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REPLY TO SANTA FE OFFICE

May 24, 1985

HAND DELIVERED

Richard L. Stamets, Chairman
New Mexico Oil Conservation
Commission
Post Office Box 2088
Santa Fe, New Mexico 87504-2088

Re: OCC Cause No. 8224

Dear Dick:

Enclosed is a copy of a proposed order in the No-Pit case. This proposed draft is submitted to you on behalf of Meridian Oil Inc., El Paso Natural Gas Company and Giant Industries, Inc.

The provisions of the proposed rule contained within this proposed order are substantially those contained in the draft rule submitted to you by the short-term Water Study Committee.

Thank you in advance for your consideration of these matters.

Sincerely,

W. Perry Pearce

WPP:dml
Enclosure

STATE OF NEW MEXICO
DEPARTMENT OF ENERGY AND MINERALS
OIL CONSERVATION COMMISSION

IN THE MATTER OF THE HEARING
CALLED BY THE OIL CONSERVATION
COMMISSION OF NEW MEXICO FOR
THE PURPOSE OF CONSIDERING:

CASE: 8224
ORDER R-

APPLICATION OF THE OIL
CONSERVATION COMMISSION UPON
ITS OWN MOTION, TO DEFINE THE
VERTICAL AND AREAL EXTENT OF
AQUIFERS POTENTIALLY VULNERABLE
TO CONTAMINATION BY THE SURFACE
DISPOSAL OF PRODUCED WATER,
MCKINLEY, RIO ARRIBA, SANDOVAL
AND SAN JUAN COUNTIES, NEW MEXICO.

ORDER OF THE COMMISSION

BY THE COMMISSION:

This cause came on for hearing on February 20, 1985, April 3, 1985 and April 22 and 23, 1985, at Santa Fe, New Mexico, before the Oil Conservation Commission of New Mexico, hereinafter referred to as the "Commission."

NOW, on this _____ day of _____, 1985, Commission, a quorum being present, having considered the testimony presented and the evidence received at the hearings and being fully advised in the premises;

FINDS:

1. That due public notice having been given as required by law, the Commission has jurisdiction of this cause and the subject matter thereof.

2. That this case was originally docked for hearing by an Oil Conservation Division hearing examiner on June 7, 1984.

3. That the hearing of June 7, 1984 was continued to July 18, 1984 at which time an informal conference of interested parties was held. Parties from the OCD, the New Mexico Environmental Improvement Division, private environmental groups, concerned citizens, Indian tribes, and representatives of the oil and gas industry attended this conference and participated in discussions relating to the possible contamination of underground waters by the use of unlined pits for the disposal of water processed or used in connection with the drilling for or production of oil or gas or both.

4. As a result of that conference, the OCD established short-term and long-term study committees. The goals of the Short-Term Water Study Committee were to:

   a) determine what constitutes a vulnerable aquifer;

   b) map the vulnerable aquifer;

   c) attempt to determine the probability unlined pits may have in contaminating the vulnerable aquifers; and

   d) prepare a recommendation to the OCD for an order which will address the problems identified by the committee.

5. That the Short-Term Water Study Committee held a series of meetings, mapping sessions and field tours in order to accomplish its goals.

6. A hearing was called by the Commission on February 20, 1985 to consider the recommendations of the Short-Term Water Study Committee. This recommendation reported in part that:

   > It has been determined that in San Juan, Rio Arriba, McKinley and Sandoval Counties in the State of New Mexico, there are areas where ground or surface water may be vulnerable to contamination by oil and gas production operations. Those vulnerable areas include areas where the depth to groundwater is less than 50 feet, the aquifer containing the groundwater consists of unconsolidated alluvial fill, and the water is presently used for or could reasonably be presumed

to be used for municipal, domestic, industrial, agricultural or stock watering purposes.

7. That as a result of this determination the Short-Term Water Study Committee had defined and mapped "vulnerable areas" and "special areas" in which particular care needed to be exercised in the use of unlined pits for the disposal of water produced or used in connection with the drilling for or producing of oil or gas or both in the four (4) counties.

8. That the committee reached agreement and recommends that in accordance with the presently applicable federal standard unlined pits in the vulnerable area that receive five (5) barrels per day or more should be taken out of service within eighteen (18) months following the entry of an order directing that those pits be properly lined or properly abandoned.

9. That the Short-Term Water Study Committee agrees and recommends that:

   a) Pits lying outside vulnerable or special areas be exempt from this order.

   b) Any pits, ponds, lagoons or impoundments resulting from activities regulated by a discharge plan approved and permit issued by NMOCD or NMEID under Water Quality Control Commission Regulations authorized under the New Mexico Water Quality Act be exempt from this order.

   c) Any pits, ponds, lagoons or impoundments resulting from activities regulated by a RCRA or NPDES permit issued by NMEID or EPA under RCRA or NPDES regulations authorized under the Resource Conservation and Recovery Act, New Mexico Hazardous Waste Act, Clean Water Act or Safe Drinking Water Act be exempt from this order.

   d) Any pits, ponds, lagoons or impoundments resulting from activities regulated by a mining plan approved and permit issued by

the New Mexico Coal Surface Mining Commission under the authority of the Surface Mined Lands Reclamation Act be exempt from this order.

10. That the committee agreed and recommended that permits be granted for the use of unlined pits in the vulnerable area for any pit for which the operator makes either of the following showings:

    a) Quality Permit: If the operator can demonstrate that the quality of either existing uncontaminated groundwater, or produced water is such that the introduction of produced water will not cause degradation of the groundwater, the unlined pit may be permitted upon application to the NMOCD. The demonstration must include analysis for organic and inorganic parameters as required by the Division.

    b) Soil and Geologic Characteristics Permit: If the operator can demonstrate through the use of standard soil analysis parameters (e.g., percolation tests, infiltration rates, particle size/distribution, etc.) that the existing soil and/or underlying geologic stratum exhibit low permeabilities such that the produced water will not cause degradation of the groundwater, the unlined pit may be permitted upon application to the NMOCD. This can be accomplished on an aerial or site specific basis.

11. That the committee could not agree and made no recommendation to the Commission as to whether or not small volume unlined pits should be allowed to continue to be used in the vulnerable area and special areas.

12. That there are "mechanisms of attenuation" which tend to greatly reduce the quantity of contaminants contained in produced water or tend to retard the movement of these contaminants and thereby tend to provide additional protection to the potentially vulnerable underground water resources. That these mechanisms include: flash volitilization which

eliminates volatile organics prior to their reaching the disposal pit; evaporation and volatilization from the pit which eliminates volatile organics prior to their penetrating the surface of the ground; partially saturated flow which acts to retard the velocity of the flow through the area between the surface and the water table; evaporation and volatilization from the soil which acts to eliminate volitle organics during their presence in the partially saturated zone; sorption which acts to retard the flow of contaminants; and, biodegradation which tends to mineralize organic contaminants entirely.

13. That field test data from several sites representative of the types of conditions expected to be encountered in the vulnerable and special areas indicate that these small volume pits do not cause the New Mexico Water Quality Control Standards be exceeded despite the fact that some simple or uncalibrated modeling efforts to project the incidence of contamination indicate that the contamination should be present.

14. That the more sophisticated and more accurate modeling technique model was presented in this case was calibrated to reflect the actual field results of a set of representative wells in the vulnerable area, this model indicates that water quality standards would not be exceeded by the use of small volume unlined pits at these other well locations.

15. That the cost of lining small volume pits would represent a substantial expense in relation to the production of many wells and might cause the premature abandonment of some wells with resultant waste of the natural resource and injury to correlative rights.

16. That there is insufficient evidence to support a finding that it is necessary to prohibit the use of small volume unlined pits in the vulnerable area in order to afford reasonable protection against contamination of fresh water supplies designated by the State Engineer.

17. That the recommendations of the Short-Term Water Study Committee should be adopted and that any produced water pit which receives five (5) barrels per day or less of produced water and any ancillary pit which receives one barrel per day or less of water or fluids should be exempt from the coverage of this order.

IT IS THEREFORE ORDERED:

(1) That Special Rules and Regulations governing the use of unlined pits for the disposal of produced water in the vulnerable and special areas of McKinley, Rio Arriba, Sandoval and San Juan Counties, New Mexico are hereby promulgated as follows:

SPECIAL RULES AND REGULATIONS FOR THE USE OF UNLINED PRODUCED WATER DISPOSAL PITS IN MCKINLEY, RIO ARRIBA, SANDOVAL AND SAN JUAN COUNTIES, NEW MEXICO.

RULE 1 DEFINITIONS:

1. Aquifer: An aquifer is a saturated permeable geologic unit (a geological formation, group of formations, or part of a formation) that can transmit significant quantities of water under ordinary hydraulic gradients.

   For purposes of this definition, the word significant means that the water from the aquifer is used for or may reasonably be presumed to be usable for municipal, industrial, domestic, agricultural, or stock watering purposes.

2. Vulnerable Aquifer: For the purpose of this order the following are defined as vulnerable aquifers:

   a) Unconfined aquifers in which the static water level is less than 50 feet from the surface, or

   b) Unconfined aquifers in floodplain areas, or

   c) Aquifers in unconsolidated materials.

3. Vulnerable Area: An area which lies over or adjacent to a vulnerable aquifer and is defined as an area within the river valleys of the San Juan, Animas, and La Plata Rivers which is bounded by the topographic line on either side of the river that is 100 vertical feet above the river channel measured perpendicularly to the river channel.

4. Special Areas: Areas outside of the vulnerable area in which ground water is subsequently found to be within 50' of the ground surface. Special areas presently identified are listed below:

a) Sections

T28N-R 8W, Section 17	T30N-R12W, Section 13
T28N-R11W, Section 18	T30N-R12W, Section 15
T28N-R15W, Section 26	T30N-R12W, Section 27
T29N-R10W, Section 16	T30N-R12W, Section 33
T29N-R12W, Section 24	T30N-R13W, Section 1
T29N-R18W, Section 17	T30N-R15W, Section 6
T29N-R19W, Section 23	T30N-R15W, Section 16
T29N-R19W, Section 30	T30N-R15W, Section 21
T30N-R10W, Section 5	T30N-R16W, Section 29
T30N-R11W, Section 3	T30N-R19W, Section 34
T30N-R11W, Section 7	T31N-R10W, Section 13
T30N-R11W, Section 8	T31N-R11W, Section 35
T30N-R11W, Section 10	T32N-R10W, Section 10
T30N-R11W, Section 19	T32N-R11W, Section 23
	T32N-R12W, Section 25

b) Areas that lie between the rivers and the ditches mentioned below are also special areas:

Highland Park Ditch
Hillside Thomas Ditch
Cunningham Ditch
Farmers Ditch
Halford Independent Ditch
Citizens Ditch
Hammond Ditch

5. Produced Water Pit: That pit which receives water produced from primary separation in conjunction with the production of crude oil and/or natural gas whether or not such pit is located at the site of production.

6. Ancillary Pit: Those pits not receiving fluids, from primary separation including but not limited to dehydrator pits, tank drain pits, pipeline drip collector pits, blowdown pits and compressor scrubber pits. Examples are listed below:

a) Dehydrator Pit: Those pits which normally receive produced water only from the dehydration unit.

b) Blowdown Pit: Those pits which receive liquid only when a well is blown down.

c) Tank Drain Pit: Those pits which receive water that is drained from a production storage tank.

d) Pipeline Drip Collector Pit: Those pits which receive liquids which accumulate in gas pipelines.

e) Compressor Scrubber Pit: Those pits which receive liquids at the compressor suction in event or primary separator failure.

RULE 2 PROHIBITIONS

Disposal of produced water or fluids produced in connection with the production of oil and natural gas, or both, in unlined pits is prohibited, except for disposal of produced water specifically exempted herein.

RULE 3 EXEMPTIONS

The provisions of this order shall not apply to:

1. Pits lying outside vulnerable or special areas in McKinley, Rio Arriba, Sandoval and San Juan Counties, New Mexico.

2. Produced water pits lying within the vulnerable or special areas which receive five (5) barrels or less per day of produced water.

3. Unlined ancillary pits within the vulnerable or special areas which receive one (1) barrel or less per day of produced water.

4. Any pits, ponds, lagoons or impoundments resulting from activities regulated by a discharge plan approved and permit issued by NMOCD or NMEID under Water Quality Control Commission Regulations authorized under the New Mexico Water Quality Act.

5. Any pits, ponds, lagoons or impoundments resulting from activities regulated by a RCRA or NPDES permit issued by NMEID or EPA under RCRA or NPDES regulations authorized under the Resources Conservation and Recovery Act, New Mexico Hazardous Waste Act, Clean Water Act or Safe Drinking Water Act.

6. Any pits, ponds, lagoons or impoundments resulting from activities regulated by a mining plan approved and permit issued by the New Mexico Coal Surface Mining Commission under the authority of the Surface Mined Lands Reclamation Act.

RULE 4 PERMITS

Upon application to and approval by the NMOCD, unlined produced water pits which receive more than five (5) barrels per day and those ancillary pits which receive more than one (1) barrel per day that are within the vulnerable area or special

areas may be permitted under this order based on the following criteria and after satisfying either a. or b. below.

a) Quality Permit: If the operator can demonstrate that the quality of either existing uncontaminated groundwater, or produced water is such that the introduction of produced water will not cause degradation of the groundwater, the unlined pit may be permitted upon application to the NMOCD. The demonstration must include analysis for organic and inorganic parameters as required by the Division.

b) Soil and Geologic Characteristics Permit: If the operator can demonstrate through the use of standard soil analysis parameters (e.g., percolation tests, infiltration rates, particle size/distribution, etc.) that the existing soil and/or underlying geologic stratum exhibit low permeabilities such that the produced water will not cause degradation of the groundwater, the unlined pit may be permitted upon application to the NMOCD. This can be accomplished on an aerial or site specific basis.

RULE 5 COMPLIANCE SCHEDULE

Any operator currently disposing of produced water into a pit which would be prohibited or would require permitting under these rules shall have a period of eighteen (18) months from the date of this order within which to cease such disposal or receive a permit for such disposal.

RULE 6 AMENDMENTS

Prior to any application for amendment of the definitions of vulnerable area or special areas contained herein shall be heard and the OCD shall reconvene a committee similar to the Short Term Water Study Committee to discuss the proposed amendment and attempts shall be made to fully advise all interested parties of the context of such application.

(2) That jurisdiction of this cause is retained for the entry of such further order as the commission may deem necessary.

DONE at Santa Fe, New Mexico, on the day and year hereinabove designated.

STATE OF NEW MEXICO
OIL CONSERVATION

RICHARD L. STAMETS
CHAIRMAN

ED KELLEY
MEMBER

JIM BACA
MEMBER

50 YEARS

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

1935 - 1985

TONEY ANAYA
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

May 23, 1985

Mr. R. L. Stamets
Oil Conservation Commission
P.O. Box 2088
Santa Fe, NM 87501

Re: OCC Case No. 8224,
Request Post-Hearing
Documents

Dear Mr. Stamets:

Please find enclosed two copies of the proposed pit registration form submitted as a post-hearing document.

In addition, results of the pollutant load limit simulations for Total Dissolved Solids (TDS) from the "Random Walk" model run by Mr. David Boyer of the OCD are shown below. Since initial concentrations were on the order of 10,000 mg/l TDS and quantity of discharge is known, further interpretation can be made from this information for total salt load limits. Results were judged acceptable/unacceptable based on whether total TDS exceeded 1,000 mg/l (NM WQCC standard) for an initial uncontaminated ground water TDS of 725 mg/l (average from "Hydrogeology of the Aztec Quadrangle, San Juan County, NM", Bureau of Mines Hydrologic Sheet #1). The simulations were run using the same aquifer conditions presented previously for benzene except the Retardation Coefficient was set equal to.1 foot instead of 7.

K (ft/day)	Q (bbl/day)	RANGE OF MAXIMUM TDS INCREASE AND DISTANCE FROM PIT	DISCHARGE TO UNLINED PIT?
25	5	1293 to 2247 PPM at 0 to 50 feet	Unacceptable
25	1	292 to 494 PPM at 10 to 20 feet	Unacceptable
25	1/2	175 to 213 PPM at 10 to 60 feet	Acceptable
100	5	562 to 1123 PPM at 20 to 200 feet	Unacceptable

100	1	112 to 210 PPM at 10 to 160 feet	Acceptable
100	1/2	-	Acceptable
250	5	162 to 499 PPM at 20 to 150 feet	Unacceptable
250	1	-	Acceptable
250	1/2	-	Acceptable
2500	5	367 PPM at 20 feet	Unacceptable
2500	1	-	Acceptable
2500	1/2	-	Acceptable

I hope that this information is useful to the Commission in making its decision in this matter. The Division's proposed order and brief summarizing legal and factual issues should be filed by the end of the month.

Sincerely,

Jeff Taylor
General Counsel

cc: W. Thomas Kellahin, Esq. - w/enc.
Kellahin and Kellahin
P.O. Box 2265
Santa Fe, NM 87504

Jennifer Pruitt, Esq., - w/enc.
Environmental Improvement Division
P.O. Box 968
Santa Fe, New Mexico 87501

William F. Carr, Esq. - w/enc.
Attorney at Law
P.O. Box 2208
Santa Fe, NM 87501

Perry Pearce, Esq. - w/enc.
Montgomery Law Firm
P.O. Box 2307
Santa Fe, New Mexico 87501

OCD DRAFT 5/22/85

PIT REGISTRATION FORM

OPERATOR:
(List Information for only those pits operated by you at the lease)

WELL AND LEASE NAME:
LOCATION:

	PRIMARY PIT[1]	AUXILLARY PIT(s)[2] PIT 1	PIT 2	PIT 3
USE:	PRODUCED WATER			

DIMENSIONS:
(LxWxD, Ft.)

DISCHARGE:
(Bbl/day)

HOW MEASURED:
(Choose One)
Counter?
Flowmeter?
Other?
(Specify)

VOLUME PER DUMP:

DATE LAST
MEASURED:

CONDUCTIVITY & TEMP.
OF DISCHARGES
TO PIT (Mmhos, ^{o}C):

PIT DISPOSITION:
(Choose One)
Unlined?
Lined? (Show
type of lining)
Tank? (Show
type fo tank)

DEPTH TO
GROUND WATER:

MEASURED OR
ESTIMATE:

1) If no primary pit is present or if discharge is to an ancillary pit, indicate which ancillary pit received produced water.

2) Ancillary pits include blowdown pits, dehydrator pits, tank drain pits, pipeline drip pits, etc. (Use separate sheet if needed)

50 YEARS

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

1935 - 1985

TONEY ANAYA
GOVERNOR

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May 23, 1985

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Santa Fe, NM 87501

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Sincerely,

Jeff Taylor
General Counsel

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P.O. Box 2307
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OCD DRAFT 5/22/85

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(List Information for only those pits operated by you at the lease)

WELL AND LEASE NAME:
LOCATION:

	PRIMARY PIT[1]	AUXILLARY PIT(s)[2] PIT 1	PIT 2	PIT 3
USE:	PRODUCED WATER			

DIMENSIONS:
(LxWxD, Ft.)

DISCHARGE:
(Bbl/day)

HOW MEASURED:
(Choose One)
Counter?
Flowmeter?
Other?
(Specify)

VOLUME PER DUMP:

DATE LAST
MEASURED:

CONDUCTIVITY & TEMP.
OF DISCHARGES
TO PIT (Mmhos, ^{o}C):

PIT DISPOSITION:
(Choose One)
Unlined?
Lined? (Show
type of lining)
Tank? (Show
type fo tank)

DEPTH TO
GROUND WATER:

MEASURED OR
ESTIMATE:

1) If no primary pit is present or if discharge is to an ancillary pit, indicate which ancillary pit received produced water.

2) Ancillary pits include blowdown pits, dehydrator pits, tank drain pits, pipeline drip pits, etc. (Use separate sheet if needed)

Jason Kellahin
W. Thomas Kellahin
Karen Aubrey

KELLAHIN and KELLAHIN
Attorneys at Law
El Patio - 117 North Guadalupe
Post Office Box 2265
Santa Fe, New Mexico 87504-2265

Telephone 982-4285
Area Code 505

RECEIVED
MAY 2 1985
OIL CONSERVATION DIVISION

May 21, 1985

Mr. Richard L. Stamets
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87504

"Hand Delivered"

Re: OCC Case 8224

Dear Mr. Stamets:

Please find enclosed an original and one copy of Tenneco Oil Company's post hearing documents.

Very truly yours,

W. Thomas Kellahin

WTK:ca
Enc.

cc: Jeff Taylor, Esq. - w/enc.
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87504

Jennifer Pruitt, Esq. - w/enc.
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Santa Fe, New Mexico 87501

Millard F. Carr, Esq.
Tenneco Oil Company
P. O. Box 3249
Englewood, Colorado 80155

cc: Mr. Marty Buys
Tenneco Oil Company
P. O. Box 3249
Englewood, Colorado 80155

Memo

From
FRANK T. CHAVEZ
District Supervisor

To Dave Boyer

Daily
Shipyard leaked oil into the ground.

Jeff - This is a good example of the type of thing that's can happen due to a malfunction. Usually the seepage would go undetected. In the vulnerable area, it is imperative to have lined facilities to prevent this, in addition to protection from routine dumps. Dave

ALLIED Union Texas Petroleum

P. O. Box 1290
Farmington, NM 87499
Telephone (505) 325-3587

March 27, 1985

New Mexico Oil Conservation
1000 Rio Brazos Road
Aztec, NM 87410

RE: Saiz No. 1 Well Basin Dakota pool
1840' FSL; 2310' FWL
Section 20, T29N, R11W, N.M.P.M.
San Juan County, New Mexico

(See attached Schematic)

On March 15, 1985, Mr. Charles Gholson, Deputy Oil and Gas Inspector for the State of New Mexico, Energy and Minerals Department of the Oil Conservation Division, Division III called to report an oil seepage east of our Saiz No. 1 well. The seepage was directly adjacent to the sast side of the location in a natural dry drainage area running north and south. The water course drains into a second dry water course running from northwest to southeast. The oil seepage had not yet entered into the northwest to southeast water course, but surface seepage indicated that the seepage had progressed about 300 feet and was within 50 feet of entering the second dry water course.

Upon receiving the call we immediately dispatched the roustabout crew to the location with a backhoe. Several test holes were dug to determine the depth and source, but we were unable to determine the source and we could not dig deep enough with the equipment on location.

We immediately shut the well in and pressure tested the pipeline from Gas Company of New Mexico dehydrator to the well tie in to the main gathering line while we were waiting for a truck from Gary Energy Corporation to arrive to pull the oil from the tank. After the truck was emptied our roustabout crews lifted the 500 BBL tank from it's foundation and visually inspected the bottom for leakage and no leaks were found. The tank was re-set and the line from the wellhead to our separator was dug out and visually inspected. No leaks were found.

The line from the separator to the dehydrator was dug out and visually inspected. No leaks were found and the pipeline coating was found to be in excellent condition.

The Gas Company of New Mexico dehydrator had a scrubber on the dehydrator skid with an automatic dump valve which vented into an open, unlined pit adjacent to the oil seepage. This line from the scrubber to the open pit was removed and a new line was installed to dump back into the low pressure separator and into our stock tank.

The pressure test from the dehydrator to the well tie in to the main gathering line tie in held the pressure test with no leakage.

Gas Company of New Mexico had a pipeline traversing the north side of our location from a Pictured Cliffs well immediately adjacent to our Saiz No. 1 well. They also had an 8" and a 4" pipeline paralleling the east side of our location approximately 150 feet from the east boundary of our well location. We requested that they do a leak survey on all three of these lines for possible leakage problems. They subsequently did these leak detection surveys and reported that the surveys were all negative.

Mr. Gholson then recommended that we dig the entire seepage area up and burn any oil or gas encountered as it was dug up to remove the oil and gas. This was subsequently done for the entire area of oil contamination to a depth of 10 feet. It was subsequently determined that the contamination source appeared to be from the open, unlined pit installed by Gas Company of New Mexico and used to dump oil into from the scrubber on their dehydrator. This pit was removed and the area dug up and the contamination burned.

It is estimated that approximately 50 BBLs of oil were lost into this pit causing the seepage.

The Saiz No. 1 separator dumped the water from the well into a fiberglass lined pit and the water was drained off of the stock tank into this same lined pit.

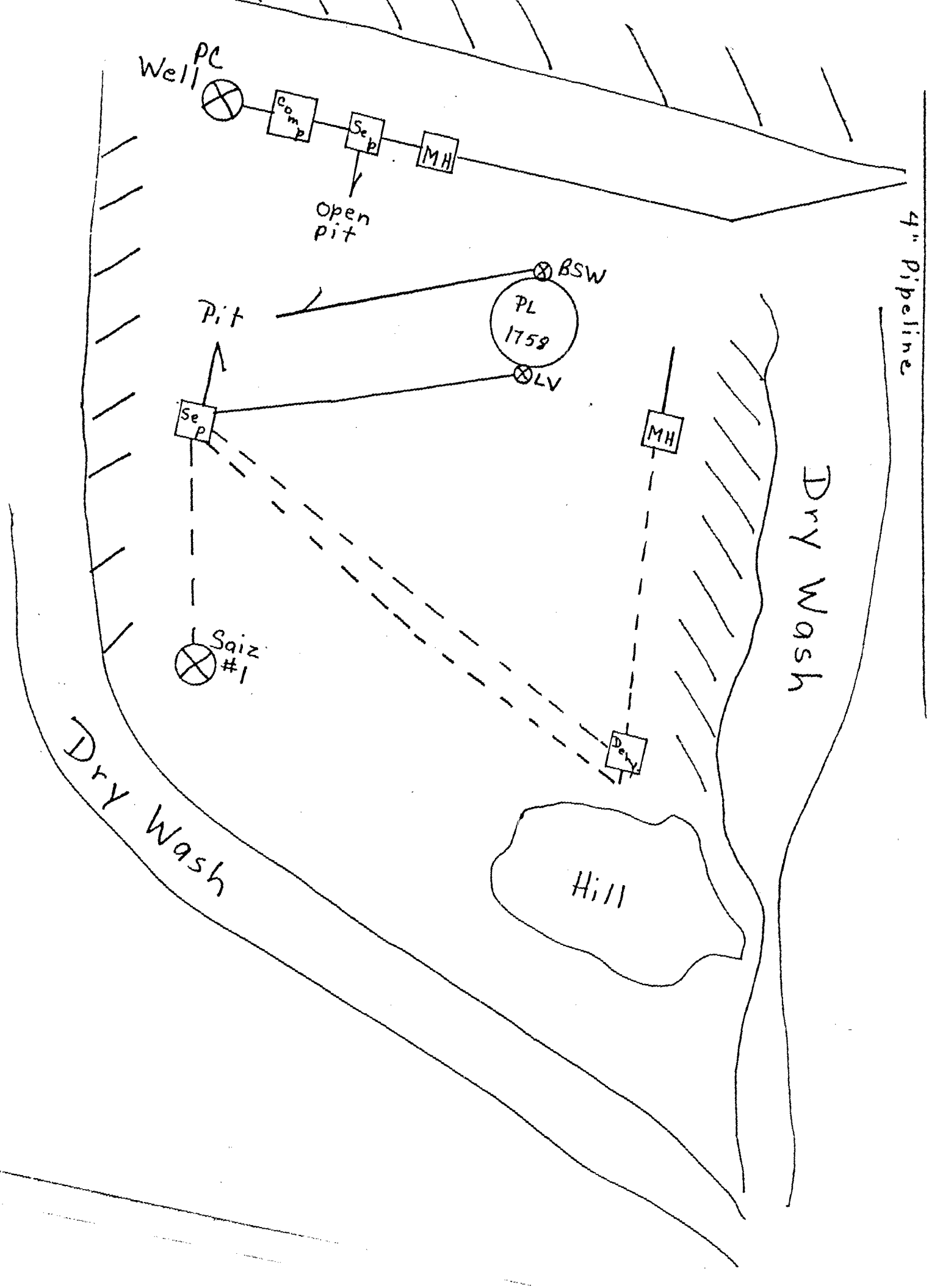
The Pictured Cliffs well on the same location is operated by another operator and the water from that well was being dumped into an open, unlined pit. The pit did not appear to have any produced oil in it, however, it did appear to be making a good quantity of salt water.

We have left two open holes in the area which has been dug out and will be monitored by Mr. Gholson and ourselves for assurance that the seepage has been stopped.

R. D. Motto
Area Operations Manager

RDM:svr

cc: BLM-Minerals Management Dept.
Mr. W. N. Hahne
Mr. K. E. Roddy
Mr. B. E. Brown
Mr. C. E. Smith


Well
PC
Comp
Sep
MH
Open pit
4" Pipeline
BSW
PL 1759
LV
Pit
Sep
MH
Saiz #1
Dry Wash
Dry Wash
Hill
Dry

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

S. E. REYNOLDS
STATE ENGINEER

May 15, 1985

BATAAN MEMORIAL BUILDING
STATE CAPITOL
SANTA FE, NEW MEXICO 87503

Dick Stamets
New Mexico Oil
Conservation Division
Box 2088
Santa Fe, New Mexico 87501

Dear Mr. Stamets:

In response to your letter dated March 15, 1985, this is to advise you that all underground waters in the State of New Mexico containing 10,000 milligrams/liter or less of dissolved solids is hereby designated by the State Engineer pursuant to Section 70-2-12-B. (15) NMSA, 1978. This designation supercedes all previous designations pertaining to underground water.

The water in water table lakes should not be contaminated even though they contain more than 10,000 milligrams/liter of total dissolved solids unless it can be shown that contamination of the lake will not adversely affect the underground water hydrologically connected to the lake.

The surface waters of all streams within the State of New Mexico regardless of the quality of the water within any given reach should be protected.

For your information I am attaching a memorandum dated April 10, 1967, and the map mentioned therein which shows the areas and formations in which water of 10,000 parts per million or less commonly occur. This is the same information which was submitted to your office by Frank Irby on April 13, 1967.

Sincerely,

S. E. Reynolds
State Engineer

By: M. B. Compton
M. B. Compton, Chief
Water Rights Division

MBC:rav

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

3/16

85 MAR 18 P 3:35

STATE ENGINEER OFFICE
SANTA FE NEW MEXICO

TONEY ANAYA
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

March 15, 1985

Mr. S. E. Reynolds,
State Engineer
101 Bataan Bldg.
Santa Fe, NM 87503

Dear Steve:

I am writing relative to getting an updated determination from you of the definition of "fresh water supplies" under the provisions of Section 70-2-12 B.(15) NMSA, 1978 compilation (copy enclosed).

I have enclosed a copy of the April 13, 1967, letter from you to Pete Porter on this matter. The letter references an earlier determination as to surface waters but that determination is not in evidence. We are thinking of revising some of our general rules to prohibit contamination of "fresh waters", both surface and subsurface, and it could be useful to have a new determination which clearly defines what must be protected.

Sincerely,

R. L. STAMETS
Director

RLS/dp

Encs.

March 21 1985

Tim Wright:
Brad would like you to
prepare a draft response
to Steve's letter attached

Ed Kogers

March 29, 1985

M.B. Compton, Chief, Water Rights Division

James I. Wright, Field Engineer

Draft of letter to Oil Conservation Division regarding the Protection of Fresh Water.

The statement regarding protection of surface water is my own opinion. I do not know what standard that we gave them originally but Steve probably does. I am not attaching the map or memo referred to in my letter. You can get a copy from Lou. I have reviewed the map and see no reason to revise it. It also might be a good idea to include groundwater discharging into stream systems in the paragraph with water table lakes.

James I. Wright
Field Engineer

JIW/tmg

April 13, 1967

Mr. A. L. Porter, Jr.
Secretary-Director
Oil Conservation Commission
Santa Fe, New Mexico

Dear Mr. Porter:

All underground water in the State of New Mexico containing 10,000 parts per million or less of dissolved solids is hereby designated by the State Engineer pursuant to Section 65-3-11.(15) N.M.S.A., 1953 Compilation; except that this designation shall not include any water for which there is no present or reasonably foreseeable beneficial use that would be impaired by contamination. This designation supercedes all previous designations pertaining to underground water.

For your information I am attaching a memorandum dated April 10, 1967 and the map mentioned therein which shows the areas and formations in which water of 10,000 parts per million or less commonly occurs.

The surface water designation previously made remains unchanged.

FEI/ma
encl.

Yours truly,

S. E. Reynolds
State Engineer

By:
Frank E. Irby
Chief
Water Rights Div.

ILLEGIBLE

M E M O R A N D U M

April 10, 1967

To: Chief, Water Rights Division
(Through Chief, Technical Division)

From: Chief, Hydrology Section, Technical Division

Subject: Designation of fresh-water supplies to be protected against contamination, as authorized by Section 65-3-11(15), New Mexico Statutes Annotated, 1953 Compilation, 1965 Supplement.

Section 65-3-11(15), New Mexico Statutes Annotated, 1953 Compilation, 1965 Supplement, is concerned with prevention of contamination of fresh-water supplies resulting from disposal of water produced or used in connection with the drilling for or production of oil or gas.

Sections 65-3-11(1) and 65-3-11(2) appear to make adequate provision for the protection of ground waters from hazards incident to wildcat and oil-well drilling and in completion of production wells.

It is believed that the intent of the legislation pertinent here is to provide reasonable protection against deterioration of the chemical quality of water presently usable or being used for domestic, irrigation, or stock-water supplies and water that could be made usable for such purposes by treatment methods now generally employed by municipalities and methods commonly used in treating individual household supplies. Such water is considered to be "fresh" within the meaning of the subject legislation.

Many irrigation water supplies in the Pecos Valley and in the Tularosa area contain more than 3,000 ppm dissolved solids and some water containing as much as 5,000 ppm dissolved solids is used. Water containing more than about 3,000 ppm dissolved solids ordinarily is considered to be too highly mineralized for use as irrigation water but evidently may be used beneficially in favorable environmental situations.

Numerous stock-water supplies in the State contain between 2,000 and 3,000 ppm dissolved solids and many contain as much as 5,000 ppm dissolved solids. A number of stock wells in southeastern New Mexico are known to produce water containing between 5,000 ppm and 9,260 ppm dissolved solids and one stock well produces water containing 17,200 ppm dissolved solids. Water containing much more than 5,000 ppm dissolved solids probably could not be practically used continuously for stock-watering purposes but water containing more than 10,000 ppm dissolved solids may be used temporarily in special or emergency circumstances (see California Water Quality Control Board Publication No. 3A, "Water Quality Criteria," 1963, pp. 112-113).

It would appear, then, that waters containing 5,000 ppm or less dissolved solids should be afforded definite protection against possible deterioration of chemical quality and it is suggested that provision for protection of supplies containing 10,000 ppm dissolved solids or less be

made in those areas where water of better quality is not available and where such water is usable or is currently being used for livestock watering purposes.

Deterioration of chemical quality of existing water supplies may occur directly or indirectly in several ways as a result of disposal of oil-field wastes:

1) Oil-field wastes placed in unlined pits will seep through the bottoms and sides of the pits and enter shallow fresh-water aquifers (such as occur in the Ogalalla formation and other Cenozoic formations found in widespread areas of New Mexico). The wastes, upon reaching the saturated zone, will tend to move to the lower parts of the aquifer because the density of the wastes is usually greater than that of the water in the aquifer. The wastes may then spread laterally as they move downdip or they may be primarily confined to topographic erosion channels. Obviously the degree of deterioration of fresh waters that will result will depend upon the rate at which wastes are disposed, the length of time the disposal operations are continued, the quality of the disposed wastes, the local geohydrology in each instance and the degree of pumping of fresh water in the vicinity of the pits.

2) Direct injection of wastes into the fresh-water zones of an aquifer by means of disposal wells would have much the same effect as pit disposal operations except that relatively deep as well as near-surface water supplies could be affected and the effects might spread more rapidly than in the case of pit disposal, other things being equivalent.

3) As an example of indirect deterioration of fresh-water supplies as a result of displacement of water of poor quality, consider a formation which contains water of both good and poor chemical quality in different areas or zones. If wastes are introduced into the areas or zones containing the poor quality water, or even into adjacent formations hydraulically connected, the poor quality water will migrate because of displacement into the areas or zones of good quality water. Obviously, as for 1) above, the impairment that would result in the areas or zones of good quality water will depend upon the magnitude of the disposal operation, its time of continuance, and the hydraulic and hydrologic properties of the formation under consideration.

4) Consider next a formation which discharges water of poor quality to a stream through springs or seeps, or indirectly through other formations. Introduction of wastes into such formations, even in areas of poor quality water, will increase the rate of accretion of poor quality water to the stream and could result in serious impairment to the quality of the stream water, particularly during periods of low flow.

All formations, deposits, or rocks younger than Cretaceous in age at most places in the State of New Mexico contain fresh-water supplies (if they contain water at all) which should be afforded protection.

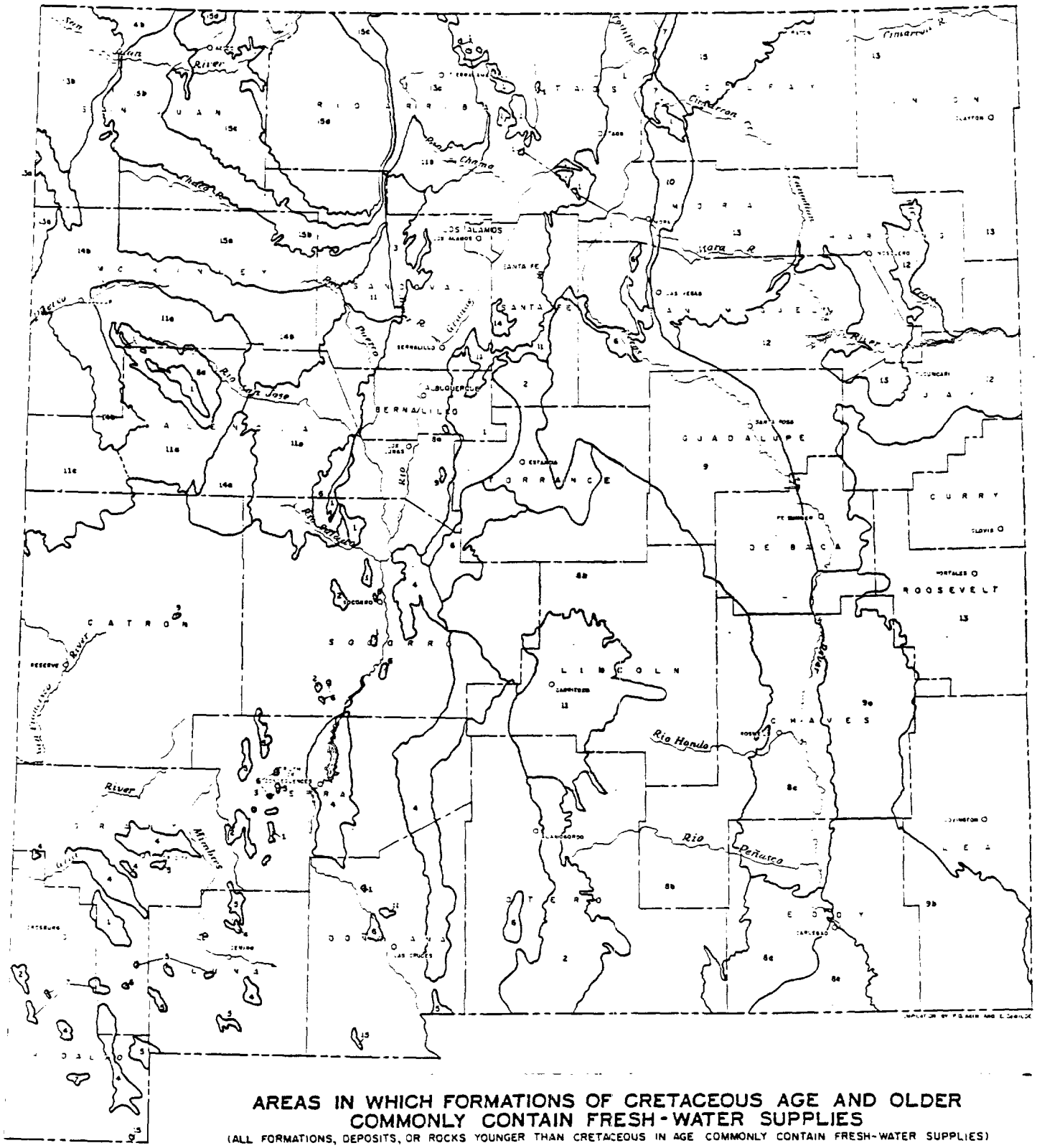
The attached map shows on a broad formation-area basis the areas in which fresh-water supplies commonly are found in formations of Cretaceous age and older in the areas delineated. It must be realized that the facts pertinent to many of the areas shown on the map are incompletely known and that revision from time to time as information is gained will be desirable. In the meantime, however, the map should serve as a guideline to interested persons.

Although this memorandum is primarily oriented to a discussion of ground-water supplies, the effect of disposal of oil-field wastes on surface-water supplies used for domestic, stock, municipal, industrial, irrigation and recreation purposes must be considered also. In general, all surface-water supplies of the State can be considered "fresh" under the definition stated above. Some reaches of some streams may have part-time flows wherein the stream waters will contain more than 5,000 ppm dissolved solids but these conditions should not be aggravated.

P. D. Akin

P. D. Akin

PDA:mm
Attachment



AREAS IN WHICH FORMATIONS OF CRETACEOUS AGE AND OLDER COMMONLY CONTAIN FRESH-WATER SUPPLIES

(ALL FORMATIONS, DEPOSITS, OR ROCKS YOUNGER THAN CRETACEOUS IN AGE COMMONLY CONTAIN FRESH-WATER SUPPLIES)

EXPLANATION

1. Precambrian through Pennsylvanian
2. Precambrian through Permian
3. Precambrian through Triassic
4. Precambrian through Cretaceous
5. Cambrian through Cretaceous
6. Pennsylvanian through Permian
7. Pennsylvanian through Cretaceous
8. Permian
   - 8a — Abo ss. — San Andres ls.
   - 8b — Yeso fm. — San Andres ls.
   - 8c — San Andres ls. — Tansill fm.
   - 8d — San Andres ls. & equivalent — Guadalupe Series
   - 8e — Capitan ls. & equivalent — Rustler fm.
9. Permian through Triassic
   - 9a — Seven River fm. — Triassic
   - 9b — Rustler fm. — Triassic
10. Permian through Jurassic
11. Permian through Cretaceous
    - 11a — Yeso fm. — Mesaverde gp.
    - 11b — Cutler fm. — Mesaverde gp.
    - 11c — Glorieta ss. — Mesaverde gp.
12. Triassic through Jurassic
13. Triassic through Cretaceous
    - 13a — Triassic — Mancos sh.
    - 13b — Triassic — Point Lookout ss.
    - 13c — Triassic — Lewis sh.
14. Jurassic through Cretaceous
    - 14a — Morrison fm. — Point Lookout ss.
    - 14b — Morrison fm. — Mesaverde gp.
15. Cretaceous
    - 15a — Point Lookout ss. — Cliff House ss.
    - 15b — Cliff House ss. — McDermott fm.
    - 15c — Lewis sh. — Ojo Alamo ss.
    - 15d — San Jose fm.

NOTE: THIS MAP IS AN INTEGRAL PART OF A STATE ENGINEER OFFICE MEMORANDUM DATED APRIL 10, 1967 FROM CHIEF, HYDROLOGY SECTION, P.O. MANN TO CHIEF, WATER RIGHTS DIVISION, (F.E. 1987) REQUIRING DESIGNATION OF FRESH-WATER SUPPLIES TO BE PROTECTED.

History: Laws 1925, ch. 118, § 3; C.S. 1929, § 97-303; 1941 Comp., § 69-105; 1953 Comp., § 65-2-5.

ARTICLE 2

Oil Conservation Commission; Division; Regulation of Wells

70-2-1. Short title.

Sections 70-2-1 through 70-2-36 NMSA 1978 may be cited as the "Oil and Gas Act."

History: 1953 Comp., § 65-3-1.1, enacted by Laws 1977, ch. 237, § 1.

Law review. — For article, "'New Mexican Nationalism' and the Evolution of Energy Policy in New Mexico," see 17 Nat. Resources J. 283 (1977).

70-2-2. [Waste prohibited.]

The production or handling of crude petroleum oil or natural gas of any type or in any form, or the handling of products thereof, in such manner or under such conditions or in such amounts as to constitute or result in waste is each hereby prohibited.

History: Laws 1935, ch. 72, § 1; 1941 Comp., § 69-202; Laws 1949, ch. 168, § 1; 1953 Comp., § 65-3-2.

Cross-reference. — As to regulation and conservation of carbon dioxide gas, see 70-2-34 NMSA 1978.

Legislative intent. — Primary concern of oil and gas legislation is eliminating and preventing waste in the pool so far as it can practicably be done, and also the protection of correlative rights of producers from the pool. El Paso Natural Gas Co. v. Oil Conservation Comm'n, 76 N.M. 268, 414 P.2d 496 (1966).

Two fundamental powers and duties of commis-

History: Laws 1935, ch. 72, § 4; 1941 Comp., § 69-205; Laws 1949, ch. 168, § 4; 1953 Comp., § 65-3-5; Laws 1965, ch. 58, § 2; 1977, ch. 255, § 41; 1979, ch. 175, § 1.

The 1979 amendment added the second sentence in Subsection B.

70-2-12. Enumeration of powers.

A. Included in the power given to the division is the authority to collect data; to make investigations and inspections; to examine properties, leases, papers, books and records; to examine, check, test and gauge oil and gas wells, and tanks, plants, refineries and all means and modes of transportation and equipment; to hold hearings; to provide for the keeping of records and the making of reports and for the checking of the accuracy thereof; to limit and prorate production of crude petroleum oil or natural gas, or both, as in this act [this section] provided; to require either generally or in particular areas certificates of clearance or tenders in connection with the transportation of crude petroleum oil or natural gas or any products thereof, or both such oil and products, or both such natural gas and products.

B. Apart from any authority, express or implied, elsewhere given to or existing in the division by virtue of this act [this section] or the statutes of this state, the division is hereby authorized to make rules, regulations and orders for the purposes and with respect to the subject matter stated herein, viz.:

(1) to require dry or abandoned wells to be plugged in such a way as to confine the crude petroleum oil, natural gas or water in the strata in which they are found, and to prevent them from escaping into other strata; the division shall require a corporate surety bond in a sum not to exceed fifty thousand dollars ($50,000) conditioned for the performance of such regulations;

(2) to prevent crude petroleum oil, natural gas or water from escaping from strata in which they are found into another stratum or other strata;

(3) to require reports showing locations of all oil or gas wells, and for the filing of logs and drilling records or reports;

(4) to prevent the drowning by water of any stratum or part thereof capable of producing oil or gas, or both oil and gas, in paying quantities, and to prevent the premature and irregular encroachment of water, or any other kind of water encroachment, which reduces or tends to reduce the total ultimate recovery of crude petroleum oil or gas, or both such oil and gas, from any pool;

(5) to prevent fires;

(6) to prevent "blow-outs" and "caving" in the sense that the conditions indicated by such terms are generally understood in the oil and gas business;

(7) to require wells to be drilled, operated and produced in such manner as to prevent injury to neighboring leases or properties;

(8) to identify the ownership of oil or gas producing leases, properties, wells, tanks, refineries, pipelines, plants, structures and all transportation equipment and facilities;

(9) to require the operation of wells with efficient gas-oil ratios and to fix such ratios;

(10) to fix the spacing of wells;

(11) to determine whether a particular well or pool is a gas or oil well, or a gas or oil pool, as the case may be, and from time to time to classify and reclassify wells and pools accordingly;

(12) to determine the limits of any pool or pools producing crude petroleum oil or natural gas or both, and from time to time redetermine such limits;

(13) to regulate the methods and devices employed for storage in this state of oil or natural gas or of any product thereof including subsurface storage;

(14) to permit the injection of natural gas or of any other substance into any pool in this state for the purpose of repressuring, cycling, pressure maintenance, secondary or any other enhanced recovery operation;

(15) to regulate the disposition of water produced or used in connection with the drilling for or producing of oil or gas, or both, and to direct surface or subsurface disposal of such water in a manner that will afford reasonable protection against contamination of fresh water supplies designated by the state engineer;

(16) to determine the limits of any area containing commercial potash deposits and from time to time redetermine such limits;

(17) to regulate and where necessary prohibit drilling or producing operations for oil or gas within any area containing commercial deposits of potash where such operations would have the effect unduly to reduce the total quantity of such commercial deposits of potash which may reasonably be recovered in commercial quantities or where such operations would interfere unduly with the orderly commercial development of such potash deposits; or

(18) to spend the oil and gas reclamation fund and do all acts necessary and proper to plug dry and abandoned oil and gas wells in accordance with the provisions of the Oil and Gas Act [70-2-1 to 70-2-36 NMSA 1978] and the Public Purchases Act [13-1-1 to 13-1-27 NMSA 1978] including disposing of salvageable equipment and material removed from oil and gas wells being plugged by the state.

History: 1953 Comp., § 65-3-11, enacted by Laws 1978, ch. 71, § 1.

Repeals and reenactments. — Laws 1978, ch. 71, § 1, repeals 65-3-11, 1953 Comp. (former 70-2-12 NMSA 1978), relating to enumeration of powers, and enacts the above section.

Effective dates. — Laws 1978, ch. 71, § 2, makes the act effective on March 31, 1978.

Emergency clauses. — Laws 1978, ch. 71, § 3, makes the act effective immediately. Approved February 24, 1978.

70-2-13. Additional powers of commission or division; hearings before examiner; hearings de novo.

In addition to the powers and authority, either express or implied, granted to the oil conservation commission or division by virtue of the statutes of the state of New Mexico, the division is hereby authorized and empowered in prescribing its rules of order or procedure in connection with hearings or other proceedings before the division to provide for the appointment of one or more examiners to be members of the staff of the division to conduct hearings with respect to matters properly coming before the division and to make reports and recommendations to the director of the division with respect thereto. Any member of the commission or the director of the division or his authorized representative may serve as an examiner as provided herein. The division shall promulgate rules and regulations with regard to hearings to be conducted before examiners, and the powers and duties of the examiners in any particular case may be limited by order of the division to particular issues or to the performance of particular acts. In the absence of any limiting order, an examiner appointed to hear any particular case shall have the power to regulate all proceedings before him and to perform all acts and take all measures necessary or proper for the efficient and orderly conduct of such hearing, including the swearing of witnesses, receiving of testimony and exhibits offered in evidence subject to such objections as may be imposed, and shall cause a complete record of the proceeding to be made and transcribed and shall certify the same to the director of the division for consideration together with the report of the examiner and his recommendations in connection therewith. The director of the division shall base the decision rendered in any matter or proceeding heard by an examiner upon the transcript of testimony and record made by or under the supervision of the examiner in connection with such proceeding, and such decision shall have the same force and effect as if the hearing had been conducted before the director of the division. When any matter or proceeding is referred to an examiner and a decision is rendered thereon, any party of record adversely affected shall have the right to have the matter heard de novo before the commission upon application filed with the division within thirty days from the time any such decision is rendered.

History: 1953 Comp., § 65-3-11.1, enacted by Laws 1955, ch. 235, § 1; 1961, ch. 62, § 1; 1977, ch. 255, § 48; 1981, ch. 63, § 1.

The 1981 amendment substituted "of" for "or" preceding "order" near the middle of the first sentence, substituted "the" for "said" preceding "hearing" near the end of the fifth sentence and preceding "matter" near the middle of the last sentence and inserted "of record" following "party" near the middle of the last sentence.

CAMPBELL & BLACK, P.A.
LAWYERS

JACK M. CAMPBELL
BRUCE D. BLACK
MICHAEL B. CAMPBELL
WILLIAM F. CARR
BRADFORD C. BERGE
J. SCOTT HALL
PETER N. IVES
LOURDES A. MARTINEZ

JEFFERSON PLACE
SUITE I - 110 NORTH GUADALUPE
POST OFFICE BOX 2208
SANTA FE, NEW MEXICO 87501
TELEPHONE: (505) 988-4421
TELECOPIER: (505) 983-6043

May 14, 1985

Mr. R. L. Stamets, Chairman
Oil Conservation Commission
Post Office Box 2088
Santa Fe, New Mexico 87504

Re: Oil Conservation Commission Case 8224: Produced Water Hearing, San Juan Basin.

Dear Mr. Stamets:

Enclosed are the two papers which Dr. Gary D. Miller, witness for Northwest Pipeline Corporation, was asked on April 22, 1985 to provide for inclusion in the record in the above-captioned case. As you will note, the paper entitled "Influence of Microbial Adaption on the Fate of Organic Pollutants in Ground Water" contains the information requested concerning contamination at a creosote site in Southern Texas.

Very truly yours,

William F. Carr

WFC/cv
enclosures

cc: Lori Komatar (w/encl.)
Jeff Taylor (w/encl.)
Jennifer Pruitt (w/encl.)
W. Thomas Kellahin (w/encl.)
W. Perry Pearce (w/encl.)
Millard F. Carr (w/encl.)
Marty Buys (w/encl.)

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

TONEY ANAYA
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

May 9, 1985

Ms. Denise Fort
Chairman, NM Water Quality
Control Commission
P.O. Box 968
Santa Fe, NM 87504-0968

Re: OCD Action Relating to
Regulation of Disposal
of Produced Water and
Oil Field Wastes

Dear Ms. ~~Fort~~ Denise:

The purpose of this letter is to advise the Water Quality Control Commission of proposed OCD action to obtain information from oil field service companies on the types, volumes, and location of waste water discharges, and to solicit WQCC concurrence of this action.

At the time the OCD's Environmental Bureau was formed in July, 1984, an "Environmental Schedule" was drawn up to give general guidance to the new staff and the Division as a whole as to the type of activities to be conducted and to indicate what priority was to be given to the differing tasks. As an example, processing of discharge plans for natural gas plants and refineries, and development of a "no-unlined pit" order for vulnerable areas in the San Juan Basin were considered the most important issues to be addressed by the two new staff persons. Included in the environmental schedule is a requirement that staff "investigate the need for better control of salt water (trucked) and other field wastes and recommend rules, procedures, or other appropriate actions to deal with any problems found."

Recent events, including the Lee Acres landfill incident and OCC hearings related to San Juan Basin produced water disposal, show the need for immediate scrutiny of these disposal methods. To that end, the OCD has developed a letter to be sent to all oil field trucking and service companies requesting that they provide information on disposal methods. A copy of the letter and accompanying questionnaire is enclosed.

As mentioned in my April 26, 1985, letter to you, Section 70-2-12 B.(15) of the Oil and Gas Act clearly addresses our authority with regard to produced water. It is less clear as to whether waste waters generated by oil field service companies are or are not covered under this act.

If not, they would in any event be covered under the Water Quality Act. If WQCC Regulations are applicable, the question of whether the OCD or EID has the regulatory responsibility needs to be resolved. The delegation of authority resolution adopted at the May 8, 1984, WQCC meeting is silent on this matter.

This Division's desire in this matter is to take control of such discharges at this time and to regulate them under either the Oil and Gas Act or the Water Quality Act, whichever may be appropriate. The questionnaire we are proposing is for the purpose of making an initial assessment of the nature and extent of the potential problem. Once this assessment is made, appropriate actions can begin on a priority basis under the appropriate act. I solicit the Commission's concurrence in our plan to obtain discharge information, and exercise regulatory authority over these facilities.

I would appreciate this matter being placed on the agenda of the May 28, 1985, WQCC meeting for discussion and possible action.

Sincerely,

R. L. STAMETS
Director

RLS/dp

cc: Paul Biderman

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

TONEY ANAYA
GOVERNOR

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Dear Sir:

In response to recent events, the Oil Conservation Division is conducting a survey of well service companies operating within the State. A response to this survey is required to establish the gravity of potential pollution problems in the field.

Please check the appropriate categories describing operations at your facilities and fill-in blanks with short one or two word answers. A long, detailed description of company activities is not required at this time.

This survey is part of the OCD regulatory duties and responsibilities and it will be used to assess activities statewide. Your full cooperation is appreciated in this matter.

If there are any questions or more information is necessary, please call Jami Bailey in Santa Fe at (505) 827-5884.

Sincerely,

R. L. STAMETS,
Director

RLS/JB/dp

Enc.

cc: OCD District Office

WELL SERVICE COMPANIES
QUESTIONNAIRE

Check one or more, as applicable.

I. Types of Services Performed:

___ Vacuum Hauling/Tank Cleaning
___ Acidizing
___ Fracturing
___ Cementing
___ Drilling mud/additives
___ Other (Specify)

II. General Types of Products and Quantities Used in Service or Transported in 1984:

Quantity (bbls.)

___ Acids
___ Brines
___ Caustics
___ Drilling Mud/Additives
    ___ Corrosion Inhibitors
    ___ Surfactants/Polymers
    ___ Shale Control Inhibitors
___ Radioactive Tracers Returned from Wellbores or Pipelines
___ Oxygen Scavangers
___ Waste Oil
___ Produced Water
___ Other (Specify)

III. TYPE, QUANTITY, AND LOCATION OF WELL SERVICE FLUIDS AND SOLIDS, PRODUCED WATER, OR WASTE OIL DISPOSAL

TYPE OF FLUID OR SOLID	VOLUME (BARRELS)	DISPOSAL SITE (NO. FROM BELOW)	LOCATION	NATURE OF DISPOSAL LOCATION (LETTER FROM BELOW)

Disposal Sites

1. Well Site (Do not list all locations)
2. Sanitary Landfill
3. Evaporation Pond
4. Chemical Waste Tank
5. City Sewer
6. Company Facilities
7. Other (Specify)

Nature of Disposal Location

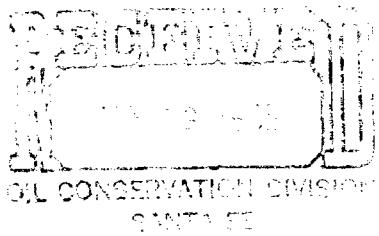
A. Lined Pit
B. Unlined Pit
C. Ground Surface
D. Above Ground Tank
E. Buried Tank
F. Other (Specify)

Jason Kellahin
W. Thomas Kellahin
Karen Aubrey

KELLAHIN and KELLAHIN
Attorneys at Law
El Patio - 117 North Guadalupe
Post Office Box 2265
Santa Fe, New Mexico 87504-2265

Telephone 982-4285
Area Code 505

May 9, 1985



Mr. Richard L. Stamets
Oil Conservation Commission
P. O. Box 2088
Santa Fe, New Mexico 87504

"Hand Delivered"

Re: Commission Case 8224
Produced Water Hearing
San Juan Basin

Dear Mr. Stamets:

I have had an opportunity to review the proposed order I submitted to the Commission at the hearing of the referenced case and find that certain proposed findings are contrary to the substantial evidence. Accordingly, I hereby withdraw the first proposed order and submit therefore the enclosed First Revised Proposed Order.

The original proposed order in Findings 15 and 17 and in Rule 2 and 3 assume that the risk of possible contamination to ground water is greater within 15 feet of the bottom elevation of the major river beds in the vulnerable area. That assumption is directly contrary to Tenneco's evidence at the hearing.

You will recall that Mr. Hick's exhibit for the Water Table elevation at the McCoy site shows a pit elevation of 5449.8 and the elevation of the Animas River at 5448.2 feet or a difference of only 1.6 feet. Also the Payne site pit elevation and the elevation of the San Juan River are within 15 feet.

Thus, the originally proposed findings which would have precluded small volume unlined produced water pits close to the river are not supported by the hydrologic testimony and accordingly are hereby withdrawn.

Very truly yours,

W. Thomas Kellahin

WTK:ca
Enc.

cc: Jeff Taylor, Esq.
Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87504

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Attorney at Law
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Frank Chavez
Oil Conservation Division
1000 Rio Brazos Road
Aztec, New Mexico 87410

May 3, 1985

Gary D. Miller
202 W. Boyd
Norman, Ok 73019

Mr. R.L. Stamets
Oil Conservation Division
New Mexico Energy and Minerals Department
Santa Fe, New Mexico 87501

Dear Mr. Stamets:

Enclosed are two papers that I promised during my recent testamony regarding biodegradation of benzene, toluene and related chemicals for Case 8224. The first paper, "Influence of Microbial Adaption on the Fate of Organic Pollutants in Ground Water", has been peer reviewed and accepted for the November issue of Environmental Toxicology and Chemistry. In it the authors report on a field study of contamination at a wood-creosote site in southern Texas. They found rapid biodegradation and adaption of the microorganisms including an active treatment zone over relatively short distances that resulted in extensive ground water renovation.

The second paper, "Behavior of Organic Compounds During Infiltration of River Water to Ground Water. Field Studies", describes a situation similar to that which occurs in the oil and gas production areas in northwest New Mexico. While there was no evidence of biological transformation of chlorinated organic compounds there is also no evidence that these occur from oil or natural gas production. Non-halogenated aromatics including benzene, toluene and naphthalene were biotransformed during infiltration. These chemicals were not found in any of the observation wells (page 476) and were not transported more than 2.5 meters from the river.

Congratulations on conducting a thourough and open hearing on this matter. I hope my testamony, including these two additional papers, is helpful for you to reach an informed decision. If I can be of further help feel free to call on me.

Very truly yours,

Gary D. Miller

Gary D. Miller, Ph. D.

50 YEARS

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

1935 - 1985

TONEY ANAYA
GOVERNOR

April 26, 1985

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

Denise Fort, Director
Environmental Improvement
Division
Crown Building
Santa Fe, New Mexico 87501

Dear Ms. Fort:

I am writing you to advise of this Division's plans relative to a survey of oil field service companies and to discuss cooperation between our two agencies.

Section 70-2-12 B.(15) states the Oil Conservation Division shall have the authority "to regulate the disposition of water produced or used in connection with the drilling for or producing of oil or gas, or both, and to direct surface or subsurface disposal of such water in a manner that will afford reasonable protection against contamination of fresh water supplies designated by the state engineer."

The language of this section does not make clear that waste water generated by oil field service companies is or is not covered. Our long range plans called for having this determination made and taking control of discharges of such waste water if appropriate.

The recent problem at the Lee Acres county landfill has emphasized the need for someone to move ahead in this area to obtain information from service companies relative to volumes and types of discharges they are making and the locations of such discharges. This information could then be used to evaluate if immediate action needs to be taken in any specific case to protect fresh waters. The information generated could also be used to develop a guide for sample collection or for a priority list for seeking discharge plans if such were required.

Pending resolution of the question, I intend to advise the WQCC of this proposed action and solicit their concurrence.

As to the matter of the cooperation between our agencies, it has come to my attention that EID personnel have apparently been taking pictures of a surface produced water disposal facility under OCD jurisdiction without any notice to our district office. Additionally, a person from your Hazardous Waste Bureau also inspected this same facility without first giving notice to our district office. Such actions have resulted in hard feelings on the part of our district personnel. Further, they are beginning to wonder if someone in EID is trying to get something on the OCD to "make us look bad".

I believe that this problem is not a sinister plot but results from a simple error of omission on the part of those who did this work without coordinating with our office. In establishing our Environmental Bureau last July, one of the priorities we gave its Bureau Chief was improving cooperation with the EID. When I became Division Director, I further advised the Bureau Chief that I considered cooperation with EID to be of the utmost importance as a simple matter of courtesy, to avoid duplication of effort and to take advantage of the expertise within your agency. The recent cooperation with members of the Ground Water Surveillance Section on installing monitoring wells at the Flora Vista site and in assisting OCD staff at the recent produced water hearings is a good example of the kind of mutually beneficial cooperation I have in mind.

With this background, I would like to suggest that we develop a joint memorandum to be directed to our staffs which would affirm the necessity for the personnel of the two agencies to cooperate and outline how such cooperation should occur.

Sincerely,

R. L. STAMETS
Director

RLD/dp

ARCO Oil and Gas Company
Rocky Mountain District
717-17th Street
Mailing address: P.O. Box 5540
Denver, Colorado 80217
Telephone 303 575 7000

April 1, 1985

Oil Conservation Division
for the State of New Mexico
P.O. Box 2088
Santa Fe, NM 87501

Gentlemen:

This is a statement for the record on the hearing called by the New Mexico Oil Conservation Commission, (OCD) to define the disposition of produced waters in the San Juan Basin of New Mexico specifically the counties of McKinley, Rio Arriba, Sandoval and San Juan counties.

My name is John Calder. I am District Environmental Coordinator, ARCO Oil and Gas Company, a Division of the Atlantic Richfield Company, with offices in Farmington, New Mexico and Denver, Colorado. I have a Bachelor of Science in Chemical Engineering from the University of Tennessee and have held my position in ARCO's Denver offices for eight and one-half years. I have been active and have chaired many industry/government committees and task forces including those of the American Petroleum Institute, Rocky Mountain Oil and Gas Association, U.S. Bureau of Land Management, and including your own short term water study committee to determine the disposition of produced waters in the San Juan Basin.

The data presented by Drs. Shultz and Miller indicate that an exemption for quantities under 5 barrels of water per day is justified even in the areas of possibly vulnerable ground water. ARCO strongly urges the Commission to establish this exemption. There is no conclusive evidence that the oil and gas industry has contributed in any way to ground water pollution in the San Juan Basin. Lacking such evidence, ARCO believes that an exemption is justified particularly in light of the substantial financial resources that would otherwise be expended. This position is based on the knowledge gained by our participation not only in the short term study committee of the OCD but also the study previously presented and supported by ourselves, El Paso Natural Gas Company, Meridian Oil and Northwest Pipeline Company.

ARCO realizes that the world's natural resources of air, water, and land are vital to mankind's global existence, progress, and continued development. We consider environmental protection to be a paramount concern in our total activities. In over 25 years of operating in the San Juan Basin, we have made it our policy to be a good environmental citizen.

Thank you very much for your attention.

Sincerely,

J. L. Calder, III
District Environmental Coordinator

JLC:rd

OCD EXHIBITS

50 YEARS

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT
OIL CONSERVATION DIVISION

1935 - 1985

TONEY ANAYA
GOVERNOR

March 18, 1985

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501
(505) 827-5800

To Persons Interested in San Juan Basin Produced Water Disposal (OCC Case 8224):

At the request of a number of persons who attended the February 20 OCC hearing in Santa Fe, the OCD is providing copies of exhibits and material referenced during direct examination of OCD staff. It is my intention that material attached herein not already entered as exhibits be admitted as OCD exhibits since they were referenced in our testimony.

A complete compilation of all produced water sampling results available to date and the corresponding field notes have also been prepared. Final typing of the data tables has delayed their inclusion in this mailing. These results will be mailed when ready.

If you have any questions please contact me at 827-5812.

Sincerely,

DAVID G. BOYER
Environmental Bureau

DGB/fd

enc.

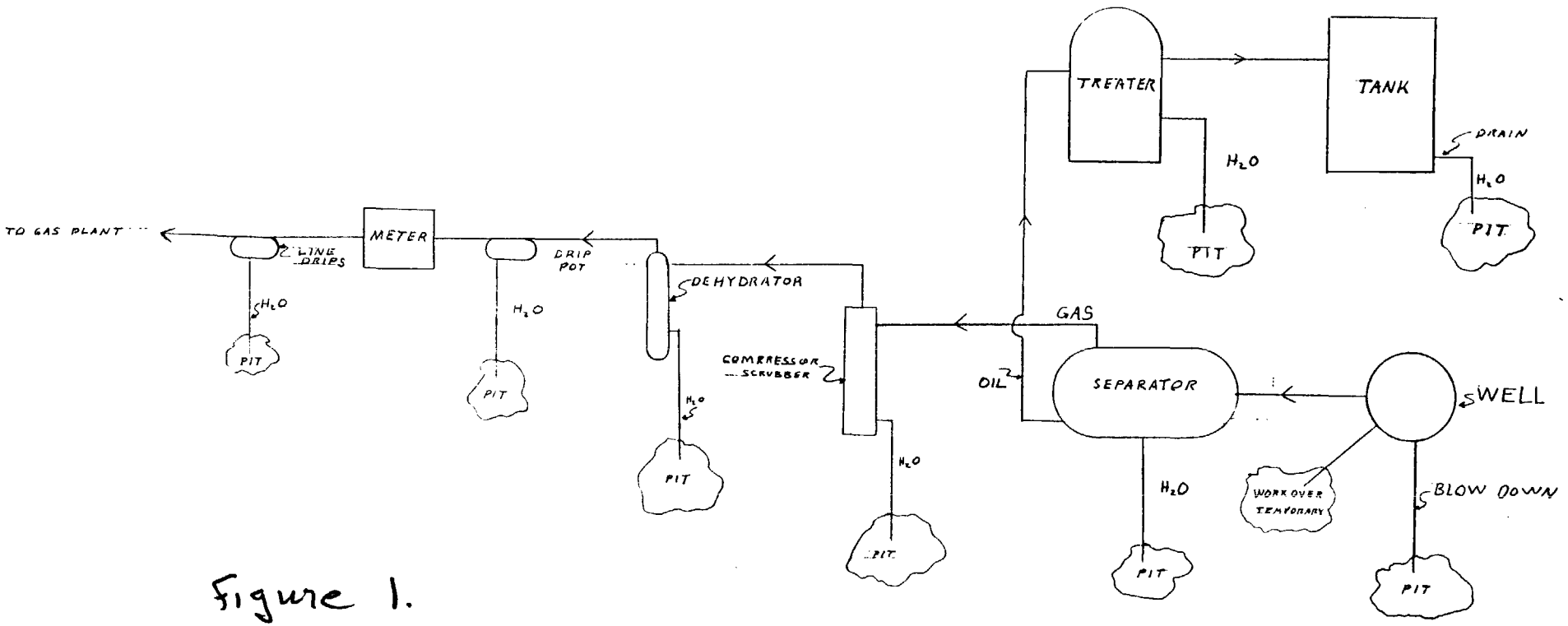
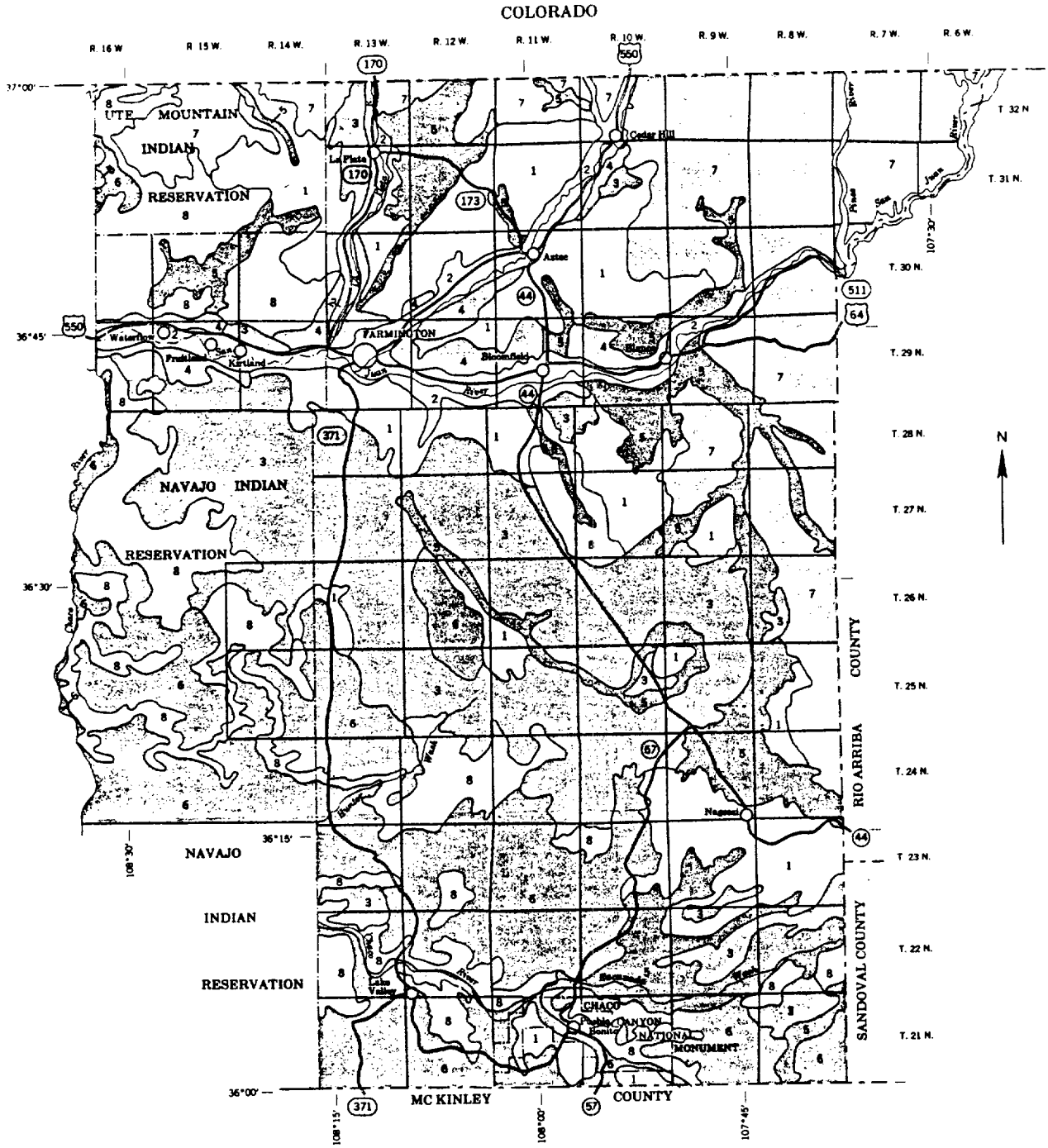


Figure 1.

POSSIBLE SOURCES OF PRODUCED WATER IN THE FIELD



MAP UNITS

1. Persayo-Fruitland-Sheppard: Very shallow to deep, nearly level to very steep, well drained to excessively drained soils that formed in alluvial, residual, and eolian material; on uplands and fans
2. Fruitland-Riverwash-Stumble: Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvium, and Riverwash; on fans and in valleys
3. Shiprock-Sheppard-Doak: Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvial and eolian material; on uplands
4. Haplargids-Blackston-Torriorthents: Very shallow to deep, nearly level to steep, well drained to excessively drained soils that formed in alluvium and residuum; on terraces, mesas, and plateaus
5. Blancot-Notal: Deep, nearly level to gently sloping, well drained to somewhat excessively drained soils that formed in alluvium; on valley sides, valley bottoms, and fans
6. Sheppard-Huerfano-Notal: Shallow to deep, nearly level to steep, well drained to somewhat excessively drained soils that formed in eolian material, alluvium, and residuum; on uplands, bottom lands, and fans
7. Travessilla Rock outcrop-Weska: Very shallow to deep, nearly level to extremely steep, well drained soils that formed in alluvium, residuum, and eolian material, and Rock outcrop; on uplands
8. Badland Rock outcrop-Monierco: Badland, Rock outcrop, and shallow, nearly level to gently sloping, well drained soils that formed in alluvial and eolian material; on uplands

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
BUREAU OF INDIAN AFFAIRS

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

SAN JUAN COUNTY, NEW MEXICO, EASTERN PART

Scale 1:506,880
1 0 1 2 3 4 5 6 7 Miles

figure 2

Compiled 1979

Each area outlined on this map ... more than one kind of soil. The ...

Figure 2 (con't)

2. Fruitland-Riverwash-Stumble

Deep, nearly level to moderately steep, well drained to somewhat excessively drained soils that formed in alluvium, and Riverwash; on fans and in valleys

This map unit consists of elongated areas in the northern part of the survey area. It is on fans and in valleys. Slope is 0 to 20 percent. The vegetation is dominantly grasses, sedges, and hardwood trees along drainageways. Elevation is 4,800 to 6,400 feet. The average annual precipitation is 6 to 10 inches, and the average annual air temperature is 51 to 55 degrees F.

This unit makes up about 5 percent of the survey area. It is about 21 percent Fruitland soils, 20 percent Riverwash, 12 percent Stumble soils, and 8 percent Turley soils. The remaining 39 percent is Garland, Walrees, Werlog, Green River, and Youngston soils, Fluvaquents, and other soils of minor extent.

Fruitland soils are on fans and in valleys. These soils are deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is brown sandy loam. The underlying material is pale brown and light yellowish brown sandy loam.

Riverwash is in streambeds and arroyos and on flood plains. It consists of unstabilized sandy, silty, clayey, and gravelly sediment that is frequently flooded and reworked by water. It supports little or no vegetation.

Stumble soils are on fans and in valleys. These soils are deep and somewhat excessively drained. They formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is yellowish brown loamy sand. The upper part of the underlying material is pale brown and light yellowish brown sand and loamy sand. The lower part is brownish yellow gravelly sand, gravelly loamy sand, and sand.

Turley soils are on fans and in valleys. These soils are deep and well drained. They formed in alluvium derived dominantly from sandstone and shale. Typically, the surface layer is grayish brown clay loam. The underlying material is grayish brown, light brownish gray, and light yellowish brown clay loam.

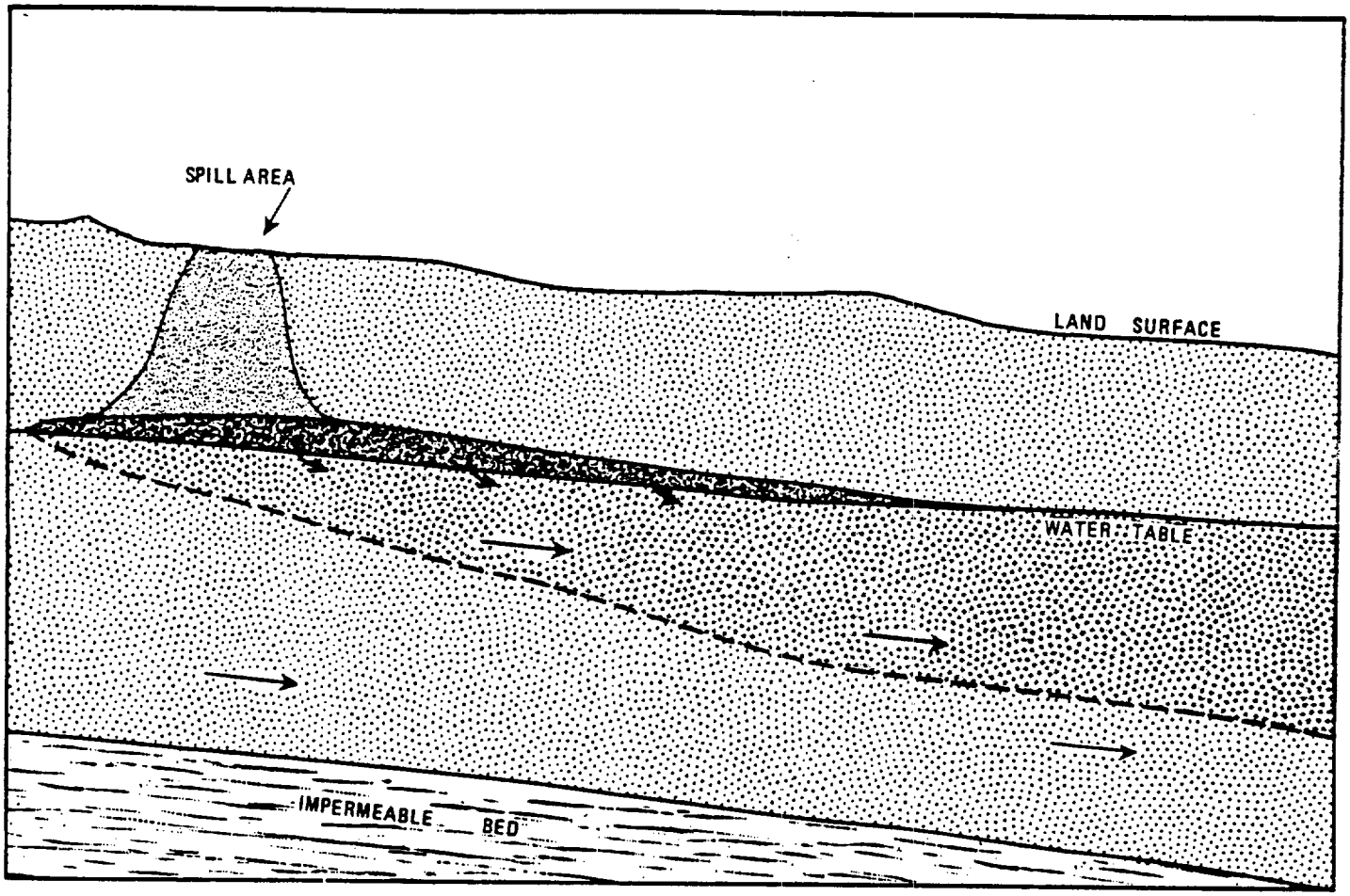
Areas of water, such as lakes, rivers, large storage ponds, and reservoirs, are in this unit.

This unit is used for irrigated crops, urban development, recreation, and wildlife habitat.

This unit provides habitat for wetland, woodland, and openland wildlife. The major limitation is urban encroachment. The wetland wildlife habitat consists of sedges and cattails and areas of shallow water. It provides food and cover for wildlife such as ducks, geese, heron, muskrat, and beaver. Suitable wildlife habitat improvement practices include the development of wetland areas.

The woodland wildlife habitat along the drainageways consists of Fremont cottonwood, Russian-olive, New Mexico forestiera, shrubs, and grasses. It provides food and cover for wildlife such as mule deer, gray fox, porcupine, squirrels, woodpeckers, and Gambel's quail. Suitable wildlife habitat improvement practices include retaining healthy trees and clearing spots or strips of old or dense stands.

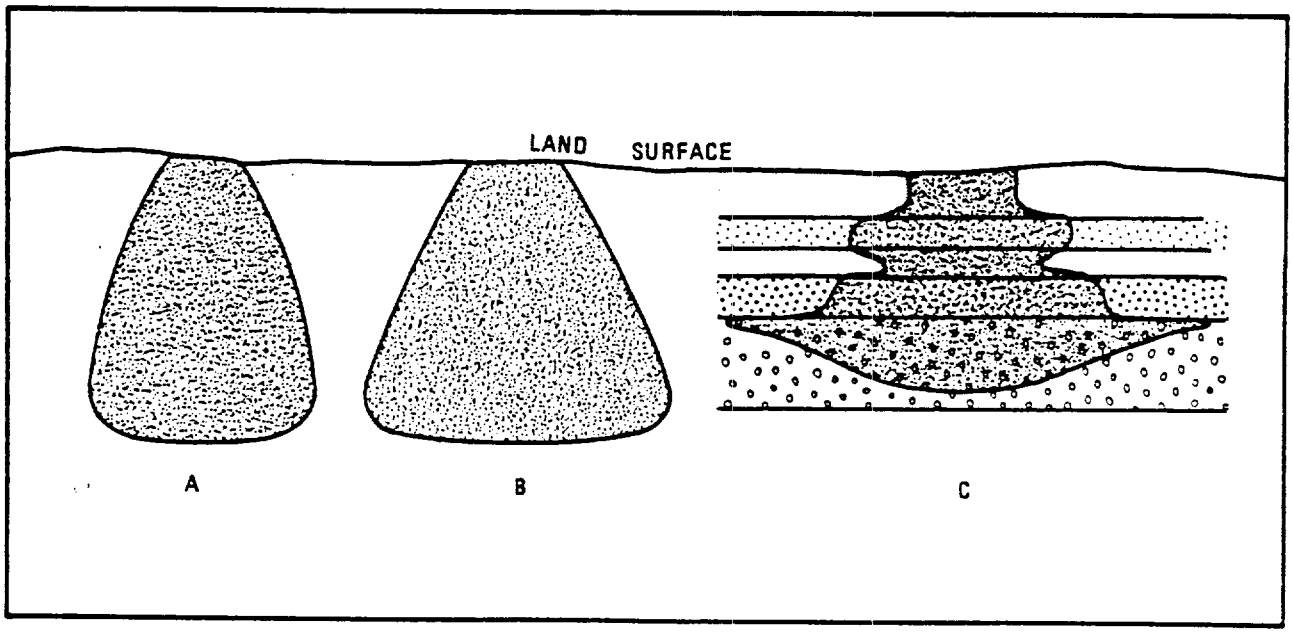
The openland wildlife habitat consists of grain and seed crops, domestic grasses and legumes, and wild herbaceous plants. It provides food and cover for such wildlife as skunk, cottontail, pheasant, Gambel's quail, meadowlark, field sparrows, and killdeer. Suitable wildlife habitat improvement practices include stripcropping, planting windbreaks, and planting small grain for winter use.



GROUND WATER CONTAMINATED BY SOLUBLE COMPONENTS.

FLUID OIL FLOATING ON WATER TABLE.

RESIDUAL SATURATION



SPREADING CONES

A – HIGHLY PERMEABLE, HOMOGENEOUS SOIL
B – LESS PERMEABLE, HOMOGENEOUS SOIL
C – STRATIFIED SOIL WITH VARYING PERMEABILITY

Figure 3

(source: API #4149)

Table 1. Properties of Soils in the San Juan River Valleys.

SOIL NAME	SYMBOL	ACREAGE	DEPTH (IN)	USDA TEXTURE	PERMEABILITY (FT/DAY)	HYDROLOGIC SOIL GROUP	SOIL LOCATION	SEVERITY & TYPE OF LIMITATION FOR UNLINED PIT
Apishapa Clayloam	Ap	576	0-5 5-81	Clayloam Clay	0.4-1.2 0.12-0.4	C	A	Severe: Wetness, Floods
Apishapa Clay	Ap	1,045	0-6 6-81	Clay Clay	0.12-0.4 0.12-0.4	C	A	Severe: Wetness, Floods
Beebe Loamy Sand	Be	2,484	0-6 6-61 61-81	loamy sand sand very gravelly sand	12-40 >40 >40	A	A	Severe: Floods, Seepage
Beebe Variant loamy sand	Bf	1,800	0-8 8-61 61-81	loamy sand sand, loamy sand very gravelly sand	12-40 12-40 12-40	C	A	Severe: Floods, Seepage
Blackston loam 0-3% slopes	Bk	1,888	0-11 11-27 27-81	loam very gravelly clay loam very gravelly sand	1.2-4 1.2-4 12-40	B	B	Severe: Seepage
Blackston gravelly loam, 3-8% slopes	Bm	1,225	0-9 9-25 25-60	gravelly loam very gravelly clay loam very gravelly sand	1.2-4 1.2-4 12-40	B	B	Severe: Seepage
Blancot Fruitland Assoc. Blancot loam	BR	17,614 (7,926)	0-6 6-60	loam sandy clay loam & loam	0.4-4 1.2-4	B	C	Moderate: Seepage
Fruitland sandy loam		(4,403)	0-8 8-60	sandy loam sandy loam	4-12 4-12	B	D	Severe: Seepage
OTHER		(5,285)	—	—	—	—	—	—

Table 1 (con't)

Fluvaquents Ponded	Fp	1,607	0-4 4-30 30-60	organic material loam Strat. sand, loamy sand & gravel	- 0.4-4	-	E	—	
Fruitland, sandy loam, 0-2 slopes	Fr	2,776	0-7 7-60	sandy loam sandy loam	4-12 4-12	B	D	Severe:	Seepage
Fruitland sandy loam, 2-5% slopes	Fs	5,271	0-6 6-60	sandy loam sandy loam	4-12 4-12	B	D	Severe:	Seepage
Fruitland sandy loam, wet 0.2% slopes	Ft	2,072	0-6 6-60	sandy loam sandy loam	4-12 4-12	B	D	Severe:	Seepage, wetness
Fruitland loam 1-3% slopes	Fu	4,621	8-8 8-60	loam sandy loam	1.2-4 4-12	B	D	Severe:	Seepage
Fruitland loam 5-8% slopes	Fw	2,096	0-3 3-60	loam sandy loam	1.2-4 4-12	B	D	Severe:	Seepage
Fruitland slick spots complex:	Fy	4,848							
Fruitland, sandy loam		(3,636)	0-9 9-60	sandy loam sandy loam	4-12 4-12	B	D	Severe:	Seepage
slick spots		(970)	-	Alkai-affected soil					
Other		(242)	-	-	-	—	—	—	

Table 1 (con't)

Garland loam	Ga	4,017	0-4	loam	1.2-4.0	B	H	Severe:	Seepage
			4-24	clay loam					
			24-60	very gravelly sand & loamy sand					
Green River find sandy loam	Gr	1,190	0-6	fine sandy loam	4-12	B	A	Severe:	Floods,
			6-60	stratified fine sandy loam and loam	1.2-4			Seepage,	wetness
Riverwash	RA	29,514	-	sandy, silty, clay or gravelly sediment	-	-	E		
Stumble loamy sand, 0-3% slopes	St	4,299	0-5	loamy sand	12-40	A	F	Severe:	Seepage
			5-29	sand, loamy sand	12-40				
			29-81	sand, gravelly sand, gravelly loamy sand					
Stumble loamy sand, 3-8% slopes	Su	3,086	0-5	loamy sand	12-40	A	F	Severe:	Seepage
			5-49	sand, loamy sand	12-40				
			49-81	gravelly sand, sand	12-40				
Stumble sandy clay loam, gently sloping	Sv	969	0-7	sandy clay loam	1.2-4	A	F	Severe:	Seepage
			7-60	sand	12-40				
Stumble Fruitland Assoc., gently sloping:	Sw	22,073							
Stumble loamy sand		(8,829)	0-6	loamy sand	12-40	A	F	Severe:	Seepage
			6-29	sand, loamy sand	12-40				
			29-60	gravelly sand	12-40				
Fruitland sandy loam		(6,622)	0-7	sandy loam	4-12	B	F	Severe:	Seepage
			7-60	sandy loam	4-12				
Other		(6,622)	-		-				

Table 1 (con't)

Stumble - Notal complex, gentle sloping Stumble loam sand	Sx	11,088 (6,098)	0-31 loamy sand 3-60 sand, loamy sand	12-40 12-40	A	F	Severe:	Seepage
Notal clay loam		(3,326)	0-24 clay loam 24-60 clay	0.4-1.2 <0.12	D	D	Slight	
Other		(2,772)	- -	-	-	-		
Stumble - slick spots Sz complex, gently sloping: Stumble loamy sand		3,603 (2,252)	0-4 loamy sand 4-60 sand, loamy sand	12-40 12-40	A	F	Severe:	Seepage
Slick spots		(721)	- Alkali affected soil	-	-	-		
Other		(360)	- -	-	-	-		
Turley clay loam 0-1% slopes	Tp	1,544	0-3 clay loam 3-80 clay loam	0.4-1.2 0.4-1.2	B	F	Slight	
Turley clay loam, 1-3% slopes	Tr	4,637	0-9 clay loam 9-60 clay loam	0.4-1.2 0.4-1.2	B	F	Slight	
Turley, clay loam 3.5% slopes	Ts	485	0-4 clay loam 4-60 clay loam	0.4-1.2 0.4-1.2	B	F	Slight	
Turley, clay loam, wet 0.2% slopes	Tt	3,185	0-9 clay loam 9-60 clay loam	0.4-1.2 0.4-1.2	C	G	Severe:	Wetness

Table 1 (cont)

Turley, Slick Spots complex, 0-3% slopes:	Tv	1,566						
Turley clay loam		(1,096)	0-8	clay loam	0.4-1.2	B	G	Slight
			8-60	clay loam	0.4-1.2			
Slick Spots		(313)	-	Alkali Affected soil	-	-	-	-
Other		(159)	-	-	-	-	-	-
Walrees loam	Wa	4,112	0-6	loam	1.2-4	C	A	Severe: Floods, Wetness
			6-30	loam	0.4-1.2			
			30-81	stratified sand, gravel, cobbles	>40			
Werlog loam	Wr	4,515	0-6	loam	1.2-4	C	A	Severe: Wetness
			6-60	loam, clay loam	0.4-1.2			
			6-81	sand gravel, cobbles	>40			
Werlog loam, saline	Ws	1,984	0-5	loam	1.2-4	C	A	Severe: Wetness
			5-60	silty clay loam	.4-1.2			
Youngston clay loam	Yo	918	0-10	clay loam	.4-1.2	C	A	Severe: Floods
			10-66	loam, stilt loam	.4-1.2			

From: Soil Survey of San Juan County, NM, Eastern Part
USDA, SCS, 1980

2/20/85
DMR

Table 1 (con't)

Soil Locations

A. Floodplains and low river terraces

B. River terraces

C. Alluvial fans and upland valleys

D. Alluvial fans and valley bottoms

E. Floodplains

F. Alluvial fans and valley sides

G. Alluvial fans

H. Terraces and valley sides

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Table 2.
Application Rates For Pits
of Various Diameters and
Variable Discharge Rates

$$\text{Application Rate} = \frac{\text{Volume Discharged/day}}{\text{Pit Area}}$$

$$AR = \text{Vol(gpd)} \times \left(\frac{1\ ft^3}{7.48\ gal}\right) \times \frac{1}{A(ft^2)} = \left(\frac{ft}{day}\right)$$

$$A = \pi \frac{d^2}{4}$$

d'	5 bbls/day	1 bbl/day	½ bbl/day	2.5 gpd
2	8.9 ft/d	1.79 ft/d	0.89 ft/d	0.11 ft/d
3	4.0 ft/d	0.79 ft/d	0.40 ft/d	0.05 ft/d
4	2.2 ft/d	0.45 ft/d	0.22 ft/d	0.03 ft/d

(At depths beneath 6 to 24 inches, Most Permeabilities [ie. infiltration rates] exceed and in some cases greatly exceed application rates. Therefore, ponding will not occur under natural conditions)

Table 3.
Days to Complete Saturation of Material beneath pits
(Assuming storage & no movement)

Volume = $(n)(A)(h)$

$n = 0.25$, $A = \pi \frac{d^2}{4}$

h = depth to groundwater,
= 10, 25, & 50'

Rate of Discharge (Q) 5, 1, & ½ bbls/day, 2.5gpm

Q = bbls/day

d	A	h	V	Q_{5bbl} (Days)	Q_{1bbl} (Days)	$Q_{.5bbl}$ (Days)	$Q_{2.5gal}$ (Days)
2	3.14 ft^2	10'	7.85 ft^3	0.3	1.4	2.8	23.5
2	3.14 ft^2	25	19.6	0.7	3.5	7.0	58.6
2	3.14 ft^2	50	39.3	1.4	7.0	14.0	117
3	7.07 ft^2	10	17.7	0.6	3.2	6.3	53.0
3	7.07 ft^2	25	44.2	1.6	7.9	15.7	132
3	7.07 ft^2	50	884	3.2	15.7	31.5	264
4	12.57 ft^2	10	31.4	1.1	5.6	11.2	93.9
4	12.57 ft^2	25	78.6	2.8	14.0	28.0	235
4	12.57 ft^2	50	157	5.6	28.0	55.9	470

$$\#days = \frac{1\ day}{\#gal} \times \frac{7.48\ gal}{ft^3} \times Volume(ft^3)$$

Table 4.
Ranges of K for alluvial material in River Valleys

K = Permeability in ft/day

Davis & DeWeist (1966):
25 to 250 ft/day, 1200 ft/day not rare
One gravel alluvium tested at 2350 ft/day

Bouwer (1978):
Sand & Gravel – 15-325 ft/day
Gravel – 3250 ft/day

Stone, et al (1983):
Pump (Aquifer) Test on McMahon #1
T30N, R12W, Section 32.2331
(Vicinity Farmington)

Avg. Transmissivity = 37900 ft^2/day
b = Thickness of aquifer Tested (opposite well) = 15'

$$K = \frac{T}{b} = \frac{37900\ ft^2/day}{15\ FT} = 2527\ ft/day$$

∴ Range of values chosen:
25 ft/day
250 ft/day
2500 ft/day

Ranges of Porosity (n) for sands & gravels:
Bouwer (1978): 10-30%
Fetter (1980): 20-35%
} value chosen 25%

Table 5

Examples of River Gradients,
Farmington and vicinity

Quad	River	Location	Gradient
Bloomfield 15'	San Juan	W. Blanco to Bloomfield	0.0028
Aztec 15'	Animas	Cedar Hill to Aztec	0.0041
Horn Canyon 7½	San Juan	W. Bloomfield to Fairgrounds	0.0018
Farmington South 7½	San Juan	5300' line to Animas River	0.0022
Farmington South 7½	La Plata	Gauging Station (5260' to 5240')	0.0059
Kirtland 7½	San Juan	5200' line to Kirtland	0.0021
Fruitland 7½	San Juan	Fruitland to 5050' line	0.0023
Flora Vista 7½	Animas	W. Aztec to 5420'	0.0041
Flora Vista 7½	Animas	Flora Vista (5490' to 5470')	0.0040

Notes:
1. In absence of additional information, it is assumed that the ground water flow gradient is the same as the river gradient in the shallow groundwater areas near the river.
2. A gradient of 0.0022 is equivalent to 11.6 feet per mile.

Table 6.

Rates of Ground Water Movement
(Average linear Velocity)
San Juan River Valley

$$\bar{v} = \frac{K}{n}\left(\frac{dh}{dl}\right)$$ Where K is ft/day
dh/dl = gradient
n = porosity

San Juan River

$\bar{v}$ = 0.24 ft/day, 2.4 ft/day, 24 ft/day

Animas River

$\bar{v}$ = 0.41 ft/day, 4.1 ft/day, 41 ft/day

La Plata (one measurement)

$\bar{v}$ = 0.59 ft/day, 5.9 ft/day, 59 ft/day

Table 7
Estimation of Ground Water Concentrations

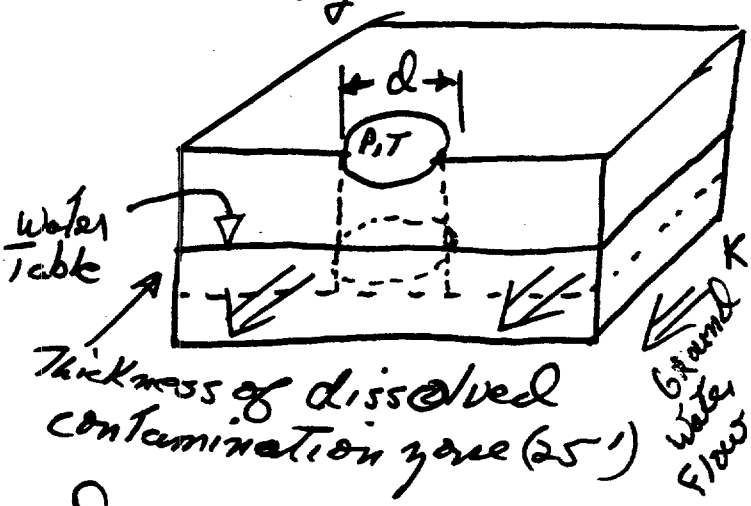
$$C_F = \frac{C_L Q_i + C_E Q_E}{Q_i + Q_E}$$

Where: C_f = Final Concentration
C_i = Initial Conc.
C_E = Effluent Conc.
Q_E = Effluent rate
Q_i = Ground water rate

For San Juan Rivers: $\frac{dh}{dl} = 0.0024$

$Q_i = A \times K \frac{dh}{dl}$, A = diam $\times$ 25' (A is the saturated aquifer area perpendicular to ground water flow)
K = 25, 250, 2500 FT/day
d = diameter of pit = 2, 3, or 4 FT

$$\therefore Q_i = (25' \times d)(K)(0.0024) \times \frac{7.48 \text{ gal}}{\text{day}}$$



C_E = 14 mg/l benzene (average of 9 San Juan basin produced water samples)

C_E = 10,900 mg/l TDS (average of 7 San Juan basin produced water samples)

Q_E = 5 bbls/day (210 gpd), 1 bbl/day (42 gal/day), 1/2 bbl/day (21 gpd), 2.5 gallons/day

C_{iB} = 0 for Benzene
C_{iTDS} = 725 mg/l (average 13 Alluvial wells AZTEC Quad - Range 317 to 1104 mg/l)

Table 7 (con't)

For pit diameter = 2'

K	Q_i	Q_E	C_{FB}	C_{FTDS}
25	22.4	210	12.7	9920
25	22.4	42	9.1	7360
25	22.4	21	6.8	5650
25	22.4	2.5	1.4	1750
250	224.4	210	6.8	5640
250	224.4	42	2.2	2330
250	224.4	21	1.2	1600
250	224.4	2.5	0.15	840
2500	2244	210	1.2	1600
2500	2244	42	0.26	910
2500	2244	21	0.13	820
2500	2244	2.5	0.016	740
	(ft/day)	(gpd)	(gpd)	(mg/l)	(mg/l)

Table 7A.

For P,T diameter = 3'

K	Q_i	Q_E	C_{FB}	C_{FTDS}
25	33.7	210	12.1	9490
25	33.7	42	7.8	6420
25	33.7	21	5.4	4630
25	33.7	2.5	0.97	1430
250	336.6	210	5.4	4630
250	336.6	42	1.5	1850
250	336.6	21	0.82	1320
250	336.6	2.5	0.10	800
2500	3366	210	0.82	1320
2500	3366	42	0.17	850
2500	3366	21	0.087	790
2500	3366	2.5	0.010	730
2500	3366			

TABLE .7B.

Table 7 (con't)

For pit diameter = 4'

K (ft/day)	Q_i (gpd)	Q_E (gpd)	C_{FB} (mg/l)	C_{FTDS} (mg/l)	
25	44.9	210	11.5	9110	
25	44.9	42	6.8	5640	
25	44.9	21	4.5	3970	
25	44.9	2.5	0.74	1260	
250	448.8	210	4.5	3970	Table 7c
250	448.8	42	1.2	1600	
250	448.8	21	0.63	1180	
250	448.8	2.5	0.078	780	
2500	4488	210	0.63	1180	
2500	4488	42	0.13	820	
2500	4488	21	0.065	770	
2500	4488	2.5	0.008	730	

Note: NM Standard in groundwater for benzene is 0.01mg/l
The standard for TDS is 1000mg/l.

NEW EXHIBIT (13)

San Juan Basin Produced Water Hearing

OCD List of References

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Final

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HEALTH & ENVIRONMENT department

STATE OF NEW MEXICO

ENVIRONMENTAL IMPROVEMENT DIVISION
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March 11, 1985

Mr. Richard Stamets
Chairman, Oil Conservation Commission
Energy & Minerals Department
Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87501

RE: STATEMENT FOR THE RECORD OF THE FEBRUARY 20, 1985 HEARING BEFORE THE OIL CONSERVATION COMMISSION

Dear ~~Mr. Stamets~~ Dick:

The Environmental Improvement Division (EID) supports efforts by the Oil Conservation Commission to develop regulations designed to ensure protection of ground water from liquids discharged to pits associated with oil and gas production wells in northwest New Mexico. EID representatives participated in the Short Term Study Group meetings held during the last 6 months, and EID generally supports the Recommendations document developed by that group at its meeting on January 9, 1985.

We want to emphasize, however, the importance of ensuring that numerical values, which will be incorporated into the exemptions and permits sections of the proposed regulations, will adequately protect ground water. We feel that additional studies are warranted to determine realistic values for permissible discharge volumes and depths to ground water. Field investigations are essential because of the complexity of hydrologic, geochemical, and biological factors that will control the movement of contaminants from unlined pits toward the water table and within the aquifer.

Mathematical techniques can be used to estimate the range of migration rates that might reasonably be expected under geologic and hydrologic conditions typical of the area in question. The following paragraphs contain calculations relevant to the seepage of liquid from unlined pits. The following conclusions are reached based on calculations and assumptions described within the subsequent paragraphs:

1) virtually all liquid discharged to unlined pits could infiltrate within two or three hours;

2) the wetting front from an unlined pit could reach the water table within one month if 0.5 barrel per day was discharged to a pit located 10 feet above the water table; and

3) the travel time required for liquid to move from the pit to the water table under saturated conditions could be on the order of 10 days.

Infiltration Rate

The rate at which a liquid infiltrates into a porous material is highest when the material is dry, decreases as the material becomes wetter, and approaches a steady state value, called the final infiltration rate, as the material becomes saturated. Infiltration rates are higher for coarse, open-textured materials (e.g., sandy soils) and lower for materials having finer pores (e.g., clay soils). Final infiltration rates are typically greater than 20mm/hr for sands and between 10 and 20mm/hr for sandy and silty soils (Hillel, p. 140). Initial infiltration rates would be considerably higher than these values.

Assuming a value of 20mm/hr, 0.49 gallons would infiltrate each hour for each square foot of wetted area. Thus, 12.3 gallons (0.29 barrel) would infiltrate per hour if the wetted area covers 25 square feet and 49.1 gallons (1.17 barrels) would infiltrate per hour if the wetted area covers 100 square feet. These values suggest that virtually all liquid discharged to an unlined pit (assuming a 0.5 barrel per day limit) potentially could infiltrate within two or three hours.

Movement of the Wetting Front

The volume of liquid required to saturate an initially dry porous material is equal to the effective porosity of the material. Sand and gravel materials typically have porosities in the range 10% to 30%, unconsolidated find to medium sands have porosities in the range 35% to 50%, and sandstones typically have porosities in the range 5% to 30% (Bouwer, p. 22).

Assuming the water table is 10 feet below land surface, a material having a 5% porosity could hold 3.74 gallons (0.089 barrel) of liquid per square foot of wetted surface; a material having a 30% porosity could hold 22.4 gallons (0.53 barrel) of liquid per square foot of wetted surface; and a material having 50% porosity could hold 37.4 gallons (0.89 barrel) of liquid per square foot of wetted surface. Using the intermediate porosity value (30%), the soil below a 25 square foot wetted area would be completely saturated after 13.3 barrels of liquid had infiltrated.

Negligable protection would be afforded to ground water if a discharge of 0.5 barrel per day were permitted since the wetting front emanating from the pit could reach the water table within 27 days, assuming a 25 square foot wetted area and 30% porosity.

Travel Time

Another important consideration is the rate or velocity of downward movement of the liquid. Under saturated conditions, this velocity will be equal to the vertical hydraulic conductivity of the porous material divided by its porosity.

Typical hydraulic conductivity ranges for various materials are: 0.001 to 1 cm/sec (2.83 to 2835 ft/day) for clean sands (i.e., good aquifers); 0.000001 to 0.001 cm/sec

(0.0028 to 2.83 ft/day) for clayey sands and fine sands (i.e., poor aquifers); and about 0.002 cm/sec (5.84 ft/day) for sandstone having a 29% porosity (Davis and DeWiest, p. 162). These values are for horizontal hydraulic conductivity. A rule of thumb for sedimentary geologic materials is that vertical conductivity is about 10% of the horizontal conductivity.

Assuming a 30% porosity, vertical velocities would range from 0.001 foot per day in an unconsolidated clayey sand to 945 feet per day in a clean sand; and vertical velocities in a sandstone might be about 1.9 feet per day. Assuming an intermediate velocity of 1 foot per day, liquid introduced to an unlined pit would travel to the water table in just 10 days if the initial water table is 10 feet below land surface and the material below the pit is saturated.

Calculations presented in the preceeding paragraphs do not consider effects of evaporation, surface films or crusts, layering within the geologic materials, dispersion, adsorption, or biological degredation of contaminants. They do illustrate, however, that the potential exists for significant migration of contaminants from unlined pits to the ground water, if adequate control measures are not taken.

Given this demonstrated potential for ground water pollution by contaminants discharged into these unlined pits, EID recommends a conservative approach to establishing discharge limits. We feel that until and unless site-specific field investigations demonstrate safe discharge levels, there should be no discharge to unlined pits within vulernable aquifer areas. EID therefore fully supports the position of the Oil Conservation Division that there should be no blanket small-volume exemption for discharges within vulnerable aquifer areas.

We hope that these comments will be of use to the Oil Conservation Commission.

Sincerely,

Denise Fort
Director

DF:DE:dlr

Attachment

cc: Paul Biderman

References:

Davis, S.N. and R.J.M. DeWiest, 1966. Hydrogeology, John Wiley & Sons, Inc. New York, 463 pp.

Hillel, D., 1971. Soil and Water. Academic Press, New York, 288 pp.

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