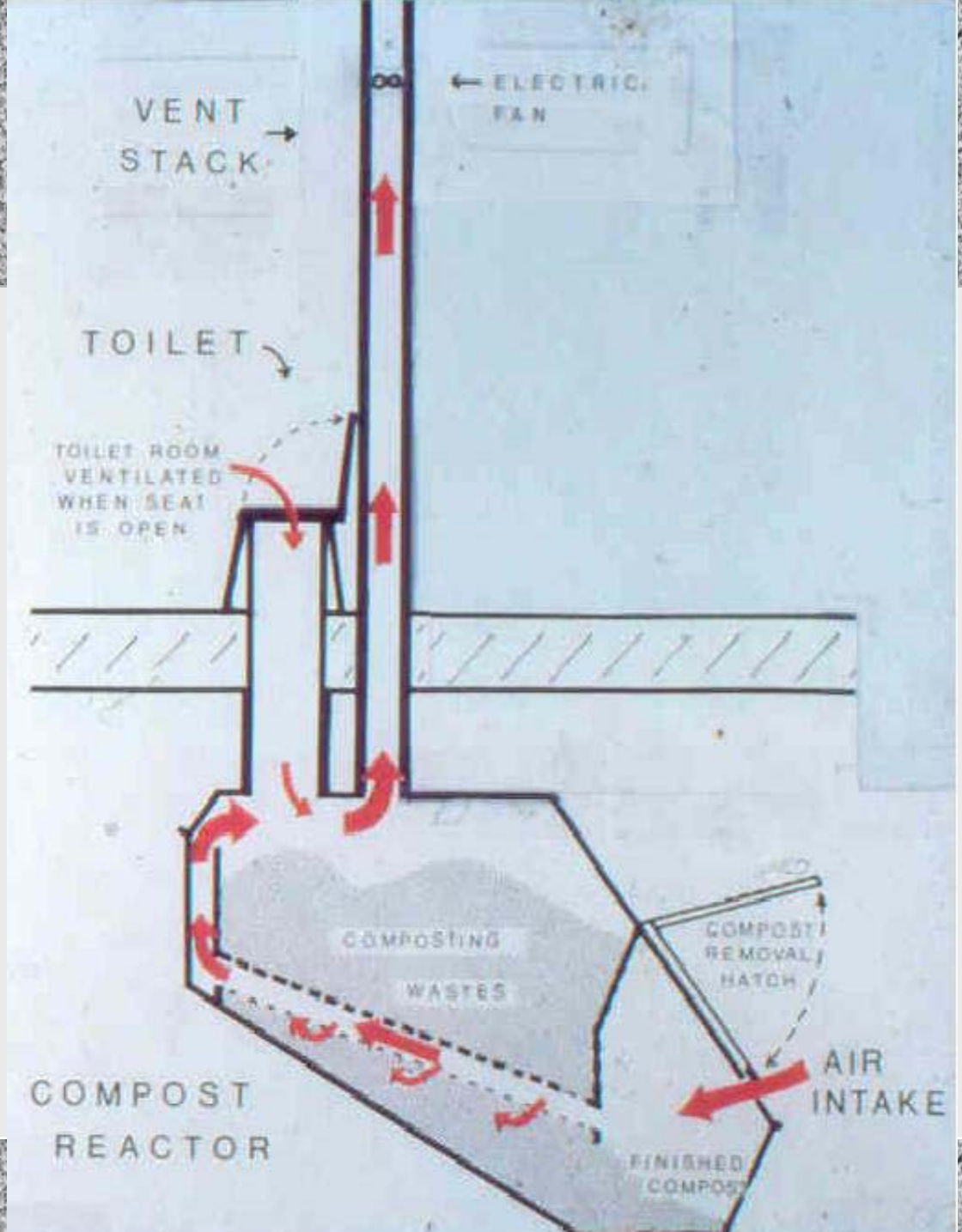
<u>Manganese</u> – neurotoxicity

<u>Pathogens</u> –

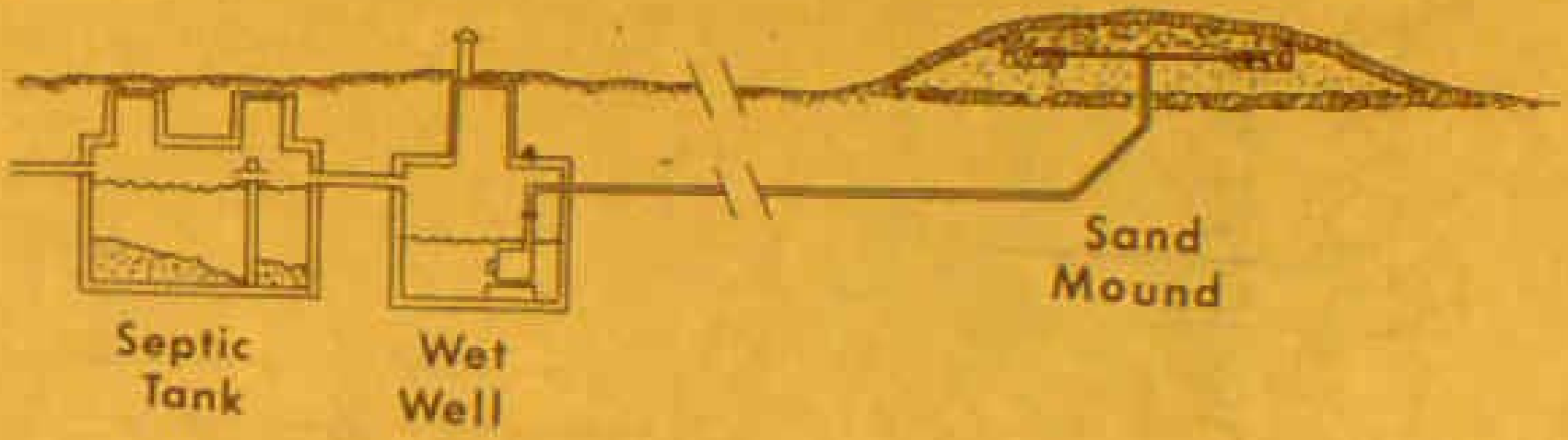
- **1980's study in ABQ South Valley found no statistical relationship between diarrheal illness and consumption of private well water**
- **Additional human health studies are underway in in ABQ North Valley, and needed elsewhere**

Alternatives to Conventional Septic Tanks and Leachfields

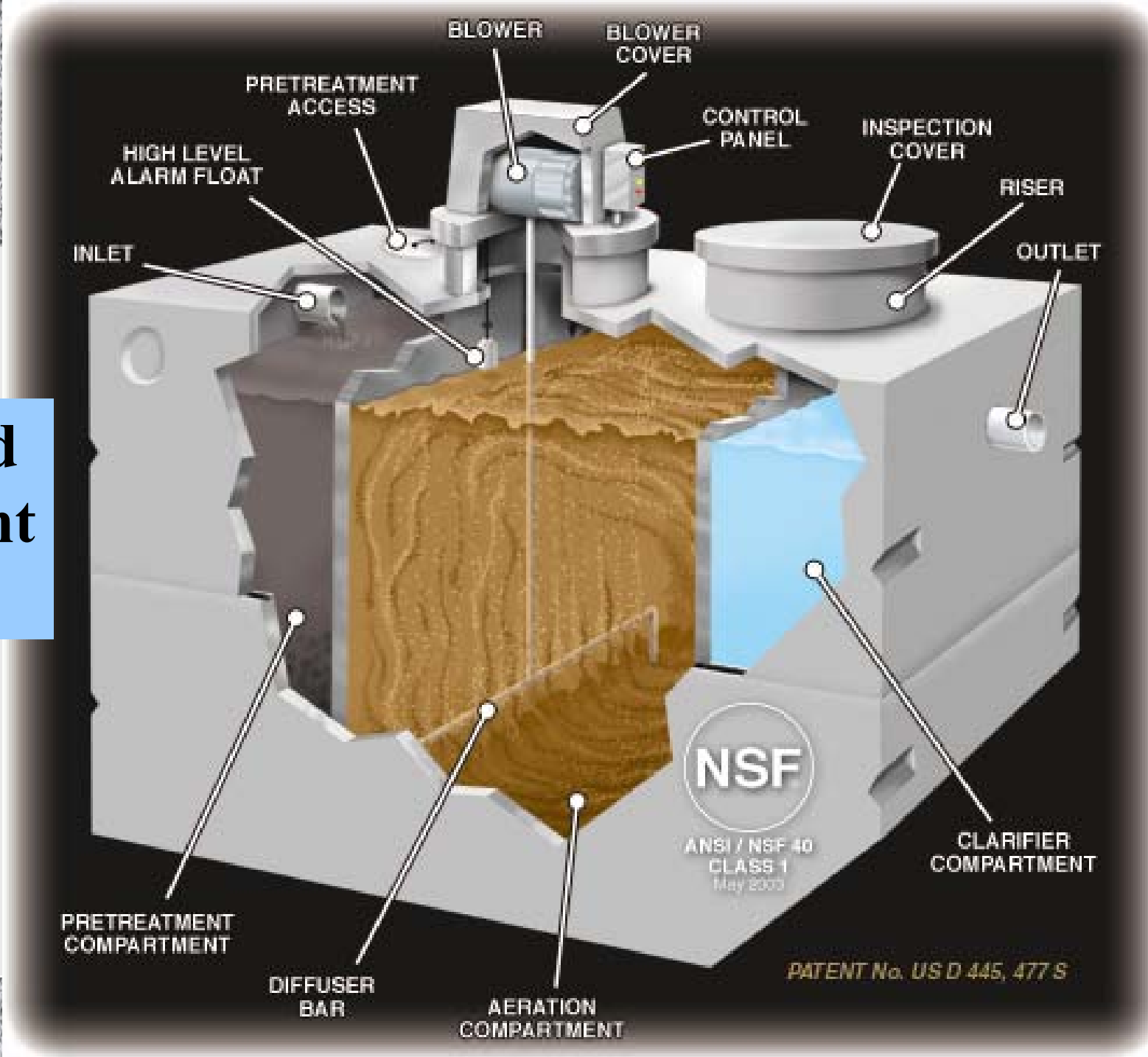
- Composting toilets
- Holding tanks
- Evapotranspiration (ET) systems
- Sand mounds
- Advanced treatment systems
- Centralized management of on-site systems
- Cluster systems
- Regional collection/treatment systems


VENT
STACK
ELECTRIC
FAN
TOILET
TOILET ROOM
VENTILATED
WHEN SEAT
IS OPEN
COMPOSTING
WASTES
COMPOST
REMOVAL
HATCH
AIR
INTAKE
COMPOST
REACTOR
FINISHED

Septic Tank and Sand Mound



Advanced Treatment System

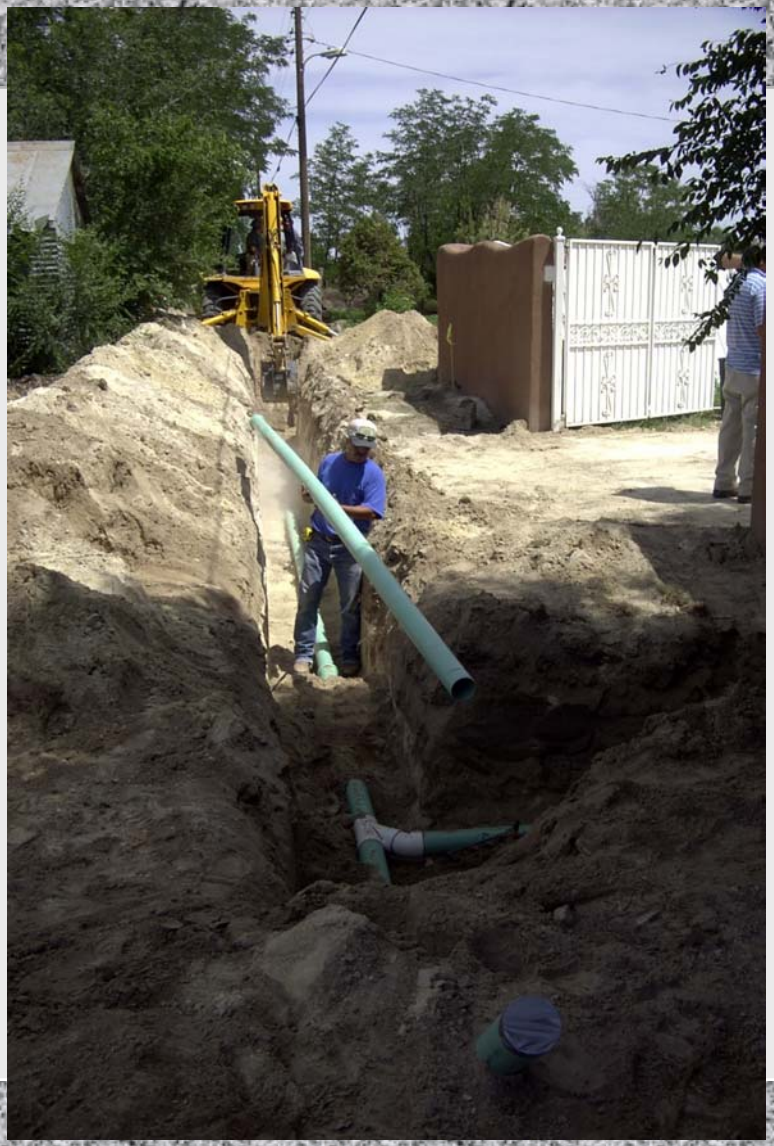


Cluster or “Pod” Systems

- Replace old cesspools and septic tanks with new septic tanks to provide primary treatment
- Centralized management of septic systems
- “Small pipe” collection network from septic tanks to pods
- Advanced treatment in pod areas
- Conventional disposal methods

New Septic Tank Installation

Small Pipe Collection System



Advanced Treatment Pods

Re-Circulating Textile Filter

Installation

Constructed Pod