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**GENERAL  
CORRESPONDENCE**

**YEAR(S):**

1990



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

GARREY CARRUTHERS  
GOVERNOR

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

August 23, 1990

Jami Bailey, Petroleum Engineer  
Oil, Gas & Mineral Division  
New Mexico State Land Office  
P. O. Box 1148  
Santa Fe, New Mexico 87504-1148

RE: Yates Petroleum Bioremediation project at G-21-105, 27E, Chaves County, New Mexico

Dear Ms. *Jami* Bailey:

I have reviewed the copy of your letter of July 2, 1990 to Yates Petroleum regarding the proposed bioremediation project at the above site. We support at the idea of bioremediation as a method for reducing the oil and grease fraction in these pits and appreciate the opportunity to provide input during your review of the application. Our comments on the proposal are presented below.

OCD Rule 313 and Order R-3221, as amended, are applicable here. Rule 313 regarding emulsion, basic sediments, and tank bottoms requires that:

"Wells producing oil shall be operated in such a manner as will reduce as much as practicable the formation of emulsion and basic sediments. These substances and tank bottoms are removed to surface pits, the pits shall be fenced and the fence shall be kept in good repair. To protect migratory birds, all tanks exceeding 16 feet in diameter, and exposed pits and ponds shall be screened, netted or covered. ...."

Rule 313 must be adhered to, especially keeping the pit netted and fences in good repair to prevent livestock trespass.

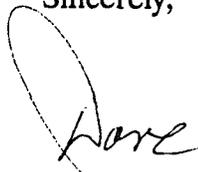
Ms. Jami Bailey  
August 23, 1990  
Page -2-

Order R-3221 prohibits disposal of more than one barrel per day of produced water into unlined pits in this area. If water to the pit does not exceed this maximum volume, OCD Order R-3221 is not applicable. As documented in the August 16th SLO Memo from R. D. Williford to Commissioner Humphries, ground water is at depths in excess 250 feet, production is less than 2 gpm and the water of very poor quality (heavy in salt/sulphur concentration). Therefore, OCD's concerns about this activity's impacts on ground water are minimal.

Although OCD does not require a permit for this type of activity we are concerned that records of any acids or alkalis, or other chemicals or biological media added to pit be maintained. Before beginning experimentation, and upon completion of experiments and prior to closure, the pit should be sampled for the presence and concentrations of any substances that may not normally be present in similar pits. Final closure or continued use should not be approved until an evaluation is completed on the effect (good or bad) of the treatment on pit materials.

Thank you for giving OCD a chance to comment on this proposal. If you have any questions, please contact me at 827-5812.

Sincerely,

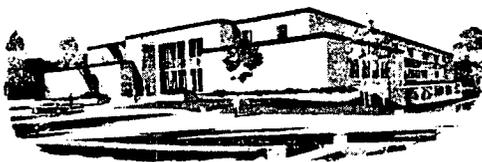


David G. Boyer, Hydrogeologist  
Environmental Bureau Chief

DGB/sl

cc: OCD Artesia Office

## State of New Mexico



W.R. HUMPHRIES  
COMMISSIONER

## Commissioner of Public Lands

P.O. BOX 1148  
SANTA FE, NEW MEXICO 87504-1148

August 16, 1990

TO: W. R. Humphries, Commissioner of Public Lands  
Santa Fe, New Mexico

FROM: R. D. Williford, Land Use Specialist  
Roswell, New Mexico

SUBJECT: Yates Petroleum: LG-5246  
Bioremediation Project  
Assignment Received: July 9, 1990

REFERENCE: (a) State Land Office letter to Yates Petroleum Corporation  
dated July 2, 1990

(b) Yates Petroleum letter to Dr. Clinton P. Richardson  
NMIMT dated July 19, 1990

(c) Dr. Clinton P. Richardson letter to Yates Petroleum  
dated August 1, 1990

(d) Project Abstract of Slurry-phase bioremediation of  
oilfield production pit sludges

*Dick Williford*

SYNOPSIS

The Oil, Gas and Minerals Division has requested a field inspection of current lease status and potential contamination problems.

Reference (a) is a letter from Floyd Prando that outlines 6 points of information required prior to State Land Office approval of subject project.

Reference (b) is a letter from Yates to NMIMT forwarding reference (a) above.

Reference (c) is NMIMT's reply as outlined below:

1. Current pit status. Is the pit presently in use? Is it dry? Will there be continued use during the study?

Response: "We envision the pit being developed in-situ as a batch mode reactor. Therefore, during the period of study, we would encourage a temporary suspension of use, or oil sludge loading. A probable length of study would be six months. Afterwards, the pit could be returned to use or closed in accordance with your usual closure plans."

Remarks: The pit is currently in use. On the day of inspection it was about 1/3 full with a protective net covering in place. The pit will not be used during the study but could be returned to use or closed after study.

A phone conversation with Dr. Richardson indicated that he wants the use of a dirt pit rather than the steel pit in photo's attached.

The term "in-situ" as used in response (1) above and in the last paragraph, last sentence of Reference (d), in my definition means "in place". Biological slurries will be introduced to the pit and will react "in place" to remediate the pit contaminants.

2. Geohydrologic status. Specifically, what is the depth to groundwater, intervening geologic formations and characteristics, and distance to closest water wells? Will there be any monitor wells?

Response: "No installation of monitor wells are planned. Groundwater aspects of pit disposal of sludges are not germane to our study."

Remarks: According to the response, groundwater aspects are not relevant or related to the study.

I assume this means there will be no liquid phase or contaminant left in place after the bioremediation process is complete. But, the response to Item 3 below states the proposed scheme seeks to reduce the oil and grease fraction of the pit contents in place to levels suitable for subsequent disposal.

I have checked with the State Engineers Office concerning depth to water and well location. The following information was furnished.

This area is out of the controlled water basin; however, records indicate that 1 well was drilled in Section 28, south of subject that tested at 1 GPM @ 250'. Another well was drilled to 450' in Section 22, east of subject and tested at 2 GPM. Quality of water is very poor, heavy in salt/sulphur concentration.

3. What are the expected by-products of the treatment and their physical and chemical characteristics?

Response: "The proposed bioremediation scheme seeks to reduce the oil and grease fraction of the pit contents in-situ to levels suitable for subsequent disposal, for example, land farming. If successful, the by-products of treatment will be a sludge having lower oil and grease by weight and having improved dewaterability properties."

Remarks: By-products of this treatment, if successful, will have less oil and grease by weight than materials currently in the pit. Materials currently in the pit are exempted by EPA from consideration as "Hazardous Wastes". This treatment method is experimental and is not expected to "create" undesirable elements.

4. Please submit a waste disposal plan.

Response: "No external waste disposal of pit contents are planned. The research objective is simply to demonstrate bioremediation feasibility by monitoring of selected degradation parameters."

Remarks: If a disposal plan is not necessary for material currently in the pit, why should one be necessary for materials treated to reduce contaminants?

The purpose of this project is to experiment with bioremediation of oilfield pit sludges. Monitoring should be required to determine results. Hopefully, disposal will be, at least in part, in-situ.

5. Please submit a closure plan.

Response: "We envision the pit being developed in-situ as a batch mode reactor. Therefore, during the period of study, we would encourage a temporary suspension of use, or oil sludge loading. A probable length of study would be six months. Afterwards, the pit could be returned to use or closed in accordance with usual closure plans.

Remarks: If the experiment is successful, a closure plan could be simplified by reducing oil and grease in the sludge.

6. The State Land Office will not give final approval without concurrent agreement by the Oil Conservation Division.

Response: None

Remarks: The last paragraph of Attachment (c) states that this field study will be initiated only if on-going laboratory experimentation indicates that bioremediation of this particular sludge is possible. These experiments should be concluded sometime next year. A go/no-go for field demonstrations would be decided at that time.

This should give us time enough to run this project abstract by OCD for their concurrence/or otherwise.

#### REMARKS

It is my opinion that if these experiments are to be conducted by NMIMT via Yates, there is no better place to start than on a State lease. Close monitoring can be assured, and if successful, could eliminate future disposal problems of these materials.

Attachment (d) specifically states that research indicates that biodegradation of oilfield production pit sludges is possible, however, such technology has not been demonstrated for use with oily sludges.

This research has the potential to devise and to show how that process can be used in-situ to remediate an oilfield waste pit.

It is my recommendation, that with concurrent agreement by OCD, we approve this research project.

I will be in contact with Randy Patterson to determine if a specified dirt pit has been identified for use.

It is recommended that the attached information be submitted to OCD for review and consideration.

RW:bw

Attachments

State of New Mexico

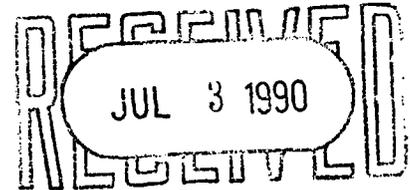


W.R. HUMPHRIES  
COMMISSIONER

Commissioner of Public Lands

P.O. BOX 1148  
SANTA FE, NEW MEXICO 87504-1148

July 2, 1990



Yates Petroleum Corporation  
105 South Fourth Street  
Artesia, New Mexico 88210  
Attn: Randy G. Patterson

Re: NMIMT WERC Research Project 89-003  
Bioremediation of Production Pit  
G-Sec. 21-T10S-R27E

Dear Mr. Patterson:

We have received your letter of May 22 regarding New Mexico Institute of Mining and Technology's request to use the production pit at the Pathfinder San Andres Battery for a bioremediation project. The pit is located in Unit G, Section 21, Township 10 South, Range 27 East, Chaves County, New Mexico. Before the State Land Office makes a final decision on your request for a release of liability for any contamination which may be created or discovered by the experimentation, the following information must be provided:

1. Current pit status. Is the pit presently in use? Is it dry? Will there be continued use during the study?
2. Geohydrologic status. Specifically, what is the depth to groundwater, intervening geologic formations and characteristics, and distance to closest water wells? Will there be any monitor wells?
3. What are the expected by-products of the treatment and their physical and chemical characteristics?
4. Please submit a waste disposal plan.
5. Please submit a closure plan.
6. The State Land Office will not give final approval without concurrent agreement by the Oil Conservation Division.

If you have any questions regarding these requirements, please contact Jami Bailey at (505) 827-5783.

Sincerely,

W.R. Humphries  
Commissioner of Public Lands  
By:

*Floyd O. Prando*  
Floyd O. Prando, Director  
Oil, Gas & Minerals Division  
(505) 827-5746

cc: OCD  
Gary Carlson

MARTIN YATES, III  
1912 - 1985  
FRANK W. YATES  
1936 - 1986



105 SOUTH FOURTH STREET  
ARTESIA, NEW MEXICO 88210  
TELEPHONE (505) 748-1471

S. P. YATES  
CHAIRMAN OF THE BOARD  
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EXECUTIVE VICE PRESIDENT  
RANDY G. PATTERSON  
SECRETARY  
DENNIS G. KINSEY  
TREASURER

July 19, 1990

New Mexico Institute of Mining and Technology  
Socorro, New Mexico 87801

Attention: Dr. Clinton P. Richardson

Re: Request of New Mexico Institute of  
Mining and Technology  
WERC Research Project 89-003  
Bioremediation of Oilfield  
Production Pit Sludges

Dear Dr. Richardson:

Please find enclosed a letter, dated July 2, 1990, from the New Mexico State Land Office with several questions regarding your research project. Could you please help us in furnishing this information to the State Land Office so that your project can get under way?

If you have any questions, please do not hesitate to call me.

Very truly yours,

YATES PETROLEUM CORPORATION

Randy G. Patterson  
Land Manager

RGP/mw

Enclosure



New Mexico Tech

Socorro, NM 87801

Department of Mining, Environmental & Geological Engineering

(505) 835-5345

August 1, 1990

Mr. Randy Patterson  
Land Manager  
Yates Petroleum Corporation  
105 South Fourth Street  
Artesia, New Mexico 88210

RE: WERC Research Project 89-003

Dear Mr. Patterson:

In reference to the State Land Office letter dated July 2, 1990, I offer the following comments:

ITEM 1. We envision the pit being developed in-situ as a batch mode reactor. Therefore, during the period of study, we would encourage a temporary suspension of use, or oil sludge loading. A probable length of study would be six months. Afterwards, the pit could be returned to use or closed in accordance with your usual closure plans.

ITEM 2. No installation of monitor wells are planned. Groundwater aspects of pit disposal of production sludges are not germane to our study.

ITEM 3. The proposed bioremediation scheme seeks to reduce the oil and grease fraction of the pit contents in-situ to levels suitable for subsequent disposal, for example, land farming. If successful, the by-products of treatment will be a sludge having lower oil and grease by weight and having improved dewaterability properties.

ITEM 4. No external waste disposal of pit contents are planned. The research objective is simply to demonstrate bioremediation feasibility by monitoring of selected degradation parameters.

ITEM 5. Refer to Item 1.

Mr. Randy Patterson

August 1, 1990

page 1

In addition, please note that this field study will be initiated only if on-going laboratory experimentation indicates that bioremediation of this particular sludge is possible. These experiments should be concluded sometime next year. A go - no go for field demonstrations would be decided at that time. If there are any additional questions, please advise.

Sincerely,



Clinton P. Richardson  
Assistant Professor of  
Environmental Engineering

CPR:cr

# SLURRY PHASE BIOREMEDIATION OF OILFIELD PRODUCTION PIT SLUDGES

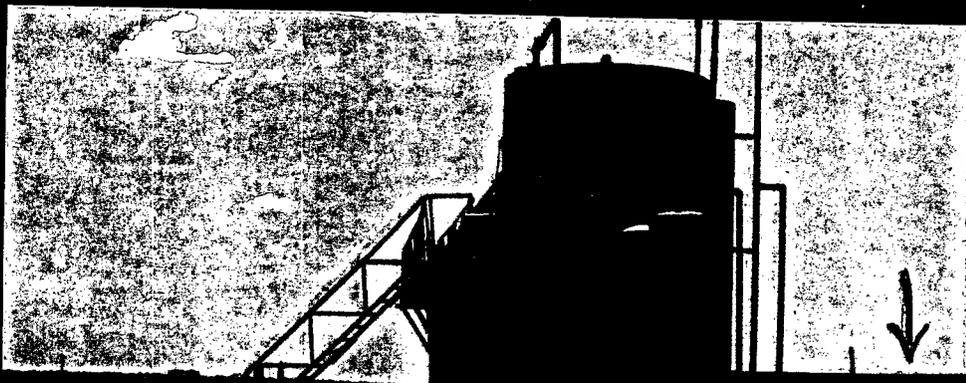
## Project Abstract

Production sludges from exploration and production activities have been typically discharged into earthen surface impoundments, or pits. Components of oilfield pits originate from facility operations, gathering systems, and well operations. Waste products include crude oil, salt water, de-emulsification chemicals, spent caustic and acid, corrosion inhibitors, produced sands, and so forth. Federal legislation presently exempts such industry associated wastes from a hazardous waste classification; however, improper waste management could pose a potential threat for environmental contamination.

The proposed research addresses the problem of oilfield pit closure. The major component in the elimination of existing or derelict pits is disposal of oil laden solids accumulated at the pit bottom. Those pits high in oil content may not be readily amendable to cost-effective closures by conventional methodologies such as land farming, due to restrictive regulations governing final organics concentration. A modified program using biological treatment for hydrocarbon degradation could provide either an intermediate step or possibly an ultimate processing step in rendering oilfield pits suitable for closure.

Biological treatment has long been recognized as a relatively inexpensive and highly efficient means to remediate contaminated waters and soils of such chemicals as petroleum hydrocarbons, pesticides, chlorinated solvents, and halogenated aromatic hydrocarbons. One innovative approach to treatment of contaminated soils is slurry-phase bioremediation. Here contaminated soils are treated as an aqueous slurry in mobile bioreactor equipment. The solid is mechanically agitated to keep the solids suspended. Nutrients, oxygen, and acid or alkali for pH control, along with acclimated inoculum, may be added to maintain appropriate environmental conditions and promote rapid biodegradation. This treatment scheme may be appropriate technology for degrading oilfield production pit sludges consisting of high solids coupled with high oil content.

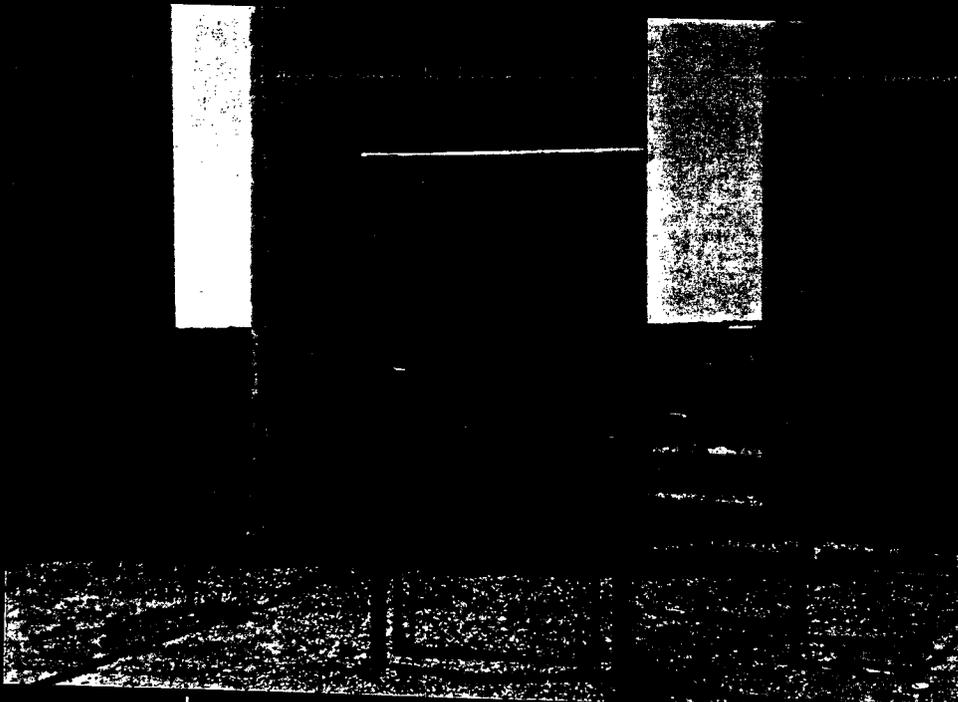
Recent research shows that biodegradation of oilfield production pit sludges is possible. These studies, however, provided limited evaluation of biokinetic parameters used to quantitatively describe biodegradation. The present research will provide the necessary experimental framework to estimate biokinetic information will be utilized to design and operate bench-scale slurry-phase bioreactors. Such technology has not been demonstrated for use with oily sludges. This research has the potential to devise and refine an oilfield bioremediation process and to show how that process can be used in situ to remediate an oil field waste pit.



SEC. 21, T10S, R27E, PRODUCTION PIT  
LOOKING SOUTH



SEC. 21, T10S, R27E, PRODUCTION PIT  
LOOKING NORTH



SEC. 21, T10S, R27E, PATHFINDER  
TANK BATTERY LG-5246