STATE OF NEW MEXICO

ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
AZTEC DISTRICT OFFICE

1000 RIO BRAZOS ROAD
AZTEC, NEW MEXICO 87410
(505) 334-6178

OIL CONSERVATION DIVISION
BOX 2088
SANTA FE, NEW MEXICO 87501

DATE 3-2-89

RE: Proposed MC_____
Proposed DHC_____
Proposed NSL_____
Proposed SWD X
Proposed WFX_____
Proposed PMX_____

Gentlemen:

I have examined the application dated 3-1-89

for the Blackwood & Nichols Co. NEBU #503 N-36-31N-8W
Operator Lease and Well No. Unit, S-T-R

and my recommendations are as follows:

Approve

Yours truly,

Frank T. Chavez

STATE OF NEW MEXICO
ENERGY AND MINERALS DEPARTMENT

OIL CONSERVATION DIVISION
POST OFFICE BOX 2088
STATE LAND OFFICE BUILDING
SANTA FE, NEW MEXICO 87501

FORM C-108
Revised 7-1-81

APPLICATION FOR AUTHORIZATION TO INJECT

Northeast Blanco Unit No. 503

I. Purpose: ☐ Secondary Recovery ☐ Pressure Maintenance ☒ Disposal ☐ Storage
Application qualifies for administrative approval? ☐ yes ☐ no

II. Operator: Blackwood & Nichols Co., Ltd.

Address: P. O. Box 1237, Durango, CO 81302-1237

Contact party: William F. Clark Phone: (303) 247-0728

III. Well data: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? ☐ yes ☒ no
If yes, give the Division order number authorizing the project _____.

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review.

* VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail.

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected;
2. Whether the system is open or closed;
3. Proposed average and maximum injection pressure;
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.).

MAR 23 1989
OIL CON. DIV.
Dist. 3

*VIII. Attach appropriate geological data on the injection zone including appropriate lithologic detail, geological name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such source known to be immediately underlying the injection interval.

IX. Describe the proposed stimulation program, if any.

* X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division they need not be resubmitted.)

* XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken.

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground source of drinking water.

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form.

XIV. Certification

I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

Name: William F. Clark Title Operations Manager

Signature: William F. Clark Date: February 27, 1989

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be duplicated and resubmitted. Please show the date and circumstance of the earlier submittal. _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate Division district office.

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; location by Section, Township, and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) the intended purpose of the injection well; with the exact location of single wells or the section, township, and range location of multiple wells:

(3) the formation name and depth with expected maximum injection rates and pressures; and

(4) a notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, P. O. Box 2088, Santa Fe, New Mexico 87501 within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

Blackwood & Nichols Co., Ltd.
Northeast Blanco Unit No. 503
990' FSL, 1600' FWL
Section 36, T31N, R8W
San Juan County, New Mexico
E-3707-4

Mineral Owner: State of New Mexico
Surface Owner: State of New Mexico
Surface Leasee: Reginaldo Espinoza
P. O. Box 206
Espanola, New Mexico 87532
Phones: Espanola (505) 753-2006
Santa Fe (505) 983-8388

Estimated Formation Tops

Surface -	San Jose	300'	Menefee	5310'	
	Animas	1220'	Pt. Lookout	5570'	
	Ojo Alamo	2200'	Mancos	5948'	
	Kirtland	2290'	Dakota	7855'	
	Fruitland	2960'	Burro Canyon	8005'	
	Pictured Cliffs	3272'	Morrison	8100'	
	Lewis	3400'	Entrada	8950'	
	Cliff House	4900'	Total Depth - Chinle		9180'

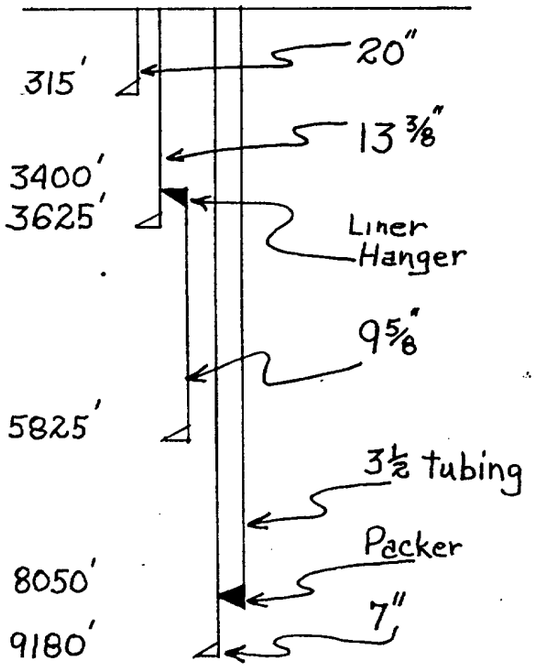
INJECTION WELL DATA SHEET

III

Blackwood & Nichols Co., Ltd.	Northeast Blanco Unit			
OPERATOR	LEASE			
503	990' FSL, 1600' FWL	36	31 North	8 West
WELL NO.	FOOTAGE LOCATION	SECTION	TOWNSHIP	RANGE

San Juan County, New Mexico

Schematic



Tabular Data

Surface Casing

Size 20 " Cemented with 825 sx.

TOC surface feet determined by circulation

Hole size 26"

Intermediate Casing

Size 13 3/8 " Cemented with 1780 (2 stage) sx.

TOC surface feet determined by temperature survey and circulation

Hole size 17 1/2"

Long string

Size 7 " Cemented with 800 sx.

TOC 5500 feet determined by bond log

Hole size 8 3/4"

Total depth 9180'

Injection interval (will perforate selected intervals)

8100 feet to 9100 feet

(perforated ~~or open-hole~~ indicate which)

Liner

Size 9 5/8 " Cemented with 565 sx.

TOC 3400 feet determined by circulation

Hole size 12 1/4"

Total Depth 3400' - 5825'

Tubing size 9.3#, 3 1/2" EUE lined with ICO Spincote (material) set in a Baker Mod AL-2 plastic lined (or equivalent) (brand and model) packer at 8050 (approx.) feet

(or describe any other casing-tubing seal).

Other Data

1. Name of the injection formation Entrada

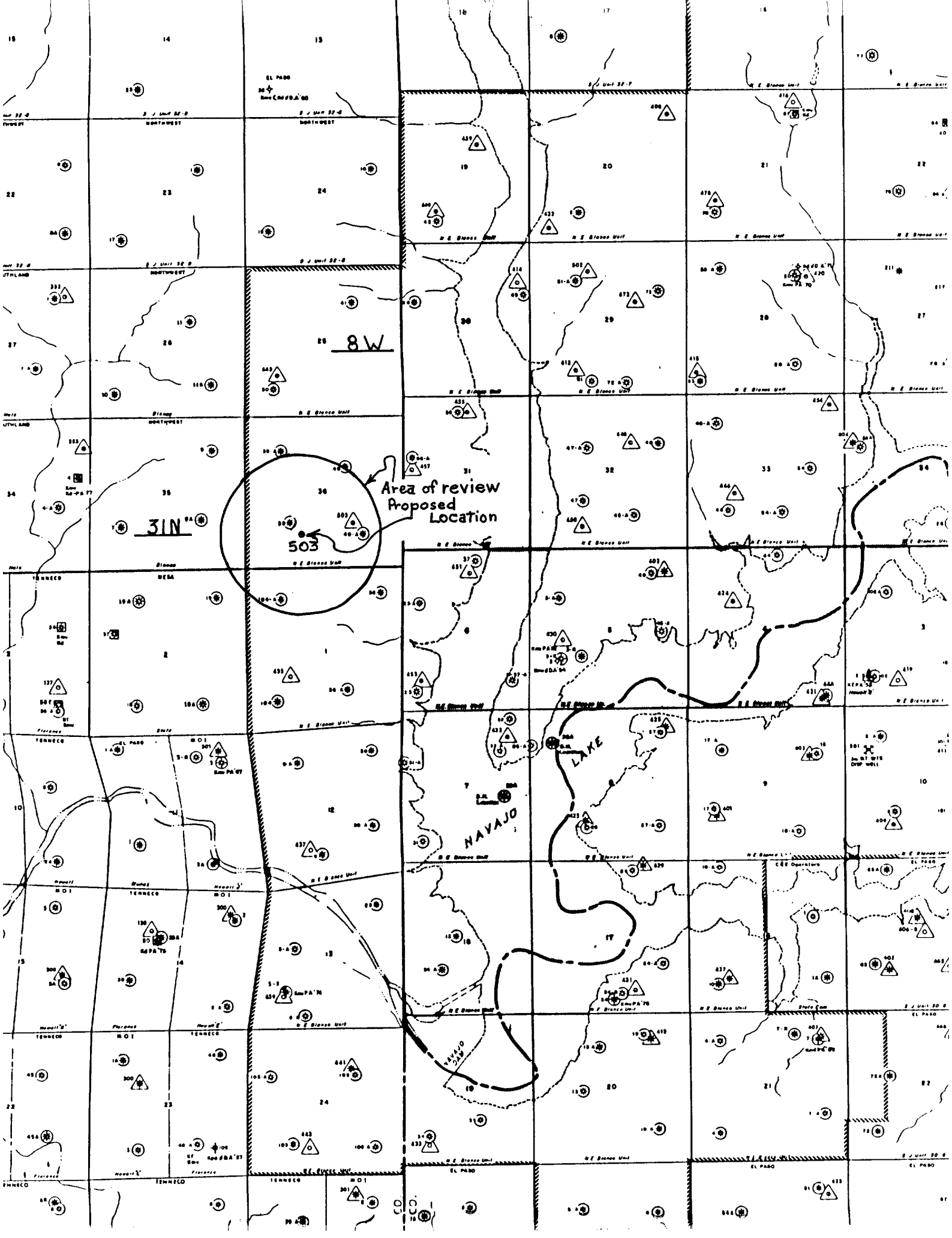
2. Name of Field or Pool (if applicable) NA

3. Is this a new well drilled for injection? XX Yes / No

   If no, for what purpose was the well originally drilled? _____

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail (sacks of cement or bridge plug(s) used) No.

5. Give the depth to and name of any overlying and/or underlying oil or gas zones (pools) in this area. 3000' Fruitland, 3300' Pictured Cliffs, 4900' Mesaverde, 7860' Dakota


8W
31N
Area of review
Proposed
Location
503
LAKE
NAVAJO
NAVAJO DAM

III. Well Data

A. See Injection Well Data Sheet

B. 1. Name of injection formation Entrada.
(No field or pool name for this formation.)

2. 8100'-9100' injection intervals will be selected from logs run at total depth. Intervals will be perforated.

3. This well will be drilled for the purpose of injection for water disposal.

4. None anticipated.

5. The Dakota formation, top 7855', is the next higher formation known to produce gas in this area; there is no known lower oil or gas producing formation.

VI. No wells within the area of review penetrate the proposed injection zone.

VII. 1. Rate of disposal will be determined by a step rate injection test. primary use of the facility will be disposal of produced water from Fruitland coal development wells. The amount of water to be injected will depend on this development.

2. The proposed injection system will be designed as a closed system.

3. Maximum injection pressure will be determined by a step rate injection test. Average injection pressure will be kept below this maximum pressure.

4.

	Fruitland Coal Wells								
	Na	Ca	Mg	K	Cl	HCO3	SO4	CO3	TDS
NEBU 400	3545	24	24	-	639	8540	0	0	12800
NEBU 441	4795	128	39	-	1278	11183	0	0	17400
NEBU 404	4562	32	39	-	1349	10126	-	240	16400
NEBU 406	3829	88	54	-	568	9760	0	0	14300
NEBU 211	4859	32	39	-	2024	9760	0	0	16700
NEBU 212	3480	31.5	21.8	14.8	600	8010	<100	516	9120
NEBU 218	3625	24	39	-	391	9252	0	0	13300

Currently there are no water sample analyses available for specific wells which will be producing water that will be injected into this well; however, the above listed wells and the analyses of produced water are indicative of the water that will be injected into the Northeast Blanco Unit #503.

Water from Fruitland coal gas wells with similar analyses has not demonstrated incompatibility when injected into the Entrada formation of the Northeast Blanco Unit #501.

5. Analysis from Meridian Oil, Inc., Pump Canyon No. 1, Sec. 7, T30N, R8W, approximately 7 miles southwest of the proposed location should be on file with the NMOCD. Attached are analyses of water samples from the NEBU #501, NW 1/4, Section 20, T30N, R7W, Rio Arriba County, New Mexico.

VIII. The closest overlying aquifers are the Ojo Alamo, Animas, San Jose, and Nacimiento. The Ojo Alamo should be encountered in this well from 2200' to 2290'. There are no known aquifers below the Entrada.

The proposed injection zones are the sandy and porous portions of the Morrison, Bluff, and Entrada formations. At the proposed NEBU #503 location the zones could be described as follows:

Morrison - light gray to gray, fine grained to medium grained, well rounded and slightly calcareous sandstones. Individual sandstone bodies are expected to be 10-50' thick separated by shales and siltstones. Some sandstones may be slightly arkosic, but generally are quartzitic with some friable sands. Overall depth would be estimated at 8100-8500' with overlying unit being Burro Canyon and the underlying unit being the Bluff member. A possible thickness of 200' sand is anticipated.

Bluff - light red to pink to gray, fine grained to medium grained sandstones. Clean, slightly friable, sorted. Individual sandstones are expected to be 10-20' thick and separated by shales and siltstones. Overall depth of zone would be estimated at 8500-8800' with approximately 80' of porous sandstone. Rests on top of Todilto.

Entrada - gray to white, hard, fine to medium grained sandstone. Well sorted and well-rounded. Depth of zone is estimated at 8950-9150' with the upper 100' being estimated as porous sandstone. Rests on Chinle.

IX. Stimulation will consist of perforating selected porous intervals in the Morrison and Entrada and stimulating using a sand water frac treatment. Details will be provided to the District NMOCD office prior to stimulation.

Item 3B
SWD-339

API WATER ANALYSIS REPORT FORM

Company		Sample No.	Date Sampled
Field	Legal Description	County or Parish	State
Lease or Unit	Well	Depth	Formation	Water, B/D
Type of Water (Produced, Supply, etc.)	Sampling Point	Sampled By

DISSOLVED SOLIDS

CATIONS	mg/l	me/l
Sodium, Na (calc.)		
Calcium, Ca		
Magnesium, Mg		
Barium, Ba		

ANIONS	mg/l	me/l
Chloride, Cl		
Sulfate, SO_4		
Carbonate, CO_3		
Bicarbonate, HCO_3		

Total Dissolved Solids (calc.)

Iron, Fe (total)

Sulfide, as H_2S

OTHER PROPERTIES

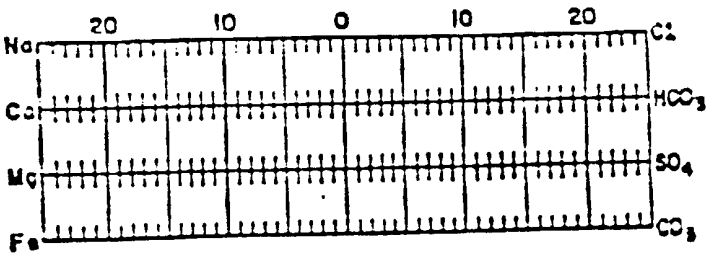
pH

Specific Gravity, 60/60 F.

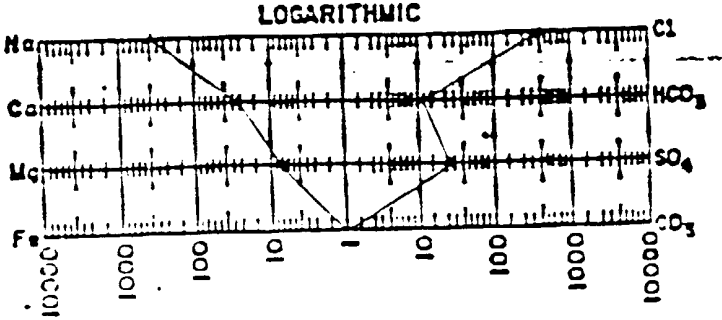
Resistivity (ohm-meters) F.

WATER PATTERNS — me/l

STANDARD



LOGARITHMIC



REMARKS & RECOMMENDATIONS:

Northeast Blanco Unit No. 503

Item 2B
SWD-339

Northeast Blanco Unit No. 503

API WATER ANALYSIS REPORT FORM

Company Blackwood Nichols		Sample No.	Date Sampled 8/2/88
Field	Legal Description	County or Parish	State
Lease or Unit	Well # 501	Depth / Formation	Water, B/D
Type of Water (Produced, Supply, etc.) Entrada	Sampling Point		Sampled By

DISSOLVED SOLIDS

CATIONS	mg/l	me/l
Sodium, Na (calc.)	4237	184.0
Calcium, Ca	1162	58.0
Magnesium, Mg	247	22.0
Barium, Ba		

ANIONS	mg/l	me/l
Chloride, Cl	9165	259.0
Sulfate, SO_4	1600	33.3
Carbonate, CO_3	0	0
Bicarbonate, HCO_3	102	1.7

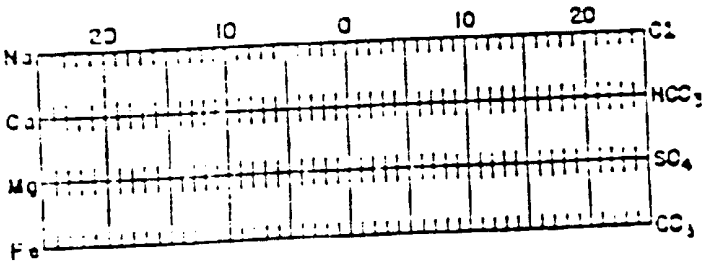
Total Dissolved Solids (calc.)	15,500
Iron, Fe (total)	Dow 500+ mg
Sulfide, as H_2S	

OTHER PROPERTIES

pH	5.35
Specific Gravity, 60/60 F.	1.0077
Resistivity (ohm-meters) 73° F.	.50

WATER PATTERNS — me/l

STANDARD



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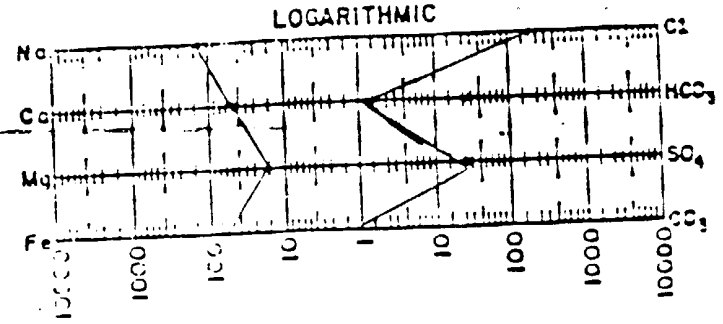

REMARKS & RECOMMENDATIONS:

Contact Bill Clark.

505-247-0728

Northeast Blanco Unit 503

SUTTLE STREET
BOX 2605
RANGO, CO 81302
03) 247-4220

ATTEN: L CLARK
PO BOX 1237
DURANGO, CO 81302
(303) 247-0728

DATE SAMPLED: 8/X/88
WELL NAME: NEBU UNIT 501
LOCATION:
FORMATION: MORRISON PERFS.
SAMPLED FROM:
WELL ON/OFF:

S ID #: 1120

Item 3A
SWD-339

ISTITUENT		ppm	epm
dium	Na +	10600	461.1
assium	K +	1810	46.3
lcium	Ca ++	685	34.2
gnesium	Mg ++	65.9	5.4
on Total	Fe++ & Fe+++	230	12.4
SITIVE SUB-TOTAL		13390.9	559.3565
loride	Cl -	18200	513.2
bonate	CO3 =	0	0.0
carbonate	HCO3-	537	8.8
droxide	OH -	0	0.0
lfate	SO4 =	1750	36.4
GATIVE SUB-TOTAL		20487	558.47643

tal Dissolved Solids	35100 ppm
	6.71 units
ecific Gravity	1.023 @ 73 F.
sistivity	24 ohm-m

PROVED BY: Joe Bowden

DR. JOE BOWDEN, DIRECTOR

esults are based on analysis made at the time samples are received at the laboratory.

75 SUTTLE STREET
PO BOX 2605
DURANGO, CO 81302
(303) 247-4220

ATTEN: L CLARK
PO BOX 1237
DURANGO, CO 81302
(303) 247-0728

DATE SAMPLED: 8/1/88
WELL NAME: NEBU UNIT 501
LOCATION:
FORMATION: ENTRADA WATER
SAMPLED FROM:
WELL ON/Off:

Northeast Blanco Unit 503

CDS ID #: 1119

Item 2A
SWD-339

CONSTITUENT		ppm	epm
Sodium	Na +	4760	207.1
Potassium	K +	169	4.3
Calcium	Ca ++	1310	65.4
Magnesium	Mg ++	29.4	2.4
Iron Total	Fe++ & Fe+++	164	8.8
POSITIVE SUB-TOTAL		6432.4	287.9799
Chloride	Cl -	8280	233.5
Carbonate	CO3 =	0	0.0
Bicarbonate	HCO3-	152	2.5
Hydroxide	OH -	0	0.0
Sulfate	SO4 =	2100	43.7
NEGATIVE SUB-TOTAL		10532	279.70928

Total Dissolved Solids	19000 ppm
pH	5.07 units
Specific Gravity	1.01 @ 73 F.
Resistivity	45 ohm-m

APPROVED BY: _____

DR. JOE BOWDEN, DIRECTOR

Results are based on analysis made at the time samples are received at the laboratory.

X. Test information and logs will be provided to the District NMOCD office as available.

XI. There are no known wells producing fresh water within one mile of the proposed injection well.

XII. I hereby certify that I have examined available geologic and engineering data and can find no evidence of connection between the disposal zone and underground drinking water sources.

XIII. Proof of Notice