BEFORE THE OIL CONSERVATION COMMISSION
STATE OF NEW MEXICO

IN THE MATTER OF THE HEARING CALLED BY THE OIL CONSERVATION COMMISSION FOR THE PURPOSE OF AMENDING COMMISSION ORDER R-7940 TO PROVIDE FOR THE EXPANSION OF THE DESIGNATED VULNERABLE AREA OF THE SAN JUAN BASIN, ELIMINATION OF DISCHARGES TO UNLINED PITS, CREATION OF WELLHEAD PROTECTION AREAS, ESTABLISHMENT OF DEADLINES FOR COMPLIANCE, AND OTHER MATTERS	)	CASE NO 10436
UPON THE APPLICATION OF THE OIL CONSERVATION DIVISION, ON ITS OWN MOTION	)	

Compilation of Written Testimony and Exhibits of Chris Shuey
and Summary of Testimony and Exhibits of Michael Wallace
on behalf of Southwest Research and Information Center

April 9, 1992

For the convenience of the Commissioners and parties to this proceeding, Southwest Research and Information Center ("SRIC") has compiled into this bound document the written testimony and exhibits of witness Chris Shuey and the summary of testimony and exhibits of witness Michael Wallace. The exhibits contained herein were provided to the Oil Conservation Division ("the Division" or "OCD") and other parties to this proceeding on April 1, 1992, or shortly thereafter, as required. Summaries of the testimonies of Mr. Shuey and Mr. Wallace also were provided at that time. Changes advocated by SRIC to OCD's proposed revised Order R-7940 are contained herein and are reprinted on separate sheets for the convenience of the Commissioners and other parties.

Written Testimony and Exhibits of Chris Shuey
Southwest Research and Information Center

Introduction

My full name is Christopher L. Shuey. I am employed at Southwest Research and Information Center ("SRIC") in Albuquerque, New Mexico, where I am the director of the Community Water Quality Program. I have been a member of the senior technical staff at SRIC for nearly 11 years. My educational background, employment history, and professional experience is detailed in my resume, which is marked as **Exhibit SRIC-1.**

I am testifying today in support of the Oil Conservation Division's motion to amend Commission Order R-7940 to (1) expand the existing "Vulnerable Area" of the San Juan Basin, (2) create wellhead protection areas around fresh water springs and wells, (3) eliminate discharges of production fluids to unlined pits located in the existing and expanded vulnerable area, (4) require the registration of pits that are located outside of the vulnerable area, (5) require the closure of pits pursuant to Division guidelines, (6) establish an implementation schedule for compliance with the proposed new requirements of Order R-7940, and (7) establish variance procedures.

My qualifications for appearing as a witness in this case today include:

- I was a member of the Division's Short-Term Produced Water Study Committee in 1984 and 1985 and participated, *pro se*, in the Commission's 1985 hearing (Case No. 8224) that led to adoption of Order R-7940;

- I have been a member of the Division's Long-Term Produced Water Study Committee since 1986 and have assisted in the mapping of the proposed expanded Vulnerable Area;

- I have participated in field investigations of possible ground water contamination beneath unlined pits, including a study that was presented as evidence in the 1985 hearing on Case No. 8224;

- I have been an active participant in scientific and public policy matters related to oil and gas exploration and production ("E&P") wastes, having testified before the U.S. Environmental Protection Agency in 1988 and the United States Senate in 1991 on E&P waste issues and having served as an advisor to the Interstate Oil and Gas Compact Commission's ("IOGCC") Council on Regulatory Needs;

- I represented national environmental and citizens' interests in IOGCC's review of the state of Wyoming's oilfield waste regulatory program in 1991 and in IOGCC's review of the state of Oklahoma's E&P waste regulatory program earlier this year; and

- I have a bachelor's of arts degree in university studies from the University of New Mexico. Included in my college studies were several courses in geology, math and chemistry. Additionally, in January 1987, I successfully completed a short course in hydrogeology taught by the National Water Well Association. I have attended numerous professional conferences on water pollution, ground water contamination and monitoring, and waste management.

Since September 1991, I have spent more than 70 hours reviewing OCD files

and talking in detail with Division staff about information and data on discharges of oilfield wastes to unlined pits in the San Juan Basin. I have reviewed the Division's March 27, 1992, proposed revised Order R-7940, titled "Oil Conservation Division Proposed Vulnerable Area Order" (hereinafter referred to as "Proposed Vulnerable Area Order"). Based on my experience in oilfield waste management, my education, my ongoing research into the environmental impacts of unlined produced water disposal pits, and my review of the Proposed Vulnerable Area Order, I will discuss today five separate issues:

(1) Available data demonstrate that discharge of virtually any amount of produced water to unlined pits will result in contamination of shallow ground water at approximately 70 percent of pit sites and contamination of soils at virtually every pit site, and that this record of contamination necessitates the elimination discharges of produced water to unlined pits.

(2) Technology exists to phase out unlined pits and to replace them with lined pits or above-grade or below-grade tanks and that such technology is being implemented by operators in the San Juan Basin.

(3) Operators who have closed pits in the San Juan Basin since January 1, 1987, should be required to submit the results of investigations, studies and closures to the Division for review and approval, subject to additional monitoring or corrective actions as the Division may deem necessary to protect fresh water supplies, public health and the environment.

(4) Variances to the pit-liner requirement of the Proposed Vulnerable

Area Order should be granted only upon a demonstration by the operator that a suggested alternative (such as no liner) affords the same level of protection as that of a liner system. Additionally, variances should be granted only after notice, opportunity for comment, and hearing before the Commission or Division examiners.

(5) The deadlines proposed by the Division for elimination of discharges should be tightened in two areas: The deadline for compliance for pits located in the expanded Vulnerable Area (proposed Rule 3(b)(2)) should be 18 months from the effective date of the Order and 24 months for all other vulnerable areas (proposed Rule 3(b)(3)).

(1) **Available data demonstrate that discharge of virtually any amount of produced water to unlined pits will result in contamination of shallow ground water at approximately 70 percent of pit sites and contamination of soils at virtually every pit site, and that this record of contamination necessitates the elimination of discharges of produced water to unlined pits.**

In preparing for this hearing, I reviewed dozens of files in the OCD's Santa Fe Environmental Bureau office, spoke directly on at least 14 different occasions with OCD's Environmental Bureau staff (Mr. Bill Olson and Mr. Roger Anderson) and with OCD's Aztec District Office staff (Mr. Frank Chavez, Mr. Denny Foust, Mr. Ernie Busch, and Mr. Charles Gholson),[1] and reviewed the exhibits and testimony given in Case No. 8224 in 1985. Based on that research, I compiled a list of field

[1]The dates of my personal communications with OCD staff members were November 5 and 14, 1991; December 31, 1991; January 3, 7, 8, 9, 10, and 14, 1992; February 11 and 13, 1992; March 11 and 27, 1992; and April 3, 1992.

investigations that have been conducted since 1983 on possible soil and ground water contamination around unlined pits or other surface disposal facilities that are located in the Vulnerable Area of the San Juan Basin. The results of that compilation are shown in an exhibit marked **SRIC-2**.

I should emphasize that the list of investigations in **Exhibit SRIC-2** is based on information that is publicly available. I am not privvy to information gathered or developed by operators, other than information they may have submitted to OCD.

The data and information shown in **Exhibit SRIC-2** were obtained from a variety of sources and documents, all of which are contained in OCD files. Selected references from this documentation are listed at the end of the table. Because of the large amount of paper involved, I have chosen not to provide the detailed documentation upon which the compilation is based. This documentation is in my possession today and I would be happy to provided copies if the Commission so requests. At least one source of data has been presented as evidence in this proceeding: Mr. Olson's December 1989 report on ground water studies at pits sites, which is identified as **OCD Exhibit 6**.

Calling your attention to the column headed "Gwater Contam?" in **Exhibit SRIC-2**, the data and information in that column show that ground water contamination was detected at 17 of 22 sites for which analytical data from ground water samples were reported.[2] That ratio is 77 percent, or roughly three out of every

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[2]I define "ground water contamination" as (1) the presence of a chemical constituent in ground water in excess of its corresponding numerical standard under section 3-103 of the New Mexico Water Quality Control Commission Regulations; or (2) the presence of a chemical constituent in ground water in excess of background

four sites which were investigated and for which data have been reported publicly.

Calling your attention to the column headed "BTEX Contam?" in **Exhibit SRIC-2**, the data and information show that aromatic hydrocarbons (hereinafter referred to as "BTEX" for benzene, toluene, ethylbenzene, and xylenes) were detected in ground water at 15 of 22 sites for which analytical data for ground water samples were available. This represents 68 percent of the sites for which ground water chemistry was obtained and 63 percent of the 24 sites listed in the table. These ratios correspond closely with those determined by Mr. Olson, whose study of ground water chemistry around unlined pit sites found BTEX contamination at nine of 13 sites, or 69 percent of sites investigated. (See **OCD Exhibit 6.**)

Referring to the column headed "BTEX >Stds?" in **Exhibit SRIC-2**, the data and information also show that 11 of 22 sites for which analytical data were available had BTEX contamination of ground water exceeding New Mexico Water Quality Control Commission numerical standards.[3] This ratio of 50 percent also closely parallels that found by Mr. Olson.

I should note here that there were no ground water chemistry data reported for two of the 24 sites listed in **Exhibit SRIC-2**: Site No. 6 (Gallegos Canyon Unit #250) and Site No. 16 (Saiz #1). The documentation that I reviewed reported soil contamination at both of these sites.

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concentrations, as provided for in section 3-101 of the Water Quality Control Commission Regulations; or (3) the presence of a chemical constituent that does not occur naturally in ground water in alluvial river deposits.

[3]See section 3-103.A. of the Commission's regulations.

Further inspection of the information in **Exhibit SRIC-2** shows that ground water contamination was detected at seven of nine pits that had received one barrel or less of produced water per day. (Those discharge volumes are found in the column headed "BWPD".) At six of those seven sites, pits were located greater than 10 feet to ground water. (Depths to ground water are found in the column headed "DTGW (ft)".) In all, 11 of 15 sites where ground water was greater than 10 feet exhibited ground water contamination. Five of seven sites where the depth to ground water was 20 feet or more exhibited ground water pollution.

These findings support OCD's proposed amendments to Order R-7940, which exempted discharges of produced water to production pits that received less than five barrels of produced water a day and were located more than 10 feet from ground water. They demonstrate that small-volume discharges to unlined pits contaminate ground water that is greater than 10 feet deep.

In developing **Exhibit SRIC-2,** I assumed that all analytical data used to reach conclusions about the presence or lack of ground water contamination at each site were valid at the time they were reported. I have no reason to believe that chain of custody or other quality assurance procedures were not used in any of the investigations. I also assumed that evidence of ground water contamination was *prima facie* evidence of soil contamination. Pollutants that migrate vertically to the water table must pass through the vadose zone leaving contamination in the unsaturated soils beneath unlined pits.

Referring to the column headed "Soil Contam?" in **Exhibit SRIC-2,** 20 sites are

listed as having soil contamination. Of those, six sites are listed based on the availability of soil chemistry data, on information on reports of spills and appearance of oily residues in soils, or on my own observations of soil discoloration and hydrocarbon odors in soils excavated from beneath unlined pits.[4]

The soil and ground water studies at unlined pit sites shown in **Exhibit SRIC-2** are the extent of investigations that have been reported publicly. If other investigations have been conducted, their results were not available to me and not included in the records that I reviewed.[5]

Accordingly, my compilation of soil and ground water investigations demonstrates that discharges of small quantities of produced fluids to unlined pits in the Vulnerable Area will lead to ground water contamination in three out of every four sites, contamination of ground water by aromatic hydrocarbons in two out of every three sites, and contamination by aromatic hydrocarbons that exceed state ground water protection standards at about half the sites. Soils underlying

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[4]Sites for which soil chemistry data are available are No. 6 (GCU #250) and No. 10 (Lee Acres). Oily fluids that leaked from a dehy pit at Site No. 16 (Saiz #1) were reported by the operator to have been observed in soils downgradient from the pit. Information on file with OCD's Environmental Bureau documented soil contamination at Site No. 3 (Earl Morris A #1). I personally observed characteristics of soil contamination by hydrocarbons at sites No. 11 (Mary Wheeler #1E) in March 1985 and No. 14 (North Hogback 6 #11) in February and March 1985.

[5]I am aware of ground water investigations at three other pit sites, the results of which were reported by consultants to Tenneco at the 1985 hearing. After reviewing the record from that hearing, I concluded that those investigations should not be counted in the total because of questions raised about the completeness of the studies, the accuracies of the reported quantities of discharges, and the validity of the results. If those investigations are included in the totals shown in **Exhibit SRIC-2**, the percentage incidence of ground water contamination from unlined pits would not change significantly because parts-per-billion levels of benzene were detected in ground water at two of the three sites investigated.

unlined disposal pits are shown to be contaminated at all sites where data are collected and reported.

These data are convincing evidence that discharges to unlined pits should be prohibited, regardless of the location of the pit, in order to protect both ground water and soils. The Commission is charged by the state Oil and Gas Act with protecting fresh water supplies and with protecting public health and the environment. §70-2-12.B.15., N.M.S.A. 1978, and §70-2-12.B.22., N.M.S.A. 1978, Cumulative Supplement 1989. Ground water and soils are part of the environment; as such, the Commission must protect them.

There is one other reason that produced water should not be disposed in unlined pits: the industry recommends against such practice. If it would please the Commission, I would like to read two short excerpts from the American Petroleum Institute's E&P waste guidance document[6] to support this point. First, on page 56 of the guidance document, API states:

> "*Produced water pits have been used in lieu of tankage. Produced water pits should be lined and only be operated as a substitute for process vessels . . .*" (emphasis added)

And again on page 56, API recommends that "*[s]urface evaporation pits should be lined where ground water or usable soils may be endangered.*" (Emphasis added.)

Thus, lined pits or tanks for the storage of produced water are not novel or even radical approaches to E&P waste management. Rather, they are necessary to

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[6]American Petroleum Institute. Environmental Guidance Document – Onshore Solid Waste Management in Exploration and Production Operations. API (Washington, D.C.), January 15, 1989.

protect fresh water supplies, public health and the environment and they are the standard that industry itself recommends.

(2) Technology exists to phase out unlined pits and to replace them with lined pits or above-grade or below-grade tanks and that such technology is being implemented by operators in the San Juan Basin.

In preparing for this hearing, I investigated the Division's records pertaining to compliance with Order R-7940. The pertinent records are contained in the Environmental Bureau's "Vulnerable Area Pit Replacement" files, located in the Bureau's Santa Fe office. I have summarized the information contained in those files in a table marked as **Exhibit SRIC-3**, titled "OCD-Approved Tanks or Lined Pits in Vulnerable Area, San Juan Basin."

Upon evaluating the information in those files, I determined that since late 1986 and early 1987, at least 562 pits have been, or imminently will be, replaced with above-grade or below-grade tanks or with manufactured synthetic liner systems. At least 17 different operators in the Basin are complying with existing Order R-7940 or are anticipating adoption of an amended Order R-7940 by installing tanks or liners to Division specifications. The exact number of pits that have been replaced to date cannot be determined from the information in the OCD files I inspected.

Tanks that meet Division design requirements are being used as pit liners and are being installed by operators throughout the Basin. One typical tank design is shown in a diagram marked as **Exhibit SRIC-4**. This below-grade tank with synthetic underlining and leak detection was proposed and implemented by Manaña Gas

Company as shown in **Exhibit SRIC-4**. I learned from my inspection of OCD's files that this same tank design also was implemented by Kimbrell Oil Company of Texas and Tenneco Oil Company before Tenneco left the oil business.

Another pit liner system that meets Division design requirements is shown in **Exhibit SRIC-5**. This synthetic double liner system that is sold by Frank Liner Fabrications of Farmington was approved by the Division for installation in pits owned by Snyder Oil Corporation and Unocal Corporation.

Compliance with the proposed prohibition on small-quantity discharges to unlined pits was technically feasible in 1986 when operators were implementing requirements of Order R-7940. Referring to typical pit registration forms marked as **Exhibit SRIC-7**, El Paso Natural Gas and Meridian Oil Company in 1986 installed 50-barrel fiberglass tanks in pits that received as little as 0.4 barrels of water per day. As shown in **Exhibit SRIC-8**, Tenneco that same year installed steel tanks with leak detection systems and synthetic underliners in 31 pits, including 16 that were reported to receive no discharge and only one pit that was reported to receive more than five barrels a day.

Tanks and pit liners are not only environmentally beneficial, but they compare favorably in cost with costs associated with cleaning up ground water and soils contaminated by leakage from unlined pits. As shown in documents marked as **Exhibit SRIC-6**, Meridian Oil Company calculated that installing fiberglass tanks with leak detection systems at 44 pit sites would cost $52,586.73 in 1986 dollars. I calculated that that total cost was an average of $1,195.15 per site in 1986.

Such compliance costs pale in comparison to the costs of remediating a soil or ground water contamination problem at a pit site. For instance, Mr. Anderson has testified that it was his knowledge that more than $250,000 has been spent on the investigation and remediation at the Manaña-Mary Wheeler #1E well site (Site No. 11 in **Exhibit SRIC-2**) near Flora Vista. That figure is not surprising and may be low. I learned from my review of the Flora Vista contamination case files at OCD's Environmental Bureau that the investigation and cleanup at the Mary Wheeler #1E well site involved the installation of several monitoring wells, the drilling of numerous soil borings, the collection and analysis of dozens of ground water and soil samples, the excavation and off-site disposal of contaminated soils, and the replacement of at least one polluted water supply well. In addition to costs associated with those activities, there were undoubtedly expenses for salaries, benefits and professional fees.

Obviously, preventing contamination by lining pits or replacing them with leak-proof tanks is far more economical than remediating ground water contamination. Prevention, which is the intent of the proposed prohibition on use of unlined pits for produced water disposal, is wise public policy; in a state that depends so heavily on ground water for drinking water as New Mexico does, allowing contamination of fresh water supplies is simply not wise or careful stewardship of our limited and precious water resources.

(3) **Operators who have closed pits in the San Juan Basin since January 1, 1987, should be required to submit the results of investigations, studies and closures to the Division for review and approval, subject to additional**

monitoring or corrective actions as the Division may deem necessary to protect fresh water supplies, public health and the environment.

SRIC proposes that operators who have closed pits since January 1, 1987, submit data and information pertaining to those closures to OCD for approval and possible additional corrective actions. This requirement is needed to insure that pits that were closed after the deadline for compliance with original Order R-7940 are protective of fresh water supplies, public health and the environment. To make such a determination, OCD staff must be furnished with results of investigations and details about closures that have taken place since 1987. Information that documents how many pit sites have been or are being investigated or how many have been or are being closed is not now furnished on a routine basis. Without this information, the state may never know the locations or conditions of closed pits until they become contamination problems.

At least two of the major operators, Amoco and Meridian, are conducting soil and ground water investigations at pit sites. Mr. Chavez and Mr. Anderson told me on separate occasions that the results of those investigations are being furnished to the Division only when OCD staff requests such data or when the operator voluntarily submits such data. Data on investigations at Sites No. 12, No. 23 and No. 24 of **Exhibit SRIC-2** were obtained by OCD in this fashion.

To implement such a reporting requirement, SRIC proposes the following amendment to the Proposed Vulnerable Area Order: In proposed Rule 6, insert a second paragraph which states:

"For pits closed prior to the effective date of this Order and after January 1,

1987, the operator shall submit to the Division for review and retroactive approval, all reports, analytical data and any other pertinent information pertaining to such pits. Such information shall be submitted within 180 days of the effective date of this rule. The Division may require additional investigations, monitoring or corrective action as may be needed to protect fresh water supplies or to protect public health and the environment. Any corrective action conducted under this section shall be carried out pursuant to applicable Division closure guidelines."

SRIC proposes a six-month deadline in order to give operators ample time to locate, compile and submit to OCD records of their pit closures.

(4) **Variances to the pit-liner requirement of the Proposed Vulnerable Area Order should be granted only upon a demonstration by the operator that a suggested alternative (such as no liner) affords the same level of protection as that of a liner system. Additionally, variances should be granted only after notice, opportunity for comment, and hearing before the Commission or Division examiners.**

The evidence of ground water contamination from unlined pits that receive any amount of produced water is substantial, considering that ground water contamination has been detected at about 70 percent of pit sites that have been studied in detail. As such, the prohibition on disposal of produced water in unlined pits should be the rule. Any exceptions to that rule should be granted only pursuant to a variance procedure in which the burden of proof lies with the individual who is applying for the variance.

OCD's proposed variance procedure incorporates these principles. The applicant must demonstrate, to the satisfaction of the Director, that the quality of the discharge does not exceed Water Quality Control Commission numerical standards or that fresh water will not be affected by the discharge and the discharge is not

located in a wellhead protection area. SRIC proposes that one additional criterion be added to the three factors now proposed:

> Insert the following new wording as a subparagraph after Rule 7(a)(3):
>
> "In no case shall the Director approve an application for a variance to Rule 3(a) where the applicant has not demonstrated that the proposed use of an unlined pit affords the same level of protection to fresh water supplies, public health and the environment as that afforded by a liner system or tank system with leak detection."

This criterion will insure that there will continue to be equivalent protection of fresh water and the environment should a variance from the prohibition on use of unlined pits be granted. It will allow the Director to consider site-specific factors, such as geology and soil characteristics, in determining whether the proposed alternative prevents contamination of soils and ground water. This additional criterion also is consistent with the API guidance document, which recommends that "unlined onsite pits used for disposal of waste should be restricted to areas where soil conditions, hydrological factors and rainfall *prevent* [emphasis added] significant soil or ground water contamination." API guidance at 55.

Variances should be granted only in rare circumstances. And because of their nature as exceptions to a rule, they should be subject to public notice, opportunity for comment and hearing. Certainly, the owner of land upon which an unlined pit is sited should be informed of the filing of an application for a variance from the pit lining requirements of the proposed Order. The interest of the landowner is protection of his soils and ground water supplies. The interest of the public in being informed of the application is whether fresh water supplies, public health and the

environment will be protected.

As such, SRIC proposes the following amendment to the Proposed Vulnerable Area Order: After Rule 7(b), insert the following new material:

> "(c) The discharger shall file with the Director an application for a variance to Rule 3(a). Such application shall address the criteria established in Rule 7(a). The Director shall provide public notice of the application and afford the public an opportunity to comment and to request a hearing before the Commission or Division examiners. Such provisions for notice and hearing on variances to Rule 3(a) shall be consistent with the Commission's existing notice and hearing requirements. "

(5) The deadlines proposed by the Division for elimination of discharges should be tightened in two areas: The deadline for compliance for pits located in the expanded Vulnerable Area (proposed Rule 3(b)(2)) should be 18 months from the effective date of the Order and 24 months for all other vulnerable areas (proposed Rule 3(b)(3)).

The evidence of adverse effects to ground water resources from small-volume discharges to unlined pits also is reason to tighten the deadlines for elimination of discharges in the expanded Vulnerable Area. SRIC supports the proposed one-year deadline for eliminating discharges to unlined pits in the existing Vulnerable Area. However, the two-year and three-year deadlines for major tributaries and remaining drainages, respectively, are likely to allow considerable additional contamination of soils and ground water. These deadlines are even more lenient in light of proposed Rule 7(b), which will allow for an extension of time of up to two years for phase-out of discharges to unlined pits in the expanded Vulnerable Area. Under the Division's proposal, an operator could receive up to five years to comply with the requirement of proposed Rules 3(a) and 3(b) to

eliminate discharges to unlined pits. That simply is too long.

To prevent additional contamination of soils and ground water, SRIC proposes that proposed Rule 3(b)(2) be amended as follows:

> "(2) All discharges of oil and natural gas wastes to unlined pits located in areas defined in Subsection (I)(d)(2) and discharges which are within the following major tributaries of the respective river systems will be eliminated within ~~two (2) years~~ 18 months of the effective date of this order:"

Simarily, proposed Rule 3(b)(3) should be amended as follows:

> "(3) All discharges of oil and natural gas wastes to unlined pits in any remaining surface water tributaries within the Vulnerable Area will be eliminated within ~~three (3) years~~ 24 months from the effective date of this order."

These changes should be supplemented by amending proposed Rule 7(b) to limit extensions of time for compliance with Rule 3(b) to one year. As such, Rule 7(b) should be amended as follows:

> "(b) For good cause shown, the Director of the OCD may administratively allow an extension of time for a period not to exceed ~~two (2) years~~ one (1) year from that specified in Rule 3(b) for elimination of discharges of oil and natural gas wastes to unlined pits."

Alternatively, SRIC would support the deadlines proposed in Rules 3(b)(2) and 3(b)(3) if no time extension of any length is allowed; that is, I would support Rules 3(b)(2) and 3(b)(3) as proposed if proposed Rule 7(b) is eliminated.

The compliance schedules proposed by the Division, coupled with the opportunity for a two-year extension of those deadlines, are not warranted when one examines the history of this rulemaking. The genesis of the proposed prohibition on discharges to unlined pits was during meetings of OCD's Long-Term

Produced Water Study Committee as many as six years ago. I know this because I attended those committee meetings and, at the request of the committee members, kept the notes of the meetings and prepared the meeting minutes. For the record, I have provided as **Exhibits SRIC-9** and **SRIC-10** copies of the minutes of Long-Term Committee meetings of December 9, 1987, and November 18, 1986, respectively. Both are covered by letters of transmittal to former OCD Environmental Bureau Chief David Boyer; the minutes of December 9, 1987, also are covered by a letter of transmittal to the committee chairperson, Lori Komatar.

I would like to point out for the Commission's information and consideration several items which appear in these minutes. First, from the minutes of the November 18, 1986, meeting you will discern that details of Mr. Olson's study were discussed at length. Mr. Olson and Mr. Boyer explained that their goal was to determine if discharges of less than five barrels a day of fluids to unlined pits posed contamination threats. They covered the process by which they would select pit sites for detailed study, the methods to be used to install monitoring wells, and the protocols for sampling and analysis of ground water. Following this discussion, the members broke into small groups to map "special" vulnerable areas. This was the beginning of the process of identifying what we now refer to as the expanded Vulnerable Area.

The minutes of the December 9, 1987, meeting (**Exhibit SRIC-9**) show that Mr. Olson and Mr. Boyer discussed in detail the results of their investigations of the impacts of small-volume discharges into unlined pits. The minutes also show that

representatives of oil and gas operators acknowledged the new findings. To substantiate those claims, I would like to read for the record one paragraph from page 3 of the minutes:

> "Boyer said Olson's studies at the 11 sites showed that low-volume discharges (i.e., discharges <5 bpd) into production and ancillary pits can cause contamination of ground water that is > 10 feet deep. 'Small discharges in the vulnerable area appear to pose significant risks of contamination and are a serious problem,' he said. 'About one-half of the pits caused contamination and several [monitoring wells] had floating product.' He said the problem was not limited to produced water pits, but extended to dehy pits and tank drain pits. Based on the information presented, Marty Buys said that OCD 'has demonstrated that the vulnerable area is vulnerable and more vulnerable than [previously] thought.'"

Many of the same individuals who attended those meetings in 1986 and 1987, and many of the same companies that were represented at those meetings, are represented here today in this proceeding. I submit that oil and gas operators in the San Juan Basin have had ample warning and ample time to prepare for the day in which discharges of produced water to unlined pits are finally, and justifiably, banned. Unlike the record of Case No. 8224 in 1985, the record of this proceeding is clear and unmistakable: Discharges of oil field wastes to unlined pits cause contamination of soils and ground water. The Division's Proposed Vulnerable Area Order is not just a timely response to a demonstrated need to protect fresh water supplies, public health and the environment — it is a long overdue regulation.

That concludes my direct testimony. I would be happy to answer any questions.

EXHIBIT SRIC-1

Résumé of
CHRISTOPHER L. SHUEY
(current as of March 1992)

PRESENT POSITION: Member of the senior staff, Southwest Research and Information Center (Director, Community Water Quality Program; Director, National Citizens' Oil and Gas Waste Policy Project; Coordinator, Puerco River Education Project), Albuquerque, New Mexico; 1981 to present.

EDUCATION: Bachelor of University Studies, University of New Mexico, 1990. (155 semester hrs. at four colleges between 1973 and 1990; cumulative GPA appx. 3.35; UNM GPA 3.70; course work emphases included English, journalism, geology/earth sciences/chemistry, Navajo language, math through calculus II)

Institutions attended:
1988-1990, University of New Mexico, Albuquerque, N.M.
1987-1989, Albuquerque Technical Vocational Institute
July 1983, Colorado School of Mines, Golden, Colo.
1974-1980, Arizona State University, Tempe, Ariz.
1973-1974, Ohio University, Athens, Ohio

EMPLOYMENT HISTORY:

9/81-present	Southwest Research & Information Center, Albuquerque, N.M.
10/80-9/81	The Fonts Typeset and Design, Phoenix, Ariz.
5/80-9/80	Amedsa Hills Farm, Springfield, Ohio (farm worker)
12/79-5/80	Arizonans for a Better Environment (staff researcher)
11/78-9/79	World Records Inc. (assistant manager), Tempe, Ariz.
9/78-3/80	Time/Life Inc. (news correspondent), Tempe, Ariz.
5/76-9/81	Free-lance writer and editor, based in Tempe, Ariz.
12/74-8/78	Scottsdale (Ariz.) Daily Progress (staff writer)
9/74-6/75	Thrifty Drugs Inc., Phoenix, Ariz.
1/74-6/74	Ohio University food service department, Athens, Ohio
mid-60s-9/73	Amedsa Hills Farm, Springfield, Ohio (part-time farm worker)

PROFESSIONAL AFFILIATIONS: Member, Oilfield NORM Task Force, New Mexico Environment Department (1992); member, State Review Coordinating Committee, Advisory Committee to Council on Regulatory Needs, Interstate Oil and Gas Compact Commission (1989-1992); member, Interstate Oil and Gas Compact Commission, Oklahoma Review Team (1992); member, Interstate Oil and Gas Compact Commission, Wyoming Review Team (1991); member, Albuquerque/Bernalillo County Ground Water Protection Advisory Committee (1988-1992); member, Governor's Ground Water Quality Advisory Committee (1988); member, Long-term San Juan Produced Water Study Committee, New Mexico Oil Conservation Division (1984-1992); member, Association of Ground Water Scientists and Engineers, National Water Well Association (1986-1988).

Résumé of Christopher L. Shuey
(continued)

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CURRENT BUSINESS ADDRESS: c/o SRIC, P.O. Box 4524, Albq., NM 87106, 505-262-1862.

PROFESSIONAL PUBLICATIONS:

Shuey, C. Policy and Regulatory Implications of Coal-Bed Methane Development in the San Juan Basin, New Mexico and Colorado. In: *Proceedings of the First International Symposium on Oil and Gas Waste Management Practices* (U.S. Environmental Protection Agency: New Orleans, La.), September 11, 1990.

Shuey, C. Affected-Citizen Involvement in Land Use and Water Quality Decisions: A Model for New Mexico in the 1990s. In: *Proceedings of Land Use V* (Southwest Land Use Institute: Albuquerque, N.M.), April 14, 1989, pp. 124-134.

Eiceman, G.A., McConnon, J.T., Zaman, M., Shuey, C., and Earp, D. Hydrocarbons and Aromatic Hydrocarbons in Groundwater Surrounding an Earthen Waste Disposal Pit for Produced Water in the Duncan Oil Field of New Mexico. *International Journal of Environmental Analytical Chemistry* (Great Britain), vol. 24, 1986, pp. 143-163.

Shuey, C., and Robinson, W.P. Characterization of Ground Water Quality Near a Uranium Mill Tailings Facility and Comparison to Standards. In: *Proceedings of a Symposium on Water Quality and Pollution in New Mexico* (New Mexico Bureau of Mines and Mineral Resources: Socorro, N.M.), Hydrologic Report 7, April 12, 1984, pp. 184-193.

SELECTED ARTICLES, REPORTS, PUBLIC COMMENTS:
(additional citations are available upon request)

Shuey, C. Citizens Take Oil and Gas Waste Problems to Congress. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 16, no. 4, Winter 1991, p. 193.

Shuey, C. Increased Protection Proposed for Ground Water from Oil and Gas Drilling. *The Green Fire Report* (New Mexico Environmental Law Center: Santa Fe), November/December 1991, pp 1-3.

Shuey, C. Policy and Regulatory Initiatives for the Management of Radioactive Oilfield Wastes in New Mexico. Statement to the New Mexico Water Quality Control Commission (Socorro, N.M.), November 12, 1991.

Shuey, C. Oral Testimony and Written Statement to the Energy, Natural Resources and Environment Committee, New Mexico State Legislature, concerning environmental consequences of oil and natural gas exploration and production (Hobbs, N.M.), October 25, 1991.

Shuey, C. Oral Testimony and Written Statement to the Subcommittee on Environmental Protection, Committee on Environment and Public Works, United States Senate, concerning the need to regulate oil and gas exploration and production wastes under the Resource Conservation and Recovery Act of 1976, September 11, 1991.

Shuey, C. Marathon Indian Basin Gas Plant Gathering Line Leak — Incident Summary and Recommendations for Enforcement Action (Southwest Research and Information Center: Albuquerque, N.M.), July 16, 1991.

Shuey, C. Written and Oral Testimony In the Matter of the Promulgation and the Establishment of Field Rules to Govern Operations in the Ignacio Blanco Field, Archuleta and La Plata Counties, Colorado, before the Colorado Oil and Gas Conservation Commission, Cause No. 112, Docket No. 12-18, May 21, 1991, February 18, 1991, and December 17, 1990.

Shuey, C. Lessons Learned from Coal-bed Methane Development in the San Juan Basin of New Mexico and Colorado and Implications for Proposed CBM Development in the Red Desert of Southwest Wyoming," prepared for Powder River Basin Resource Council, Sheridan, Wyoming; May 4, 1991.

Shuey, C. At War in the Oil Patch: Citizens Push for a National Oil and Gas Waste Policy. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 15, no. 3, Fall 1990, pp. 96-102.

Shuey, C. Bald Alfalfa Fields and "Gassy" Water: Coal-Bed Methane Premiers in Cedar Hill and Bondad, Parts I and II. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 15, nos. 2 and 3, Summer 1990, pp. 53-61, and Fall 1990, pp. 103-105.

Begay, R., and Shuey, C. Navajos Fight for Clean Water. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 14, no. 3, July/September 1989, pp. 116-117.

Shuey, C. Oil and Gas Issues. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 14, no. 2, April/June 1989, p. 89.

Taylor, L., Shuey, C., Wiggins, C., Ortiz, G., Ortiz, D.M., Chavez, J., Hughes, R.W., Lujan, J.M., and Behnfield, L. The Importance of Cross-Cultural Communication between Environmentalists and Land-Based People. *The Workbook* (Southwest

Research and Information Center: Albuquerque, N.M.), vol. 13, no. 3, July/September 1988, pp. 90-100.

Shuey, C. Comments of Southwest Research and Information Center on the U.S. Environmental Protection Agency's *Report to Congress—Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy*. Southwest Research and Information Center (Albuquerque, N.M.), March 15, 1988.

Shuey, C., and Morgan, R. Summary of Surface Water and Ground Water Quality Investigations Conducted by Southwest Research and Information Center in the Puerco River Valley, New Mexico and Arizona, 1986-1987. Southwest Research and Information Center (Albuquerque, N.M.), December 1987; revised February 1988.

Shuey, C., Rich, S., and Bean, K. Ground Water Contamination in New Mexico: "Seeing" What It's All About. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 12, no. 2, April/June 1987, pp. 44-53.

Shuey, C. The Puerco River: Where Did The Water Go? *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 11, no. 1, January/March 1986, pp. 1-10.

Shuey, C., Robinson, W.P., and Taylor, L. The "Costs" of Uranium: Who's Paying With Lives, Lands, and Dollars. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 10, no. 3, July/September 1985, pp. 102-117.

Shuey, C. Oil and Water Still Don't Mix—Oil and Gas Wastes Pollute the Nation's Ground Water. *The Workbook* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 9, no. 4, October/December 1984, pp. 131-146.

Shuey, C. Comments of Southwest Research and Information Center and Two Rivers Citizens Association on EPA Advanced Notice of Proposed Rulemaking for 'Low' and 'Medium' Priority Uranium Mill Tailings Sites. (Southwest Research and Information Center:Albuquerque, N.M.), May 5, 1983.

Shuey, C. Church Rock Revisited — The Tailings Spill Three Years Later. *Mine Talk* (Southwest Research and Information Center: Albuquerque, N.M.), vol. 2, nos. 1-2, Summer/Fall 1982.

Shuey, C. Calamity at Church Rock, Parts I and II. *Saturday Magazine, Scottsdale* (Ariz.) *Daily Progress*, February 1981.

Shuey, C. The Widows of Red Rock. *Saturday Magazine, Scottsdale* (Ariz.) *Daily Progress*, June 2 and 9, 1979.

SUMMARY OF SOIL AND GROUND WATER INVESTIGATIONS AT UNLINED OILFIELD PIT SITES AND DISPOSAL FACILITIES, SAN JUAN BASIN, NEW MEXICO, 1983-1992

Compiled by Southwest Research and Information Center, January-March 1992

Site Identification	*Owner/ Operator	Location	DTGW (ft)	BWPD	Gwater Contam?	Soil Contam?	BTEX Contam?	BTEX >Stds?	Year(s) of investigation/ Source of contamination
1. **Abrams L #1**	Amoco	29.10.26M	16.0	3.0	yes	yes	yes	yes	1987/dehy pit
2. **Bruce Sullivan Comm B #1**	Amoco	29.10.18.0	0.06	unk	no	unk	no	no	1987
3. **Earl Morris A #1****	Amoco	29.10.26K	26+	unk	no	yes	no	no	1990/separator pit
4. **Gallegos Canyon Unit F#162**	Amoco	29.12.36	20.0	0.10	yes	yes	yes	yes	1987/separator pit
5. **Gallegos Canyon Unit #153E**	Amoco	29.12.28C	9-13	0.05	yes	yes	yes	yes	1987/separator pit; floating product detected
6. **Gallegos Canyon Unit #250**	Amoco	28.12.14N	unk	unk	unk	yes	soils-yes gwater-unk	soils-yes gwater-unk	1991/unknown
7. **Gerk Gas Comm B #1M**	Amoco	29.9.19N	15.0	0.26	no	unk	no	no	1987
8. **Grambling A #3A**	Meridian	29.9.22E	15.0	0.21	yes	yes	yes	yes	1987/separator upset
9. **Heath Gas Comm C #1**	Amoco	30.9.30K	20.0	0-1	no	unk	no	no	1987
10. **Lee Acres Landfill**	BLM/SJC	29.12.22	35+	(a)	yes	yes	yes	yes	1985-92/lagoon at municipal solid waste landfill
11. **Manaña-Mary Wheeler #1E**	EPNG	30.12.23M	7-8	unk	yes	yes	no	no	1983-92/dehy pit
12. **Marcotte Gas Comm #1**	Amoco	31.10.5H	25+	unk	yes	yes	yes	no	1991-92/blowdown, tank drain pits
13. **Marquis Eaton A #1E**	Tenneco	29.10.	13.0	1.5	no	unk	no	no	1987
14. **North Hogback 6 #11**	RTDOC	29.16.6M	4-6	2.0	yes	yes	yes	no	1985/separator pit
15. **Riddle F LS #3A**	Tenneco	28.8.20F	14.3	0.64	yes	yes	yes	yes	1987/tank drain pit
16. **Saiz #1**	GCNM/ UTP	29.11.20	unk	unk	unk	yes	unk	unk	1985/dehy pit
17. **Sullivan Frame A #1E**	Tenneco	29.10.30A	13.5	2.0	yes	yes	yes	no	1987/separator pit
18. **Tapp Comm 5**	Tenneco	28.8.17P	31.5	1.0	yes	yes	yes	no	1987/separator pit
19. **Thomas #1**	Mobil	29.11.10L	4-10	unk	yes	yes	yes	yes	1988-92/undetermined***
20. **Valdez A #1**	Tenneco	29.11.24I	6-19	0.5	yes	yes	yes	yes	1987/separator pit
21. **Valdez A #1E**	Tenneco	29.11.24G	13.0	0.45	yes	yes	yes	yes	1987/separator pit
22. **Dogie Canyon Compressor**	GCNM	25.6.4.D	5-6	unk	yes	yes	yes	yes	1987/dehy pit
23. **Johnston Federal #6A**	Meridian	31.9.35	36	unk	yes	yes	yes	yes	1991-92/production pit
24. **Maddox Com #1A**	Meridian	30.8.17	13	unk	yes	yes	no	no	1991-92/production pit

Notes:

* Owner/operator of record at time of investigation.

** This well may also be known as Morris Gas Comm C #1E, 29.10.26K.

*** Leak in condensate storage tank or spills within bermed area around tank are suspected source(s) of contamination; however, unlined pits at the site and located near the storage tank area were used for disposal of production fluids through 1987.

(a) The Lee Acres Landfill lagoon contained thousands of barrels of fluids at the time the contamination investigations began in 1985. Much of this fluid was produced water trucked to the facility from off-site oil and gas leases. The lagoon was drained and covered in 1986-87.

Abbreviations:

BLM/SJC	U.S. Bureau of Land Management/San Juan County	BTEX Contam?	contamination of ground water (unless otherwise indicated) by benzene, toluene, ethylbenzene, and-or xylenes
BWPD	barrels of water produced per day	DTGW	depth to ground water (in feet)
Contam	contamination	GCNM/UTP	Gas Company of New Mexico/Union Texas Petroleum
EPNG	El Paso Natural Gas Company	RTDOC	Raymond T. Duncan Oil Company
Gwater	ground water	unk	unknown
>Stds.	BTEX exceeded applicable N.M. Water Quality Control Commission numerical pollutant standards		

EXHIBIT SRIC-2

Selected References and Data Sources to Exhibit SRIC-2:

AEPCO, Inc. Site Investigation Report for Lee Acres Site, submitted to U.S. Bureau of Land Management, May 30, 1986. **Site No. 10.**

Amoco Production Company. Pit Inventory Sheet and analytical data for ground water samples from monitor wells at Marcotte Gas Comm #1, October 9, 1991. **Site No. 12.**

Amoco Production Company. Request for approval of oily soil composting operation; analytical data for oily soils excavated from GCU #250 site, October 4, 1991. **Site No. 6.**

Brown, K. W. and Associates. Site Investigation of Manana-Mary Wheeler #1-E Well Site Near Flora Vista, New Mexico. Prepared for EPNG, September 1989. **Site No. 11.**

Cresswell, G. A., Mobil Exploration and Producing. Letter to David Boyer, NMOCD, concerning ground water investigation at Mobil Thomas #1 well site. **Site No. 19.**

Dunlap, Lloyd E. Dissolved Hydrocarbons in Groundwater Near Gas Well GCU 153E Near Farmington, New Mexico. Report to Amoco Production Co., April 23, 1987. **Site No. 5.**

Eiceman, Gary A., et al. Hydrocarbons and Aromatic Hydrocarbons in Groundwater Surrounding an Earthen Waste Disposal Pit for Produced Water in the Duncan Oil Field of New Mexico. *International Journal of Analytical Environmental Chemistry*, vol. 24, pp. 143-162, 1986. **Site No. 14.**

Geoscience Consultants Ltd. Proposed Work Plan for Site Investigation at Thomas #1 Well Site, prepared for Mobil Exploration and Producing, July 26, 1991. **Site No. 19.**

McEneny, M. J., Meridian Oil. Letter to Roger Anderson, N.M. Oil Conservation Division, "Re: Groundwater Analyses from the Johnston Federal #6A and Maddox Com #1A Well Sites, San Juan County, New Mexico," March 4, 1992. **Sites Nos. 23, 24.**

Motto, R. D., Union Texas Petroleum. Letter to N.M. Oil Conservation Division Aztec District office, concerning Saiz No. 1 Well, March 27, 1985. **Site No. 16.**

New Mexico Oil Conservation Commission. Hearing record for Case No. 8224; testimony and exhibits of Masud Zaman, Gary A. Eiceman and Rick Meyerhein concerning the Duncan Oil Field study, February-March 1985; April 3, 1985. **Site No. 14.**

New Mexico Oil Conservation Division (Santa Fe Office, Environmental Bureau). District III file for Amoco Earl Morris A #1E; correspondence and photos showing black staining of soils beneath separator pit, black and yellow sludges in blowdown pit; August 1990. **Site No. 3.**

New Mexico Oil Conservation Division (SFO/EB). District III files for Tenneco Valdez A-1 and A-1E and Riddle F LS 3A, 1987-1989. **Site Nos. 15, 20, 21.**

New Mexico Oil Conservation Division (SFO/EB). Ground-water discharge plan files for Dogie Canyon Compressor Station. **Site No. 22.**

New Mexico Oil Conservation Division (SFO/EB). Hydrocarbon and general chemistry for water samples collected from test holes at the Mobil Thomas #1 well site, July 1988; H+GCL, "Thomas #1 Well Site Subsurface Investigation Report, San Juan County, New Mexico," prepared for Mobil Exploration and Producing, November 26, 1991. **Site No. 19.**

Olson, William C. Volatile Organic Contamination of Ground Water Around Unlined Produced Water Pits. New Mexico Institute of Mining and Technology (Socorro), Open File Report H89-9, December 1989. **Sites Nos. 1,2,4,5,7,8,9,13,15,17,18,20,21.**

U.S. Environmental Protection Agency. Report to Congress -- Management of Wastes from the Exploration, Development, and Production of Crude Oil, Natural Gas, and Geothermal Energy, Office of Solid Waste and Emergency Response (Washington, D.C.); Volume 3, Appendix C, Damage Cases NM02, NM03, and NM05. **Site Nos. 10,11,14.**

EXHIBIT SRIC-3

OCD-APPROVED TANKS OR LINED PITS IN VULNERABLE AREA, SAN JUAN BASIN*

Operator	Type of Tank**	Approval Date	# Sites
Amoco	BG, steel	05/04/87	330+
Beta Development	BG, fiberglass	NI	1
Blackwood and Nichols	fiberglass	NI	7
Clayton Investment	(no documentation of compliance)		1
Dugan Production Co.	(no documentation of compliance)		1
Raymond T. Duncan	steel	05/87	5
El Paso Natural Gas	500-bbl steel	01/22/87	5
Hedrick/Kendrick	BG	02/10/86	1
Kimbrell Oil Co.	BG, steel	12/04/86	2
Manana Gas Co.	100-bbl steel	12/09/86	8
Horace McKay Jr.	BG, 100-bbl steel	01/06/87	3
***Meridian Oil Co.	fiberglass	12/86	44
Mesa Operating Ltd.	BG, fiberglass	unknown	26+
Mobil Exploration	AG, fiberglass	unknown	1+
Quinoco Petroleum	AG, 330-bbl	03/25/87	4
Snyder Oil Corp.	DL, plastic	09/13/91	17
***Tenneco Oil Co.	steel	Fall 1986	31
Unocal Corp.	steel	05/87	1+
Unocal Corp.	DL, plastic	11/05/91	68
Union Texas Petroleum	BG, steel	unknown	6

Notes and Abbreviations:

* Data compiled from OCD Vulnerable Area Pit Replacement files, OCD Environmental Bureau, Santa Fe office.

** Below-grade tanks must be installed with a synthetic underliner and have leak detection capabilities pursuant to OCD's below-grade tank installation guidelines; this column also denotes operators that used double synthetic liners instead of tanks.

*** These companies replaced unlined pits that received as little as one-half barrel of produced water a day, regardless of the type of pit or the quality of the fluids discharged.

AG above-grade
BG below-grade
DL double liner
NI no information available in OCD files

EXHIBIT SRIC-4

Manana Gas, Inc.
P. O. BOX 36990
ED HARTMAN, PRES. ALBUQUERQUE, NEW MEXICO 87176 TELE: (505) 884-4863
(505) 884-0814

October 28, 1986

N.M. Energy & Minerals Department
Oil Conservation Division
Box 2088
Santa Fe, N.M. 87504

Attn: Mr. Jami Bailey

Dear Mr. Bailey:

The following plans and specifications for installation of produced water pit liners are submitted for your approval or suggestions.

For installation on:

	Name	Formation	Location	Daily Water Produced	Ground Water Level
	Hartman #1-E	Dakota	NE/4 Sec. 22, 29N-11W	New well,unknown	20
	Nancy Hartman #1	Chacra	NE/4 Sec. 22, 29N-11W	New well,unknown	20
	Nancy Hartman #2	Chacra	SE/4 Sec. 22, 29N-11W	New well,unknown	10
	Mary Jane #1	Chacra	SW/4 Sec. 22, 29N-11W	New well,unknown	9
(A)	Aunt Maggie #1	Pictured Cliffs	SE/4 Sec. 25 29N-11W	0.6	25
(A)	Sullivan #1	Farmington	SE/4 Sec. 25 29N-11W	0.6	25

((A) These wells had excessive solids when tested.)

Tank Specifications: 100 Bbl., welded, open top, 12' Diam. x 5' high, 3/16" thick steel coated inside and outside with Coal Tar Epoxy.

Impermeable Barrier: Polyethylene Fabric - 30 mils thick, one piece.

Leak Detection System: 2" steel drain pipe, 4" steel inspection sump.

Inspection Frequency: Each time well is checked; 2 to 3 times weekley.

Contingency Plan: In the event of a leak in the tank, the tank will be drained, lifted out of the pit and holes repaired by welding.

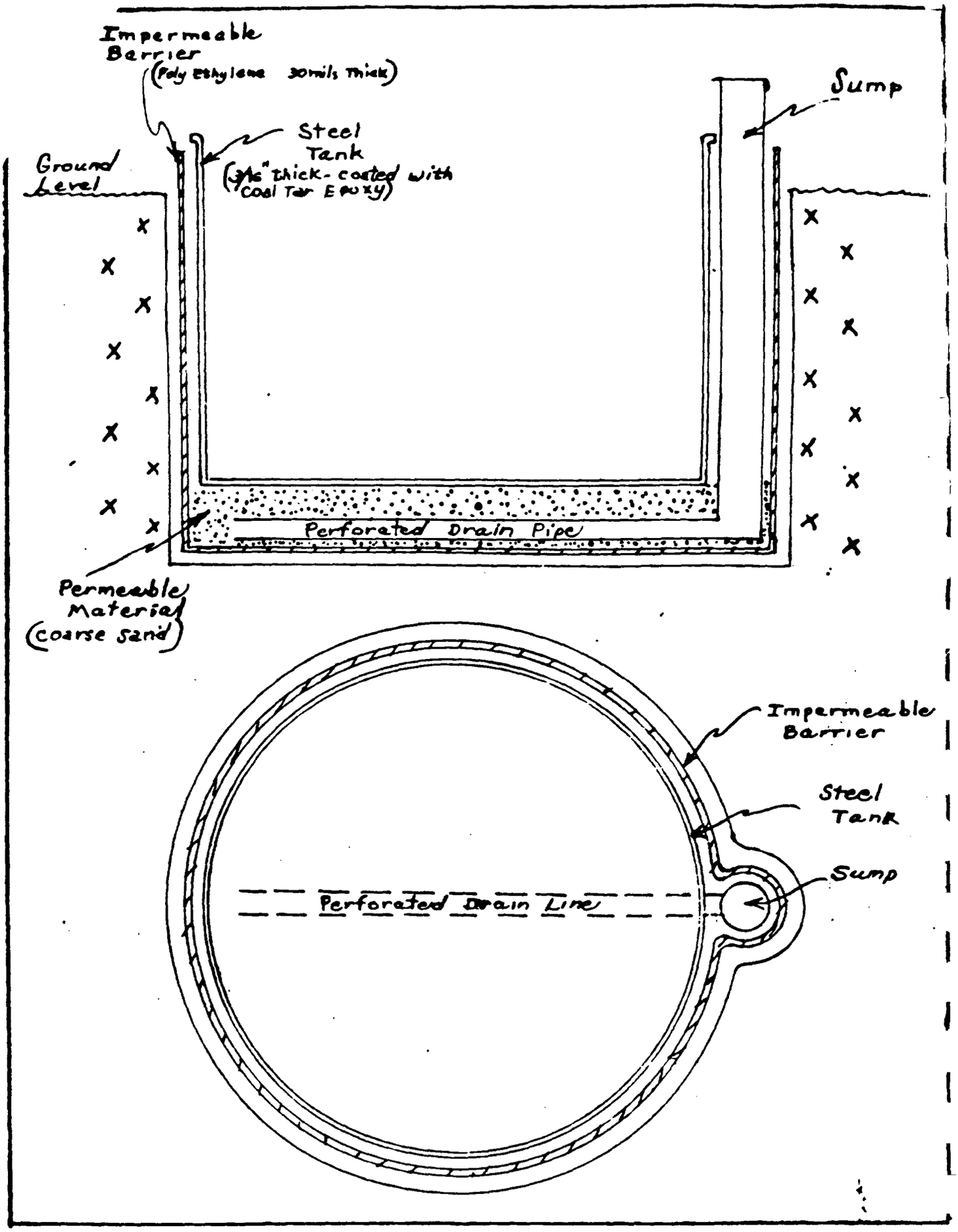
A drawing, showing side view and plan view, is enclosed.

MANANA GAS, INC.

Ed Hartman

Ed Hartman
President

Encl
EMH/nh


Impermeable Barrier
(Poly Ethylene 30mils Thick)
Steel Tank
(3/16" Thick - coated with Coal Tar Epoxy)
Sump
Ground Level
Perforated Drain Pipe
Permeable Material (Coarse Sand)
Impermeable Barrier
Steel Tank
Sump
Perforated Drain Line

STATE OF NEW MEXICO

ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION

TONEY ANAYA
GOVERNOR

October 30, 1986

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

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Ed Hartman
Manana Gas, Inc.
P. O. Box 36990
Albuquerque, New Mexico 87176

RE: APPROVAL OF DESIGN FOR BELOW-GRADE PRODUCED WATER TANKS

Dear Mr. Hartman:

We have reviewed the plans and specifications in your application for approval for below-grade tanks at six wells located in Sections 22 and 25, Township 29 North, Range 11 West. The design specifications submitted are acceptable provided that a slight slope of the perforated drain pipe toward the sump is incorporated during installation.

Your request for approval of design of below-grade produced water tanks for the six well sites in the San Juan Basin Vulnerable Area was submitted pursuant to the Oil Conservation Commission's Order R-7940 and is hereby approved, with the stipulated modification, pursuant to that order and Rule 8 of the Oil Conservation Division's Rules and Regulations. Please be advised that the approval of this design does not relieve you of liability should your operation result in actual pollution of surface or ground waters which may be actionable under other laws and/or regulations.

There will be no routine monitoring requirements other than those outlined in your application.

Please notify this office upon completion of the installation of the tanks on the wells listed in your application. Notification is required, with completion date, for any additional wells identified as requiring tanks under Order R-7940 or R-7940-A.

On behalf of the staff of the Oil Conservation Division, I wish to thank you (and your staff and/or consultants) for your cooperation during this application review.

Sincerely,

R. L. STAMETS
Director

RLS:JB:dp

cc: OCD-Aztec District Office

STATE OF NEW MEXICO

EXHIBIT SRIC-5

ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

OIL CONSERVATION DIVISION

BRUCE KING
GOVERNOR

SEPTEMBER 13,1991

POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87504
(505) 827-5800

CERTIFIED MAIL
RETURN RECEIPT NO:P-106-675-366

Mr. Dale E. Richardson
Snyder Oil Corporation
P.O. Box 2038
Farmington, N.M. 87499

RE: Produced Water Pit Liners

Dear Mr. Richardson:

The Oil Conservation Division (OCD) has received your proposal, dated August 28, 1991, to install production pit liners consisting of double synthetic lining equipped with leak detection on 14 wells in the San Juan Basin.

The designs submitted with the proposal afford protection to groundwater and the environment and are approved for installation.

Please be aware this approval does not relieve you of liability should your operation result in actual pollution actionable under other laws and/or regulations.

If you have any questions, please do not hesitate to call me at (505)827-5884.

Sincerely,

Roger C. Anderson
Environmental Engineer

xc: OCD Aztec Office

SOCO
Snyder Oil Corporation
P O Box 2038
Farmington, New Mexico 87499
(505) 632-8056

August 28, 1991

Mr. Roger Anderson
New Mexico Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico

RE: Liners for Produced Water Pits

Dear Roger,

Snyder Oil Corporation has contracted with Frank Liner Fabrication to install 17 production pit liners on 14 wells in San Juan Basin. (See attached list)

A copy of the installation procedures and cut away cross-section is attached as per your request. The pit liners are all designed for 85 bbl capacity and have the following dimensions: 17' Length - 13' Width - 3' Depth

If you need any additional information, please contact me at 1-505-632-8056.

Sincerely,

Dale E. Richardson
Area Superintendent

Attach.

WELL NAME	LOCATION	
LINDA 1A	NWNW 31-27N-8W	San Juan County, NM
NCRA 1	NWNW 22-26N-7W	Rio Arriba County, NM
CANDADO 1	SWSW 15-26N-7W	Rio Arriba County, NM
CANDADO 1E	NWSE 15-26N-7W	Rio Arriba County, NM
CAIN 1E	NESE 25-31N-13W	San Juan County, NM
CLAYTON 1	SESW 2-30N-12W	San Juan County, NM
CLAYTON 1E	SESE 2-30N-12W	San Juan County, NM
JICARILLA C1	SESE 11-26N-4W	Rio Arriba County, NM
JENNEY 1	NWNE 13-26N-4W	Rio Arriba County, NM
JICARILLA B 1A	SESE 26-26N-4W	Rio Arriba County, NM
CHAMPLIN 1E	NWSE 35-27N-4W	Rio Arriba County, NM
CHAMPLIN 1	SWSW 35-27N-4W	Rio Arriba County, NM
CHAMPLIN 4E	NWNE 35-27N-4W	Rio Arriba County, NM
COMPRESSOR #7	NWNE 26-26N-4W	Rio Arriba County, NM

All the above listed wells will have a single lined production pit, except the Clayton 1 & 1E and Jenney 1, which will require an additional lined pit to contain produced water from the dehydrators.

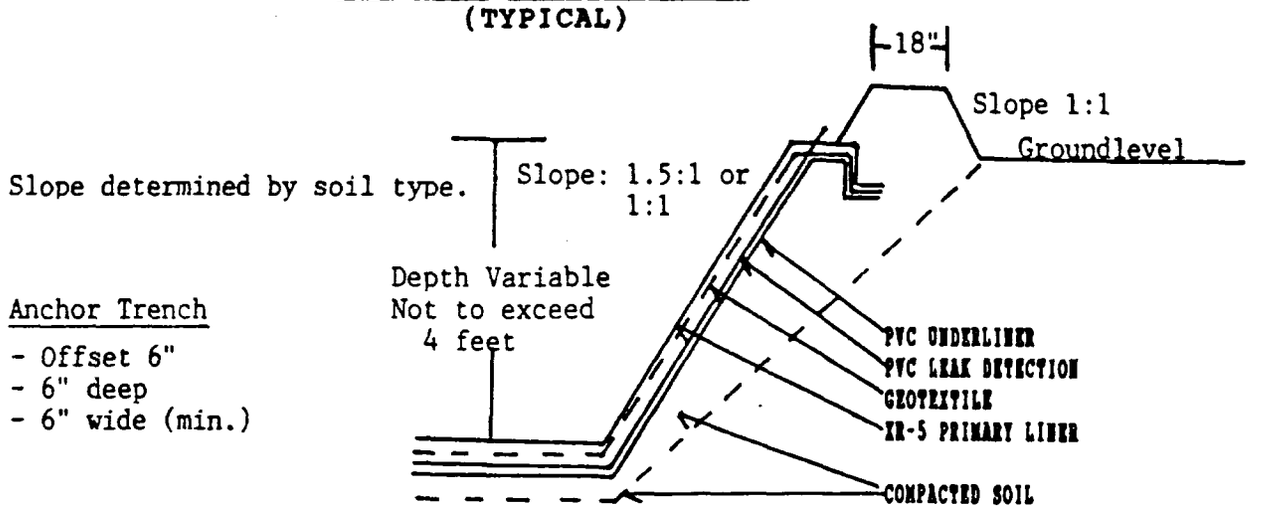
FRANK LINER FABRICATIONS, INC.
P.O. Box 308 • Farmington NM 87499 • (505) 326 - 1962
Oilfield Pit & Tank Liners

INSTALLATION PROCEDURES

PRODUCTION PIT LINER SYSTEMS

1. Take down existing fence. Layout cut and fill stakes.
2. Remove excess dirt or bring in fill dirt, as necessary. Cut anchor trench..
3. Compact bottom and all side slopes with vibrating compactor.
4. Remove all sharp objects,(rocks, roots, etc...).
5. Install 30 mil PVC underliner.
6. Install leak detection system (0.5" open-ended pvc).
7. Install geotextile over leak detection system.
8. Install 30 mil XR-5 Primary liner.
9. Bury liners and geotexile in anchor trench. Compact soil in anchor trench. Install compacted soil ,rain diversion berm.
10. Put fence back up.

CUT AWAY CROSS-SECTION
(TYPICAL)



Anchor Trench
- Offset 6"
- 6" deep
- 6" wide (min.)

MERIDIAN OIL

Memorandum

EXHIBIT SRIC-6

To: Mr. D. R. Read

Date: September 30, 1986

From: Gary W. Brink

Location: Farmington, N. M.

Subject: Fiberglass Pits

New Mexico Oil Conservation Division order R-7940 requires lined pits and leak detection systems installed prior to January 1, 1987, on all wells within the vulnerable area that exceed the regulations governing produced water. Attached is a list of wells operated by Meridian that require fiberglass pits and leak detection systems in order to conform to the Oil Division's regulations.

It is recommended that fiberglass pits be ordered and installed on the attached list of wells prior to the first of the year. The total estimated cost of the project to Meridian is about $52,600.

If you concur with this recommendation, please secure the necessary approvals and I will schedule the installation. Several wells will require Joint Interest Approval prior to making any expenditure for pit installation.

Gary W. Brink
Regional Production Engineer

Concur: _____
Don R. Read
Regional Operations Manager

GWB:DRR:te
Attachment

SUMMARY

Well Name	WI	Price	Net
Meridian			
Farmington A #1	.4885	$1,920.00	$937.92
Farmington A #1E	.4885	1,920.00	937.92
Howell J #3A	.5000	1,920.00	960.00
Howell K #1	1.0000	1,920.00	1,920.00
Howell K #3	1.0000	1,920.00	1,920.00
Hubbell #10	.5000	1,920.00	960.00
Montgomery #1	1.0000	1,920.00	1,920.00
Montgomery #2	1.0000	1,920.00	1,920.00
Munoz #1	.5031	1,920.00	965.95
Neudecker #2	.7500	1,920.00	1,440.00
Randlemon #2	.6000	1,920.00	1,152.00
San Juan Unit 32-5 #15	.9143	1,920.00	1,755.45
San Juan Unit 32-5 #15A	.9143	1,920.00	1,755.45
San Juan Unit 32-5 #18	.9143	1,920.00	1,755.45
Simmons #1	1.0000	1,920.00	1,920.00
Stull #1	.8796	1,920.00	1,688.84
Tapp #2	.5000	1,920.00	960.00
Tapp #2A	.5000	1,920.00	960.00
Turner A #1	.2429	1,920.00	466.36
Turner A #1A	.2429	1,920.00	466.36
Wilmuth #1	.7391	1,920.00	1,419.07
Wilmuth #1A	.7391	1,920.00	1,419.07
			29,599.84
Southland Royalty			
Cozzens B #1	.6148	1,450.00	891.46
Cozzens B #1E	.6148	1,450.00	891.46
Flora Vista #1	.2204	1,920.00	423.17
Gerard A #1E	1.0000	1,450.00	1,450.00
Harris #1	1.0000	1,920.00	1,920.00
Mangum #4	1.0000	1,450.00	1,450.00
Mangum #4E	1.0000	1,450.00	1,450.00
Mangum #5	1.0000	1,450.00	1,450.00
Mangum #5E	1.0000	1,450.00	1,450.00
Mangum B Com #1	.1180	1,450.00	171.10
Mangum B Com #1E	.1464	1,450.00	212.80
McWhorter-Duncan #1	.7500	1,450.00	1,087.50
Randleman #1	.6872	1,920.00	1,319.42
Randleman #1A	.6872	1,920.00	1,319.42
Ruple #1A	.6872	1,450.00	996.44
Ruple #1X	.6872	1,450.00	996.44
Sammons #2	.6248	1,450.00	905.96
Sammons #2E	.6248	1,450.00	905.96
Sategna #2	.5872	1,450.00	851.44
Sategna #2E	.5872	1,450.00	851.44
Turner #1	.6872	1,450.00	996.44
Turner #1A	.6872	1,450.00	996.44
			22,986.89

Meridian Net	$29,599.84
Southland Royalty Net	22,986.89
Total	$52,586.73

EXHIBIT SRIC-7

STATE OF NEW MEXICO
Energy and Minerals Department

OIL CONSERVATION DIVISION
P. O. Box 2088
Santa Fe, New Mexico 87501
(505) 827-5800

AZTEC DISTRICT OFFICE
1000 Rio Brazos Road
Aztec, New Mexico 87410
(505) 334-6178

PRODUCED WATER
PIT REGISTRATION FORM
(Instructions on Back)

Owner/Operator: EPNG/Meridian Oil Inc.
(List information only for pits operated by you at a lease or at other locations)

Well and Lease, or Facility Name: San Juan 30-6 Unit #404

Location: Sec. 23, T30N, R7W, Rio Arriba County, New Mexico

(A) Pit	(B) Maximum Daily Discharge to Each Pit	(C) Pit Type	(D) Depth to Ground Water	(E) Sample of Discharge to Each Pit	
				TDS (in mg/l) or conductivity & temperature	Sample Date
Primary Pit/ Produced Water Pit	500 BWPD	5-500 BBL Tanks	110' Groundbed Cathodic	24,600	12-28-87
Ancillary Pit(s)					
Dehydrator	0.4 BWPD	50 BBL Fiberglass Pit			
Blow Pit	0	Unlined			

STATE OF NEW MEXICO
Energy and Minerals Department

OIL CONSERVATION DIVISION
P. O. Box 2088
Santa Fe, New Mexico 87501
(505) 827-5800

AZTEC DISTRICT OFFICE
1000 Rio Brazos Road
Aztec, New Mexico 87410
(505) 334-6178

PRODUCED WATER
PIT REGISTRATION FORM
(Instructions on Back)

Owner/Operator: EPNG/Meridian Oil Inc.
(List information only for pits operated by you at a lease or at other locations)

Well and Lease, or Facility Name: San Juan 30-6 Unit #406

Location: Sec. 15, T30N, R7W, Rio Arriba County, New Mexico

(A) Pit	(B) Maximum Daily Discharge to Each Pit	(C) Pit Type	(D) Depth to Ground Water	(E) Sample of Discharge to Each Pit	
				TDS (in mg/l) or conductivity & temperature	Sample Date
Primary Pit/ Produced Water Pit	360 BWPD	3 - 500 BBL Tanks	150' Groundbed Cathodic	20,000	11-17-87
Ancillary Pit(s)					
Dehydrator	0.6 BBL	50 BBL Fiberglass Pit			
Blow Pit 50x50x10'	0	Unlined			
Underground Drip Blow Off	0	50 BBL Fiberglass Pit			

RECEIVED
JAN 1 1988
OIL CON. DIV.
DIST. 3

STATE OF NEW MEXICO
Energy and Minerals Department

OIL CONSERVATION DIVISION
P. O. Box 2088
Santa Fe, New Mexico 87501
(505) 827-5800

AZTEC DISTRICT OFFICE
1000 Rio Brazos Road
Aztec, New Mexico 87410
(505) 334-6178

PRODUCED WATER
PIT REGISTRATION FORM
(Instructions on Back)

Owner/Operator: EPNG/Meridian Oil Inc.
(List information only for pits operated by you at a lease or at other locations)

Well and Lease, or Facility Name: San Juan 30-6 Unit #400

Location: Sec. 14, T30N, R7W, Rio Arriba County, New Mexico

(A) Pit	(B) Maximum Daily Discharge to Each Pit	(C) Pit Type	(D) Depth to Ground Water	(E) Sample of Discharge to Each Pit	
				TDS (in mg/l) or conductivity & temperature	Sample Date
Primary Pit/ Produced Water Pit	450 BWPD Flowmeter	5 - 500 BBL Tanks	180' Groundbed Cathodic	20,400	11-17-87
Ancillary Pit(s)					
Dehydrator	0.5 BWPD	50 BBL Fiberglass Pit			
Blow Pit 50x50x10'	0	Unlined			

RECEIVED
JAN 19 1988
OIL CON. DIV.
DIST. 3

STATE OF NEW MEXICO
Energy and Minerals Department

OIL CONSERVATION DIVISION
P. O. Box 2088
Santa Fe, New Mexico 87501
(505) 827-5800

AZTEC DISTRICT OFFICE
1000 Rio Brazos Road
Aztec, New Mexico 87410
(505) 334-6178

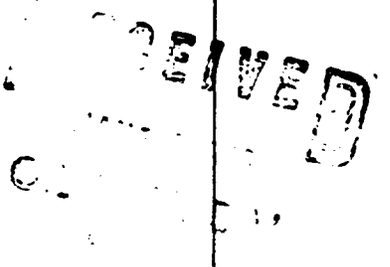
PRODUCED WATER
PIT REGISTRATION FORM
(Instructions on Back)

Owner/Operator: EPNG/Meridian Oil Inc.
(List information only for pits operated by you at a lease or at other locations)

Well and Lease, or Facility Name: San Juan 30-6 Unit #402

Location: _____

(A) Pit	(B) Maximum Daily Discharge to Each Pit	(C) Pit Type	(D) Depth to Ground Water	(E) Sample of Discharge to Each Pit	
				TDS (in mg/l) or conductivity & temperature	Sample Date
Primary Pit/ Produced Water Pit	240 BBLS	3 - 500 BBL Tanks	200' Groundbed Cathodic	22,200	11-17-87
Ancillary Pit(s)					
Dehydrator	0.5 BBL	50 BBL Fiberglass Pit			
Blow Pit 40x40x10'	0.0	Unlined			
Underground Pit Blow Off	0.0	Unlined			



Tenneco Oil
Exploration and Production
A Tenneco Company
Rocky Mountain Division

P O Box 3249
Englewood Colorado 80155
(303) 740-4800

Delivery Address
6162 South Willow Drive
Englewood Colorado 80111

EXHIBIT SRIC-8

October 24, 1986

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

State of New Mexico
Energy & Minerals Department
Oil Conservation Division
P.O. Box 2088
Santa Fe, New Mexico 87501

Attention: Ms. J. Bailey

Re: Installation of Below Grade
Produced Water Tanks

Dear Ms. Bailey:

As a result of Order No. R-7940 we have removed thirty-one (31) produced water pits from service. A list of these wells is attached.

The pits were replaced with steel tanks. The tanks were installed according to the procedures you approved in our application. Please call me at (303) 740-2579 if you have any questions.

Very truly yours,

TENNECO OIL COMPANY

Martin W. Buys
Staff Environmental/Safety Coordinator

MWB/cmf:2636a

cc: Frank Chavez
1000 Rio Brazos Rd.
Aztec, NM 87410

LIST OF WELLS TO RECEIVE STEEL PRODUCED WATER PITS

	Well Name	Produced Water/Day (bbls)
1.	Archuleta 1 SE/SW, Sec. 19, T30N, R8W	1
2.	Callow 9E SE/NE, Sec. 28, T29N, R13W	1/4
3.	Calloway LS 2 SE/NE, Sec. 34, T31N, R11W	0
4.	Calloway LS 3 SW/SE, Sec. 34, T31N, R11W	0
5.	Eaton A 1E NW/NE, Sec. 25, T29N, R11W	15
6.	Florance 27 NW/SW, Sec. 26, T29N, R9W	0
7.	Florance 32A SE/NW, Sec. 15, T30N, R8W	1/4
8.	Florance 69 NE/NW, Sec. 27, T29N, R9W	0
9.	Florance 87 SE/SW, Sec. 26, T29N, R9W	0
10.	Florance 124 NE/NW, Sec. 27, T29N, R9W	0
11.	Hutchins LS 1A SE/SE, Sec. 7, T31N, R10W	1/2
12.	Irvin Com 1 SE/NE, Sec. 11, T29N, R13W	1
13.	Jacques 1 SW/SW, Sec. 25, T30N, R9W	1/2
14.	Jacques 3 SW/NW, Sec. 25, T30N, R9W	0
15.	Jacques Com A1 SW/SW, Sec. 25, T30N, R9W	0
16.	Florance 126 SW/SW, Sec. 26, T29N, R9W	0

LIST OF WELLS TO RECEIVE STEEL PRODUCED WATER PITS - Page 2

	Well Name	Produced Water/Day (bbls)
17.	Mudge LS 32 SW/SE, Sec. 23, T31N, R11W	0
18.	Nye LS 1A SW/SE, Sec. 23, T31N, R11W	2
19.	Payne A-1E SE/SW, Sec. 19, T29N, R10W	2
20.	Riddle Com 9 NW/SW, Sec. 17, T28N, R8W	1/2
21.	Riddle F LS 1 NW/SW, Sec. 17, T28N, R8W	0
22.	Riddle F LS 10 SW/SW, Sec. 17, T28N, R8W	0
23.	Sanchez 2 SE/NW, Sec. 28, T29N, R10W	0
24.	San Juan Gravel A1 SE/SE, Sec. 21, T29N, R13W	1
25.	San Juan Gravel A 1E SE/NE, Sec. 21, T29N, R13W	1/2
26.	Sullivan Frame A1 NW/NW, Sec. 30, T29N, R10W	1
27.	Sullivan Frame A 1E NE/NE, Sec. 30, T29N, R10W	2
28.	Sullivan Frame Com B1 NW/NW, Sec. 30, T29N, R10W	1
29.	Valdez 2 SW/NE, Sec. 24, T29N	0
30.	Valdez A 1E SW/NE, Sec. 24, T29N, R11W	0
31.	Valdez A1 NE/SE, Sec. 24, T29N, R11W	1
32.	Valdez Com B1 SW/SE, Sec. 24, T29N, R11W	0

3447L

EXHIBIT SRIC-9

SOUTHWEST RESEARCH AND INFORMATION CENTER

January 22, 1988

Mr. David G. Boyer, Chief
Environmental Bureau
N.M. Oil Conservation Division
P.O. Box 2088
Santa Fe, NM 87504-2088

Dear Dave: ~~Mr. Boyer~~:

Attached please find a copy of the minutes of the December 9, 1987, meeting of the Long-Term Produced Water Study Committee. The minutes are based on the 14 pages of notes I took during the meeting and on phone conservations I had with you and Mr. Bill Olson of your staff this past week. Those conversations helped clarify several important pieces of information that OCD presented during the meeting. While I have done my best to make a complete and accurate report of the meeting, you might want to review the minutes to insure that they accurately reflect statements and facts presented to the Committee.

At least three tasks are pending as a result of the December 9 meeting: (1) mapping of 60-foot contours on topo maps for portions of the San Juan Basin not now included in the descriptions of the vulnerable and special areas in OCD Order R-7940; (2) preparation by OCD staff of study-site layouts including locations of pits, wellheads and monitoring wells; and, (3) completion of laboratory analyses for inorganic components of monitoring well samples.

The Committee had agreed to meet again in February, or following completion of the three tasks described above. Mr. Olson said it is not likely that he will be able to complete his "report" on the 1987 field investigations until some time this spring. In light of the work that remains to be done, you might want to give the Committee an idea of the new timeframe for hearings before the Oil Conservation Commission. The summer season now appears to be a more likely time for hearings.

I have provided the Committee chair, Ms. Lori Komatar, with a copy of this letter and the attached minutes. Please do not hesitate to call if you have any questions.

Sincerely,

Chris Shuey, Member
Long-Term Produced Water Study Committee

Attachment.

P.O. BOX 4524 ALBUQUERQUE NEW MEXICO 87106 505 - 262-1862

SOUTHWEST RESEARCH AND INFORMATION CENTER

January 22, 198[illegible]

Ms. Lori Komatar
Northwest Pipeline Corp.
Environmental Services M.S. 10307
P.O. Box 8900
Salt Lake City, UT 84108-0900

Dear ~~Ms. Komatar~~ Lori:

Attached please find a letter I sent today to Mr. David Boyer, N.M. Oil Conservation Division, transmitting a copy of the minutes of the December 9, 1987, meeting of the Long-Term Produced Water Study Committee. Please do not hesitate to call me if you have questions about the minutes or their contents.

Sincerely,

Chris Shuey, Member
Long-Term Produced Water Study Committee

Attachments.

P.O. BOX 4524 ALBUQUERQUE NEW MEXICO 87106 505 - 262-1862

MINUTES OF THE DECEMBER 9, 1987 MEETING OF THE
LONG-TERM PRODUCED WATER STUDY COMMITTEE
New Mexico Oil Conservation Division

minutes prepared by Chris Shuey

PLACE: The meeting convened at 10 a.m. in the conference room of the New Mexico Oil Conservation Division, 2nd Floor, State Land Office Building, Santa Fe, New Mexico.

ATTENDEES: A list of the 21 attendees, which is based on a sign-up sheet that was passed around during the morning session of the meeting, is attached. The attendees included 10 representatives of oil and gas companies (including one attorney and one consultanting firm officer), 7 representatives of two state agencies, 2 public interest group representatives, a private consultant, and a representative of an Indian tribe.

AGENDA AND SUBJECTS: The meeting was called by the Environmental Bureau of NMOCD for three purposes: (1) to review the findings of the agency's 1987 studies of ground water chemistry around unlined produced water disposal pits and ancillary pits in portions of San Juan and Rio Arriba counties, (2) to review the history and requirements of NMOCD order R-7940, which regulates disposal of produced water in vulnerable areas of the San Juan Basin, and (3) to discuss the range of activities of the Committee in preparation for public hearings before the Oil Conservation Commission on possible amendments to R-7940.

HANDOUTS AND DOCUMENTS: The following handouts and documents were provided to the Committee by OCD Environmental Bureau staff:

1. "Long-Term San Juan Produced Water Study Committee. Minutes of November 18, 1986, Meeting at Meridian Oil Inc. Office, Farmington," prepared by Chris Shuey, December 9, 1986, 6 pp.

2. "San Juan Basin Produced Water Study Committee," prepared by OCD staff, November 12, 1987, 3 pp.

3. "Site Selection for the San Juan Basin Produced Water Study," prepared by OCD staff, undated, 4 pp.

4. "Sample Methodology for the San Juan Basin Produced Water Study," prepared by OCD staff, undated, 4 pp.

5. "General Chemistry Analyses of San Juan Basin Produced Water Study Sites, prepared by OCD, staff, undated, 5 pp.

6. "Volatile Organic Analyses of San Juan Basin Produced Water Study Sites," prepared by OCD staff, undated, 15 pp.

7. "Possible Regulatory Scenarios," prepared by OCD staff, undated, 1 p.

DAVE BOYER opened the meeting by reviewing the agenda, explaining the purpose of OCD's 1987 field investigations at unlined pits in the San Juan Basin, and and

describing the above-referenced documents.

BOYER said the purpose of the investigations was to determine if "low-volume" discharges (i.e., <5 barrels of produced water per day [bpd]) to unlined pits has a significant affect on the quality of ground water >10 feet below the surface. (Any discharge to an unlined pit where the ground water was less than 10 feet deep was prohibited by Order R-7940; discharges to unlined pits where the ground water was 10 to 50 feet deep was limited to no more than 5 bpd.)

Document 3 describes the methods used by OCD to select field sites for study. The sites are adjacent to unlined produced water disposal pits and so-called ancillary pits in the existing vulnerable area of the San Juan Basin. Document 4 summarizes the methods used by OCD to auger and install monitoring wells and to collect ground water samples at the study sites. Documents 5 and 6 contain the chemical analyses for ground water samples collected by the OCD staff. BOYER noted that the volatile organic chemical (VOC) analyses were preliminary and that some of the general chemistry analyses were still pending at the State Lab. He said the complete analyses for all parameters will be furnished to the Committee before its next meeting. Document 7 listed the number of sites that would be subject to regulation under four different regulatory approaches that OCD could take as a result of the 1987 field investigations.

BILL OLSON, the OCD staffer who carried out the field studies, said he was able to develop monitoring wells at 11 production sites that met the site-selection criteria outlined in Document 3. He reviewed information on more than 200 sites and visited dozens of sites, but he said that many did not meet the criteria, were misreported, or could not be augered. Augering was limited by his strength, the maximum 28-foot reach of the hand auger, and the ubiquitous gravels that form the subsurface sediments in the vulnerable area. He expressed frustration at not being about to auger through gravels when he knew the water table was only a few more feet below tip of the auger. He said that at least two OCD staffers were present during sample collection and that the owner/operator of each site was invited to witness and participate in sampling.

OLSON reviewed the sampling methodology and stated that all field equipment was cleaned prior to sample collection. Each study site was surveyed based on the wellhead land surface datum. Water level measurements in the monitoring wells usually were taken the following morning after the holes had been drilled, cased and purged the previous day. Field measurements (pH, conductivity, temperature) were taken for water in each monitoring well. One-gallon samples were collected for general chemistry analyses and 40-millileter samples were collected for VOC analyses. Produced water discharge volumes were noted and compared to the volumes estimated on pit registration forms. OLSON said he is preparing summaries of the field data and drawings of the monitoring well layout for each site; he will provide that information to the Committee when it is completed.

OLSON reviewed the VOC analyses for the 11 sites that met the site-selection criteria. Monitoring wells at four of the sites showed no detectable VOC contamination. At least one monitoring well at the other seven sites showed detectable VOC contamination of shallow ground water. Dissolved organic species contributed to VOC contamination in excess of state regulatory standards at four sites; floating petroleum product was detected in monitoring wells at a fifth site. VOC contamination was detected but did not exceed state numeric standards

at a sixth site. Organic contamination was detected at the seventh site, but OLSON said the chemical analyses for that site are questionable. Primary production (i.e., separation) pits were believed to be the cause of ground water contamination at five of the seven sites, while ancillary pits (tank drain and dehydration pits) were believed to be the sources of contamination at two of the seven sites, said.

The sites that exceeded standards were Amoco-Abrams L-#1, Amoco-Gallegos Canyon Unit F-#162, Meridian-Gambling A-#3A (floating product), Tenneco-Riddle F-LS-#3A (tank drain and dehy pits suspected sources), and Tenneco-Valdez A-#1E, Sites where VOCs were detected but did not exceed regulatory standards were Tenneco-Sullivan Frame A-#1E and Tenneco-Tapp Comm 5 (analyses questionable). All contaminated monitoring wells were downgradient from the disposal pit, OLSON said.

BOYER said that samples were collected from monitoring wells at three other sites where the depth to ground water was <10 feet. All showed VOC contamination above state standards. Those sites were the Amoco-Gallegos Canyon Unit #153-E, the Gas Co. of New Mexico Dogie Canyon Compressor Station, and the Tenneco-Valdez A-#1. He said that the source of "extensive contamination" found at the Tenneco site, where the depth to ground water was six feet, has since been removed by the operator.

BOYER said further investigation by OCD at the Flora Vista Mary Wheeler 1-E site (a site that was discussed during the 1985 vulnerable aquifer hearing) has shown the source of shallow ground water contamination to be a dehydration pit owned by El Paso Natural Gas Co. A plume eight feet wide was discovered after a series of trenches were excavated in the gravels at the site. Remediation is now being proposed for the site, which was not one of the 11 in Olson's investigation. BOYER said he thought that the new findings at the Flora Vista site and investigations at the three additional sites provided ample verification and support to OCC's 1985 decision to ban disposal in unlined pits where the depth to ground water is <10 feet.

BOYER said Olson's studies at the 11 sites showed that low-volume discharges (i.e., discharges <5 bpd) into production and ancillary pits can cause contamination of ground water that is >10 feet deep. "Small discharges in the vulnerable area appear to pose significant risks of contamination and are a serious problem," he said. "About one-half of the pits caused contamination and several [monitoring wells] had floating product." He said the problem was not limited to produced water pits, but extended to dehy pits and tank drain pits. Based on the information presented, MARTY HUYS said that OCD "has demonstrated that the vulnerable area is vulnerable and more vulnerable than [previously] thought."

BOYER said that no further investigations will be conducted by OCD at the sites Olson studied, except that the agency is asking for remedial action plans from the operators of sites at which floating product was discovered.

LORI KOMATAR, the Committee chair, asked, "Do we need another regulation?" to address the contamination discovered by OCD in the Olson investigations. BOYER said that existing OCD regulations can be used to require remedial action, but that he believes new regulations are needed to address discharges of <5 bpd to

unlined pits and to extend vulnerable area protection to areas where ground water is between 10 and 50 feet deep.

OLSON reviewed the possible regulatory scenarios (Document 7) that might result from the new field studies and the number of sites that would be affected by each scenario. Up to 174 oil and gas production sites could be affected, according to the scenarios. He said OCD has received registration forms for 1,335 sites since R-7940 went into affect in 1986. Anywhere from one to four pits are located at each of those 1,335 sites, he said, noting that some sites may have been reported more than once because some operators listed pits they did not own on their registration forms. Similarly, he said that many of the 1,335 registration forms did not list dehy pits and tank drain pits (i.e., ancillary pits).

BOYER said ancillary pits now appear to pose an even greater threat to ground water and should be considered by the Committee in drafting new rules or expansions of R-7940. He noted that production wastes are consolidated at very few oil and gas sites and that most sites have more than one disposal pit. (Consolidation of all liquid wastes at each wellhead site has been rejected by operators in the past because of fire hazards, the potential for water lines freezing up in the winter, and legal restrictions between the producers and gatherers.)

TOM KELLAHIN, attorney for Tenneco, asked if dehy pits in areas where ground water is >10 feet are subject to R-7940. **BOYER** said they are, that R-7940 restricts disposal to no more than .5 (one-half) bpd in ancillary pits where the depth to ground water is 10 feet to 50 feet. He said he now is considering treating ancillary pits and production pits equally by banning any discharge in unlined pits where the ground water is <50 feet deep. He noted that El Paso Natural Gas Co., Northwest Pipeline Co., and Gas Co. of New Mexico would be the only companies affected by a more stringent restriction on disposal in ancillary pits since they are the only natural gas "transporters" in the San Juan Basin.

BUYS asked the OCD staff to quantify how many pits would have to be taken out of service as a result of the new findings. OLSON said the number is difficult to estimate because some sites have no production pits and only dehy pits, some have only production pits, and many have a combination of several types of pits. He estimated that 550 of the 1,335 sites have dehy pits that are owned by EPNG, a 750 of the 1,335 sites have production pits. He said OCD is pleased with industry's compliance in taking out of service unlined pits that are subject to the criteria of R-7940.

BUYS said he suspects that more than 174 sites would be affected by new or expanded rules, especially in light of **BOYER's** view that all discharges into production or ancillary pits should be banned where the depth to ground water is <50 feet. He said Tenneco and Amoco alone have more than 174 sites. He said he thought Tenneco alone would have 300 to 400 well sites affected by a new rule. **BUYS** added that more sites would be affected because OCD's new findings probably underestimate the extent of the shallow ground water problem since pollutants are likely to move freely through the gravels that Olson could not drill through. Later in the meeting, following a discussion about extending the existing vulnerable area to include areas where the ground water is <50 feet, **BUYS** commented that OCD's suggested regulatory approach represents "a signficant money expenditure," several times greater than the funds industry spent to

implement R-7940. He estimated that between 2,000 and 3,000 additional oil and gas well sites would be affected Basinwide.

KELLAHIN said that based on the information presented, the Committee might consider addressing two issues: (1) expanding the size of the vulnerable area to include arroyos and canyon floors where the depth to ground water is <50 feet, and (2) requiring removal (or lining) of unlined pits where the ground water is <50 feet. **BOYER** agreed, saying that the 100-foot contour above the arroyo and river floors, coupled with a listing of "special areas," has worked well for operators implementing the requirements of R-7940 in the vulnerable area, and could be the approach taken in expanding the vulnerable area to areas not now covered by R-7940. He said he now is convinced that "there should be no discharges from [unlined] pits in the vulnerable area, both from production pits and ancillary pits, where the ground water is 50 feet or less."

BOYER said OCD recognizes that the industry will need time to comply with any new rules and is willing to consider reasonable compliance periods following adoption of new rules (provided the OCC does adopt new rules after public hearings). OCD would certainly notify the owners of pits that would need to be taken out of service in the event new rules are adopted. **KOMATAR** said a reasonable compliance deadline would be the spring of 1989 since the 1988 budgets for most of the companies are already set.

KOMATAR asked if OCD is concerned only about alluvial ground water or alluvial and bedrock ground water. She said operators would be burdened by having to bring different types of drill rigs to sites that might have different geologic materials within 50 feet of the surface. **OLSON** said the presence of ground water can be estimated fairly well within 50 feet of the surface, even if it is in bedrock beneath the alluvium. **BOYER** said all ground water is OCD's concern, whether it is in the alluvium, the bedrock, or both. **RANDY HICKS** cautioned against requiring a "parade of drill rigs" going to the same wellhead location.

BOYER said he wants to go to hearing in the spring on the issues considered and recommendations made by the Committee. He said the Committee needs to speak directly with, and receive input from, the major operators who would be affected extensively by new or expanded rules. He specifically named EPNG and Northwest Pipeline as the operators that would be directly affected. **OLSON** said OCD can make a computer printout of all pits, including dehy pits, that might be affected because the registration forms submitted in response to R-7940 include pits not in the vulnerable area.

BUYS expressed concern about the lack of available produced water disposal space in the Basin in light of R-7940 and any new requirements that may be adopted by OCD. **JAMIE BAILEY** of the OCD staff said that two centralized commercial disposal facilities have been permitted by OCD and that one injection well is now operating on non-Indian lands in the Basin. **BOYER** said OCD plans to extend the requirements of R-7940A, the centralized pit rule, to all commercial disposal facilities in the state.

BOYER noted that the U.S. EPA's Report to Congress on oil and gas production wastes does not recommend RCRA Subtitle C regulation of production wastes as hazardous wastes, but does suggest that production wastes could be addressed as solid wastes under Subtitle D of RCRA. Whatever EPA does or does not recommend

following public hearings and comment in the spring, BOYER said he feels that the state needs to move forward with expanded regulations regardless of EPA's approach.

BOYER said the next step in the process is identifying additional special protection areas based on tracing the 60-foot contour in the arroyos and canyons south of the San Juan River. He said he already had traced the 60-foot contour in the Lindrith quad and in doing so had included most of the water wells in that area. Using the 60-foot contour would not affect the 50-foot depth-to-ground water criteria of R-7940 or any new amendments to it, he said. Once the broad special areas of the canyons and arroyos are delineated through contour-mapping, an expanded list of vulnerable areas would be developed in the same way as the original list of special areas in R-7940, i.e., by township, range and section (T, R and S). BOYER said he wants to start with the list of special areas that appeared in Table 1 of the minutes of the November 18, 1986 Committee meeting (Document 1) and start assigning T, R and S coordinates to them. If no T, R and S exists, latitude/longitude coordinates would be used.

BOYER said the newly listed special areas will be incorporated into the vulnerable area and would be subject to the same regulations at the existing vulnerable area. While the parameters to define the vulnerable area may be different (60-foot contours in the interior of the Basin vs. 100-foot contours along the San Juan, Animas and La Plata rivers), the protection would be the same — no unlined pits where the ground water is <50 feet. He said OCD would print out the names of the operators in the special areas and notify them of any rule changes. FRANK CHAVEZ, supervisor of OCD's Aztec office, said a printout can be made of both transporters and producers. (A "transporter" is the "gatherer" or "purchaser" at each wellhead, while the "producer" is the owner of the oil or gas well.)

IN THE AFTERNOON SESSION, Committee members inspected topographic maps and oil and gas production maps and began listing new special areas that would have to be defined by T, R and S later. Those new special areas, which would be added to the list in Table 1 of the November 18, 1986 minutes, are:

Arroyo Blanco
Canoncito las Yeguas
Canyon de los Ojitos
Capulin Creek
Rio Gallina

BOYER said that OCD staff will begin outlining the 60-foot contour in the canyons and arroyos in January and begin preparing a suggested regulatory outline for the Committee's consideration in February. CHRIS SHUEY said he could volunteer one of his work-study students to assist in the contour mapping in order to lessen the time burden on OCD's already over-worked staff. OCD will call the next meeting of the Committee when these initial tasks are completed and the various paperwork is prepared.

THE MEETING ADJOURNED AT APPROXIMATELY 2:10 P.M.

LIST OF ATTENDEES
Meeting of the Long-Term Produced Water Study Committee
New Mexico Oil Conservation Division
December 9, 1987
at NMOCD Conference Room, Santa Fe

Ed Alizadeh, Amoco Production Co., 505-325-8841
Roger Anderson, N.M. Oil Conservation Division, 505-827-5885
Jami Bailey, N.M. Oil Conservation Division, 505-827-5884
David G. Boyer, N.M. Oil Conservation Division, 505-827-5812
Marty Buys, Tenneco Oil Co., 303-740-2579
Frank Chavez, N.M. Oil Conservation Division, 505-334-6178
John Eichelmann, Burlington Northern Inc., 505-988-9804
Bruce Frederick, N.M. Environmental Improvement Division, 505-827-2914
Bruce Gallaher, N.M. Environmental Improvement Division, 505-827-2899
Randall Hicks, Geoscience Consultants Ltd., 505-842-0001
Tom Kellahin, attorney for Tenneco Oil Co., 505-982-4285
Lori Kotamar, Northwest Pipeline, 801-584-6734
Scott H. Lindsay, Meridian Oil, 505-326-9718
Bill Olson, N.M. Oil Conservation Division, 505-827-5825
Edith Pierpont, New Mexico League of Women Voters, 505-982-1938
Joe D. Ramey, Mobil Oil, 505-392-6525
Andy Reeves, Amoco Production Co., 505-325-8841
Dixon Sandoval, Jicarilla Apache Tribe, 505-759-3242
Chris Shuey, Southwest Research and Information Center, 505-262-1862
Dick Stamets, consultant, 505-982-1680
Henry Van, El Paso Natural Gas Co., 915-541-2832

EXHIBIT SRIC-10

SOUTHWEST RESEARCH AND INFORMATION CENTER

December 10, 1986

Mr. David Boyer, Chief
Environmental Bureau
Oil Conservation Division
P.O. Box 2088
Santa Fe, NM 87504-2088

Dear Dave:

Please find enclosed four copies of the typewritten minutes of the November 18, 1986, meeting of the Long-Term San Juan Produced Water Study Committee. The copies are intended for use by you and your staff: Roger Anderson, Jami Bailey, and Bill Olson. I apologize for the delay in preparing the minutes.

I have also sent a copy of the minutes to Lori Komatar, members of the Committee who attended the November 18 meeting, and others who have attended in the past.

Please call if you have questions or need additional information.

Sincerely,

Chris Shuey, Coordinator
Ground Water Protection Project

Enclosures.

P.O. BOX 4524 ALBUQUERQUE NEW MEXICO 87106 505 - 262-1862

LONG-TERM SAN JUAN PRODUCED WATER STUDY COMMITTEE

MINUTES OF NOVEMBER 18, 1986, MEETING
AT MERIDIAN OIL INC. OFFICE, FARMINGTON

prepared by Chris Shuey
December 9, 1986

Present: Roger Anderson, N.M. Oil Conservation Division; Jami Bailey, NMOCD; Jim Bridges, El Paso Natural Gas Co.; Marty Buys, Tenneco; Tom Chandler, Texaco Inc.; Lori Komatar, Northwest Pipeline; Arlene Luther, Navajo Environmental Protection Administration; Bill Olson, NMOCD; Don Reed, Meridian Oil; Chris Shuey, Southwest Research and Information Center; Diane Visser, Unocal.

Chris Shuey distributed minutes of the Committee's September 30, 1986, meeting. Lori Komatar briefly reviewed the Committee's progress and summarized the purpose of this meeting. Items of business were:

(1) presentation by NMOCD staffers of their preliminary plans for assessing ground water quality near "small-volume" unlined disposal pits in the vulnerable area; and

(2) discussion and action on mapping and listing new "special areas" for inclusion in the definition of "vulnerable areas" in OCD Order R-7940.

OCD Presentations:

Bill Olson passed out an outline of OCD's proposed site selection and sampling methodology for investigation of the potential effects on shallow ground water from disposal of between .5 and 5 barrels per day of produced water in unlined pits. In response to a request from Lori, Bill presented a sampling protocol document and said he would supply a copy to anyone who requested one. Jami Bailey said the sampling guide was a collection of references from USGS and EPA handbooks.

Bill said all chemical analyses of ground water from augered holes near unlined pits will be shared with operators and members of the Committee (and presumably anyone else who wants to see them). Bill mentioned that there is no problem with using PVC tubes for temporary hole casings.

Lori reviewed the background behind OCD's intention to learn more about the potential effects of disposal of small volumes (less than 5 barrels per day) of produced water, citing the criteria of Order R-7940. She said all pits selected by OCD will be in the vulnerable area. Bill handed out a list of 45 candidate sites and said about 20 to 25 would be selected. Eight of the candidate sites were investigated by Geoscience Inc. as part of its work for Tenneco before the April 1985 hearing on R-7940.

Lori, Marty Buys, and Tom Chandler said the 20 sites "are a good start," but declined to say that 20 sites is statistically representative of the entire

Basin, or at least the vulnerable area as it has been defined to date. Lori said that the OCD effort was a "snap shot" of the conditions in the vulnerable area -- an attempt to take "a look to see where to go from here." Bill acknowledged that the candidate sites were picked at random. Chris said he was concerned that the Committee, before recommending that the OCC take additional regulatory action, should be satisfied that the Division is sampling enough sites to produce statistically valid results and is investigating sites that are representative of the varied conditions in the Basin.

Diane Visser said many production pits are built over reserve pits. She asked how the staff will know if contamination below a pit is a result of drilling activity or produced water disposal. No answer was given.

Mapping of New Vulnerable Areas:

The Committee broke up into small groups to begin the process of identifying areas of the Basin that may have the same characteristics as the vulnerable area defined in R-7940. A vulnerable area under the rule is any area that is 100 vertical feet perpendicular to the flow of a river, or a "special area" that has been identified as having shallow ground water and oil and gas production. In this case, the Committee was looking for areas with both shallow ground water and oil and gas production.

Maps showing water wells, windmills, and springs with depths to water of 50 feet or less were cross-referenced against 7.5-minute and 15-minute USGS quadrangle maps temporarily loaned to the Committee by Meridian Oil. Each group made lists of drainages, arroyos, canyons, etc., where known water wells and known oil and gas production occurred. Each list noted the quad map upon which each physical feature was located. In this way, OCD staff or the Committee at a later date may review and amend the list as necessary.

Thirty-one new "special areas" were listed based on the Committee's review of the various maps. Table 1 is a list of those areas.

The Committee then discussed possible criteria for operators to determine if new disposal pits are being located in a vulnerable area, and if so, whether they should be lined or not. Some of the possible criteria were:

1. An area is not vulnerable if there is no oil and gas production.
2. An area may be vulnerable if water well maps show the presence of wells with with depths to water of less than 50 feet.
3. An operator may determine the depth to water when he/she begins drilling a new oil or gas well.
4. If water is encountered, the operator should determine the chemical quality of the water. If it is less than 10,000 ppm TDS, then it is "fresh water" that is to be protected.
5. If ground water is less than 50 feet deep, then a lined pit is required. An operator may appeal the lining of a pit in a shallow ground water area if the quality of the ground water is greater than 10,000 ppm TDS.

Don Reed said that a driller might not be able to determine if water is encountered at 50 feet or less because the volume of drilling fluids is likely to be much greater than the volume of water encountered.

Table 1

DRAINAGES, ARROYOS, AND CANYONS OF THE SAN JUAN BASIN (SAN JUAN AND RIO ARRIBA COUNTIES, NEW MEXICO) WHERE BOTH OIL AND NATURAL GAS PRODUCTION AND GROUND WATER USE ARE KNOWN

Compiled by the Long Term San Juan Produced Water Study Committee

(This list is arranged in alphabetical order for convenience of review. The areas listed were based on a Committee review of 7.5-minute and 15-minute U.S.G.S. quadrangle maps, compared against maps showing water wells, windmills, and springs with depths to water of 100 feet or less. The water well maps, which were prepared in 1985 by the Short Term San Juan Produced Water Committee, may be reviewed at the Oil Conservation Division office in Santa Fe. The area of review is generally north of Township 15 North, and generally west of Range 1 West, inclusive.)

Barker Arroyo
Blanco Wash
Burns Canyon
Canada Jaquez
Canada Larga
Canyon Largo
Carrizo Wash
Cereza Canyon
Chaco River
Creek Arroyo
Dry Lake Canyon
Escavado Wash
Escrito Canyon
Gallegos Wash
Gavilan Canyon
Gobernador Canyon
Kimbeto Canyon
Kutz Canyon
Jacques Canyon
La Jara Canyon
Locke Arroyo
McDermott Arroyo
Medio Canyon
Munoz Canyon
Oso Canyon
Rattlesnake Canyon
Rincon Largo
Shumway Arroyo
Tapicito Creek
Tsah Tah (Blanco T.P. Quad)
Valencia Canyon

Lori said that an operator would know to look for shallow ground water if he/she knew the drilling was taking place in a designated arroyo, drainage, etc. Such a determination could be made at the time an APD (Application for Permit to Drill) is filed. A driller would know about those arroyos if they were listed as special areas in an amendment to R-7940. From there, the driller would use the same criteria as in R-7940: depth to water, quality of water, and quality of produced water.

Future Activities of the Committee:

OCD staff will draft an amendment to R-7940 toward the end of December and distribute it to Committee members. Lori will select a date for the next meeting and inform everyone through the mail. It is not likely that a meeting would be called before February.

(ATTACHED IS A COPY OF CHRIS'S HANDWRITTEN MINUTES.)

11/18/86 LONG-TERM COMMITTEE MTG.
@ Meridian Oil, Farmington

Bob Olson passed out outline of site selection & sampling methodology for the study of ground quality near pits receiving .5 - 5 bbls/day.

LK - How you going to preserve the samples and prevent X-contamination?

BO - presented sampling procedures document; each site operator will be contacted ahead of time.

JB - refs. are USGS + EPA handbooks

BO - analyses will be shared w/ operators and committee; no problem w/ PVC in the sampling for organics.

John Bridges of EPNG asked details about the background for the draft site selection + sampling meth. LK - reviewed the .5 - 5 bbl/d. Criteria + said the pits will be in the unlined area.

BO - passed out list of 45 sites that are candidates for further investigation

LK, MB, TC - ~~NW Pipeline, Tenneco, + Texaco~~ expect that the 20 sites "use a good start" but declined to say if 20 sites are statistically representative of the Basin

LK - this is a "snapshot" of conditions in the basin; we're taking a look to see where to go from here."

BO - the sites (45) were picked @ random; costs will limit the study to 20 sites.

Dixie Vosse (Unocal) - some production pits are built over reserve pits, so how will you tell the difference?

mapp.

The Committee broke up into small groups who reviewed water well locations, cross-ref'd them with the vulnerable area maps and came up lists of T, R, Sec with water wells in them that are outside the V. Area.

Another group took the lists of water wells and compared them to 7.5 minute USGS (and 15 minute quads) quad maps to see if the water wells were isolated or associated with drainages (such as Chaco Wash).

~~The well lists~~ Associated drainages or human development was noted on the water well T, R, Sec. lists

---

Possible:
Criteria for listing new vulnerable areas

1. eliminate areas where there is no O+G prod.
2. the water well maps showed wells w/ depths to water <50'.
3. location of water when ~~as~~ drilling takes place.
4. Then test to see if TDS is <10000 ppm
5. If you find gwater @ <50' or less, you have to leave your pit : [illegible]

[illegible]

DV - require operators to record gwater levels when drilling takes place.

LK - designate the wash-area as the area where the drilling requirement comes in.
APD - appl. for permit to drill.

DB - won't see gwater when you drill bec. the volumes of drilling fluids are much greater than water encountered.

LK - Add to R-7940 to the list of special areas the drainages (washes)
→ "potential special areas".

existing prod. - make the first cut off 5 bbls/d @ less than 5 bbl/d. or 1K or 10,000 ppm TDS of prod. ~~[illegible]~~ you wouldn't have to do anything.

- If water in ~~[illegible]~~ wash is >10000 ppm TDS, it's not fresh water + therefore no protectable.

Drainages

Based on review of Quad maps & Quad lists

Valencia Canyon
Canyon Largo (~~Quad: Rincon Largo~~)
Cabrizo Wash ~~(Cañada Largo)~~
La Jara Canyon
~~Capicito~~ Capulin Creek
Chaco Wash (River)
Gallegos Wash
Escavada Wash
Kimbeto
Rattlesnake Canyon
Media Canyon
Escrito Canyon
Blanco Wash
Gobernador Canyon
Todd Mesa (Blanco Trading Post Quad)
BURNS CANYON
CAÑADA LARGA
GAVILAN CANYON
OSO CANYON
CAÑADA JAQUEZ
JAQUES CANYON
KUTZ CANYON
Shumway ~~Wash~~ Arroyo
McDermott Arroyo
Locke Arroyo
Barker Arroyo
Creek Wash
Rincon Largo
Dry Lake Canyon

CEREZA
Bridges Canyon
Muñoz Canyon

LONG-TERM PRODUCED WATER STUDY COMMITTEE MEETING

NOV. 18, 1986

NAME	AFFILIATION	PHONE
Chris Shuey	Southwest Research & Information Center	505 262-1
JAMY BAKEY	NM OCD	827-588
Tom CHANDLER	TEXACO INC	303 793-446
MARTY BUYS	TENNECO OIL CO.	(303) 740-25
Bill Olson	NM. OCD	827-582
Don Read	Meridian Oil, Inc	325-8762
ROGER ANDERSON	NMOCD	
John Bridges	El Paso Natural Gas	(915) 541-2879
Diane M. Visser	Unocal	801-586-2
LORI KOMATAR	NORTHWEST PIPELINE	(801)-584-6734
Arlene Luttig	Navajo EPA	602/871-6651

EXHIBIT SRIC-11

CALCULATIONS DEMONSTRATING CONTAMINATION OF SOIL AND GROUND WATER DUE TO SMALL-QUANTITY DISCHARGES INTO UNLINED PITS

Michael G. Wallace, Senior Hydrogeologist, RE/SPEC Inc.
for Southwest Research and Information Center
3-31-92

Oil and gas waste in unlined pits can and do contaminate both soil and ground water. A two-dimensional, vertical unsaturated model simulation, run under a representative waste fluid loading condition and assuming hydrogeologic parameters characteristic of the vulnerable area, clearly shows that contaminants can reach ground water in concentrations that exceed ground water standards. Additional two-dimensional saturated areal modeling also demonstrates that, under the same basic conditions, contaminants can travel substantial distances through ground water in short periods of time (i.e., within five years). These modeling results support the Division's proposed rules to prohibit the use of unlined pits in the vulnerable area and to protect fresh water sources within 1,000 feet of pit locations. They also support the need to line pits located outside the vulnerable area to confer protection of soils.

Calculational Methodology

The ground water flow code SUTRA (Saturated-Unsaturated TRAnsport) was utilized in this exercise. SUTRA is a two dimensional computer code that can simulate contaminant transport and water flow through both the vadose zone and saturated zones. The solute that is modeled can be subject to equilibrium adsorption on to the porous matrix as well as to natural decay, including biodegradation. In addition, SUTRA has all of the other standard solute transport features, such as attenuation parameters, including dispersivity and molecular diffusion. All of these features were adopted in the current calculations.

Data Development

The following selected data were utilized in this modeling effort. If ranges are given, then values were selected from within those ranges:

PARAMETER	VALUE(S)
Saturated Hydraulic Conductivity (K)	~~25 to 2500 ft./day~~ 2.5 to 250 ft/d
porosity	.35
Pit water loading	~~5 bbl/day~~ 2.5 bbl/d
Pit area	144 square feet
average annual precipitation	8 inches per year
regional average hydraulic gradient	0.003 ft per foot
soil moisture (Sm) vs K relationship	default SUTRA Van Genuchten model
Pressure (P) vs K relationship	default SUTRA Van Genuchten model
depth to ground water	10 to 20 feet
aquifer thickness	10 to 40 feet
concentrations of BTEX-like solute in pit water	1 to 30 parts per million (ppm)
linear adsorption coefficient	$1.35 \cdot 10^{-4}$ cubic meters per kilogram
Biodegradation decay rate	~~0.095% per day~~ 0.95%/day

dispersivities and molecular diffusion	alphaL = .08 meter to 60 meters alphaT = .08 meter to 30 meters $D_m=1\cdot10^{-9}m^2/s$

Unsaturated Flow Model

A roughly 20 foot by 20 foot cross sectional area was modeled (Figure 11.1). Given a 12 by 12 foot pit, one segment of the pit was studied, leading to a pit boundary condition feeding water and BTEX-like solutes into the model grid along a 6 ft. section at the upper left hand corner. Rainfall was simulated as a constant (yet minor) flux along the rest of the upper boundary. The right and left hand sides were assigned as impermeable boundaries. The bottom boundary was defined as a free surface. The initial moisture content was set at approximately 65%. Although soils are likely often drier in the area of interest, this is a conservative assumption, since drier conditions would hasten the downward infiltration of solutes and water. As with the other model, solutes were simulated to enter the model and attentuate due to the mechanisms of advection, biodegradation, retardation (through adsorption), and dispersion. The model was run to a certain period of time, and model outputs were examined to determine the distribution of the contaminant.

Figure 11.1 shows the distribution of the contaminant following 44 days of discharge into the unlined pit. In other words, the model assumes that solutes had been infiltrating into the soil for only a period of a month and a half, not remotely approaching the length of time that many pits have been operating. Yet the figure clearly shows that, in spite of the short loading period and the various attenuation mechanisms, solute concentrations in excess of 5 ppm have accumulated in the soil and invaded the ground water aquifer zone. If this solute were Benzene (and it was based on Benzenes properties), it would have exceeded the New Mexico Water Quality Control Commision standards for ground water. The conditions predicted by this model compare favorably yet generally with the field data collected by Olsen (1989).

Saturated Flow Model

Olsen's work indicated that many sites had extensive areas of underlying contaminated ground water. The saturated flow model considered one of these scenarios, having a constant source of contaminant (fed by an overlying unlined pit) residing in the aquifer. The concentration of this source was set to 30 ppm, which is equivelent to data at several of Wilson's sites. The areal model once again employed SUTRA, but was limited to the investigation of potential contaminant transport exclusively horizontally through an alluvial aquifer, and did not simulate unsaturated flow. The model area was 1500 feet long and 900 feet wide (Figure 11.2). The average ground water velocity generated in the simulation was roughly 2 feet per day, which corresponds well with other independant estimates. Constant pressure heads were assigned along the 'top' and 'bottom' boundaries, with the right and left sides set as impermeable.

As with the unsaturated model, solutes were simulated to enter the domain and attentuate due to the mechanisms of advection, biodegradation, retardation (through adsorption), and dispersion. The model was run to a certain period of time, and model outputs were examined to determine the distribution of the contaminant. Figure 11.2 shows the solute distribution predicted by the model following 5 years of pit seepage. The diagram clearly demonstrates that contaminants can potentially migrate thousands of feet beyond a pit location, through the ground water. This occurs in spite of biological degradation and adsorption. In fact, other attenuation factors, such as dispersion, actually promote plume growth, making remediation increasingly problematic.

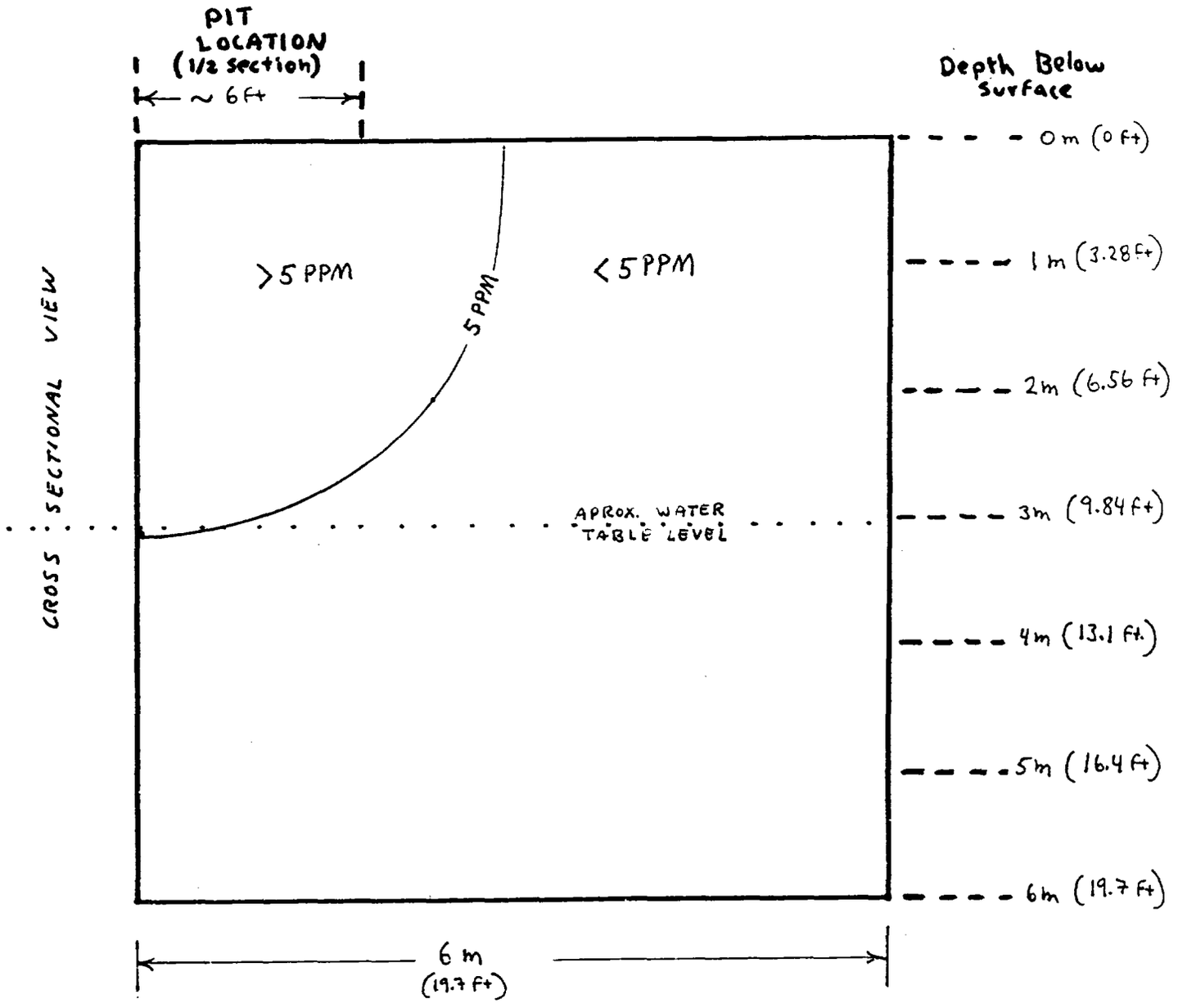


Figure 11.1 Distribution of a BTEX-like contaminant in the vadose zone due to infiltration of discharged oil/gas field waste fluids through an unlined pit.

Time of simulation: 44 days.

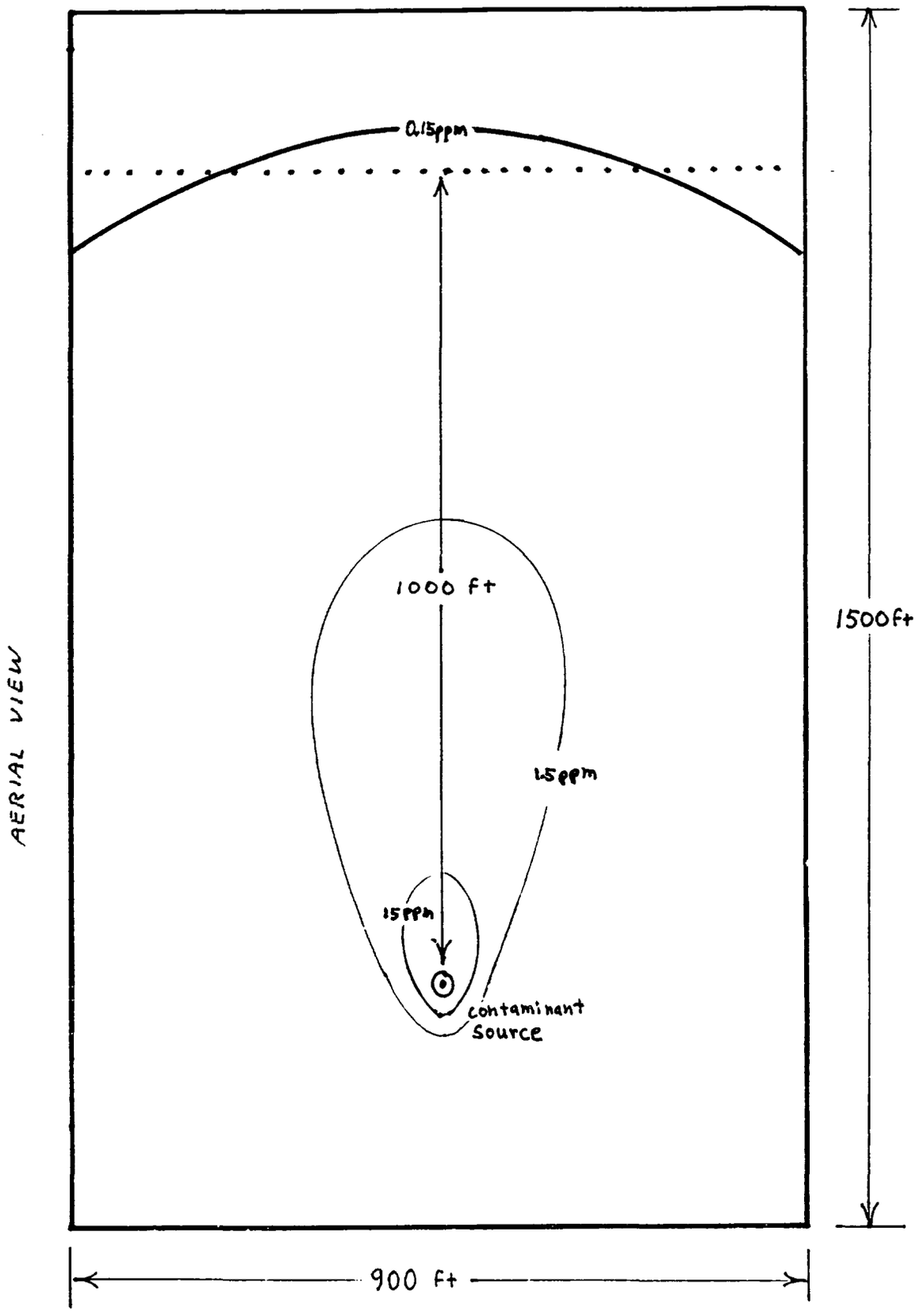


Figure 11.2 Distribution of a BTEX-like contaminant plume in an alluvial aquifer due to percolation of oil/gas field waste fluids from an unlined pit.

Time of simulation: 5 years

As can be seen in this image, the .15 ppm contour extends beyond the 1000 foot distance marker. If the contaminant were one of the BTEX components, it would exceed the New Mexico Water Quality Control Commision standards for ground water, even at that distance.

Selected References

Olsen, William C. Volatile Organic Contamination of Ground Water Around Unlined Produced Water Pits. New Mexico Institute of Mining and Technology (Socorro), Open File Report H89-9, December 1989

Freeze, Allan R., and John Cherry, Groundwater, 1979, Prentice Hall Inc.

Voss, Clifford J., A Finite Element Simulation Model for Saturated-Unsaturated Fluid-Density-Dependant Ground-Water Flow with Energy Transport or Chemically Reactive Single-Species Solute Transport. USGS Water Resources Investigations Report 84-4369, 1984

Brown, D. R. and W. J. Stone, 1979, Hydrogeology of Aztec quadrangle, San Juan County, New Mexico, Hydrogeologic Sheet 1

Baehr, A. L. and M. Y. Corapcioglu, 1987, A Compositional Multiphase Model for Groundwater Contamination by Petroleum Products 2. Numerical Solution. Water Resources Research, 23 (1)

Chiang, C.Y, et al., 1989, Aerobic Biodegradation of Benzene, Toluene, and Xylene in a Sandy Aquifer - Data Analysis and Computer Modeling, Ground Water, 27 (6)

Eiceman, G. A. et al., 1986, Hydrocarbons and Aromatic Hydrocarbons in Groundwater Surrounding an Earthen Waste Disposal Pit for Produced Water in the Duncan Oil Field of New Mexico

Stone, W. J., et al., 1983, Hydrogeology and water resources of San Juan Basin, New Mexico. Hydrogeologic Report 6, New Mexico Bureau of Mines and Mineral Resources

El Kadi

USGS Lee Acres Study

GCL Testimony from 1985 hearing

EXHIBIT SRIC-12
DEMONSTRATION OF THE HIGH PROBABILITY THAT A SIGNIFICANT PERCENTAGE OF UNLINED DISCHARGE PITS HAVE CONTAMINATED GROUND WATER.

Michael G. Wallace, Senior Hydrogeologist, RE/SPEC Inc.
for Southwest Research and Information Center
3-31-92

There is substantial evidence of ground water contamination that justifies the complete ban on unlined pits. In addition to data showing ground-water contamination at 70% of the sites where investigations have taken place, standard probability calculations show that the chance that those are the only contamination cases out of 6800 production sites is virtually zere. Those same calculations show that it is extremely likely that there are hundreds of contamination cases in the population of 6,800 production sites.

Approach and Calculational Methodology

The population of sites can be divided into two non-overlapping categories; those that have contaminated ground water, and those that haven't. We don't have prior knowledge of the total membership of each of these distinct groups. All we do know is that roughly 20 pits were investigated (and made public). Of this sample, 14 or 15 were found to have contaminated ground water. That leaves 6 or 7 that presumably haven't contaminated ground water.

Representatives of industry have suggested that 21 is not a large enough sample, that more studies need to be done before such a ruling as the banning of all pits are handed down. Their suggestions along these lines strongly imply that perhaps the spate of contamination sites is a fluke, that perhaps investigators have merely stumbled on to the only 14 sites of the 6800 that *are* contaminated.

This type of problem is solved routinely in the engineering and scientific world, and is likely solved routinely by many members of the oil and gas industry as well. It is commonly known as the hypergeometric distribution. A good example of an instance where this probability function is used involves a deck of cards: If one draws five cards at random from a deck of 52, what is the probability that 4 of them are spades? In this case, the non-overlapping categories are spade cards and non-spade cards.

Of course, in that problem, one knows in advance how many of the cards are spades (13) and how many are not (39). In the case of the unlined pits, one must work backward with the hypergeometric equation. That is done by *assuming* that certain totals of pits have already contaminated ground water, and then calculating the probability that out of a sample of 21 investigations, 14 revealed contaminated ground water. This question can be solved in a straight forward manner by the hypergeometric equation:

$$P(x)=\frac{\dfrac{S!}{O!\,(S-O)!}\cdot\dfrac{Q!}{P!\,(Q-P)!}}{\dfrac{N!}{M!\,(N!-M!)}}$$

where: P(x) = the probability that out of a sample of 21 investigations, 14 revealed contaminated ground water, *given* the total number of contaminated sites
S = total number of contaminated sites (to be assumed)
O = number of contaminated sites already investigated (14 to 15 reported)
Q = total number of clean sites (non-contaminated)
P = number of clean sites already investigated (7)
N = total population
M = sample space size (21 or 22)

The following calculations employ this technique:

scenario # 1

population, estimated total number of pits in vulnerable area = 6800
sample space, number of pits investigated = 21
number of pits not investigated (not sampled) = 6779
number of pits from sample space found to be contaminated = 14
number of pits from sample space found to be clean = 7
TOTAL number of pits assumed to be contaminated = 14
total number of pits assumed to be clean = 6786
term1 = 1
term2 =
1.311D+23
term3 =
5.767D+60

probability of 14 dirty pits sampled, given 14 TOTAL dirty pits equals 2.273026E-38

scenario # 2

population, estimated total number of pits in vulnerable area = 6800
sample space, number of pits investigated = 21
number of pits not investigated (not sampled) = 6779
number of pits from sample space found to be contaminated = 14
number of pits from sample space found to be clean = 7
TOTAL number of pits assumed to be contaminated = 100
total number of pits assumed to be clean = 6700
term1 =
4.419D+16
term2 =
1.199D+23
term3 =
5.767D+60

probability of 14 dirty pits sampled, given 100 TOTAL dirty pits equals 9.185602E-22

scenario # 3

population, estimated total number of pits in vulnerable area = 6800
sample space, number of pits investigated = 21
number of pits not investigated (not sampled) = 6779
number of pits from sample space found to be contaminated = 14
number of pits from sample space found to be clean = 7
TOTAL number of pits assumed to be contaminated = 1000
total number of pits assumed to be clean = 5800
term1 =
1.047D+31
term2 =
4.365D+22
term3 =
5.767D+60

probability of 14 dirty pits sampled, given 1000 TOTAL dirty pits equals 7.924401E-08

Conclusions

It is highly likely that *hundreds* of pits have contaminated ground water, given the current evidence.

Selected Reference

Guttman, et al., Introductory Engineering Statistics, 1982, John Wiley and Sons

EXHIBIT SRIC-13

MICHAEL G. WALLACE, Senior Hydrogeologist, RE/SPEC Inc.

Education:
M.S. in Hydrology, University of Arizona, Tucson, AZ (1989) (coursework completed 1986)
B.S. in Plant and Soil Science, Southern Illinois University, Carbondale, IL (1980)

Short Courses, Seminars, and Conferences
Design, Installation, and Sampling of Ground Water Monitoring Wells (NWWA, Boston, 84)
Hydrogeology of Unsaturated Rocks of Low Permeability (U of A, Tucson, 86)
Solving Ground Water Problems with Models (NWWA, Denver, 87 and Indianapolis, 89)
Waste Management '86 and *Waste Management '90* (U of A and DOE, Tucson)
Petroleum Hydrocarbons and Organic Chemicals in Ground Water - Use of Models for Site Assessment and Remediation (Parker et. al., L.A. 90)
Environmental Site Assessments in Conjunction with Real Estate Transactions (NWWA, Albuquerque, 1991)
40 hours OSHA-approved health and safety training (Albuquerque, 1989, 1991).

Primary Technical Areas:

- Ground-Water Flow and Contaminant Transport Modeling
- Aquifer Restoration
- Water Resources Analyses
- Expert Testimony
- Environmental Permitting

Experience Summary:

In addition to extensive field data collection experience, Mr. Wallace has applied his quantitative hydrology skills to over 20 ground water modeling projects. Nearly all of these numerical modeling projects were driven by federal ground water protection regulations, including those driven by RCRA, CERCLA, their respective amendments, and the SDWA. From that standpoint, the models usually involved either risk assessment, remedial design, or both.

Mr. Wallace has worked extensively on permits for diverse land disposal activities throughout the United States. One notable example is the granting by the EPA of the nation's first No Migration exemption for a major mixed waste disposal facility (WIPP). This achievement was due in part to the persuasive models built by Mr. Wallace.

Mr. Wallace has utilized many state-of-the-art techniques in the quantitative and statistical analysis of ground water problems. These techniques include 3-D modeling of flow and solute transport, vadose zone modeling, Monte Carlo simulations, ground water resource optimization, NAPL transport in the subsurface, hydraulic test analyses, coupling of rock mechanics with ground water flow codes, coupling of geochemical analyses with ground water flow and solute transport analyses, and development of new finite element ground water flow codes.

Mr. Wallace has worked on seven CERCLA, or CERCLA-driven sites: Syntex Chemicals (Colorado), Unocal (Colorado), Union Carbide (Texas), Odessa Chromium II (Texas),

IWC (Arkansas), Old Midland Products (Arkansas), and Firestone (California). At the Syntex and Unocal sites he participated in site investigations in addition to leading the risk assessment and remedial ground water modeling efforts. At the other sites, he supervised remedial design ground water modeling activities.

Mr. Wallace has also worked on over seven RCRA or RCRA-driven sites: Page Ranch Hazardous and Mixed Waste Landfill (Arizona), Pima County Landfills (Arizona), Waste Isolation Pilot Plant (WIPP) (New Mexico), Panoche Landfill (California), the U3 ax/b1 Land Disposal Unit, Nevada Test Site, a solid waste landfill at Holloman Air Force Base, and a county landfill in southern New Mexico. The nature of his involvement varied with each project. A partial list of activities includes: overall project management, ground water and surface water sampling and monitoring, establishment of site investigation programs, well design, logging of boreholes, conducting and analyzing of well hydraulics tests, litigation support/expert witness services, and predictive ground water flow and contaminant transport modeling.

Finally, Mr. Wallace has worked on three hazardous waste deep-well injection petitions, which fall under the authority of both RCRA and SDWA. His involvement primarily consisted of the development of predictive numerical flow and solute transport models, and subsequent interface with regulatory agencies, including USEPA Office of Drinking Water, USEPA Region VI, and the Texas Water Commission.

Selected Publications

Wallace, Michael G., and Tracy L. Christian-Frear, "1992", *New Tools to Aid in Scientific Computing and Visualiztion* , Paper submitted and accepted for the 3rd International High Level Radioactive Waste Management Conference, April 12-16, 1992, Las Vegas, Nevada

Alcorn, S. R., W. E. Coons, T. L. Christian-Frear, and M. G. Wallace, 1991, *Theoretical Investigations of Grout Seal Longevitiy. I. Geochemical Modeling of Grout-Groundwater Interactions - Flow and Diffusion Models*, Stripa Project Technical Report - 91-24, Stockholm, Sweden

Alcorn, S. R., T. L. Christian-Frear, and M. G. Wallace, 1991, *Degradation Modelling for the Concrete Silo in TVO's VLJ Repository,* Report YJT-91-09, Nuclear Waste Commission of Finnish Power Companies

Wallace, M., J. M. Pietz, B. Lauctes, J. B. Case, and D. E. Deal, 1990. *Coupled Fluid-Flow Modeling of Brines Flowing Through Deforming Salt Around the Excavations for the Waste Isolation Pilot Plant* (WIPP) *in the Permian Salado Formation,* Proceedings, Waste Management '90, Tucson, AZ.

Wallace, M., 1989. *A Three Dimensional Analysis of Flow and Solute Transport Resulting from Deep Well Injection into Faulted Stratigraphic Units,* M.S. Thesis, University of Arizona, Tucson, AZ.

Wallace, Michael G., and John Pietz, 1989. *A Three Dimensional Flow and Solute Transport Model of a Deep Well Injection System,* Proceedings: "Solving Groundwater Problems with Models", Feb. 7-9, 1989, Indianapolis, Indiana, jointly sponsored by the NWWA and the IGWMC.

Niou, S., J. Case, J. Pietz, M. Wallace and J. Zurkoff, 1987. *Coupled Fluid Flow and Salt Creep Analysis for Room Saturation of a Salt Repository,* Proceedings, International Waste Management 87, Tucson, AZ.

Contributing Author on Consultant Reports

Holloman Air Force Base Landfill Application / Permit Plan Report (draft), 1992, Technical report prepared by Tierra Engineering Consultants, Inc., and RE/SPEC Inc. for the U.S. Army Corps of Engineers.

Degradation Modeling for the Concrete Silo in TVO's VLJ *Repository, 1990.* Technical report prepared by RE/SPEC Inc. for Teollisuuden Voima Oy, Helsinki Finland.

Engineered Alternatives Task Force, Culebra Far-Field Model, 1990 report, prepared by International Technology Corporation, Albuquerque, New Mexico, for Westinghouse Corporation, Carlsbad, NM.

Waste Isolation Pilot Plant (WIPP) *No-Migration Petition, 1989,* prepared by International Technology Corporation, Albuquerque, New Mexico, for Westinghouse Corporation, Carlsbad, NM.

Ground Water Monitoring Waiver U3ax/bl Land Disposal Unit, Nevada Test Site, Mercury , Nevada., 1989, Prepared by IT Corp. on behalf of REECo Inc. for the U.S. DOE, Nevada Operations Office.

Brine Sampling and Evaluation Program, 1988 report, prepared by International Technology Corporation, Albuquerque, New Mexico, for Westinghouse Corporation, Carlsbad, NM.

Application for Exemption to Continue Underground Injection of Banned Hazardous Waste, prepared by International Technology Corporation, Austin, Texas, for Sterling Chemicals Inc., Texas, 1988.

Application for Exemption to Continue Underground Injection of Restricted Hazardous Waste, prepared by International Technology Corporation, Austin, Texas, for Texas Ecology Co., Texas, 1988.

Application for Exemption to Continue Underground Injection of Restricted Hazardous Waste, prepared by International Technology Corporation, Austin, Texas, for CECOS, Inc., Ohio, 1988.

Action Line Plan, Syntex Landfill Site, Boulder County, CO., September 1988. prepared by International Technology Corporation, Denver, Colorado, for Syntex Chemicals, Boulder, Colorado.

Plume Remediation Plan, Syntex Landfill Site, Boulder County, CO., November 1988. prepared by International Technology Corporation, Denver, Colorado, for Syntex Chemicals, Boulder, Colorado.

Program and Schedule for Ground-water Cleanup, Denver Toluene Site, 1987 report, prepared by International Technology Corporation, Denver, Colorado, for Unocal Petrochemical Distribution Center, Unocal Chemical Division, Denver, Colorado.

Exh. # 14

LIST OF SRIC'S PROPOSED AMENDMENTS TO OIL CONSERVATION DIVISION PROPOSED VULNERABLE AREA ORDER

April 9, 1992

Closure Reporting Requirements:

In proposed Rule 6, insert a second paragraph which states:

> "For pits closed prior to the effective date of this Order and after January 1, 1987, the operator shall submit to the Division for review and retroactive approval, all reports, analytical data and any other pertinent information pertaining to such pits. Such information shall be submitted within 180 days of the effective date of this rule. The Division may require additional investigations, monitoring or corrective action as may be needed to protect fresh water supplies or to protect public health and the environment. Any corrective action conducted under this section shall be carried out pursuant to applicable Division closure guidelines."

Variance Criteria:

Insert the following new wording as a new subparagraph after Rule 7(a)(3):

> "In no case shall the Director approve an application for a variance to Rule 3(a) where the applicant has not demonstrated that the proposed use of an unlined pit affords the same level of protection to fresh water supplies, public health and the environment as that afforded by a liner system or tank system with leak detection."

Notice of Applications for Variances:

After Rule 7(b), insert the following new material:

> "(c) The discharger shall file with the Director an application for a variance to Rule 3(a). Such application shall address the criteria established in Rule 7(a). The Director shall provide public notice of the application and afford the public an opportunity to comment and to request a hearing before the Commission or Division examiners. Such provisions for notice and hearing on variances to Rule 3(a) shall be consistent with the Commission's existing notice and hearing requirements. "

Compliance Deadlines:

Amend proposed Rule 3(b)(2) as follows:

> "(2) All discharges of oil and natural gas wastes to unlined pits located in areas defined in Subsection (I)(d)(2) and discharges which are within the following major tributaries of the respective river systems will be eliminated within ~~two (2) years~~ 18 months of the effective date of this order:"

Amend proposed Rule 3(b)(3) as follows:

> "(3) All discharges of oil and natural gas wastes to unlined pits in any remaining surface water tributaries within the Vulnerable Area will be eliminated within ~~three (3) years~~ 24 months from the effective date of this order."

Amend proposed Rule 7(b) as follows:

> "(b) For good cause shown, the Director of the OCD may administratively allow an extension of time for a period not to exceed ~~two (2) years~~ one (1) year from that specified in Rule 3(b) for elimination of discharges of oil and natural gas wastes to unlined pits."

Alternatively, eliminate in its entirety proposed Rule 7(b) and do not change proposed Rule 3(b).

16 of 24 sites are in existing vulnerable area

EXHIBIT SRIC-17

LOCATIONS OF UNLINED PIT SITES LISTED IN EXHIBIT SRIC-2 RELATIVE TO THE EXISTING AND EXPANDED VULNERABLE AREA

Site No.	Site Identification	Site Location	Vulnerable Area Designation
1.	Abrams L #1	29.10.26.M	existing
2.	Bruce Sullivan Comm B #1	29.10.18.O	existing
3.	Earl Morris A #1	29.10.26.K	existing
4.	Gallegos Canyon Unit F#162	29.12.36.	existing
5.	Gallegos Canyon Unit #153E	29.12.28.C	existing
6.	Gallegos Canyon Unit #250	28.12.14.N	outside
7.	Gerk Gas Comm B #1M	29.09.19.N	existing
8.	Grambling A #3A	29.09.22.E	expanded
9.	Heath Gas Comm G #1	30.09.30.K	existing
10.	Lee Acres Landfill	29.12.22.	outside ←
11.	Manana-Mary Wheeler #1E	30.12.23.M	existing
12.	Marcotte Gas Comm #1	31.10.05.H	existing
13.	Marquis Eaton A #1E	29.10.	existing
14.	North Hogback 6 #11	29.16.06.M	existing
15.	Riddle F LS #3A	28.08.20.F	expanded
16.	Saiz #1	29.11.20.	expanded
17.	Sullivan Frame A #1E	29.10.30.A	existing
18.	Tapp Comm 5	28.08.17.P	expanded/margin
19.	Thomas #1	29.11.10.L	existing
20.	Valdez A #1	29.11.24.I	existing
21.	Valdez A #1E	29.11.24.G	existing
22.	Dogie Canyon Compressor	25.06.04.D	expanded
23.	Johnston Federal #6A	31.09.35.	expanded
24.	Maddox Com #1A	30.08.17.	existing

Sources:

NMOCD, Current and Expanded San Juan Basin Vulnerable Area list (draft), August 20, 1991.
NMOCD, Vulnerable Area Maps, January 1992 revisions.
Olson, William, NMOCD; personal communications, May 13 and 20, 1992.
Union Texas Petroleum Corp., Vulnerable Area Map, November 1984.

Prepared by C. Shuey, SRIC, May 20, 1992.