Geohydrology Associates, Inc.

September 28, 1982

Mr. Robert Brakey
Unichem International
P. O. Box 1499
Hobbs, New Mexico 88240

Dear Mr. Brakey:

The attached report contains our hydrologic evaluation of Unichem International's proposal to dispose oil-field brine into existing lakes in the Laguna Tres area, Eddy County, New Mexico. This investigation was requested by Unichem International in your letter dated August 27, 1982.

It has been a pleasure working with you, and we hope that we can be of additional service to you in the future.

Sincerely,

GEOHYDROLOGY ASSOCIATES, INC.

T. E. Kelly
President

TEK/kc

attachment

CASE 9140
PERMIAN
EXHIBIT 3

4015 Carlisle, N.E. • Suite A • (505) 884-0580
Albuquerque, New Mexico 87107

POTENTIAL IMPACTS OF OIL-FIELD BRINE DISCHARGE

LAGUNA TRES AREA, EDDY COUNTY, NEW MEXICO

prepared for

Unichem International
Hobbs, New Mexico

by

Geohydrology Associates, Inc.
Albuquerque, New Mexico

September 1982

CONTENTS

ILLUSTRATIONS AND TABLES

POTENTIAL IMPACTS OF OIL-FIELD BRINE DISCHARGE, LAGUNA TRES AREA, EDDY COUNTY, NEW MEXICO

by

Geohydrology Associates, Inc.

INTRODUCTION

Unichem International, Inc., of Hobbs, New Mexico, has proposed to build and operate a facility for the disposal of oil-field brine at Laguna Tres in Eddy County, New Mexico. This facility would be located approximately eight miles east of Loving in Township 23 South, Range 29 East.

In August 1982, Geohydrology Associates, Inc., of Albuquerque was requested to conduct a hydrologic investigation of the area. The purpose of this investigation was to determine the impacts that might result from operation of the proposed facility. Unichem proposes to dispose oil-field brine into existing brine lakes in the area.

The investigation requested by Unichem was conducted by the staff of Geohydrology Associates, Inc., under the supervision of T. E. Kelly. A thorough literature and file search of existing data was conducted. This drew heavily from earlier reports of the area that have been prepared by Geohydrology Associates, Inc. Water-quality samples were collected by Unichem and the results submitted for evaluation. A field reconnaissance was not conducted. An analysis of the data and the resulting conclusions are presented in this report.

PREVIOUS STUDIES

Owing to the proximity of the Laguna de la Sala Grande, commonly called Salt Lake, to the Pecos River, a number of ground-water investigations have been conducted in the region. One of the earliest studies was made by Robinson and Lang (1938). They concluded that brine from the Salt Lake was not discharging into the Pecos River. Hendrickson and Jones (1952) evaluated the water-bearing deposits in the vicinity of Salt Lake and the Pecos; however the hydrologic relationship between the two water bodies

was not discussed. Thomas (1963) and Mower and others (1964) studied the relationship of the Pecos River discharge to ground-water conditions in the area. Most of this work was completed before the major impacts of the potash refineries were exerted on the project area.

One of the earliest detailed water-supply studies of the Nash Draw and Laguna Tres area was made by Gilkey and Stotelmyer (1965). They concluded that the potash refineries contribute to the hydrologic system by leakage from brine-disposal ponds. A detailed study by Geohydrology Associates, Inc. (1979) was made for the Bureau of Land Management. This study identified and quantified significant amounts of brine entering the ground-water and surface-water systems in the Nash draw and Clayton basin areas.

In 1982 Geohydrology Associates, Inc., conducted two studies in the Laguna Tres area at the request of Riqueza, Inc., and B & E, Inc. Both of these studies were directed to the suitability of Laguna Tres, Lindsey Lake, and surrounding areas for disposal of oil-field brines. Both of these applications have been considered and approved by the Oil Conservation Division of New Mexico.

DESCRIPTION OF THE PROJECT AREA

Geology

A number of studies have been made of the geology of the study area. Most noteworthy is the work by King (1942), Vine (1953), and Brokaw and others (1972). These comprehensive studies were used as a guide to the geologic deposits that will be impacted by the proposed disposal site.

There are two formations in the project area which exert considerable control on the hydrologic system in the Laguna Tres area (table 1). The Salado Formation is present only in the subsurface of the project area. The overlying Rustler Formation is present at the surface. The Rustler generally is subdivided into a Lower Member, the Culebra Dolomite, the Tamarisk Member, the Magenta Member, and the uppermost Forty-nine Member.

Salado Formation

The Salado Formation is widespread throughout southeastern New Mexico and generally east of the Pecos River. The formation consists of more than 75 percent salt deposits with minor amounts of interbedded clay and siltstone, anhydrite, and dolomite. The Salado is the source of the potash which is extensively mined in the area.

Because the Salado is soluble to ground water, the formation exerts major control over the shallow and surficial structures in the Tres Lagunas-Salt Lake area. The upper surface of the formation has been dissolved by

Table 1.--Summary of Permian deposits, Laguna Tres area, New Mexico.

Age	Formation	Member or Zone	Description	Remarks
Late Permian	Rustler	Forty-niner	Gypsum, white, massive, and siltstone; 40 to 65 ft thick.	Principal aquifer for stock wells near Nash Draw. Quality improves away from area.
		Magenta	Dolomite, pink, interlaminated with pale-green anhydrite; 20 ft thick.	Locally produces small quantities of mineralized water.
		Tamarisk	Gypsum, white, massive, and siltstone; 115 ft thick.	Not known to produce water to wells
		Culebra dolomite	Dolomite, light-gray, silty, thin-bedded to massive; contains spherical vugs 1 to 10 mm in diameter; 30 ft thick.	Produces up to 300 gpm of highly mineralized water to wells.
		Unnamed or Lower Member	Siltstone, gypsum, and very fine grained gray sandstone; 120 ft thick.	Not known to produce water to wells.
	Salado	Upper leached zone.	Gypsum, siltstone, and anhydrite, brecciated; 50 to 200 ft thick.	So-called "brine aquifer". May produce large quantities of water to wells.
		Zone of massive salt.	Halite, anhydrite, siltstone, and polyhalite; soluble potash minerals locally; as much as 2,000 ft thick.	Non-water bearing.

ground-water movement, and this has resulted in the collapse of the overlying Rustler deposits. Salt Lake and the brine lake chain which includes Laguna Tres all occupy topographic depressions in the Rustler Formation which formed as a result of collapse following the solution of the underlying Salado deposits.

The depth to the top of the Salado Formation in the vicinity of Laguna Tres is approximately 275 feet, according to Vine (1963, p. 7).

Rustler Formation

The primary components in the Rustler Formation are gypsum and/or anhydrite with some dolomitic limestone, siltstone, and halite. Due to solution of the soluble minerals, the halite does not crop out. The Rustler and Salado Formations are separated by a leached zone approximately 60 feet thick. This insoluble residue is regarded as basal Rustler Formation by some authors (Cooper and Glanzman, 1971) and as uppermost Salado Formation by others (Vine, 1963, p. 7).

The zone which separates the Salado and the Rustler consists of an insoluble rubble of brecciated clastics and limestone which collapsed following the solution of the underlying evaporite deposits. The rubble represents material from the Lower Member, the Culebra Dolomite, and insoluble deposits from the Tamarisk Member. Material from the Magenta and uppermost Forty-nine members has also collapsed to form the floor of Nash Draw; however this material probably is not incorporated into the rubble zone itself.

Because of the brecciated and unconsolidated nature of the rubble zone, this is a major zone of ground-water movement. It has been called the "brine aquifer" by Robinson and Lang (1938).

The Lower Member of the Rustler Formation is predominately siltstone and fine-grained sandstone that locally contains gypsum, anhydrite, and halite (Brokaw and others, 1972, p. 30). The thickness ranges from about 60 to 120 feet (table 1).

The Culebra Dolomite is a distinctive and persistent marker bed in the Rustler which is usually about 30 feet thick.

The Tamarisk Member was named for its exposures near Lindsey Lake about two miles northwest of the proposed disposal site. According to Vine (1963, p. 14), the Tamarisk Member consists of about 115 feet of massive, coarsely crystalline gypsum in the outcrop, but it is chiefly anhydrite in the subsurface. In the vicinity of Laguna Tres, there are massive exposures of deformed gypsum beds and large selenite crystals indicating recrystallization by movement of ground water. Locally the Tamarisk deposits are banked by silt and clay that has washed into Nash Draw; there are some areas of dune development also. Most of the disposal ponds used by the potash refineries have been excavated in the Tamarisk Member.

Inasmuch as the Tamarisk Member forms the bottom of most of Nash Draw, the Magenta and Forty-nine Members probably were removed by erosion

before and following the formation of Nash Draw. Consequently these two members have little bearing on the suitability of the Laguna Tres area for disposal of brine.

Topographic Setting

Nash Draw and Clayton Basin are two of the most prominent surface features east of the Pecos River in Eddy County. According to Vine (1963, p. B38), these features represent undrained depressions which resulted from regional differential solution of evaporite deposits in the upper Salado and the lower Rustler Formations. The solution of these deposits produced large-scale collapse of the three lower members of the Rustler Formation. Evidence for this solution can be found throughout the exposures of the various members, and especially the Tamarisk Member which forms the floor of Nash Draw.

Collapse was not everywhere uniform. Although the regional dip of the beds is eastward, the strata exposed along the margins of Nash Draw and Clayton Basin dip toward the depressions. Hydration of anhydrite to gypsum has caused local doming, and there is extreme deformation within the Tamarisk deposits. Sinkholes and domes also influence the local topography. Work by Geohydrology Associates, Inc., (1979) has shown that collapse was greatest in Nash Draw, and as a result of differential collapse, there is a topographic divide between Clayton Basin on the north and Nash Draw on the south.

The Salt Lake occupies the lowest topographic depression in Nash Draw. Likewise there is a large closed depression northeast of the lake which is ringed by a series of surface lakes, including Laguna Tres which is the proposed disposal site (fig. 1).

Hydrology

Ground Water

There have been several comprehensive studies of the hydrology of the potash area; these include the work by Brokow and others (1972) and Geohydrology Associates, Inc. (1979). In addition, Geohydrology Associates (1982a,b) also has prepared two site studies in the vicinity of Salt Lake and Laguna Tres. All of these studies have verified that the normal hydrologic system has been modified by collapse of Nash Draw. The system is further complicated by discharge from the various potash refineries in the area.

A study conducted by Hendrickson and Jones (1952) defined the regional water table in eastern Eddy County before major influence of the potash refineries was apparent. East of the Pecos River the ground-water movement is predominately from north to south with local deviations created by the topography. Livingston Ridge on the east and Quahada Ridge on the west tend to divert the regional flow of ground water into Nash Draw. The shallow water table intersects the land surface along the flanks of the Draw, and a series of springs and seeps discharge at these points.

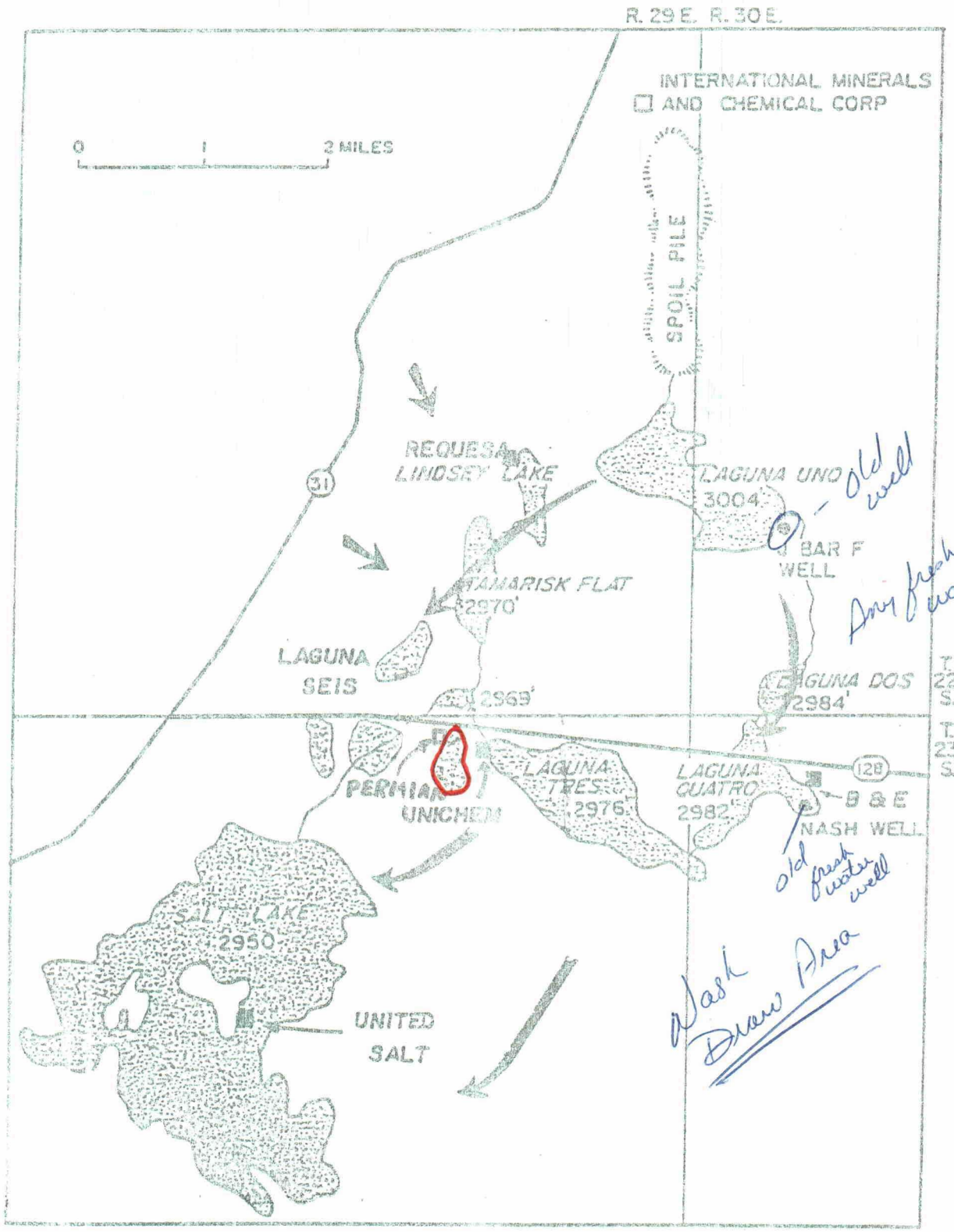

Figure 1.--Distribution of lakes in the vicinity of IMC refinery and Salt Lake, with selected altitudes. Arrows show generalized direction of ground-water flow.

There is no known potable water within Nash Draw at the present time (1982). The rubble zone, which represents the collapsed Rustler Formation in the bottom of Nash Draw, has produced potable water to wells in the past. Nash well, which is located in T. 23 S., R. 30 W., section 6, was completed for stock use prior to 1935 (fig. 1). Subsequently the level of Laguna Quatro has risen to the point that this well was completely inundated by 1977. Likewise, the J Bar F well in T. 22 S., R. 30 E., section 20 produced water for stock at Laguna Uno. The water level in this well was 134.0 feet below land surface on March 17, 1949 (Hendrickson and Jones, 1952, p. 134). The water was at land surface in 1979 which shows a rise of 134 feet in 31 years. Most of the rise in the water table of Nash Draw can be attributed to the discharge of water by the potash refineries.

Surface Water

There are no perennial streams in Nash Draw. The mean annual precipitation at Carlsbad is about 12 inches per year, and most of this is lost to evaporation and plant transpiration shortly after falling. Small amounts of runoff enter Nash Draw through normally dry arroyos. This runoff typically pounds in topographic lows such as Lindsey Lake, Tamarisk Flats, and numerous undrained depresssion on the floor of the Draw.

In addition to small amounts of runoff, there is a considerable amount of refinery waste released annually. Approximately 9,248 acre-feet per year is discharged as a brine by refineries located in the area (Geohydrology Assoc., Inc., 1979, p. 60). As a consequence of the potash refining process, this discharge is a saturated brine containing as much as 30 percent solids in the form of suspended clay.

The refinery discharge from International Minerals and Chemical Corporation (IMC) enters the headwaters of Laguna Uno in section 24, T. 22 S., R. 29 E. The lake itself extends into adjoining sections and has a total area of about 710 surface acres. Discharge records of brine from the IMC refinery are not available. However, according to the New Mexico State Engineer Office in Roswell, the amount of water imported by IMC during 1977 was 5,233 acre-feet, or the equivalent of 3,244 gpm (gallons per minute). The measured discharge into the Laguna Uno is nearly equal to the quantity of imported water which indicates that the refining process and evaporation losses are small.

Evapoartion-rate losses were calculated for Laguna Uno during a study for the Bureau of Land Management by Geohydrology Assoc., Inc. (1979, p. 71). It was determined that the summer evaporation rate at the lake was 0.69 gpm per acre of surface area; the winter evaporation rate was 0.369 gpm per acre. On the basis of these evaporation rates and the surface area of Laguna Uno, it was determined that virtually all of the refinery inflow is lost during the summer, but only about 10 percent of the winter inflow is lost.

There is no surface outlet from Laguna Uno, therefore the amount of refinery waste which is not evporated must enter the ground-water flow system by seepage along the fringes of the lake. Much of this ground-water

flow surfaces in the chain of lakes which include Laguna Dos, Laguna Tres, Laguna Quatro, and the Salt Lake. In addition, Lindsey Lake, Tamarisk Lake, and Laguna Seis are topographically lower than Laguna Uno, and it is unlikely that a subsurface connection exists between these surface-water bodies (fig. 1).

A field reconnaissance was made in May 1982 in the area between the IMC discharge point and Salt Lake. This included the areas of Laguna Quatro and Laguna Tres, in addition to the Lindsey Lake region. It was determined that there is no surface connection between Laguna Quatro and the lakes farther north and west. However there is a surface connection between Laguna Quatro and Laguna Tres through a culvert and ditch that was recently completed by the State Highway Department. In May 1982 it was estimated that the discharge through this culvert was about 500 gpm. Inasmuch as there is no surface inflow source to Laguna Quatro, the entire 500 gpm outflow must represent ground-water inflow to the lake.

Recent work (1982) by the Highway Department has connected all of the lakes and ponds south of Highway 128 with the Salt Lake. Therefore it is now possible for water entering Laguna Tres to move directly to Salt Lake.

The total surface area of these lakes, excluding Salt Lake, exceeds 1,200 acres. On the basis of the evaporation rates calculated for Laguna Uno, the surface area of these lakes would have the capacity to evaporate 8,028 gpm during the summer months and 443 gpm during the winter.

DISCHARGE PROPOSAL

Unichem International, Inc., has proposed to construct an oil-field brine disposal facility which will have a capacity to process approximately 2,000 barrels of brine per day. Assuming that the maximum discharge is maintained throughout the year, the daily rate would be about 84,000 gallons, or a continuous discharge of about 58.3 gpm. The average daily disposal rate is estimated to be approximately 500 to 700 barrels.

The location of the facility proposed by Unichem International, Inc., is in the northwest quarter of section 2, T. 23 S., R. 29 E. This would be near the outlet of Laguna Tres at the extreme northwest end of the lake (fig. 1).

Work recently performed by the Highway Department has provided a surface connection between Laguna Quatro, Laguna Tres and several unnamed ponds south of Highway 128. Trenching has connected these lakes and ponds with Salt Lake. The total surface area of these lakes exceeds 1,200 acres.

Two earlier studies by Geohydrology Associates, Inc., (1982a,b) have evaluated proposed oil-field brine disposal sites in the same general area.

The first proposal was submitted by Requesa, Inc., to discharge a maximum of about 88 gpmm into Lindsey Lake (fig. 2). B & E, Inc., has proposed a facility to be located near the east end of Laguna Quatro which would have a maximum capacity of about 218 gpm.

The applications made by Requesa, Inc., and B & E., Inc., have been granted by the Oil Conservation Division. If it is assumed that both facilities are put into operation, and that both operate at a maximum capacity during the winter months, there would be a discharge of 306 gpm from the two facilities, or approximately 60 percent of the total evaporation potential of 509 gpm for the lakes receiving the discharge. When the maximum Unichem discharge of 58 gpm is added to the hydrologic system, the total oil-field brine inflow would be 364 gpm (maximum) or 71 percent of the evaporation potential of the lakes in the area (fig. 2).

Assuming that a worst-case condition as cited above prevailed for extensive lengths of time, we believe that the 29 percent margin of error would be sufficient to protect the hydrologic system of the Laguna Tres area. Furthermore we believe that this may be approaching the maximum safe carrying capacity of the hydrologic system in the Laguna Tres area.

CHEMICAL QUALITY OF PROPOSED DISCHARGE

Unichem International, Inc., will operate a private disposal facility to discharge oil-field brines presently hauled by Unichem. Most of these brines are produced from wells completed in the Bone Springs and the Morrow Formations. Water analyses from representative wells are included in the Appendix of this report.

Most of these samples exceed 100,000 mg/l (milligrams per liter) dissolved solids; they are classified as sodium chloride type water. The chemical quality of water within the Bone Springs and the Morrow Formations does not vary significantly, and it is believed that the analyses given in the Appendix are representative of these two zones.

The surface water in Laguna Tres and adjoining ponds is similar to the samples presented in the Appendix. Mixing of the brines with the existing lake water would not produce a noticeable effect on the water quality.

CONCLUSIONS

1. The proposed discharge system by Unichem International, Inc., will contribute a maximum of 58 gpm to the hydrologic system in the vicinity of Laguna Tres.

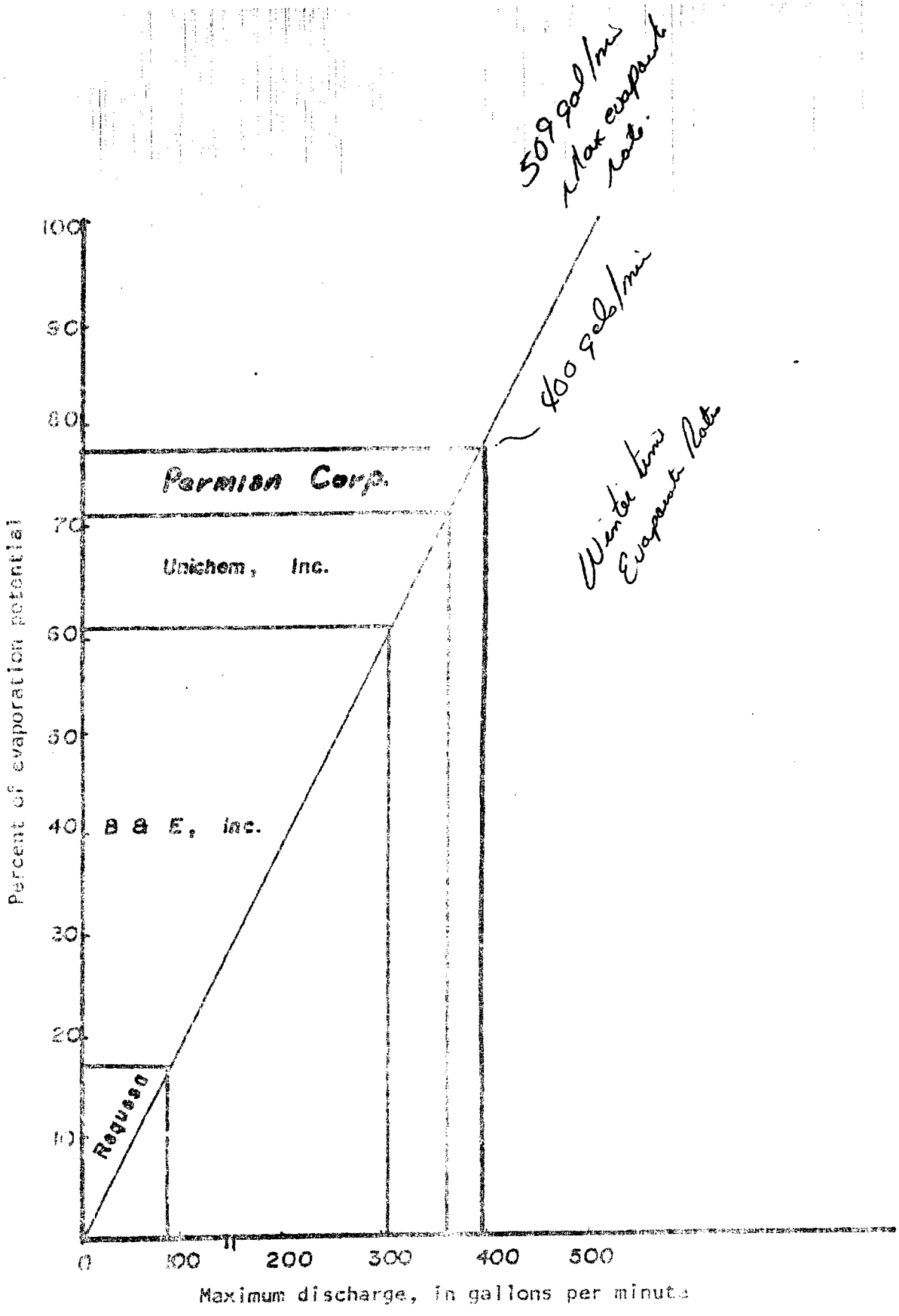

Figure 2.--Relationship of proposed discharge to evaporation potential in Laguna Tres area.

2. The existing hydrologic system has the capacity to evaporate 509 gpm during the winter months when evaporation losses are at the annual low. Unichem and two other disposal operations are all operating at maximum capacity; the total discharge would be about 364 gpm. This is approximately 29 percent less than the minimum evaporation potential.

3. The chemical quality of the brine to be disposed by Unichem will not appreciably change the existing water quality in Laguna Tres and adjoining ponds.

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APPENDIX

UNICHEM INTERNATIONAL

601 NORTH LEECH P O BOX 1499

HOBBS, NEW MEXICO 88240

COMPANY : NWJ PRODUCTION COMPANY
DATE : 8-27-82
FIELD,LEASE&WELL : STGWA #1 UNIT 1 SEC 36 T20S R37E
SAMPLING POINT:
DATE SAMPLED : 8-25-82

SPECIFIC GRAVITY = 1.136
TOTAL DISSOLVED SOLIDS = 200691
PH = 5.20

		MG/L	MG/L
CATIONS			
CALCIUM	(CA)+2	1020	20440.
MAGNESIUM	(MG)+2	340	4133
SODIUM	(NA).CALC.	3184.	30215.
ANIONS			
BICARBONATE	(HCO3)-1	.5	30.5
CARBONATE	(CO3)-2	0	0
HYDROXIDE	(OH)-1	0	0
SULFATE	(SO4)-2	18.7	900
CHLORIDES	(CL)-1	3525	124971.
DISSOLVED GASES			
CARBON DIOXIDE	(CO2)	NOT RUN	
HYDROGEN SULFIDE	(H2S)	NOT RUN	
OXYGEN	(O2)	NOT RUN	
IRON(TOTAL)	(FE)		10.5
BARIUM	(BA)+2		0
MANGANESE	(MN)	NOT RUN	

SCALING INDEX	TEMP
	30C
	86F
CARBONATE INDEX	1.61
CALCIUM CARBONATE SCALING	LIKELY
SULFATE INDEX	.414
CALCIUM SULFATE SCALING	LIKELY

LEAD	0.28 MG/L
SILVER	0.22 MG/L
BARIUM	326.30 MG/L
RESISTIVITY	.050 @ 74°F

ILLEGIBLE

UNICHEM INTERNATIONAL

601 NORTH LEECH P.O.BOX1499

HOBBS, NEW MEXICO 88240

COMPANY : MADDOX ENERGY CORPORATION
DATE : 8-27-82
FIELD,LEASE&WELL : PARDUE FARMS 27-5 BONE SPRINGS SEC 27 T23S R28E
SAMPLING POINT:
DATE SAMPLED : 8-25-82

SPECIFIC GRAVITY = 1.199
TOTAL DISSOLVED SOLIDS = 294775
PH = 5.42

		ME/L	MG/L
CATIONS			
CALCIUM	(CA)+2	1433.	28724
MAGNESIUM	(MG)+2	306.	3727.
SODIUM	(NA).CALC	3430	78839
ANIONS			
BICARBONATE	(HCO3)-1	3.8	231.
CARBONATE	(CO3)-2	0	0
HYDROXIDE	(OH)-1	0	0
SULFATE	(SO4)-2	5.7	275
CHLORIDES	(CL)-1	5160.	182958.
DISSOLVED GASES			
CARBON DIOXIDE	(CO2)	NOT RUN	
HYDROGEN SULFIDE	(H2S)	NOT RUN	
OXYGEN	(O2)	NOT RUN	
IRON(TOTAL)	(FE)		121.
BARIUM	(BA)+2	NOT RUN	.56
MANGANESE	(MN)		

SCALING INDEX	TEMP	
	30C	
	86F	
CARBONATE INDEX	-1.4	
CALCIUM CARBONATE SCALING	UNLIKELY	
SULFATE INDEX	.122	
CALCIUM SULFATE SCALING	LIKELY	

H2S	0.30 MG/L
IRON	0.12 MG/L
NITRATE	132.00 MG/L
RESISTIVITY	.043 @ 74°F

ILLEGIBLE

UNICHEM INTERNATIONAL

601 NORTH LEECH P.O.BOX1499

HOBBS, NEW MEXICO 88240

COMPANY : MADDOX ENERGY CORPORATION
DATE 8-27-82
FIELD,LEASE&WELL : FLOWER DRAW #1 BONE SPRINGS SEC 2 T26S R28E
SAMPLING POINT:
DATE SAMPLED : 8-25-82

SPECIFIC GRAVITY = 1.176
TOTAL DISSOLVED SOLIDS = 259639
PH = 5.5

		ME/L	MG/L
CATIONS			
CALCIUM	(CA)+2	580	11623.
MAGNESIUM	(MG)+2	240	2917.
SODIUM	(NA),CALC.	3695.	84948.
ANIONS			
BICARBONATE	(HCO3)-1	3	183
CARBONATE	(CO3)-2	0	0
HYDROXIDE	(OH)-1	0	0
SULFATE	(SO4)-2	.06	3
CHLORIDES	(CL)-1	4513	159963.
DISSOLVED GASES			
CARBON DIOXIDE	(CO2)	NOT RUN	
HYDROGEN SULFIDE	(H2S)	NOT RUN	
OXYGEN	(O2)	NOT RUN	
IRON(TOTAL)	(FE)		64.5
BARIUM	(BA)+2		54.2
MANGANESE	(MN)	NOT RUN	

	SCALING INDEX	TEMP
		30C
		86F
CARBONATE INDEX		.125
CALCIUM CARBONATE SCALING		LIKELY
GYPSUM INDEX		-260
CALCIUM SULFATE SCALING		UNLIKELY

IRON	0.26 MG/L
LEAD	0.10 MG/L
NITRATE	3.50 MG/L
RESISTIVITY	.042 @ 74°F

ILLEGIBLE

UNICHEM INTERNATIONAL

401 NORTH LEECH P.O.BOX1499

HOBBS, NEW MEXICO 88240

COMPANY : SAMEDAN OIL CORPORATION
DATE : 8-27-82
FIELD,LEASE&WELL : CARLSBAD STATE #1 MORROW SEC 34 T23S R26E
SAMPLING POINT
DATE SAMPLED : 8-23-82

SPECIFIC GRAVITY = 1.056
TOTAL DISSOLVED SOLIDS = 83447
PH = 6.37

		ME/L	MG/L
CATIONS			
CALCIUM	(CA)+2	213.	4273.
MAGNESIUM	(MG)+2	36.6	445.
SODIUM	(NA),CALC.	1193.	27433.
ANIONS			
BICARBONATE	(HCO3)-1	4.6	280
CARBONATE	(CO3)-2	0	0
HYDROXIDE	(OH)-1	0	0
SULFATE	(SO4)-2	.48	23.5
CHLORIDES	(CL)-1	1438.	50988.
DISSOLVED CASES			
CARBON DIOXIDE	(CO2)	NOT RUN	
HYDROGEN SULFIDE	(H2S)	NOT RUN	
OXYGEN	(O2)	NOT RUN	
IRON(TOTAL)	(FE)		74.8
BARIUM	(BA)+2		42.8
MANGANESE	(MN)	NOT RUN	

SCALING INDEX	TEMP
	30C
	86F
CARBONATE INDEX	1.10
CALCIUM CARBONATE SCALING	LIKELY
SULFATE INDEX	-78.
CALCIUM SULFATE SCALING	UNLIKELY

LEAD	0.12 MG/L
SILVER	0.03 MG/L
NITRATE	87.10 MG/L
RESISTIVITY	.090 @ 74°F

ILLEGIBLE

5-7-87

Joe:

Les told me you needed the volumn's on the two systems disposing into the salt lakes, Unichem International and B & E, Inc. for the last 6 months. If I can be of further help please let me know.

Betty Rollins

Unichem: Rattlesnake

Nov.'86	38,152	1390 B/D
Dec.'86	31,392	
Jan.'87	54,380	
Feb.	50,314	40+ GALS/MIN
Mar.	34,291	
Apr.	NA	

Cumulative 2,389,726

B & E: Tuzlu Kopek

137,291	4,167 B/D
125,528	
107,777	
136,670	121.5 GALS/MIN
119,697	
123,283	

Cumulative 4,626,449

CASE 9140
PERMIAN
EXHIBIT 4

Joe D Ramey
P. O Box 6016
Hobbs, NM 88241

May 3, 1987

Commissioner of Public Lands
P. O. Box 1148
Santa Fe, NM 87504-1148

Mr. Hart M. Greenwood
P. O. Box 104
Carlsbad, NM 88220

Gentlemen:

This is to advise that Permian Corporation has scheduled a hearing before the Oil Conservation Division to be held at the OCD conference room State Land Office Building at 8:30 am on June 3, 1987, in Santa Fe.

The subject of the hearing is an application to dispose of up to 1000 barrels of produced water per day into a salt lake located in Section 2, Township 23 South, Range 29 East, Eddy County, New Mexico. The facility will be located on State land in the NW/4 of said Section 2.

After receiving an Order and prior to commencing any work, all necessary requirements will be met for operating on State land.

If you have any questions on this matter you may contact me at the above address or call me at 392-6525.

Yours very truly,

Joe D. Ramey
Consultant

CASE 9140
PERMIAN
EXHIBIT 5

Disposal Water enters 500 Gun Barrel Tank ① and mixes with chemically treated water. Oil separates and migrates to top of tank, and solids (iron sulfide) fall to tank bottom.

Water flows thru 6 inch dog leg into top of 500 Primary Settlement Tank ②. Any carry over solids fall to tank bottom and carry over oil collects on top of water. Downcomer on 8" equalizer line allows up to 12 inches of oil to collect before any carry over into Tank ③. Collect 3 Ft. of solid bottoms before clean out Tank ②

Water flows thru 8 inch equalizer line into 500 Secondary Settlement Tank ③ Again, solids allowed to settle to tank bottom and oil collect on top of water. Collect 3 Ft. of solid bottoms before cleanout Tank ③.

Water flows thru 8 inch equalizer line into 300 Surge Tank ④. Solids can settle to tank bottom and oil collect on top. Can collect 2 Ft. of solids before cleaning tank is necessary.

Water then flows to charge pump which pumps water through Lakos Super Separator for final solids removal. Solids collected in Super Separator are purged into 110 bbl. collection tank for removal to approved oil field waste pit. Clean water is delivered into Salt Lake.

Note: Tanks ① ② ③ ④ will be checked on a regular basis for accumulated skim oil and solids. Tanks will be cleaned as necessary to prevent migration of settled solids from tank to tank.