AE Order Number Banner

Report Description

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NM - 29

SOUTHWEST WATER DISPOSAL

4/23/2013

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Hydrolgeologic Studies
Site Investigations
Remediation Plans

SITE ASSESSMENT
"SKIMMER PIT"
SOUTHWEST WATER DISPOSAL SITE
SE/4 SW/4 SECTION 32, T30N, R9W
SAN JUAN COUNTY, NEW MEXICO

Prepared For
SOUTHWEST WATER DISPOSAL, INC.
David Sweazey, President
Robert Dillard, Site Foreman

Prepared By

Mark E. Weidler, Professional Geologist
PG-2097 (WY), CPG-2488

August 20, 1993

Nacimento Shale
under bentonite.

Won't move until disturbed

SITE ASSESSMENT
"SKIMMER PIT"
SOUTHWEST WATER DISPOSAL SITE

1.0 INTRODUCTION

The "skimmer pit" investigated for this report was utilized for separation of crude oil type hydrocarbons from water accepted at the site for disposal. The pit was subsequently removed from use, backfilled with fill material, and leveled. During the backfilling procedure, the 'soils' utilized as fill material became heavily contaminated with crude oil sludge which had accumulated in the pit. The New Mexico Oil Conservation Division has requested that Southwest Water Disposal, Inc. conduct a site investigation and submit a plan of reclamation. This firm was retained by Southwest Water Disposal, Inc. to conduct the site investigation.

2.0 LOCATION AND DESCRIPTION OF SETTING

The water disposal facility operated by Southwest Water Disposal, Inc., is located approximately one mile north of the San Juan River between the communities of Blanco and Turley in eastern San Juan County, New Mexico (Refer to Figure 1). The facility is constructed in shale of the Animas Formation (Paleocene). Elevation of the facility is about 5730 feet MSL. Elevation of the San Juan River at is nearest point is about 5580 feet MSL. The alluviated river valley is approximately three-fourths mile wide in the vicinity and is nearly three-fourths mile south of the disposal facility. The alluviated valley contains the nearest significant surface and underground water. The terrain becomes rugged north

and west of the facility, with steep, deeply incised canyons in the Animas Formation.

3.0 INVESTIGATION OF "SKIMMER PIT"

On site personnel showed us the approximate location of the former pit. Because the surface has been leveled the outline of the old pit was not evident. A location near the center of an area encircled by the current access and egress road was selected and staked as test boring C-1 (see Figure 2). The test boring was made with a 3-inch hand auger designed for soil sampling. Samples were collected and tested on 1 to 2 foot intervals. Field testing was made by the headspace method. Pint glass jars are half-filled with sample, and sealed with aluminum foil. The sample is allowed to volatilize a minimum of 15 minutes in the jar, then is agitated for 1-minute, and tested with a pre-calibrated Thermo-Environmental 580-B organic vapor meter. In this case the instrument was calibrated with 250 PPM isobutylene test gas. The instrument utilizes a photo-ionization detector. Headspace testing results and description of samples collected from the boreholes are recorded in Appendix A. In addition, 5 samples collected for TPH analysis in the laboratory are listed both in Table 1 and Appendix A.

The locations of subsequent test borings were referred by direction and distance from test boring C-1. Therefore, North 30-6' refers to the sample collected at 6 feet below grade, 30 feet north of C-1. The contamination was defined both horizontally and vertically in this manner. Many of the borings could not be advanced to the base of contamination because of unpredictable

pebble and cobble gravel which cause auger refusal. Those that could be fully advanced show the bottom of the contamination consistently at the 12-13 foot level below grade. The thickest contamination is the hemisphere defined by South 43 to North 37 to Northwest 22. In this hemisphere contamination starts about 1-foot below grade and continues to 13 feet B.G. It appears this is the result of backfilling from northeast to southwest, displacing and squeezing the heavy oil ahead of the fill dirt. The vertical distribution of contamination is shown in the cross-sectional profiles enclosed as Figure 3.

4.0 DESCRIPTION AND CHARACTERIZATION OF CONTAMINATION

The contamination of the soils by crude oil in the pit is severe. This is reflected in the high TPH readings obtained in laboratory analysis of 5 samples collected from the pit. The laboratory analyses are listed in Table 1. Much of the light-end hydrocarbons have been lost by volatilization and weathering in the pit while it was in use. The residue is heavily weathered, viscous crude oil.

Based on the test boring data we estimate the **volume of contaminated soil to be about 1,540 cubic yards.** This is covered by about 510 cubic yards of relatively uncontaminated fill dirt, mainly on the northeast and east side. In the event of excavation it will be difficult to prevent some mixing of uncontaminated and contaminated soils.

Fortunately, **ground water has not been impacted** and it appears there is little risk of that occurring based upon the geological and hydrological setting.

5.0 RECLAMATION OR DISPOSAL OF CONTAMINATED SOIL

The skimmer pit was located on an area built-up of fill dirt as part of the earth work involved in creating the containment of the site's large evaporation pond. It appears the evaporation pond containment is built to approximately 18-20 feet above original grade. I measured the fall from the access road to grade to the south of the skimmer pit and found a fall of about 14 feet. Therefore, it appears that the bottom of the skimmer pit contamination is now approximately 1' to 2' above original grade of the site. No evidence of lateral seepage is evident inspecting the base of the fill on the south side. The north side of the fill abuts against an outcrop of Animas Formation bed rock which provides excellent containment.

As a result of these observations it appears to the investigator that the contamination described in this report is adequately contained on a near-term basis and poses no immediate threat to the environment. It should be remediated however, because the nature of the contamination and containment will not allow for natural biodegradation. **It is also the opinion of this investigator that excavation and transport to another site for remediation poses a greater threat to the environment than keeping the contaminated soil in its present site.** However, in the event you elect, or are required, to excavate the contaminated material for disposal at a NMOCD approved site or land farm elsewhere, it is important to account for a bulking factor of about 20 per cent. Therefore, the in-situ contaminated soil of 1,540 cubic yards will bulk to about 1850 cubic yards and the overburden from 510 cubic

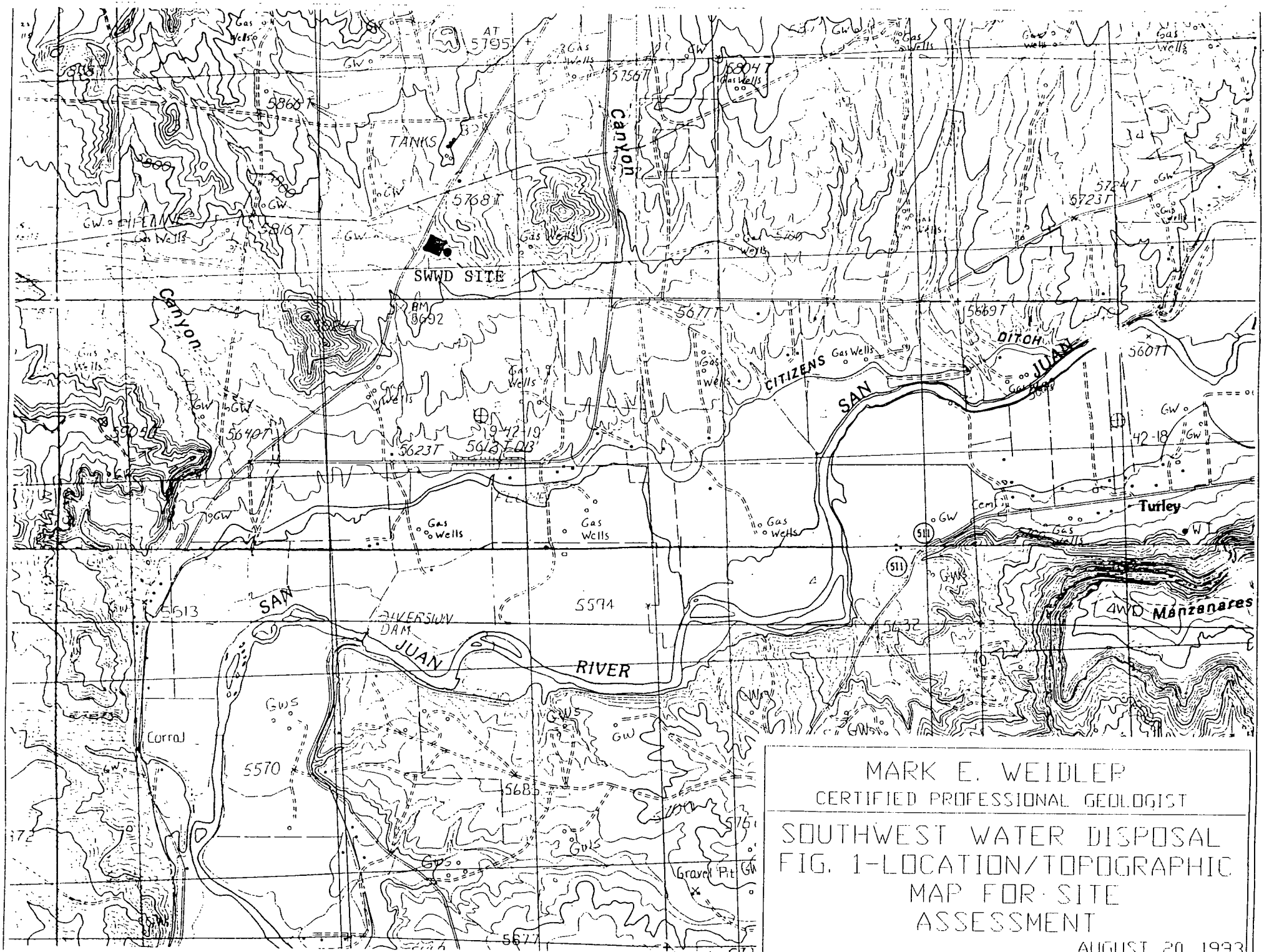
yards to about 612 cubic yards for trucking and disposal purposes after excavation.

Please let me know if you have questions regarding any findings or opinions expressed in this report. I appreciate the opportunity to provide the service and trust that my investigation will provide you the data on which you can make a decision on how to proceed.

Mark E. Weidler

MARK E. WEIDLER
PROFESSIONAL GEOLOGIST

FIGURES



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CERTIFIED PROFESSIONAL GEOLOGIST

SOUTHWEST WATER DISPOSAL
FIG. 1-LOCATION/TOPOGRAPHIC MAP FOR SITE ASSESSMENT

AUGUST 20, 1993

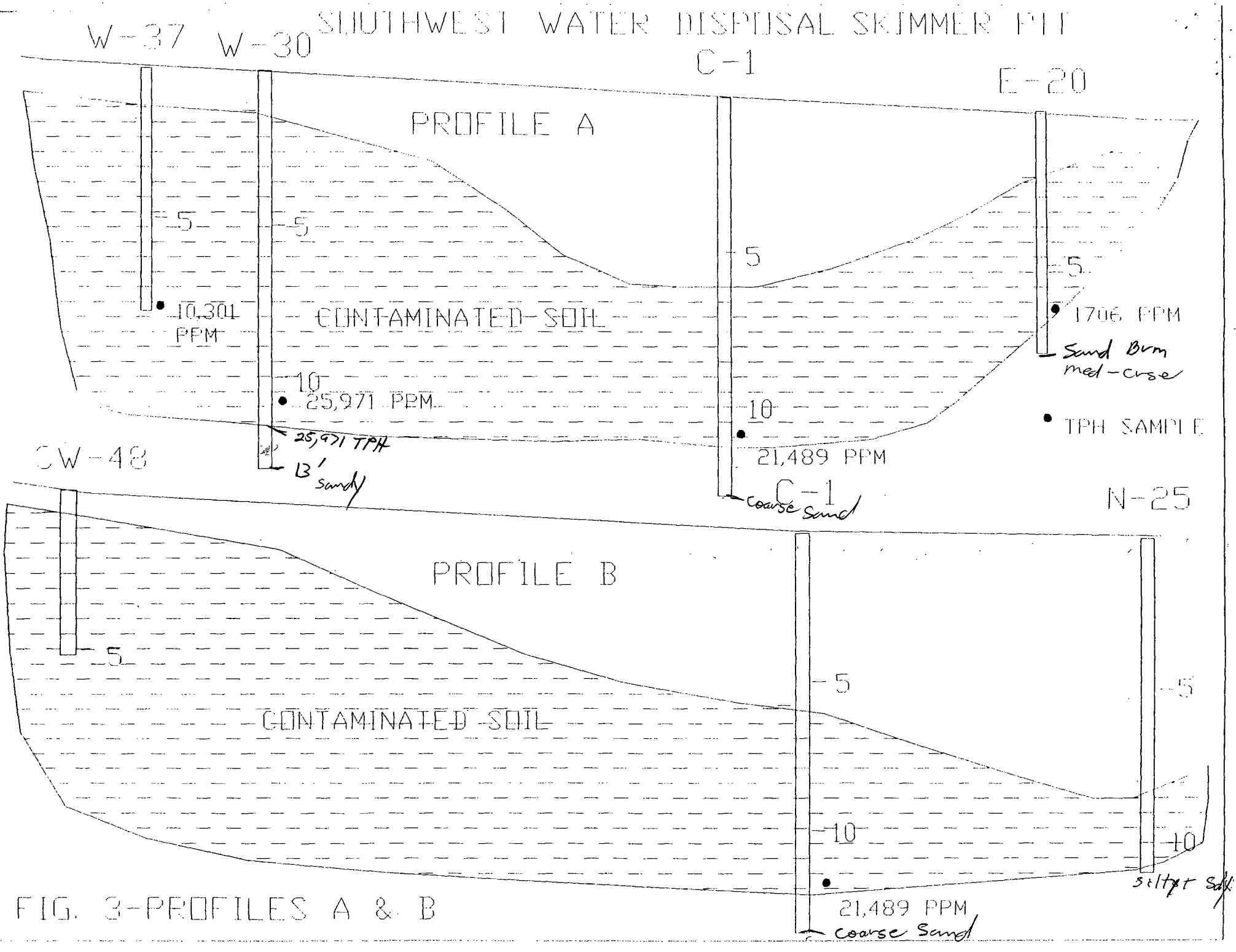
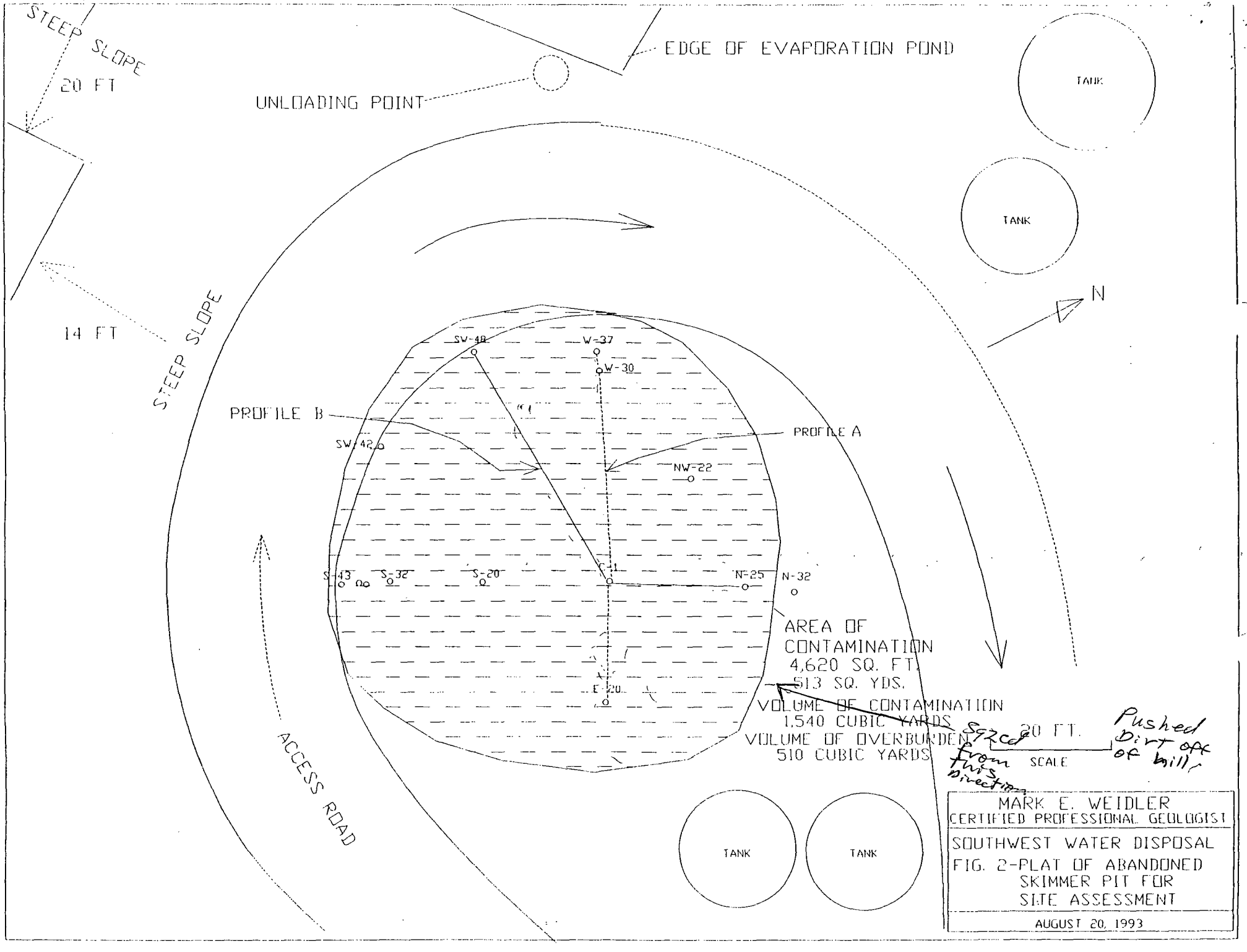


FIG. 3-PROFILES A & B


STEEP SLOPE
20 FT
EDGE OF EVAPORATION POND
UNLOADING POINT
TANK
TANK
N
14 FT
STEEP SLOPE
SW-48
W-37
W-30
PROFILE B
PROFILE A
SW-42
NW-22
S-43
S-32
S-20
C-1
N-25
N-32
E-20
AREA OF
CONTAMINATION
4,620 SQ. FT.
513 SQ. YDS.
VOLUME OF CONTAMINATION
1,540 CUBIC YARDS
VOLUME OF OVERBURDEN
510 CUBIC YARDS
ACCESS ROAD
20 FT.
SCALE
Pushed dirt off of hill from this direction
TANK
TANK
MARK E. WEIDLER
CERTIFIED PROFESSIONAL GEOLOGIST
SOUTHWEST WATER DISPOSAL
FIG. 2-PLAT OF ABANDONED SKIMMER PIT FOR SITE ASSESSMENT
AUGUST 20, 1993

TABLES

TABLE 1
LABORATORY TESTING DATA

TEST BORING	DEPTH	TPH, PPM*
E-20	7'	1706
W-37	8'	10,301
C-1	11'	21,489
NW-22	10.5'	5,392
W-30	11'	25,971

*TPH-TOTAL PURGEABLE HYDROCARBONS
EPA METHOD 8015 (MODIFIED)

BIOTECH LABORATORIES

EPA METHOD 8015 (MOD)
PURGABLE AROMATICS

CLIENT:	SOUTHWEST WATER DISPOSAL	SAMPLE MATRIX:	SOIL
CLIENT NUMBER:	60106	PRESERVATIVE:	COOL
PROJECT NAME:	SKIMMER PIT	REPORT DATE:	08/19/93
PROJECT LOCATION:	BLANCO, NEW MEXICO	DATE SAMPLED:	07/26/93
SAMPLE ID:	BORING C-1	DATE RECIEVED:	07/27/93
SAMPLE NUMBER:	S1107263	DATE ANALYZED:	08/18/93

ANALYTE	CONCENTRATION (mg/KG)	DETECTION LIMIT (mg/KG)
TOTAL PETROLEUM HYDROCARBON	21489	0.8

ND - ANALYTE NOT DETECTED AT STATED DETECTION LIMIT

REFERENCE: METHOD 8015
TEST METHOD FOR EVALUATION SOLID WASTE,
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SW-846,
VOLUME IB, NOVEMBER 1990

ANALYZED BY

REVIEWED BY

THRIFTWAY PROFESSIONAL BUILDING 710 EAST 20TH STREET SUITE 400 FARMINGTON, NEW MEXICO 87401
LABORATORY OFFICE (505) 632-3365 FAX (505) 632-3365

BIOTECH LABORATORIES

EPA METHOD 8015 (MOD)
PURGABLE AROMATICS

CLIENT:	SOUTHWEST WATER DISPOSAL	SAMPLE MATRIX:	SOIL
CLIENT NUMBER:	60106	PRESERVATIVE:	COOL
PROJECT NAME:	SKIMMER PIT	REPORT DATE:	08/19/93
PROJECT LOCATION:	BLANCO, NEW MEXICO	DATE SAMPLED:	08/10/93
SAMPLE ID:	BORING W-30	DATE RECIEVED:	08/11/93
SAMPLE NUMBER:	S1108103	DATE ANALYZED:	08/18/93

ANALYTE	CONCENTRATION (mg/KG)	DETECTION LIMIT (mg/KG)
TOTAL PETROLEUM HYDROCARBON	25971	0.8

ND - ANALYTE NOT DETECTED AT STATED DETECTION LIMIT

REFERENCE: METHOD 8015
TEST METHOD FOR EVALUATION SOLID WASTE,
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SW-846,
VOLUME IB, NOVEMBER 1990

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BIOTECH LABORATORIES

EPA METHOD 8015 (MOD)
PURGABLE AROMATICS

CLIENT:	SOUTHWEST WATER DISPOSAL	SAMPLE MATRIX:	SOIL
CLIENT NUMBER:	60106	PRESERVATIVE:	COOL
PROJECT NAME:	SKIMMER PIT	REPORT DATE:	08/19/93
PROJECT LOCATION:	BLANCO, NEW MEXICO	DATE SAMPLED:	08/11/93
SAMPLE ID:	BORING W-37	DATE RECIEVED:	08/12/93
SAMPLE NUMBER:	S0808113	DATE ANALYZED:	08/18/93

ANALYTE	CONCENTRATION (mg/KG)	DETECTION LIMIT (mg/KG)
TOTAL PETROLEUM HYDROCARBON	10301	0.8

ND - ANALYTE NOT DETECTED AT STATED DETECTION LIMIT

REFERENCE: METHOD 8015
TEST METHOD FOR EVALUATION SOLID WASTE,
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SW-846,
VOLUME IB, NOVEMBER 1990

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BIOTECH LABORATORIES

EPA METHOD 8015 (MOD)
PURGABLE AROMATICS

CLIENT:	SOUTHWEST WATER DISPOSAL	SAMPLE MATRIX:	SOIL
CLIENT NUMBER:	60106	PRESERVATIVE:	COOL
PROJECT NAME:	SKIMMER PIT	REPORT DATE:	08/19/93
PROJECT LOCATION:	BLANCO, NEW MEXICO	DATE SAMPLED:	08/11/93
SAMPLE ID:	BORING E-20	DATE RECIEVED:	08/12/93
SAMPLE NUMBER:	S0708113	DATE ANALYZED:	08/18/93

ANALYTE	CONCENTRATION (mg/KG)	DETECTION LIMIT (mg/KG)
TOTAL PETROLEUM HYDROCARBON	1706	0.8

ND - ANALYTE NOT DETECTED AT STATED DETECTION LIMIT

REFERENCE: METHOD 8015
TEST METHOD FOR EVALUATION SOLID WASTE,
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SW-846,
VOLUME IB, NOVEMBER 1990

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BIOTECH LABORATORIES

EPA METHOD 8015 (MOD)
PURGABLE AROMATICS

CLIENT:	SOUTHWEST WATER DISPOSAL	SAMPLE MATRIX:	SOIL
CLIENT NUMBER:	60106	PRESERVATIVE:	COOL
PROJECT NAME:	SKIMMER PIT	REPORT DATE:	08/19/93
PROJECT LOCATION:	BLANCO, NEW MEXICO	DATE SAMPLED:	08/14/93
SAMPLE ID:	BORING NW-22	DATE RECIEVED:	08/15/93
SAMPLE NUMBER:	S2208143	DATE ANALYZED:	08/18/93

ANALYTE	CONCENTRATION (mg/KG)	DETECTION LIMIT (mg/KG)
TOTAL PETROLEUM HYDROCARBON	5392	0.8

ND - ANALYTE NOT DETECTED AT STATED DETECTION LIMIT

REFERENCE: METHOD 8015
TEST METHOD FOR EVALUATION SOLID WASTE,
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SW-846,
VOLUME IB, NOVEMBER 1990

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BIOTECH LABORATORIES

EPA METHOD 8015 (MOD)
PURGABLE AROMATICS

QUALITY ASSURANCE / QUALITY CONTROL

CLIENT:	NA	SAMPLE MATRIX:	HEXANE
CLIENT NUMBER:	NA	PRESERVATIVE:	NA
PROJECT NAME:	NA	REPORT DATE:	08/18/93
PROJECT LOCATION:	NA	DATE SAMPLED:	NA
SAMPLE ID:	LABORATORY BLANK	DATE RECIEVED:	NA
SAMPLE NUMBER:	B1508183	DATE ANALYZED:	08/18/93

ANALYTE	CONCENTRATION (mg/KG)	DETECTION LIMIT (mg/KG)
TOTAL PETROLEUM HYDROCARBON	ND	1.0

ND - ANALYTE NOT DETECTED AT STATED DETECTION LIMIT

REFERENCE: METHOD 8015
TEST METHOD FOR EVALUATION SOLID WASTE,
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SW-846,
VOLUME IB, NOVEMBER 1990

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LABORATORY OFFICE (505) 632-3365 FAX (505) 632-3365

APPENDIX

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505-325-9359

TEST BORING LOG

TEST BORING NO. C-1 SITE: SOUTHWEST WATER DISPOSAL
DATE: 7/27/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
0-6'	<100		CLEAN FILL DIRT
7'	188		SAND, FINE TO MEDIUM
8'	489		SAND, FINE TO MEDIUM
9'	593		SAND, FINE TO MEDIUM
10'	435		CLAY, GRY/BLACK, STRONG HC ODOR
11'	450	21,489	CLAY, GRY/BLACK, STRONG HC ODOR
12'	38		CLAY, TAN
13'	12		SAND, COARSE, APPEARS CLEAN

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TEST BORING LOG

TEST BORING NO. 30-W SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/10/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
1.5'	375		CLAY, SANDY, BLACK W/OIL
3'	269		CLAY, SANDY, BLK & BRN, CONTAM.
5'	385		CLAY, BLK, OILY, SDY
7'	380		AS ABOVE
8'	375		CLAY,SDY, BRN
9'	347		CLAY, SDY, BLK & BRN
11'	321	25,971	CLAY, SDY, BLK
12'	132		CLAY, GRY TO TAN, SDY
13'	24		CLAY, TAN -GRY, SDY, LOOKS OK

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TEST BORING LOG

TEST BORING NO. W-37 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/11/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
1.8'	440		CLAY, BRN, SDY
3'	451		CLAY, BLK, SDY, HC ODOR
5'	501		CLAY, BLK, MOIST, OILY
6'	315		CLAY, BLK, MOIST, OILY
7'	325		CLAY, BLK, MOIST, OILY
8'	400	10,301	CLAY, BLK MOIST, HVY OIL SAT.

NOTE: Shut down at 2030 because dark. Hvy rain during night washed surface soil and water into hole, filling to 3-ft below grade. Elected to not re-enter test boring to deepen.

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TEST BORING LOG

TEST BORING NO. E-20 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/11/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
2'	51		CLAY, SDY, PEBBLY, BRN
3'	324		CLAY, SDY, PEBBLY, BLK & BRN
5'	362		CLAY, SDY, PEBBLY, BLK & BRN
6'	136		SAND, BRN, MED TO CRSE, UNCONSOL.
7'	507	1706	SAND, BRN, MED TO CRSE, UNCONSOL.
7.5'	44		SAND, BRN, MED TO CRSE, UNCONSOL.
8'	20		SAND, BRN, MED TO CRSE, UNCONSOL.

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TEST BORING LOG

TEST BORING NO. S-20 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/11/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
1'	349		CLAY, BLK, SDY, HC ODOR
1.5	20		SAND, BRN, SILTY
REFUSAL			

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TEST BORING LOG

TEST BORING NO. N-25 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/14/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
2'	.7		CLAY, SILTY
4'	.7		CLAY, SILTY
6'	.7		CLAY, SILTY AND SANDY
8'	51		CLAY, SILTY
9'	155		CLAY, BLACK, HVY CONTAMINATION
10	83		CLAY, BLACK, CONTAM.
11	5.7		CLAY, GRY-BRN, SILTY & SDY

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TEST BORING LOG

TEST BORING NO. NW-22 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/14/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
2'	565		CLAY, BLK, SDY, CONTAMINATED
2.5'	306		CLAY, BLK, CONTAM.
4'	283		CLAY, BLK, SDY, CONTAM.
6'	323		CLAY, BLK, SDY, CONTAM.
8'	286		CLAY, BLK, SDY, CONTAM.
10'	311	5392	CLAY, BLK, SDY, CONTAM.
11'	314		CLAY, GRY-BRN, SDY
12'	437		CLAY, GRY-BRN, SDY
12.5	128		SAND, BRN, SILTY
13'	13		CLAY, GRY-BRN, SDY

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TEST BORING LOG

TEST BORING NO.S-32,38,40,43 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/16/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
S-32 1'	496		SAND/GRAVEL, REFUSAL
S-38 1'	400		AS ABOVE, REFUSAL
S-40 1'	420		AS ABOVE, REFUSAL
S-43 1'	434		AS ABOVE, REFUSAL
2.5'	44		GRAVEL & SAND, CLEAN, AUGER REFUSAL

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TEST BORING LOG

TEST BORING NO. SW-42, SW-48 SITE: SOUTHWEST WATER DISPOSAL
DATE: 8/16/93

SAMPLE METHOD: HAND AUGER

DEPTH	OVM, PPM	TPH,PPM	DESCRIPTION
SW-42 2'	NOT TSTD		BLACK OILY SAND AND GRAVEL
4'	NOT TSTD		BLACK OILY SAND AND GRAVEL
4.5'	NOT TSTD		AUGER REFUSAL
SW-48 2'	60		BLACK OILY SAND, SILT, CLAY
3'	354		BLACK OILY SILT AND CLAY
5'	374		BLACK OILY SOIL, ALMOST PURE OIL
5.2'			AUGER REFUSAL IN COBBLE GRAVEL

SITE INFORMATION AND PLUGGING/REMEDIATION/RESTORATION PROCEDURES

ARTICLE I - STATEMENT OF WORK

A. EMNRD is requesting proposals to provide professional services to design and implement the final closure of a commercial surface waste management facility (Facility) located in SE/4 SW/4 of Section 32, Township 30 North, Range 9 West, San Juan County, New Mexico. The final closure will include, as applicable:

1. Removal and disposal of fluids in tanks to an OCD-approved surface waste management facility;

2. Removal and disposal of all tanks, vessels, equipment, hardware, and debris;

3. Removal of demolition and disposal of buildings and foundation;

4. Excavation of the previously covered skimmer pit that is approximately fifty feet by fifty feet by seven feet deep (50' x 50'x7') and removal of contaminated soils to an OCD-approved surface waste management facility;

5. Reroute all surface drainage away from the Facility, which may include the use of rip rap, erosion control mats, or other appropriate erosion control methods;

6. Plug and abandon eight (8), four (4) inch schedule 40 PVC monitoring wells. Depth of wells as follows: Well No. 1 is 36.5 feet; Well No. 5 is 75 feet; Well No. 8 is 53 feet; Well No. 9 is 35 feet; Well No. 10 is 58 feet; Well No. 11 is 35 feet; Well No. 12 is 55 feet; and Well No. 13 is 82 feet.

7. Fill and regrade skimmer pit area, surface depressions and erosional features at the Facility; and

8. Recontour, terrace, prepare the soil and seed with native vegetation to prevent all future erosion or degradation of the Facility, which shall include the borrow pit and access road north of the Facility.

9. Additional seeding and modification or repair of surface drainage and erosion control devices to be determined after follow-up inspection nine (9) months after facility is initially seeded.

B. The proposal should be designed in the general format shown in A.1 through 9 above. The successful offeror must have all licenses and certifications required to design and implement the closure.

ARTICLE II - BACKGROUND

A. The Oil and Gas Act, Chapter 70, Article 2, NMSA 1978, authorizes the Oil Conservation Division (OCD) to regulate the disposition of non-domestic wastes resulting from the exploration, development, production or storage of crude oil or natural gas to protect public health and the environment.

B. OCD permits and regulates commercial waste disposal facilities that collect, dispose, evaporate or store produced water, drilling fluids, drill cuttings, completion fluids and/or other approved oil

field-related waste in surface pits, ponds, or below grade tanks. Such facilities are required to be closed at the cessation of disposal operations to protect public health and the environment.

C. The Facility was initially remediated to eliminate the immediate threat to public health and the environment. During this remediation effort the 396 foot by 387 foot evaporation pond was treated to prevent the formation of hydrogen sulfide (H_2S), the water was evaporated and/or hauled to an OCD authorized disposal facility, equipment was removed from the pond and the pond was filled in.

ARTICLE III. - FACILITY SITE INFORMATION

A. OCD has certain information and documentation that may be helpful to offerors in preparing their proposals, including the following:

1. A plat and topographic map showing the location of the Facility in relation to governmental surveys (¼¼ section, township and range), highways or roads giving access to the Facility site, and watercourses, and dwellings within one mile of the site;

2. A description of the Facility with photographs of fences, ponds, buildings, tanks, vessels, equipment, hardware, and debris. Detailed as-built engineering construction/installation diagrams of pond, pit, liners, leak detection monitor wells, and tanks at the Facility;

3. Laboratory analysis; and

4. Previous contractor work including treatment and removal of water and filling in of the evaporation pond.

B. **For site tour, contact Martyne Kieling at (505) 827-7153 by 5:00 p.m., April 16, 1999.**

STATE OF NEW MEXICO

STATE ENGINEER OFFICE
SANTA FE

S. E. REYNOLDS
STATE ENGINEER

BATAAN MEMORIAL BUILDING
STATE CAPITOL
SANTA FE, NEW MEXICO 87503

June 28, 1988

File No. 4305

David B. Swezey
Southwest Water Disposal
P.O. Box 10734
Farmington, NM 87401

Dear Mr. Swezey:

Enclosed is your copy of the above-numbered Application for Permit to Construct a Dam which has been approved.

Please note that Proof of Completion of Works will be due in this office on or before June 30, 1990.

Sincerely,

S.E. Reynolds
State Engineer

by: R.Q. Rogers
R.Q. Rogers, Assistant Chief
Water Rights Division

RQR:egr

Enclosure

IMPORTANT - READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM

APPLICATION FOR PERMIT TO CONSTRUCT A DAM

File No. 4305 Date of receipt April 15, 1988

1. Name of applicant Southwest Water Disposal
   Address P.O. Box 10734
   City and State Farmington, NM Zip code 87499

2. Dam hazard classification (SCS criteria) Class A

3. Dam is to be located on: (a) Name of stream or watercourse N/A Pond is out of all water use but is 1½ NW of San Juan River
   (b) Which is a tributary of

4. Location of the intake structure of the principal spillway conduit from detention storage: San Juan County. (a) SE ¼ SW ¼ N/A ¼ of Section 32, Township 30N, Range 9W, N.M.P.M. or (b) within feet of X = feet, Y = feet, N.M.C.S., zone, within Grant.

5. Drainage area characteristics: (a) drainage area N/A acres; (b) 100-year, 6 hour precipitation N/A inches; (c) probable maximum precipitation (PMP), 6 hour storm N/A inches; (d) volume of run-off from the 100-year, 6 hour storm N/A acre-feet. (e) volume of run-off from the PMP, 6 hour storm N/A acre-feet.

6. Properties of detention dam: (a) maximum height above foundation at downstream toe 25 feet; (b) length of crest 1600 feet; (c) width of crest 10 feet: (d) maximum width at base 130 feet; (e) slope of upstream face 3:1, (f) slope of downstream face 3:1; (g) elevation at crest of dam feet; (h) elevation of emergency spillway crest N/A feet; (i) elevation of flow line of the intake structure of the principal spillway conduit feet; (j) characteristics of emergency spillway, (1) location N/A
   (2) width N/A feet, (3) maximum capacity N/A cubic feet per second, (4) freeboard above maximum high water line 1.5 feet, (5) cross-sectional area at maximum flow N/A square feet; (k) characteristics of principal spillway conduit, (1) size, type and numer of gates N/A
   (2) dimension N/A feet, (3) length N/A feet, (4) slope N/A, (5) Manning coefficient N/A, (6) maximum discharge capacity N/A cubic feet per second, time to empty the detention reservoir N/A hours, (96 hours maximum unless prior approval has been obtained); (l) construction material, etc. N/A

   (m) approximate volume of material in dam 42040 cubic yards, (n) type of construction Native clay

7.

Height Above Flow Line of Intake Structure	Area of Water Surface, Acres	Storage Capacity, Acre Feet	Remarks and Critical Points
0			Flow line of intake structure
N/A	3.5	37.9	

8. Additional data or explanations The pond will recieve only produced water and is located away from any established water way

9. Estimated costs: Detention dam and appurtenances . . . $ 25,000.00
   Other constructed works . . . . . $ 8,000.00
   Total cost 33,000.00 $

10. Estimated date to begin construction May 1, 1988
    Estimated date to complete construction May 15, 1988

11. Dam will be constructed under supervision of Western Technolgies, Inc.

12. Signature of Applicant

ACTION OF STATE ENGINEER

This application to construct a dam is approved provided it is not exercised to the detriment of any others having prior, valid and existing rights to the use of waters of this stream system and further provided that and further subject to the following conditions:

1. The qualifications of a professional engineer registered in New Mexico who will supervise construction must be submitted to and approved by the State Engineer prior to undertaking construction.

2. The professional engineer supervising construction shall submit a report to the State Engineer by the 10th day of each month. The report shall include a summary of progress, number of materials tests performed and summary of test results.

3. Construction shall be in accordance with approved plans and specifications. Any modification of the approved plans and specifications or design changes must be approved in writing by the State Engineer prior to undertaking such modifications.

4. Within 60 days of completion of construction, the professional engineer supervising construction shall submit to the State Engineer:

a. a completion report which shall include description of problems encountered and their solution; summary of materials test data and construction photographs;

b. as-built drawings;

c. a certificate that the evaporation pond dam as constructed is safe for the intended use.

Construction of works to be completed on or before June 30, 1990.

Witness my hand and seal this 28 day of June, A.D., 19 88.

S.E. Reynolds, State Engineer

By: R.Q. Rogers

R.Q. Rogers, Assistant Chief
Water Rights Division

Instructions

This form shall be filed in triplicate and accompanied by maps, plans, specifications, etc.

Section 1	- Fill in all blanks
Section 2	- Class (a). — Dams located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.
	Class (b).— Dams located in predominantly rural or agricultural areas were failure may damage isolated homes, main highways or minor railroads or cause interruption of use or service of relatively important public utilities.
	Class (c). — Dams located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways, or railroads.
Section 3	- Fill in all blanks
Section 4	- Fill in either part a or b
Sections 5, 6, 7	- Fill in all blanks
Section 8	- Fill in if necessary
Section 9, 10	- Fill in all blanks
Section 11	- Construction must be under supervision of registered engineer, consulting engineer firm or government agency.
Section 12	- Signature

FILING FEE - $10.00

SOUTHWEST WATER DISPOSAL
P.O. Box 10734
Farmington, NM 87499
505-325-8729

May 25, 1988

Mr. William L. LeMay
Director, Energy Minerals and
Natural Resources Department
P.O. Box 2088
State Land Office Building
Santa Fe, NM 87503

Dear Mr. LeMay,

Thank you for your letter of May 17, 1988 for conditional approval of our application for a commercial clay-lined surface evaporation pit for the disposal of produced water, to be located in the SW/4, SW/4, Section 32, T-30-N, R-9-W, San Juan County, New Mexico.

The following conditions were stated in your letter:

1. Construction of the pit will proceed when the State Engineer's approval is obtained. All correspondence copies with the State Engineer will be filed with your office.

2. A registered professional engineer will submit as-built plans for the facility as soon as possible after construction.

3. Any facility expansion or modification, or any changes in the types of wastes disposed at the site will be submitted for approval by the Director of the Oil Conservation Division.

We will of course adhere to these conditions. Additionally your office will be notified by phone prior to construction. Notification will also be given to your office a minimum of five working days prior to the acceptance of any produced water for with revenue is received.

I want to thank your professional team of Dave Bover, Jami Bailey, Frank Chavez, and others for their assistance during the permitting process. I believe their commitment to State policy with an eye toward innovation has resulted in a much improved environmentally sound waste water treatment facility.

I remain committed to the goal of SWWD being the most responsible, responsive and efficient operation of its type in your state. Again, thank you.

Cordially,

David B. Swezey
President

dbs/sg/5-24-88

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

May 17, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David Swezey
SOUTHWEST WATER DISPOSAL
P. O. Box 10734
Farmington, New Mexico 87499

Dear Mr. Swezey:

The application for a commercial clay-lined surface evaporation pit for the disposal of produced water, to be located in the SW/4, SW/4, Section 32, T-30-N, R-9-W, San Juan County, New Mexico is hereby approved with the following conditions:

1. Construction of the pit may proceed when State Engineer approval is obtained. All copies of State Engineer correspondence should be filed with this office.

2. A registered professional engineer will submit as-built plans for the facility as soon as possible after construction.

3. Any facility expansion or modification, or any changes in the types of wastes disposed at the site must be approved by the Director of the Oil Conservation Division (OCD).

The facility application consists of the original application dated July 14, 1987 and additional submittals dated September 16 and October 28, 1987 and March 28, March 29, May 9, and May 11, 1988.

Please be advised that the approval of this application does not relieve you of liability should your operation result in actual pollution of surface or ground water which may be actionable under New Mexico laws or regulations.

On behalf of the staff at the OCD, I wish to thank you and your consultant for the cooperation shown during the application review.

Sincerely,

William J. LeMay
Director

WJL:JB:sl

cc: Frank Chavez, OCD-Aztec

SOUTHWEST WATER DISPOSAL
P.O. Box 10734
Farmington, NM 87499
505-325-8729

May 11, 1988

Mr. Dave Bover
State of New Mexico
Energy, Minerals and Natural Resources Department
Oil Conservation Division
P.O. Box 2088
State Land Office Building
Santa Fe, NM 87504

RE: Commercial Surface Disposal Facility
SW/4, SW/4, Section 32, T-30-N, R-9-W
San Juan County, New Mexico

Dear Mr. Boyer,

In response to your letter of April 18, 1988, please note the following:

Monitoring Wells

The Company has complied with your monitoring well requirement. Ms. Bailey has a copy of the drilling log for your review.

Aeration System

Southwest Water Disposal agrees that the use of spray evaporation will not be allowed when mist or salt solids are carried beyond the berms of the evaporation pit. Dike walls will be maintained to prevent significant erosion.

Fluid Contingency Plan

Southwest Water Disposal agrees to the analyses of any fluids found in the required boring which will be used to determine the TDS concentration at which Southwest Water Disposal will cease accepting fluids. If no fluids are found in the wells after completion, then any fluid later discovered in the wells will be analyzed to determine the source.

The written approval from the State Engineer could be received as early as next week. With any luck at all the final approval from all State agencies could be in hand by May 25, 1988.

Thank you for your immediate attention to our project. Please feel free to give me a call should there be any unanticipated hurdles to cross.

Cordially,

David B. Swezey

dbs/sg/5-11-88

May 9, 1988

Ms. Jami Bailey
N. M. Oil Conservation Division
P. O. Box 2088
Santa Fe, NM 87501-2088

Re: Southwest Water Disposal
Commercial Evaporation Pond
Section 32-T30N-R9W
San Juan County, New Mexico

Dear Jami,

Pursuant to our conversation of May 9, 1988, attached please find a copy of the driller's log for the test holes drilled near the southeast and southwest corners of the proposed facility.

The well in the southeast corner was drilled to a depth of 40' with sandstone being encountered at 34'. Casing was landed at 36.5 with the casing backfilled with sand to 7" from surface. The casing is perforated from 11.5' to 36.5'.

The well in the southwest corner was drilled to a depth of 53' with sandstone being encountered at 45'. There was no water encountered during the drilling. Casing was landed at 53' with the casing backfilled with sand to 7' from surface. The casing was perforated from 7' to 53'.

I feel very comfortable with my interpretation that the unconsolidated sand is the result of an erosional process. Inasmuch as no water was encountered in the wells, I feel that the groundwater of the State should be adequately protected by the natural clays that will line this pond.

If I may be of any further assistance, please advise.

Very truly yours,

Robert C. Frank

Robert C. Frank

DRILLER'S LOG

SE Corner

Depth	Description
0-2	Loess
2-34	Sand: unconsolidated, poorly sorted, sub angular, variable clay content 5-15%
34-40	Sandstone: tan-light brown, hard, subangular, very fine grain, fair sorting, clay content 10% No water

4" Schedule 40 PVC casing landed at 36.5', backfilled to 7' from surface with sand. Perforated interval 11.5'-36.5'.

SW Corner

Depth	Description
0-2	Loess
2-7	Dark brown clay, 50% clay, 50% sand
7-19	Sand: unconsolidated, poorly sorted, variable clay content 5-15%
19-24	Tan clay 30%, tan silt 40%, sand 30%, powderlike when drilling
24-42	Sand: unconsolidated, tan, poorly sorted, subangular, variable clay content 5-15%
42-45	Sand: unconsolidated, tan, poorly sorted, subangular, 35% clay
45-47	Sandstone: tan-light brown, hard, subangular, very fine grain, fair to good sorting, clay content 5%
46-53	Sandstone: tan-light brown, medium hard, subangular, fair sorting, clay content 5% No water

4" Schedule 40 PVC casing landed at 53', backfilled to 7' from surface with sand. Perforated interval 7'-53'.

May 9, 1988

Ms. Jami Bailey
N. M. Oil Conservation Division
P. O. Box 2088
Santa Fe, NM 87501-2088

Re: Southwest Water Disposal
Commercial Evaporation Pond
Section 32-T30N-R9W
San Juan County, New Mexico

Dear Jami,

Pursuant to our conversation of May 9, 1988, attached please find a copy of the driller's log for the test holes drilled near the southeast and southwest corners of the proposed facility.

The well in the southeast corner was drilled to a depth of 40' with sandstone being encountered at 34'. Casing was landed at 36.5 with the casing backfilled with sand to 7" from surface. The casing is perforated from 11.5' to 36.5'.

The well in the southwest corner was drilled to a depth of 53' with sandstone being encountered at 45'. There was no water encountered during the drilling. Casing was landed at 53' with the casing backfilled with sand to 7' from surface. The casing was perforated from 7' to 53'.

I feel very comfortable with my interpretation that the unconsolidated sand is the result of an erosional process. Inasmuch as no water was encountered in the wells, I feel that the groundwater of the State should be adequately protected by the natural clays that will line this pond.

If I may be of any further assistance, please advise.

Very truly yours,

Robert C. Frank

Robert C. Frank

DRILLER'S LOG

SE Corner

Depth	Description
0-2	Loess
2-34	Sand: unconsolidated, poorly sorted, sub angular, variable clay content 5-15%
34-40	Sandstone: tan-light brown, hard, subangular, very fine grain, fair sorting, clay content 10% No water

4" Schedule 40 PVC casing landed at 36.5', backfilled to 7' from surface with sand. Perforated interval 11.5'-36.5'.

SW Corner

Depth	Description
0-2	Loess
2-7	Dark brown clay, 50% clay, 50% sand
7-19	Sand: unconsolidated, poorly sorted, variable clay content 5-15%
19-24	Tan clay 30%, tan silt 40%, sand 30%, powderlike when drilling
24-42	Sand: unconsolidated, tan, poorly sorted, subangular, variable clay content 5-15%
42-45	Sand: unconsolidated, tan, poorly sorted, subangular, 35% clay
45-47	Sandstone: tan-light brown, hard, subangular, very fine grain, fair to good sorting, clay content 5%
46-53	Sandstone: tan-light brown, medium hard, subangular, fair sorting, clay content 5% No water

4" Schedule 40 PVC casing landed at 53', backfilled to 7' from surface with sand. Perforated interval 7'-53'.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

MEMORANDUM OF MEETING OR CONVERSATION

☒ Telephone ☐ Personal | Time 3PM | Date 5/2/89

Originating Party	Other Parties
David Boyer, OCD	Bob Frank, consultant for Bob Swezey, Southwest Water Disposal

Subject: Commercial Surface Disposal Facility, Blanco

Discussion: I called in response to Bob's call last week regarding our April 18 letter. OCD is concerned about the finding of unconsolidated sand in one corner of the site. I told Bob that the clay liner is the only source of protection (no synthetic liner), and we were expecting natural low permeab material as a backup. If sand, shallow water, good quality water, will need to reevaluate use of single liner. Told him I appreciated construction equipment could damage holes, but need subsurface info is greater concern.

Conclusions or Agreements: I told Bob we needed two holes on the southern end outside pond berms. Bob agreed to get OK from Swezey and contact drillers to get info.

Distribution: SWW & File

Signed: D Boyer

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

April 18, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David B. Swezey
Southwest Water Disposal
P. O. Box 10734
Farmington, New Mexico 87499

RE: Commercial Surface Disposal Facility
SW/4, SW/4, Section 32, T-30-N, R-9-W
San Juan County, New Mexico

Dear Mr. Swezey:

In response to your letter of March 28, 1988, the Oil Conservation Division wishes to clarify commitments made by you and to inform you of issues raised by the drillers log of Boring No. 1.

Monitor Wells

The discovery of an unconsolidated, fine to coarse grained sand at a depth of 7½ feet with a minimum thickness of 17½ feet indicates that additional borings must be performed to characterize the lateral extent and full thickness of the sand bed. These additional borings, drilled one foot beyond the bottom of the sand unit, may be converted to monitor wells with screens over the entire thickness of the sand. Any fluids found in these borings shall be analyzed for base-line data.

Aeration System

Spray evaporation use will not be allowed when mist or salt solids are carried beyond the berms of the evaporation pit. Dike walls will be maintained to prevent significant erosion.

Fluid Contingency Plan

Analyses of any fluids found in the required borings will be used to determine the TDS concentration at which Southwest Water Disposal will cease accepting fluids. If no fluids are found in the wells after completion, then any fluid later discovered in the wells will be analyzed to determine the source.

When the State Engineer Office issues a permit for the construction of the main evaporation pit, please forward a copy to us for our files.

The proposed Rule 711 dealing with the permitting and operation of commercial surface disposal facilities, and requiring a $25,000 bond for such facilities, will be presented to the Oil Conservation Commission for hearing on May 19, at 9:00 A.M., in Morgan Hall, State Land Office Building, Santa Fe.

If I may be of further assistance, please call me at (505) 827-5884.

Sincerely,

Jami Bailey
Geologist

JB:sl

cc: OCD - Aztec

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

April 18, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David B. Swezey
Southwest Water Disposal
P. O. Box 10734
Farmington, New Mexico 87499

RE: Commercial Surface Disposal Facility
SW/4, SW/4, Section 32, T-30-N, R-9-W
San Juan County, New Mexico

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If I may be of further assistance, please call me at (505) 827-5884.

Sincerely,

Jami Bailey
Geologist

JB:sl

cc: OCD - Aztec

Southwest Water Disposal
Infiltration Calculations

The seepage rate from a pond with a natural clay liner can be evaluated using the approach of McWhorter and Nelson for "Unsaturated Flow Beneath Tailings Impoundments" (Journal of the Geotechnical Engineering Division, November, 1979, p 1317-1333)

where

$$q = \frac{y + D_\ell - \psi_b \left(\frac{q}{K_f}\right)^{-\frac{1}{2+3\lambda}}}{\frac{D_\ell}{K_\ell}}$$

with

q = infiltration rate $[L/T]$ (steady state rate)
y = depth of ponding = 13.5 ft = 411.48 cm
D_ℓ = thickness of liner = 2 ft = 60.96 cm
ψ_b = bubbling pressure (cm)
K_f = formation saturated conductivity (cm/sec)
λ = pore size distribution index (dimensionless)
K_ℓ = liner saturated conductivity
$= 2.7 \times 10^{-9}$ cm/sec

Using the test hole data for hole #5 and the Soil Identification Map provided

Hole #5 – Brown grey clay
25% sand 15% silt
$K_f = 2.2 \times 10^{-7}$ cm/sec
$\psi_b = -32.92$ cm (mean value determined by Statistical Analysis of Brooks Corey Parameters across Soil Textures McCuen, Rawls & Brakensiek, WRR, vol. 17, No. 4, p. 1005-1013.)
$\lambda = 0.19$ (mean value from above reference)

For a 1st approximation, McWhorter and Nelson use

$$q = \frac{y + D_e - \psi_b}{\frac{D_e}{K_e}}$$

$$= \frac{411.48 \text{ cm} + 60.96 \text{ cm} - (-32.92 \text{ cm})}{\frac{60.96 \text{ cm}}{2.7 \times 10^{-9} \text{ cm/sec}}}$$

$$q = 2.24 \times 10^{-8} \text{ cm/sec}$$

Use this value of q in the full equation to get the next approximation

$$q = \frac{411.48 \text{ cm} + 60.96 \text{ cm} - (-32.92 \text{ cm})\left(\frac{2.24 \times 10^{-8} \text{ cm/sec}}{2.2 \times 10^{-7} \text{ cm/sec}}\right)^{\frac{1}{2+3(0.19)}}}{\frac{60.96 \text{ cm}}{2.7 \times 10^{-9} \text{ cm/sec}}}$$

$$q = 2.45^{-} \times 10^{-8} \text{ cm/sec}$$

For next approximation

$$q = \frac{411.48\text{cm} + 60.96\text{ cm} - (-32.92\text{ cm})\left(\frac{2.45^{-} \times 10^{-8}\text{ cm/sec}}{2.2 \times 10^{-7}\text{ cm/sec}}\right)^{-\frac{1}{2+3(0.19)}}}{\frac{60.96\text{ cm}}{2.7 \times 10^{-9}\text{ cm/sec}}}$$

$$q = 2.44 \times 10^{-8} \text{ cm/sec}$$

Again using this value

$$q = \frac{411.48\text{cm} + 60.96\text{ cm} - (-32.92\text{ cm})\left(\frac{2.44 \times 10^{-8}\text{ cm/sec}}{2.2 \times 10^{-7}\text{ cm/sec}}\right)^{-\frac{1}{2+3(0.19)}}}{\frac{60.96\text{ cm}}{2.7 \times 10^{-9}\text{ cm/sec}}}$$

$$q = 2.44 \times 10^{-8} \frac{\text{cm}}{\text{sec}}$$

The above calculations assume $\psi_f < \psi_b$

ψ_f = pressure head at foundation and liner interface.

Do these conditions apply

$$\psi_f = \psi_b \left(\frac{q}{K_f}\right)^{-\frac{1}{2+3\lambda}}$$

$$\psi_f = (-32.92\ cm)\left(\frac{2.44 \times 10^{-8}\ cm/sec}{2.2 \times 10^{-7}\ cm/sec}\right)^{-\frac{1}{2+3(0.19)}}$$

$$\psi_f = -77.46\ cm \quad < \quad \psi_b = -32.92\ cm$$

So conditions do apply

Transit times are also calculated from the McWhorter and Nelson (equation 26 pg. 1327) approach where

$$T = \frac{D_f}{q}\left[(n - \theta_r)\left(\frac{q}{K_f}\right)^{\frac{\lambda}{2+3\lambda}} + (\theta_r - \theta_i)\right]$$

with

D_f = depth to the wetting front = 7' (from Soil Identification Map)

n = porosity = 47.5% (" mean value from McCuen, Rawls & Brakensiek)

θ_r = residual moisture content = 17.6% (")

θ_i = initial moisture content = 29% (assumed value)

other symbols are as previously defined for infiltration or seepage calculations

$$T = \frac{(7\ ft)\left(\frac{12\ in}{ft}\right)\left(\frac{2.54\ cm}{in}\right)}{2.44 \times 10^{-8}\ cm/sec}\left[(0.475 - 0.106)\left(\frac{2.44 \times 10^{-8}\ cm/sec}{2.2 \times 10^{-7}\ cm/sec}\right)^{\frac{0.19}{2+3(0.19)}} + (0.106 - 0.29)\right]$$

$$T = 1.13 \times 10^9\ sec\left(\frac{min}{60\ sec}\right)\left(\frac{hr}{60\ min}\right)\left(\frac{day}{24\ hr}\right)\left(\frac{yr}{365\ days}\right) = 36\ yrs.$$

using effective porosity (n_e) instead of total porosity

$n_e = 0.37$ (mean value McCuen, Rawls & Brakensiek)

$$T = \frac{7\,ft\left(\frac{12\,in}{ft}\right)\left(\frac{2.54\,cm}{in}\right)}{2.44 \times 10^{-6}\,cm/sec}\left\{0.37 - 0.106\left(\frac{2.44 \times 10^{-6}\,cm/sec}{2.2 \times 10^{-7}\,cm/sec}\right)^{\frac{0.19}{2+3(0.19)}} + (0.106 - 0.29)\right\}$$

$T = 3.53 \times 10^8\,sec = 11.2\,yrs.$

Cumulative Infiltrated Volume = $I = q\,T\,A$

where T = transit time for travel to D_f

$= 11.2\,yrs = 3.53 \times 10^8\,sec$

q = seepage rate $= 2.44 \times 10^{-6}\,cm/sec$

A = area $= (400\,ft)^2$

$$I = \left(2.44 \times 10^{-6}\,\frac{cm}{sec}\right)\left(3.53 \times 10^8\,sec\right)\left(400\,ft\right)^2\left(\frac{in}{2.54\,cm}\right)\left(\frac{ft}{12\,in}\right)$$

$I = 45214\,ft^3$

$= 335485$ gal

$= 7987$ bbls

SOUTHWEST WATER DISPOSAL
P.O. Box 10734
Farmington, NM 87499
505-325-8729

March 28, 1988

Mr. David G. Boyer
New Mexico Oil Conservation Division
P.O. Box 2088
Santa Fe, NM 87504

SUBJECT: COMMERCIAL SURFACE DISPOSAL FACILITY
SW/4, SW/4, SECTION 32-T30N-R9 WEST
SAN JUAN COUNTY, NEW MEXICO

Dear Mr. Boyer,

Enclosed is the complete geotechnical report from Western Technologies, Inc. in compliance with the State Engineer's Requirements. The report confirms that our site is suitable for Southwest Water Disposal's intended purpose. There are no modifications recommended in the consultant's report.

The Application for Permit to Construct a Dam has been sent, along with the engineering report, to the State Engineers Office.

Following your January 15, 1988 letter, I affirm that Southwest Water Disposal will meet the agreement set forth and provide detailed answers to the questions posed. Each item will be answered as they are presented in your communication.

Construction Requirements

1. The Oil Conservation Division (OCD) will be notified one week prior to starting any earth work at the site. Southwest Water Disposal (SWWD) anticipates commencing earthwork operations on or about May 1, 1988.

2. A licensed contractor will perform all earthwork under the supervision of a registered professional engineer and the construction will be witnessed on a daily basis by a geologist. Following completion of construction, the registered professional engineer will submit as-built plans for the facility.

3. Results of proctor compaction tests performed during construction will be certified and submitted to the OCD along with the as-built plans.

4. No construction work will be performed using frozen earth materials.

5. All topsoil will be removed from the surface at the pit location and extending to the outside toe of the berms, pursuant to the attached engineering report.

6. Berms will be keyed into the native undisturbed clay. The report did not recommend the dikes being keyed. However, SWWD will key the dikes below the existing grade to a minimum depth of three feet.

7. The outside slope of all berms will be 3:1.

8. Clay for compaction will be brought in from the hill on top, or if necessary, bentonite will be used to achieve maximum compaction and minimum permeability. Clay not meeting maximum permeability standards (1×10^{-7} cm/s) will be buried in the deepest part of the fill.

9. SWWD will use 6" or less lifts for compaction during construction for the top two (2) feet of the liner. SWWD will use nine (9) inches or less for compaction of any fill below the top two (2) feet. The total thickness of the compacted clay liner will be a minimum of three (3) feet.

Skimmer Pit/Liquids Storage Area

1. SWWD will use an elevated or on-grade steel mud pit(s) for use as primary skimmer pit. Primary separation will occur in steel pits with oil gravity-fed to storage tanks and water drained to the secondary clay-lined skimmer pit.

2. Solids from skimmer pits will be removed to the main pit unless another location is approved by the OCD.

3. Construction of the clay-lined skimmer pit will be the same as for the main clay-lined evaporation pit.

4. All above ground oil/water storage facilities shall be enclosed by diked fire walls that will form a reservoir having a capacity one-third larger than the enclosed tanks. An as-built plat showing the location of pits, tanks, diked areas, etc. will be submitted.

Monitor Wells

1. Twelve monitor wells will be constructed as shown on the submitted plans, with concrete pads at the surface extending out a minimum distance of two (2) feet from the well.

2. The monitor wells shall be drilled into the first sandstone and be completed to admit water over the entire sandstone thickness or fifteen feet. Wells shall be completed with native clay, bentonite or cement so as to prevent fluid movement along the well pipe from the surface to the top of the sandstone. Geologic logs and completion diagrams shall be submitted to OCD.

3. Placement of monitor wells will be as shown on the diagram submitted to SWWD.

4. The major arroyo will be rerouted for flood protection and to prevent flow of arroyo waters into the monitor wells.

Operating Procedures

1. No drilling muds will be accepted for disposal at SWWD.

2. No hazardous waste such as unspent acids, caustics, chlorinated solvents, etc., will be accepted for disposal at SWWD.

3. SWWD is unable to submit the final disposition of any waste oil at this time. It was our understanding at the December meeting that this was not of major concern to the OCD. However, SWWD can disclose that the oil will be sold to either the Giant Refinery or

Gary Energy Refinery, both in Bloomfield, New Mexico. If OCD desires, a copy of each "run ticket" can be sent to the OCD office.

4. All berms will be inspected monthly and after any major storm event, and required maintenance will be performed immediately to maintain integrity of the berms.

5. All requirements of Order No. R-7940-A will be observed.

6. In accordance with OCD Rule 1120, a monthly water disposal report (Form C-120-A) will be filed with the OCD.

7. No produced water shall be received at the facility from motor vehicles unless the transporter has a valid Form C-133, Authorization to Move Produced Water, on file with the Division.

Aeration System

1. SWWD will submit to the OCD design specifications, operating schedule and anticipated start-up date of any spray evaporation system at least 30 days in advance of planned use.

2. Conditions for spray evaporation use will be set by OCD after review of the information submitted. However approval of the spray system operation will not be unreasonably withheld. It is SWWD's understanding that the primary intent of the OCD review is two fold. The first concern would be that the sprayers will not be allowed to let water droplets outside of the fenced facility or be permitted to erode the dike walls. Secondly that the sprayer shall not be allowed to operate if the evaporation process emits H_2S at level of 1 ppm or greater at the fence line.

H_2S

1. Each load of fluid received will be monitored for air concentrations of the H_2S in the transport vehicle.

2. Dissolved sulfides in the main evaporation pit will be analyzed monthly.

3. Air concentrations in tenths of parts per million (ppm) of H_2S and the pH of the pond will be monitored twice daily during operating hours. Records of such measurements will be kept at the facility.

4. Predominant winds on-site are westerly, requiring that the H_2S concentration will be measured twice daily at the Northwest corner of the pond and the Southeast corner of the pond (near the fence). The measurement times will be at 8:00 A.M. (upon opening) and approximately 3:00 P.M..

Fluid Contingency Plan

Should fluid be detected in any of the monitor wells the OCD will be immediately notified and the fluids analyzed. If the TDS of the water in the well is greater than 1500 ppm, SWWD will cease accepting fluid until the source is determined. Should the liquids be determined to be pit water, SWWD will then submit a proposal and timetable for removing the source, determine the extent and degree of contamination and mitigate the contamination.

H_2S Contingency Plan

1. SWWD will purchase an H_2S detector similar to the one OCD presently uses. The detection device will have the sensitivity to detect H_2S in tenths (1/10) of a part per million. The attendant on site will have the monitor on at all times when the trucks are unloading. If the detector senses any concentration of H_2S the load will be isolated in the primary skimmer tank. The operator will be notified of the problem, the well noted for record, the water will be analyzed, and a treatment schedule will be determined and the water will be treated. SWWD anticipates that most of the problem will be controlled with a microbiocide/oxidizing agent such as NL Treating Chemical DIKLO-B. A product information sheet is enclosed for your review.

2. If air concentration of H_2S reaches 1 ppm at the fence line for two consecutive monitor readings, or if dissolved sulfides in the pit water reach 15 ppm, the OCD will be notified immediately, hourly H_2S monitoring (24 hours per day, 7 days per week) will commence at the designated locations. The pond water will be analyzed for dissolved sulfides daily, and a treatment plan will be submitted to reduce dissolved sulfides in the pond and eliminate H_2S emissions.

3. Should air concentration of H_2S at the fence line reaches 10 ppm at any time, public safety personnel, such as County Fire Marshal, County Sheriff's Department, New Mexico State Police, and the OCD will be notified. Should H_2S concentrations pose a real threat at any time to the nearby residents and the source is determined to be from SWWD operations, the affected parties will be provided accommodations until the H_2S concentration returns to acceptable levels set forth under the OCD guidelines.

I believe that all of your questions have been answered. If I may be of any further assistance, please do not hesitate to give me a call.

Cordially,

David B. Swezey

David B. Swezey

Enclosures

dbs/sg

NL Treating Chemicals

PRODUCT INFORMATION

DIKLOR™-B

Microbiocide/Oxidizing Agent

General Information:

DIKLOR-B is an environmentally acceptable microbiocide/oxidizing agent formulated to control the growth of aerobic and anaerobic bacteria. DIKLOR-B is a multipurpose product for use in various applications such as control of sulfides in production systems and control of suspended solids and hydrocarbons in overboard and injection waters.

Typical Physical Properties:

Specific Gravity at 68°F	1.100
Density, lb/gal	9.16
Flash Point, °F (PMCC)	Above 200
Pour Point, °F	23
pH, Product	9.8

Chemical Description:

DIKLOR-B is a proprietary aqueous solution of oxidizing agents.

Applications and Treating Recommendations:

DIKLOR-B applications and treating recommendations are as follows:

1. **Control of Bacterial Growth:** Treatment will depend on the severity of the problem and the amount of microbial growth present. In cases where large amounts of bacterial growth are present, the addition of 25-50 ppm of a nonionic surfactant, such as SURFLO®-S24, will improve the effectiveness of DIKLOR-B. The frequency of application should be based on visual inspections and microbiological analyses.
2. **Control of Suspended Solids and Hydrocarbons:** DIKLOR-B can aid in clarification of produced waters by removing solids which may be carrying and suspending hydrocarbons. Depending on the concentration of oxidizable solids, the chemical injection of 20-40 ppm of DIKLOR-B usually can eliminate iron sulfide, hydrocarbons and solids to improve water clarity.

   To determine proper treating ratios, bottle testing should be conducted. DIKLOR-B may be used in conjunction with other water clarification chemicals to improve the efficiency of both products. It is effective in oil sheen removal for overboard water treatment and water quality improvement for injection wells.
3. **Control of Sulfides:** The injection of DIKLOR-B into a produced water containing hydrogen sulfide will result in sulfide removal from the fluid. DIKLOR-B removes hydrogen sulfide by conversion to water-soluble sulfate without the generation of solids and without the necessity for any additional process equipment.

Precautions:

Undiluted DIKLOR-B is moderately toxic to fish and should not be discharged into lakes, ponds, streams or public waters. Do not contaminate water by cleaning of equipment or disposal of waste.

DIKLOR-B, at typical treating concentrations for oil field systems, is not expected to interact with other chemicals in the system. However, compatibility studies should be made on each system to be treated with DIKLOR-B.

As with any powerful oxidant, DIKLOR-B should not be mixed with any concentrated oil field or other chemicals such as (1) acids and alkaline materials, (2) other oxidizing and reducing agents, or, (3) organic or inorganic materials.

Mixing with any of the above mentioned materials may cause a highly exothermic reaction as well as the evolution of irritating gas.

Should any injection package be converted to/from DIKLOR-B, all equipment must be thoroughly flushed with water prior to introduction of the succeeding product.

Storage and Handling:

Store in a cool, dry place. Dispose of spilled material by flushing with large quantities of water.

Chemical drums should be set over a drip tray at the use location, should any leakage of chemical occur.

March 1987

NL Treating Chemicals

PRODUCT INFORMATION

DIKLOR™-B

Microbiocide/Oxidizing Agent

General Information:

DIKLOR-B is an environmentally acceptable microbiocide/oxidizing agent formulated to control the growth of aerobic and anaerobic bacteria. DIKLOR-B is a multipurpose product for use in various applications such as control of sulfides in production systems and control of suspended solids and hydrocarbons in overboard and injection waters.

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Should any injection package be converted to/from DIKLOR-B, all equipment must be thoroughly flushed with water prior to introduction of the succeeding product.

Storage and Handling:

Store in a cool, dry place. Dispose of spilled material by flushing with large quantities of water.

Chemical drums should be set over a drip tray at the use location, should any leakage of chemical occur.

March 1987

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

January 15, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David B. Swezey
Southwest Water Disposal
P. O. Box 10734
Farmington, New Mexico 87499

RE: Application for SWWD Commercial Surface Disposal Facility SW/4, SW/4, Section 32, T30 North, R9 West, San Juan County, New Mexico.

Dear Mr. Swezey:

The Oil Conservation Division (OCD) has reviewed your October 28, 1987 submittal addressing our geologic, hydrologic and operational concerns stated in our August 27, 1987 letter. The discussions held at the December 17, 1987 meeting between the OCD Environmental Bureau staff, Bob Frank and you clarified the permitting issues remaining.

The following is a summary, taken from our meeting notes, of our concerns as discussed in the meeting, and the information needed and requirements that must be met by SWWD to complete permitting and for you to commence operation.

Construction Requirements

1. OCD will be notified one week prior to starting any earth work.

2. A licensed contractor will perform all earthwork under the supervision of a registered professional engineer. Following completion of construction, the registered P.E. will submit as-built plans for the facility.

3. Results of Proctor compaction tests performed during construction will be certified and submitted to the OCD along with the as-built plans.

IMPORTANT - READ INSTRUCTIONS ON BACK BEFORE FILLING OUT THIS FORM

APPLICATION FOR PERMIT TO CONSTRUCT A DAM

COPIED

File No._____ Date of receipt_____

1. Name of applicant Southwest Water Disposal
   Address P.O. Box 10734
   City and State Farmington, NM Zip code 87499

2. Dam hazard classification (SCS criteria) Class A

3. Dam is to be located on: (a) Name of stream or watercourse N/A Pond is out of all water use but is 1¼ NW of San Juan River
   (b) Which is a tributary of _____

4. Location of the intake structure of the principal spillway conduit from detention storage: San Juan County. (a) SE ¼ SW ¼ N/A ¼ of Section 32, Township 30N, Range 9W, N.M.P.M. or (b) within _____ feet of X = _____ feet, Y = _____ feet, N.M.C.S., _____ zone, within _____ Grant.

5. Drainage area characteristics: (a) drainage area N/A acres; (b) 100-year, 6 hour precipitation N/A inches; (c) probable maximum precipitation (PMP), 6 hour storm N/A inches; (d) volume of run-off from the 100-year, 6 hour storm N/A acre-feet. (e) volume of run-off from the PMP, 6 hour storm N/A acre-feet.

6. Properties of detention dam: (a) maximum height above foundation at downstream toe 25 feet; (b) length of crest 1600 feet; (c) width of crest 10 feet; (d) maximum width at base 130 feet; (e) slope of upstream face 3:1; (f) slope of downstream face 3:1; (g) elevation at crest of dam _____ feet; (h) elevation of emergency spillway crest N/A feet; (i) elevation of flow line of the intake structure of the principal spillway conduit _____ feet; (j) characteristics of emergency spillway, (1) location N/A, (2) width N/A feet, (3) maximum capacity N/A cubic feet per second, (4) freeboard above maximum high water line 1.5 feet, (5) cross-sectional area at maximum flow N/A square feet; (k) characteristics of principal spillway conduit, (1) size, type and numer of gates N/A
   (2) dimension N/A feet, (3) length N/A feet, (4) slope N/A, (5) Manning coefficient N/A (6) maximum discharge capacity N/A cubic

4. No construction work will be performed using frozen earth materials.

5. All topsoil will be removed from the surface at the pit location and extending to the outside toe of the berms.

6. Berms will be keyed into the native undisturbed clay.

7. The outside slope of all berms will be 3:1.

8. Clay for compaction will be brought in from the hill on top, or if necessary, bentonite will be used to achieve maximum compaction and minimum permeability. Clay not meeting maximum permeability standards (1×10^{-7} cm/s) will be buried in the deepest part of the fill.

9. OCD requires 6" or less lifts for compaction during construction for the top 2 feet of the liner. Nine inches or less are the thickness limits for compaction of any fill below the top 2 feet. The total thickness of the compacted clay liner will be a minimum of 3 feet.

Skimmer Pit/Liquids Storage Area

1. OCD will require the use of an elevated or on-grade steel mud pit for use as primary skimmer pit. Primary separation will occur in steel pits with oil gravity-fed to storage tanks and water drained to the secondary clay-lined skimmer pit.

2. Solids from skimmer pits will be removed to the main pit unless another location is approved by the OCD.

3. Construction of the clay-lined skimmer pit will be the same as for the main clay-lined evaporation pit.

4. All above ground oil/water storage facilities shall be enclosed by diked fire walls that will form a reservoir having a capacity one-third larger than the enclosed tanks. Submit an as-built plat showing the location of pits, tanks, diked areas, etc.

Monitor Wells

1. Twelve monitor wells will be constructed as shown on the submitted plans, but with concrete pads at the surface extending out a minimum distance of 2 feet from the well.

2. The monitor wells shall be drilled into the first sandstone and be completed to admit water over the entire sandstone thickness or fifteen feet* (whichever is less). Wells shall be completed with native clays, bentonite or cement so as to prevent fluid movement along the well pipe from the surface to the top of the sandstone. Geologic logs and completion diagrams shall be submitted to OCD.

3. Placement of monitor wells will be as shown on the attached diagram.

4. The major arroyo will be rerouted for flood protection and to prevent flow of arroyo waters into the monitor wells.

Operating Procedures

1. No drilling muds will be accepted for disposal at SWWD.

2. No hazardous waste such as unspent acids, caustics, chlorinated solvents, etc., will be accepted for disposal at SWWD.

3. Prior to approval, information on the final disposition of any incidental and/or waste oil recovered at the facility must be submitted.

4. All berms will be inspected monthly and after any major storm event, and required maintenance will be performed immediately to maintain integrity of the berms.

5. All requirements of Order No. R-7940-A will be observed.

6. In accordance with OCD Rule 1120, a monthly water disposal report (Form C-120-A) will be filed with the OCD.

7. No produced water shall be received at the facility from motor vehicles unless the transporter has a valid Form C-133, Authorization to Move Produced Water, on file with the Division.

Aeration System

1. Submit to the OCD design specifications, operating schedule and anticipated start-up date of any spray evaporation system at least 30 days in advance of planned use.

*The monitor well screen length of 15 feet is an increase from the 5 feet shown in our meeting notes and will provide increased leak detection capability.

2. Conditions for spray evaporation use will be set by OCD after review of the information submitted.

H_2S

1. Each load of fluid received will be monitored for air concentrations of the H_2S in the transport vehicle.

2. Dissolved sulfides in the main evaporation pit will be analyzed monthly.

3. Air concentrations in tenths of parts per million (ppm) of H_2S and the pH of the pond will be monitored twice daily during operating hours. Records of such measurements shall be kept at the facility.

4. Submit a schedule of proposed sampling locations and sample times for H_2S monitoring.

Fluid Contingency Plan

1. Prior to permit approval a signed contingency plan will be submitted for OCD review, including but not limited to the following commitments:

   a) If fluid is detected in any monitor well, the OCD will be notified, fluids will be analyzed and the source determined;

   b) Cease acceptance of fluids until the source is determined;

   c) If the liquids are determined to be pit water, submit proposals and timetable for removing the source, determining the extent and degree of contamination, and for mitigating contamination.

H_2S Contingency Plan

1. Prior to permit approval a signed contingency plan will be submitted for OCD review, including but not limited to the following commitments:

   a) Proposed H_2S measurement limits and action to be taken and/or treatment provided if H_2S monitored in the transport vehicle is above agreed upon levels.

b) If air concentration of H_2S reaches 1 ppm at the fence line for two consecutive monitor readings, or if dissolved sulfides in the pit water reaches 15 ppm, the OCD will be notified immediately, hourly H_2S monitoring (24 hours per day, 7 days per week) will commence at the designated locations, pond water will be analyzed for dissolved sulfides daily, and a treatment plan will be submitted to reduce dissolved sulfides in the pond and eliminate H_2S emissions.

c) If air concentration of H_2S at the fence line reaches 10 ppm at any time, public safety personnel, such as County Fire Marshal, County Sheriff's Department, and New Mexico State Police, and the OCD will be notified. SWWD must submit plans prior to permit approval for actions to be taken to protect public health and safety. Requirements for pond treatment action will be at least as stringent as those for detection of 1 ppm H_2S, and additional requirements to be imposed will be determined after OCD review.

The above information was discussed with you and informally agreed to by you pending your review of this letter summarizing the meeting's discussions. A commitment from you agreeing to these requirements, and to provide the requested necessary information will be necessary to complete review of the application.

If you feel that any of the understandings detailed above are different from what was discussed and agreed to in the December meeting, or if you feel additional clarification or information is needed by you, please contact Jami Bailey or Roger Anderson at 827-5884 or 827-5885.

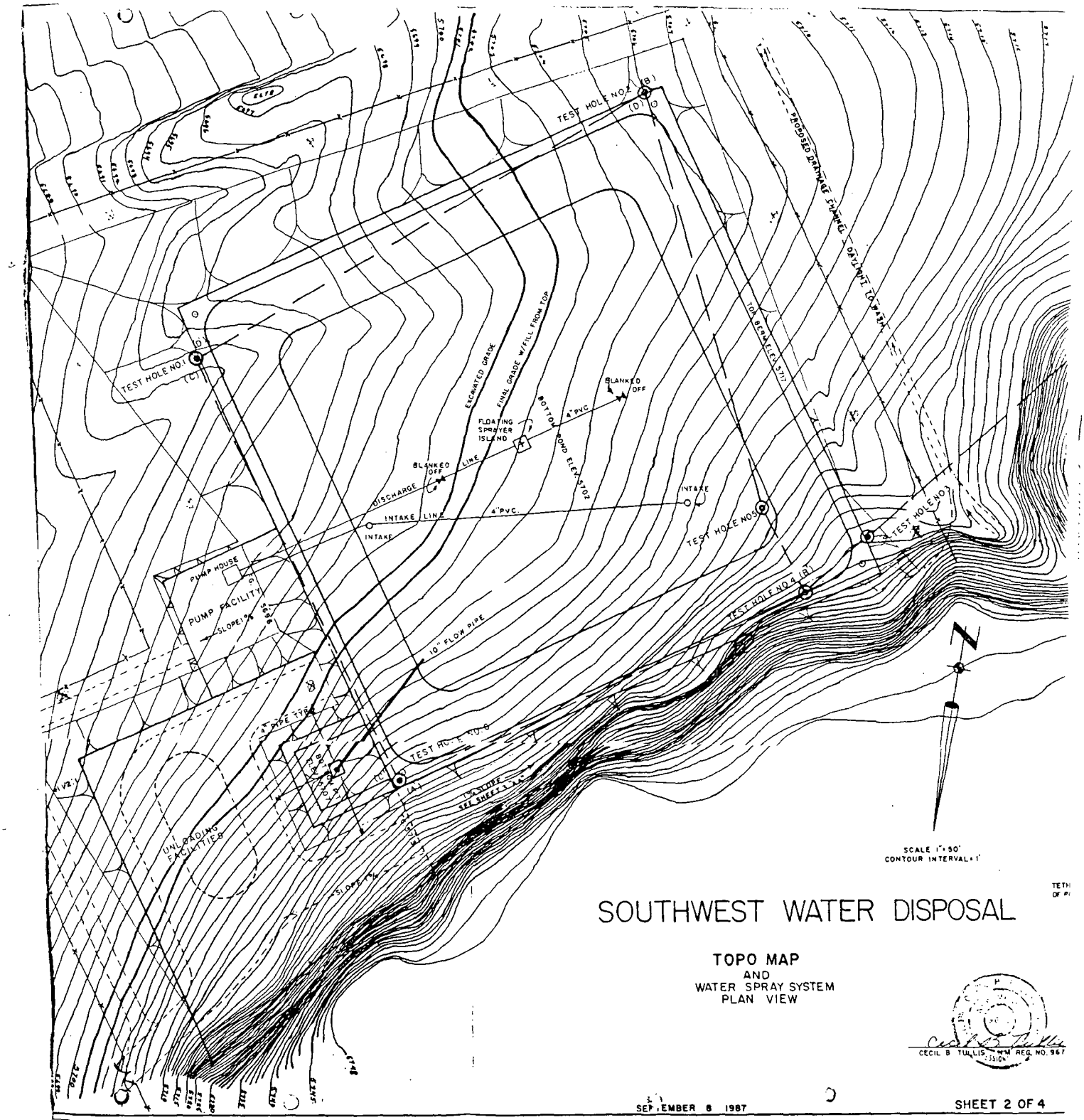
Sincerely,

David G. Boyer
Environmental Bureau Chief

DGB:sl

Encl.

cc: Frank Chavez, OCD-Aztec



SOUTHWEST WATER DISPOSAL

TOPO MAP
AND
WATER SPRAY SYSTEM
PLAN VIEW

CECIL B TULLIS NEW MEX. REG. NO. 967

SEPTEMBER 8 1987

SHEET 2 OF 4

STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

S. E. REYNOLDS
STATE ENGINEER

BATAAN MEMORIAL BUILDING
STATE CAPITOL
SANTA FE, NEW MEXICO 87503

January 19, 1988

Ms. Jami Bailey, Geologist
Oil Conservation Division
P. O. Box 2088
Land Office Building
Santa Fe, New Mexico 87504-2088

Dear Ms. Bailey:

Reference is made to Mr. Steve Schwebke's January 15, 1988, memorandum (copy enclosed) regarding his review of the Union Texas Petroleum applications for construction and operation of two evaporation ponds for disposal of produced water. Mr. Schwebke states that these ponds fall within State Engineer Office criteria requiring a permit for construction, in particular an embankment over 10 feet high and impounding 10 or more acre-feet.

By copy of this letter we are advising Mr. Bob Frank of Union Texas Petroleum that an application to construct the dams must be submitted to the State Engineer along wih a copy of plans and specifications for review and comment.

If you have any further questions, please feel free to call.

Sincerely,

S. E. Reynolds
State Engineer

By
Eluid L. Martinez, Chief
Technical Division

ELM**hl

cc: Brad Compton, WR
Bob Frank, Union Texas Petroleum, w/attachments

MEMORANDUM

January 15, 1988

State Engineer Office
Santa Fe, New Mexico

TO Donald T. Lopez, P.E., Chief, Design & Construction Section

FROM Steve Schwebke, P.E., Water Resource Engineer

SUBJECT Union Texas Petroleum evaporation ponds, San Juan County

In November, 1987 I reviewed a set of drawings on file in the Oil Conservation Division Office which describe the subject ponds. These ponds are located in San Juan County at T.31N, R.9W, S.23 and T.31N, R.8W, S19 and will contain produced water from oil and gas wells in the area. According to the drawings, the ponds will be constructed on sloping hillsides and will be partially contained by the natural hillside and partially by constructed embankment. It appears that the greatest embankment height will be about 15 feet (above the downstream toe). The ponds are designed to contain 11.5 feet of water, with a resulting volume of about 20 acre-feet each. The ponds are not located on a watercourse and are for the purpose of evaporating produced water only.

These ponds fall within the limit of State Engineer Office design criteria, that is, they impound more than 10 acre-feet and their embankment height exceeds 10 feet. Therefore, in the interest of public safety, I recommend that plans and specifications be submitted to the State Engineer for review and comment.

for Steve Schwebke, P.E.

hl

STATE OF NEW MEXICO

ENERGY, .ERALS AND NATURAL RESOURCES DE .MENT

OIL CONSERVATION DIVISION

GARREY CARRUTHERS
GOVERNOR

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

January 21, 1988

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David B. Swezey
Southwest Water Disposal
P.O. Box 10734
Farmington, NM 87499

RE: Application for Commercial Disposal Facility

Dear Mr. Swezey:

On January 19, 1988, the State Engineer's Office issued an opinion that under certain circumstances an evaporation pond will fall under their jurisdiction for design and construction. A summary of the opinion is that a pond will fall within the limit of the State Engineer's Office Design Criteria if it impounds more than 10-acre .feet and/or if an embankment height of the pond exceeds 10 feet.

By copy of this letter we are advising you that an application to construct the pond must be submitted to the State Engineer along with a copy of plans and specifications for their review and approval. Our review of your application will continue concurrently with the State Engineer's review.

If you have any questions on the State Engineer's Office requirements, contact Eluid L. Martinez, Chief Technical Division, State Engineer's Office, at (505) 827-6140. If there are any questions concerning the OCD's requirements please contact me at (505) 827-5885.

Sincerely,

Roger C. Anderson
Environmental Engineer

cc: Eluid L. Martinez, State Engineer's Office
Frank Chavez, OCD - Aztec
Bob Frank, Union Texas Petroleum

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

December 9, 1987

The enclosed public notice was published in the Farmington Daily Times on October 13, 1987. An a general service to the public, the Oil Conservation Division is supplying a copy of this notice to identified residents in the vicinity of the proposed Southwest Water Disposal facility.

If you have any questions or comments, please do not hesitate to contact me at (505) 827-5885.

Sincerely,

Roger C. Anderson
Environmental Engineer

RCA:sl

AFFIDAVIT OF PUBLICATION | Copy of Publication

No. _____

STATE OF NEW MEXICO,
County of San Juan:

_____ being duly

sworn, says: That he is the _____ of

THE FARMINGTON DAILY TIMES, a daily newspaper of general circulation published in English at Farmington, said county and state, and that the hereto attached _____

_____

was published in a regular and entire issue of the said FARMINGTON DAILY TIMES, a daily newspaper duly qualified for the purpose within the meaning of Chapter 167 of the 1937 Session Laws of the State of New Mexico for _____ consecutive (days) (weeks) on the same day as follows:

First Publication _____, 1987

Second Publication _____

Third Publication _____

Fourth Publication _____

and that payment therefor in the amount of $_____

has been made.

_____

Subscribed and sworn to before me this _____ day of _____, 19__.

_____
NOTARY PUBLIC, SAN JUAN COUNTY, NEW MEXICO

My Commission expires: _____

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

Notice is hereby given that pursuant to New Mexico Oil Conservation Division Rules and Regulations, the following permit to construct and operate a commercial evaporation facility has been submitted for approval to the Director of the Oil Conservation Division, P.O. Box 2088, State Land Office Building, Santa Fe, New Mexico, 87504-2088, (505) 827-5800.

Union Texas Petroleum, Robert Frank, permit coordinator, 375 U. S. Highway 64, Farmington, New Mexico 87401, has submitted for approval applications to construct and operate two evaporation ponds for disposal of produced water. These ponds will be located on the Seymour 10 well site located in the NE/4, SW/4 of Section 23, Township 31 North, Range 9 West, NMPM, San Juan County, New Mexico, and on the Quinn 10 well site located in the NE/4, SE/4 of Section 19, Township 31 North, Range 8 West, NMPM, San Juan County, New Mexico. Each pond will receive approximately 150 barrels of produced water per day from its corresponding well only. The ponds will have a double lining with leak detection. The ground water most likely to be affected by any accidental discharge is at a depth of 80 feet, with a total dissolved solids content of approximately 300 mg/l at the Quinn 10 site, and at a depth of 590 feet with a total dissolved solids content of approximately 500 mg/l at the Seymour 10 site.

Southwest Water Disposal, David B. Swezey, General Manager, P.O. Box 10734, Farmington, New Mexico 87499, has submitted for approval an application to construct and operate a commercial evaporation pit located in the SE/4, SW/4, Section 32, Township 30 North, Range 9 West, NMPM, San Juan County, New Mexico. Produced water associated with the completion and production operations of oil and gas wells will be disposed of in a wastewater evaporation pond lined with compacted native clays. The permit application addresses the construction, operations, spill/leak prevention and monitoring procedures to be utilized at the site. The ground water most likely to be affected by any accidental discharges is at a depth of approximately 150 feet, with a total dissolved solids content of approximately 800 mg/l.

Any interested person may obtain further information from the Oil Conservation Division and may submit written comments to the Director of the Oil Conservation Division at the address given above. Prior to ruling on any proposed permit or its modification, the Director of the Oil Conservation Division will allow at least thirty (30) days after the date of publication of this notice during which comments may be submitted to him.

GIVEN Under the Seal of the New Mexico Oil Conservation Commission at Santa Fe, New Mexico on this 30th day of September, 1987. To be published on or before October 16, 1987.
SEAL

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION
WILLIAM J. LEMAY
Director

Legal No. 20774 published in the Farmington Daily Times, Farmington, New Mexico on Tuesday, October 13, 1987

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

October 5, 1987

Mr. David B. Swezey
South West Water Disposal
P.O. Box 10734
Farmington, NM 87499

Re: Application for Unlined Commercial Surface Disposal Pit-N-32-30N-9W, San Juan County

Dear Mr. Swezey:

Enclosed is a copy of the public notice on your application for the referenced commercial disposal pit. The public comment period extends for thirty (30) days after publication, during which time our staff can be reviewing additional information required for permitting a commercial pit. Within a maximum of sixty (60) days of submittal of the information requested from you on August 27, the Division may request additional information or clarification, schedule a hearing, or approve or deny the application for an unlined pit. Because of these time constraints, your projected opening date of November 1, 1987, is not feasible.

In order to obtain approval for an unlined pit facility, an adequate demonstration must be made that horizontal or vertical leakage from the facility will have no adverse affect on fresh water anywhere in the area in the foreseeable future. Public safety must also be adequately addressed.

We will be glad to meet with you after submittal and review of the requested geotechnical information.

Sincerely,

William J. LeMay
Director

WJL:JB:mr

Enc.
xc: OCD-Aztec

SOUTHWEST WATER DISPOSAL
P.O. Box 10734
Farmington, NM 87499
505-325-8729

September 16, 1987

William J. Lemay
New Mexico Oil Conservation Division
Post Office Box 2088
Santa Fe, New Mexico 87504

RE: Application for Unlined Commercial Surface Disposal SE/4, SW/4, Section 32 - Township 30 North - Range 9 West, San Juan County, New Mexico

Dear Mr. Lemay:

Thank you for your letter of August 29, 1987. I would like to assure you that our operation will be in accordance with, and in the spirit of Orders R-7940 and R-7940-A. We have performed the additional geotechnical field work and are currently waiting on the result of the permeability tests. The additional questions and comments referenced in Ms. Bailey's August 27 letter will be addressed in our response regarding the permeability data.

We realize that there are always risks in a new business but we feel we are providing an environmentally sound solution to a large problem. You referenced the solutions that are utilized in South East New Mexico; however, as you know that is not an easy solution, nor necessarily an economically attractive solution in the San Juan Basin. There are very few areas in the San Juan Basin where an injection well is possible. The proximity of offsetting production and deepening an existing well to the Entrada is risky at best due to the Entrada's geologic nature. I share your concerns and our next project will be to find a site suitable for injection. In the meantime, we will demonstrate the integrity of our proposal and we would like to have the facility operating by this winter's heating season (November 1, 1987). I believe this would be in everyone's best interest as several projections have been made that the gas bubble will burst sometime in the next three to twelve months and with the collapse of the bubble will come tremendous quantities of produced water.

Should you have enough information for the public notice, we would appreciate your immediate publication of our intent to build a (clay-lined) unlined commercial disposal facility. The two exceptions to our original proposal is that the skim pit will be lined with a 30 mil synthetic liner and an aeration system will be placed in the pond bottom prior to start-up of operations. The details of which will be forwarded to Jami Bailey when the permeability tests are complete. The additional questions and comments will be addressed at that time as well.

As soon as this data is available, I would appreciate meeting with you and your staff to review the entire proposal. Your assistance and concern is appreciated and together we will reach a mutually satisfactory solution.

Cordially,

David B. Swezey

DBS:pk

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

Notice is hereby given that pursuant to New Mexico Oil Conservation Division Rules and Regulations, the following permit to construct and operate a commercial evaporation facility has been submitted for approval to the Director of the Oil Conservation Division, P.O. Box 2088, State Land Office Building, Santa Fe, New Mexico, 87504-2088, (505) 827-5800.

Union Texas Petroleum, Robert Frank, permit coordinator, 375 U.S. Highway 64, Farmington, New Mexico 87401, has submitted for approval applications to construct and operate two evaporation ponds for disposal of produced water. These ponds will be located on the Seymour 10 well site located in the NE/4, SW/4 of Section 23, Township 31 North, Range 9 West, NMPM, San Juan County, New Mexico, and on the Quinn 10 well site located in the NE/4, SE/4 of Section 19, Township 31 North, Range 8 West, NMPM, San Juan County, New Mexico. Each pond will receive approximately 150 barrels of produced water per day from its corresponding well only. The ponds will have a double lining with leak detection. The ground water most likely to be affected by any accidental discharge is at a depth of 80 feet, with a total dissolved solids content of approximately 300 mg/l at the Quinn 10 site, and at a depth of 590 feet with a total dissolved solids content of approximately 500 mg/l at the Seymour 10 site.

Southwest Water Disposal, David B. Swezey, General Manager, P.O. Box 10734, Farmington, New Mexico 87499, has submitted for approval an application to construct and operate a commercial evaporation pit located in the SE/4, SW/4, Section 32, Township 30 North, Range 9 West, NMPM, San Juan County, New Mexico. Produced water associated with the completion and production operations of oil and gas wells will be disposed of in a wastewater evaporation pond lined with compacted native clays. The permit application addresses the construction, operations, spill/leak prevention and monitoring procedures to be utilized at the site. The ground water most likely to be

affected by any accidental discharges is at a depth of approximately 150 feet, with a total dissolved solids content of approximately 800 mg/l.

Any interested person may obtain further information from the Oil Conservation Division and may submit written comments to the Director of the Oil Conservation Division at the address given above. Prior to ruling on any proposed permit or its modification, the Director of the Oil Conservation Division will allow at least thirty (30) days after the date of publication of this notice during which comments may be submitted to him.

GIVEN Under the Seal of the New Mexico Oil Conservation Commission at Santa Fe, New Mexico on this 30th day of September, 1987. To be published on or before October 16, 1987.

STATE OF NEW MEXICO
OIL CONSERVATION DIVISION

WILLIAM J. LEMAY
Director

S E A L

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 27, 1987

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David B. Swezey
Southwest Water Disposal
P.O. Box 10734
Farmington, New Mexico 87499

RE: Application for Unlined Commercial Surface Disposal Facility, SE/4, SW/4, Section 32, Township 30 North, Range 9 West, San Juan County, New Mexico.

Dear Mr. Swezey:

The staff of the Environmental Bureau has received your application for the above facility, and are responding with technical comments and requests for additional necessary information to continue with the review. They have apprised me of the nature of the application and its review status.

There is a need in the San Juan Basin for additional commercial facilities to dispose of produced water, drilling fluids, and other oil field wastes. Similar disposal in Southeast New Mexico is mainly by injection wells with the secondary method being surface disposal in areas having naturally saline water, or no ground water.

In order to obtain approval for an unlined pit facility, an adequate demonstration must be made that horizontal or vertical leakage from the facility will have no adverse affect on fresh water anywhere in the area in the foreseeable future. This requires extensive additional geotechnical information not required for a synthetically-lined facility. Also, because the location of your site is topographically upgradient from residences, the "Citizens Ditch" and shallow ground water of the San Juan River Valley, and because of the heightened public interest in surface disposal facilities due to problems with Basin Disposal (including odors and unauthorized seepage from their unlined mud disposal pits), your site will be under much greater public scrutiny than normally is the case. This could lead to citizen objections and requests for a hearing where their concerns may be heard. OCD may need additional technical information from you to adequately respond to such concerns, thereby delaying issuance of our order.

If you are able to make an adequate demonstration to OCD of minimal seepage, any later change in water quality (real or hypothesized) at any downgradient location will be blamed on your facility with resultant complaints to us and other agencies. Legal actions by private parties against you are possible. As the permitting agency with limited staff resources, we avoid becoming embroiled in disputes such as Basin's which have strong political and zoning overtones.

OCD's review of your application will be greatly expedited if you would consider a synthetic lining with a leak detection system for the pond. Public notice will be deferred by us until we hear from you on the issue of synthetic lining of the pond. If there is sufficient public interest within 30 days after issuing public notice, this application can be set for hearing before either an examiner or the commission. If you have any questions or wish to discuss this with me I can be reached at (505) 827-5802.

Sincerely,

WILLIAM J. LEMAY
Director

WJL:cr

cc: D.G. Poyer, OCD Santa Fe
OCD-Aztec

PS Form 3811, July 1983 447-845 DOMESTIC RETURN RECEIPT

● SENDER: Complete items 1, 2, 3 and 4.

Put your address in the "RETURN TO" space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for service(s) requested.

1. ☐ Show to whom, date and address of delivery.
2. ☐ Restricted Delivery.

3. Article Addressed to:
Mr. David Swezey
Southwest Water Disposal
P.O. Box 10734
Farmington, New Mexico 87499

4. Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail

Article Number
P 612 458 690

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Addressee
X

6. Signature — Agent
X D B Swezey

7. Date of Delivery
8-31-87

8. Addressee's Address (ONLY if requested and fee paid)

STATE OF NEW MEXICO

ENERGY, .. ERALS AND NATURAL RESOURCES DE. .. MENT

OIL CONSERVATION DIVISION

GARREY CARRUTHERS
GOVERNOR

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

August 27, 1987

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. David B. Swezey
Southwest Water Disposal
P.O. Box 10734
Farmington, New Mexico 87499

RE: Application for Unlined Commercial Surface Disposal Facility, SE/4, SW/4, Section 32, Township 30 North, Range 9 West, San Juan County, New Mexico.

Dear Mr. Swezey:

We have reviewed the plans and specifications in your application dated July 14, 1987 (received August 5), for the above-referenced evaporation pit. Before approval for the pit can be granted, a number of major geologic, hydrologic and operational concerns must be addressed.

1. General Crude Processing is no longer accepting waste oil for treating. What will be the disposition of waste oil accumulated at the facility? If the accumulated oil will be marketed to a refinery, the proposed facility will be considered a treating plant and must comply with OCD Rule 312 along with all reporting requirements.

2. No engineering details for construction of the skimmer pit were provided. Since it is to be used for oil recovery, it must be lined, or tanks used for separation pursuant to OCD Rule 310 which prohibits oil retention in earthen reservoirs or open receptacles. If a liner is used, please provide engineering diagrams for construction of the pit, including details on the liner (type, thickness and installation), size and construction of berms (size of lifts to be compacted, etc.), and piping and pumps to the main pit and storage tanks. Also include detailed diagrams and schematics for any tanks at the facility, along with their piping and operating procedures. The application states the inside slope of the skimmer pit would be 1:1. That steep a slope is unacceptable for approval. Tanks, as used at Basin Disposal, would seem to be an easier method to use to separate the fluids.

3. If fluids will be unloaded directly into the skimmer pit, precautions must be taken to prevent damage to the berms and pit walls. Please detail unloading procedures and construction plans that will prevent damage at this point and at the end of the discharge pipe between the skimmer and evaporation pit. Clarify maintenance plans on both inside and outside surfaces for all berms at the facility.

4. Exhibit 2 indicates that H_2S sensors will only be placed around the skimmer pit. How will H_2S generation be monitored around the evaporation pit? What procedures will be used for testing H_2S, HS^- and sludges in the main pit? Please indicate the type, model and calibration units of the H_2S sensors and alarm. If the alarm is sounded at 5ppm, how loud and continuous will it be, and who is to be notified? Since H_2S emission limits are set at 0.2ppm at property fence lines, how will this limit be measured and controlled. Since the facility will not be manned 24-hours per day, how will the responsible operator be notified if emissions occur at night?

5. Please provide a schematic of the plumbing system to be used in the pump house and spray system.

6. No engineering details for construction of the evaporation pit were provided. Please provide engineering diagrams for construction of the pit, including details on size and construction of the berms, amount of cut and fill, etc.

7. A geologic cross section of the facility site must be made, identifying the soil and formation lithology, thickness, and lateral extent. If you elect to line these pits with a synthetic liner and a leak detection system, only surface soil mapping and the strike and dip of the beds will be required. If you choose to construct these pits with only a native clay liner, much more detailed work will be required, including: A detailed cross section based on a minimum of four test holes; subsurface investigation to determine permeability, thickness, and continuity of clay under the pit. To be acceptable the clay must have a vertical permeability no greater than 10^{-7} cm/sec. The clay permeability given in the application is 1.7×10^{-7} cm/sec, almost twice that necessary. Additional compaction (to 95% or greater) will likely lower that value. Before operational approval is granted, lithologic logs of all monitor wells, results of compaction tests on the recompacted clay and additional permeability tests performed on the recompacted material will be necessary. The number and type of additional tests should follow the guidance given in the enclosed material from the Department of Interior's "Earth Manual".

8. The number and placement of the monitor wells, required for a clay liner in the pits, will be determined after the detailed subsurface investigations are complete. What are your plans for the type and size of casing to be used in the monitor wells? Submit proposed well installation diagrams and procedures. In case of fluid

migration from the pits, your contingency plan states that these wells will serve as conduits for removal of the contaminating water; these wells must therefore be adequate in size and construction.

9. Due to the location of property boundaries and residences in the area, a wind speed and direction gauge must be installed when spray evaporation equipment is installed. A strict policy of shutting down the spray system must be developed and followed whenever the spray is carried outside the inner face of the berm.

10. If anaerobic conditions develop that lead to pond odors, a system to circulate fluids to prevent stratification and to provide aeration throughout the pond will be required to be installed. You will be required to submit plans and specifications for the areation system for OCD review prior to construction of the pond.

11. Please indicate property boundaries on a map, along with names of owners of surrounding property.

12. Please furnish names and mailing addresses of the two residences that were visible from the proposed facility site.

Since you are proposing an unlined facility, it would be to your advantage to perform some baseline water quality sampling prior to beginning operation. OCD can assist you in selecting sample parameters and locations if you decide to do such sampling.

The OCD is preparing new Statewide regulations for surface disposal facilities that will include the requirement for posting of a bond for removal and cleanup of surface facilities. In your conversation with me earlier this month, you indicated a willingness to post such a bond prior to construction. We appreciate the offer, however we will also need to look at your financial ability to perform subsurface investigation and remedial work if the unlined pond is approved by OCD, but does not function as planned.

Enclosed for your use is a copy of the OCD Guidelines for the Design and Construction of Lined Evaporation Pits. If you have any questions, please contact David Boyer or myself at (505) 827-5884.

Sincerely,

Jami Bailey
Geologist

JB:cr

Encl.

cc: W.J. LeMay - Director OCD
OCD-Aztec

Memo

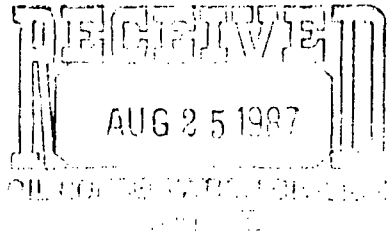
From
FRANK T. CHAVEZ
District Supervisor

SOUTHWEST WATER DISPOSAL
P.O. Box 10734
Farmington, NM 87499
505-325-8729

To John Keller

If this is approved H_2O from Fed. wells will probably be sent into it.

Frank



dministrative approval to
aporation pit. In the
ined pits, the "Guidelines
Permits" format will be
licable to the design,
ill be left unanswered.

erator

erator

he SE/4, SW/4 of Section

provide an economic and
te for produced water
erations of oil and gas
be that of produced water

Oil Conservation Aztec, New Mexico

disposal.

E. The original and two copies are enclosed for your review.

F. I hereby certify that I am familiar with the information contained and submitted with this application and that such information is true, accurate and complete to the best of my knowledge and belief.

David B. Swezey (signature) 7/15/87 (date)

David B. Swezey, General Manager

Memo

From

WILLIAM OLSON
Hydrologist

To

Questions about SWD unlined pit application

A) 1 - H_2S sensors only located around skimmer pit east of pond. What about H_2S generation from pond?

Need Treating Plant Classification ?

2a - Inside slope on skimmer pit should be less than 1:1

Solids from skimmer pit to be placed in main evaporation pit ?

Need schematic of plumbing system to be used for spray system and pump house

I B.) - Need to provide geologic cross section of proposed site

Don't need 3 upgradient monitor wells. 1 or 2 would be sufficient

Oil Conservation Division Santa Fe, New Mexico 87501
(505) 827-5800

Memo

From 8/13

JAMI BAILEY
Field Representative

To

SWD application deficiencies:

II A. General Crude not accepting waste oil

B. No engineering details for cut + fill of pit area. Width + compaction of berms?

Need statement on maintenance of berms, + pads where water received (prevent erosion during dumping) both skimmer pit + main pit

Bad placement of monitor wells. Type + size of csg?

Steep inside slope for skimmer pit!

Placement of pipe from skimmer to evap pit?

III Horizontal distance to alluvium

Notification of neighbors required?

Public notice should be sent out soon

(303) 355-4131

...nservation Division
...ta Fe, New Mexico 87501

wave [illegible]

[illegible]

Depth = 15 ft

Slope = [illegible]

[illegible] fig [illegible]

Wave [illegible] = $H = 0.6$ ft

Period = T = 1.1 sec

Breaking wave [illegible], H_b

$$\frac{H}{gT^2} = \frac{0.6}{32.2\,(1.1)^2} = .0154$$

$$\frac{H_b}{H_0} = 1.0 \implies H_b = H = 0.6 \text{ ft}$$

From fig 7-2

$\alpha \simeq 1.65$

$\beta \simeq 1.15$

$$d_{B\,max} = \alpha H_b = 1.65\,(0.6) = 0.99$$

$$d_{B\,min} = \beta H_b = 1.15\,(0.6) = 0.69$$

Freeboard

$d = 15'$

$$y_c = d + h_0 + \frac{1+x}{2} H_i$$

$H_i = 0.6 \pm$

$\frac{H_i}{2} = 0.04$ $\qquad \frac{H_i}{d} = \frac{0.6}{15} = 0.04$

from fig 7-90

$$\frac{h_0}{h_i} = .3$$

$h_0 = .3 H_i = .3(0.6) = .18$

$y_c = 15 + 0.18 + \left(\frac{1+1}{2}\right)(0.6) = 15.7$

freeboard of .7ft required ∴ a free board of 1.5 feet will allow no overtopping.

Geotechnical Services For:

Water Disposal Pond
Blanco, New Mexico
Project No. 3128J013

WESTERN TECHNOLOGIES INC.
The Quality People

ARIZONA

Phoenix
3737 East Broadway Road
P.O. Box 21387
Phoenix, Arizona 85036
(602) 437-3737

Mesa
Gateway Plaza
663 West Second Avenue, No. 10
Mesa, Arizona 85202
(602) 834-3964

Sun City
17200 North Dysart Road, No. 13
P.O. Box 2431
Sun City, Arizona 85372
(602) 975-2154

Flagstaff
2400 East Huntington Drive
Flagstaff, Arizona 86001
(602) 774-8708

Lakeside
Route 1, Box 1030
Lakeside, Arizona 85929
(602) 368-5568

Tucson
3480 South Dodge Boulevard
Tucson, Arizona 85713
(602) 748-2262

Sierra Vista
1827 South Paseo San Luis
Sierra Vista, Arizona 85635
(602) 458-0364

Laughlin / Bullhead City
1610 Riverview Drive, No. 5
Bullhead City, Arizona 86442
(602) 758-8378

NEW MEXICO

Albuquerque
8305 Washington Place, N.E.
Albuquerque, New Mexico 87113
(505) 823-4488

Farmington
400 South Lorena Avenue
Farmington, New Mexico 87401
(505) 327-4966

NEVADA

Las Vegas
3611 West Tompkins Avenue
Las Vegas, Nevada 89103
(702) 798-8050

Janine E. Lyman

3-29-88

Submitted to:

David B. Swezey
Post Office Box 10734
Farmington, NM 87499

Attn: Mr. David Swezey

March 29, 1988
Invoice No. 31280017

WESTERN TECHNOLOGIES INC.

400 South Lorena Avenue
Farmington, New Mexico 87401
(505) 327-4966

David B. Swezey
Post Office Box 10734
Farmington, New Mexico 87499

March 29, 1988

Attn: Mr. David Swezey

Re: Water Disposal Pond
Blanco, New Mexico

Job No. 3128J013
Inv. No. 31280017

Our geotechnical engineering report for the Water Disposal Pond is attached. The work was performed in accordance with our proposal of February 29, 1988.

Soils at the site generally consisted of clayey sand and clay with low to moderate load bearing capabilities. The surface clayey sand and clay soils are underlain by sands with low to moderate load bearing capabilities. The existing clays and sands can be used for construction of pond embankments provided a compacted clay liner is used.

Sincerely,
WESTERN TECHNOLOGIES, INC.
Geotechnical Engineering Services

Lawrence E. Cynova, P. E. Reviewed by: George A. Madrid, P. E.

3-24-88

/cb

Copies to: Addressee (3)
Mr. Bob Franks (1)

TABLE OF CONTENTS

otechnical Engineering E' iation
Water Disposal Pond
Blanco, New Mexico

INTRODUCTION

This report contains the results of our geotechnical engineering evaluation for the proposed Water Disposal Pond to be located approximately 3 miles northeast of Blanco, New Mexico. The purpose of these services is to provide results of field and laboratory testing, to evaluate the use of site soils for construction of the dikes and to provide engineering recommendations for construction of the dikes.

PROPOSED CONSTRUCTION

The proposed water disposal pond will be lined with compacted clay and constructed using compacted earth embankments. The width of the top of the dike will be 10 feet. The top of the dikes will be 15 feet above the bottom of the pond. The maximum height of the dike above the existing ground is approximately 25 feet on the east side. This pond will have plan dimensions of approximately 350 x 350 feet with a surface area of approximately 3.5 acres and a storage capacity of approximately 38 acre feet of water. The maximum depth of the water in the pond will be 13.5 feet. The upstream and downstream slopes of the dikes will be 3:1 horizontal to vertical.

SITE CONDITIONS

At the time of our exploration, the site was undeveloped property. The site contained a moderate growth of weeds and brush. Site drainage was to the east on a gradual and uniform slope.

SCOPE OF SERVICES

One boring was drilled to a depth of 25 feet at the location shown on the site plan. During exploration, subsoils were visually examined and sampled at selected intervals.

The following tests were performed on selected soil samples:

- o Water content
- o Dry density
- o Compression
- o Shear strength
- o Gradation
- o Plasticity Index
- o Permeability (conducted on 09/08/87)

Test results were used in the development of foundation and earthwork recommendations.

Western Technologies Inc. performed the services described in this report to develop engineering information for the purposes defined in the "Introduction." We did not intend to uncover nor identify any contaminated subsurface materials that may contain hazardous or flammable substances. Identification of such substances requires specialized exploration techniques and analyses which were not used in this investigation.

INTERPRETATION OF SUBSURFACE CONDITIONS

Exploration: As presented on Log of Boring, surface soils to depths of 1 foot were found to be silty sand of low density and nil to low plasticity. The near surface soils from 1 to 2 feet consisted of sandy clay of soft consistency and low to medium plasticity. These materials from 2 to 6 feet are underlain by clayey sand of low to medium density and low plasticity. The materials from 6 to 7 feet consisted of stiff sandy clay. The materials below 7 feet and extending to the full depth of exploration consisted of sand. A groundwater table was not encountered at the time of exploration.

Test pits had been excavated by others prior to our exploration.

Testing: Laboratory test results indicate that native subsoils at shallow foundation level are slightly to moderately compressible at existing water contents. Low additional compression occurs when the water content is increased.

Geology: The proposed water disposal pond is to be located on unconsolidated alluvial material washed down from the local topography. The alluvial materials were deposited on top of the Animas Formation. This formation consists of some 2,000 feet of greenish and tan andesitic sandstones and shales of upper cretaceous age lying in the northern half of the San Juan Basin.

ANALYSIS PROCEDURES

General: We understand that the proposed Water Disposal Pond will store water throughout the year. The pond will be filled with water from oil and gas production. The water will be evaporated by spraying the water into the air. It is understood that the compacted clay liner will be 3 feet thick on the bottom and on the slopes. The east dike, which is the deepest fill, was chosen for analysis.

Material Properties: The on-site undisturbed and compacted clay materials exhibit properties of low cohesion and moderate angles of internal friction. The underlying sand materials encountered in the test boring have nil cohesion and moderate to moderately high angles of internal friction. Based upon our observations, the results of laboratory testing, and our experience with similar materials, the following material properties were assigned to the embankment and foundation soils:

Clays

Dry unit weight - 105 to 107 pcf

Angle of internal friction - 15°

Cohesion - 400 psf

Sand

Dry unit weight - 108 pcf

Angle of internal friction - 26°

cohesion - 0 psf

Slope Stability Analysis: The static stability of anticipated embankment slopes was analyzed using strength parameters obtained from laboratory and field testing. The analysis was conducted on those dike configurations as shown in the plans for the project. A computer program (SB-SLOPE program developed by Digital Research Inc.) using simplified Bishop's Analysis was performed for both the upstream and downstream slopes for the anticipated embankment configurations.

The following table presents the results of the analysis:

Boring Location	Condition	Slope	Factor of Safety
East Dike	Steady State Seepage	Downstream	2.1
East Dike	Rapid Drawdown	Upstream	5.1

A minimum factor of safety of 1.5 is recommended under the steady state condition and rapid drawdown in the design of dams, by the New Mexico State Engineer's Office.

After reviewing the Deformation Analysis - Embankment Dams section of the Procedure on Design Criteria and Safety of Dams, for seismic considerations, we believe that seismic analysis is

not necessary. This is due to the fact that the embankments and foundations are not subject to liquifaction. Also, the dikes will be densely compacted, the slopes will be 3 horizontal to 1 vertical and the static factor of safety is greater than 1.5.

Seepage Analysis: The pond will be lined with compacted clay. Based on the permeability test results shown on our results sheet dated November 5, 1987 (Invoice No. 31470911), the clay liner would experience the following seepage amounts.

Permeability	Volume
Permeability of 2.7×10^{-9} cm/sec Liner 1 foot thick	
Permeability of 6.1×10^{-9} cm/sec Liner 2 feet thick	
Total Liner thickness 3 feet	3200 ft^3/yr

Piping, which is the movement of material by seepage forces in the foundation and embankments, is not expected due to the anticipated low seepage quantity.

DISCUSSION AND RECOMMENDATIONS

General: Based on the results of this investigation, we anticipate that the existing clay and sand soils could be used for construction of embankments. It is anticipated that the west side of the pond will be cut and the east side will be fill. The pond may be satisfactorily supported upon prepared subgrade. If

subsoil conditions other than those identified during the field exploration are encountered during construction or should design plans change, this firm should be contacted for supplemental review and recommendations.

The following general conclusions and recommendations are presented:

1. Surface soils in native undeveloped areas are loose to depths of approximately one foot. Therefore, these zones are not deemed suitable for support of earth embankments. However, removal and replacement of native soils in embankment foundation areas can provide adequate support characteristics of these zones.

2. Native soils below levels of surface soil disturbance are generally of moderate densities and will afford support for anticipated embankments.

3. Excavation of the design pond base should be possible with conventional earthmoving equipment.

Embankment: Homogeneous embankments for construction of the storage pond were analyzed. Homogeneous embankments are constructed using the same soil type throughout the embankment. The soil boring and test pits indicate that the materials for a zoned embankment are not readily available on the site. Therefore, it is recommended that a homogeneous type embankment with the liner be used in construction.

The proposed homogeneous embankment may be constructed with the on-site soils identified during exploration, including the clay and sandy soils, provided site preparation and earthwork is accomplished as recommended hereinafter. The upstream embankment

should be constructed no steeper than 3 to 1 (horizontal to vertical). The downstream embankment should be constructed no steeper than 3 to 1 (horizontal to vertical).

Materials: An investigation of borrow materials in the pond area was performed by the client and test pit logs were provided. The logs indicate that there was sands and clays in the cut portion of the pond which would be used for construction of the dikes. Permeability tests were also conducted on the soils from these test pits. Based on these test pit logs and permeability tests we believe that the on-site soils are suitable to construct the dikes and line the pond.

Site Preparation and Earthwork: The following procedure is recommended for site preparation and earthwork for the embankment portions of the water disposal pond.

1. Strip all loose surface soils, vegetation, roots and debris from the pond and embankment area to a horizontal distance of 5 feet beyond the perimeter of the new construction. Removal should extend 1 foot below the existing grade or 1 foot below the bottom of the embankment, whichever is deeper. This soil could be used for revegetating if it is needed.

2. Clean and widen depressions, washes, swales, etc., to form level working areas to accommodate compaction equipment and fill placement.

3. No material should be placed which is frozen or where the in-place material is frozen.

4. Proof-roll the exposed subgrade in the embankment and pond areas to densify materials which may have been

loosened during the stripping and excavation process. Proof-rolling may be accomplished by a minimum of 2 passes of a loaded scraper or equivalent. All soft areas should be removed and replaced with compacted fill.

5. Place and compact all embankment fill in horizontal lifts to the finished grade levels. Lift thicknesses should be compatible with compaction equipment used to achieve the required uniform densities. The maximum size of rock used for fill should be 6 inches.

6. All subgrade preparation, fill placement and compaction should be accomplished under observation and testing to assess compliance with project specifications. All fill material should be at least 95% of the maximum dry density as determined by ASTM: D-698 methods and at a moisture content of optimum to 4% above optimum.

7. The material should not be allowed to dry between layers or stages of berm construction. When drying has occurred, the dry material should be reconditioned to the proper water content and recompacted prior to placing subsequent material. Between stages of berm construction the embankment should be covered by at least 2 feet of temporary fill.

8. When the compacted surface of any layer is too smooth to bond properly with the succeeding, the layer should be scarified of otherwise roughened to provide a satisfactory bonding surface before the next layer of fill material is placed.

Drainage: Positive drainage should be provided around the

proposed lagoon during construction and maintained throughout the life of the proposed development.

Borrow excavation, basin excavation, surface stripping, subgrade preparation, and embankment fill placement should be accomplished under the observation and testing directed by a soils engineer to assess compliance with recommendations.

Post Construction Maintenance: During the life of the water disposal pond, burrowing animals should not be allowed to dig holes in the embankments.

CLOSURE

Our conclusions and recommendations are predicated on observation and testing of the earthwork and foundation preparations directed by a geotechnical engineer. It would be logical for Western Technologies Inc. to provide these services since we are most qualified to determine consistency of field conditions with those data used in our analyses.

Deviations from our recommendations by the plans, written specifications, or field applications shall relieve us of responsibility unless our written concurrence with such deviations has been obtained.

DEFINITION OF TERMINOLOGY

ALLOWABLE SOIL BEARING CAPACITY ALLOWABLE FOUNDATION PRESSURE	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
BACKFILL	A specified material placed and compacted in a confined area.
BASE COURSE	A layer of specified material placed on a subgrade or subbase.
BASE COURSE GRADE	Top of base course.
BENCH	A horizontal surface in a sloped deposit.
CAISSON	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
CONCRETE SLABS-ON-GRADE	A concrete surface layer cast directly upon a base, subbase or subgrade.
CRUSHED ROCK BASE COURSE	A base course composed of crushed rock of a specified gradation.
DIFFERENTIAL SETTLEMENT	Unequal settlement between or within foundation elements of a structure.
ENGINEERED FILL	Specified material placed and compacted to specified density and/or moisture conditions under observation of a representative of a soil engineer.
EXISTING FILL	Materials deposited through the action of man prior to exploration of the site.
EXISTING GRADE	The ground surface at the time of field exploration.
EXPANSIVE POTENTIAL	The potential of a soil to expand (increase in volume) due to the absorption of moisture.
FILL	Materials deposited by the action of man.
FINISHED GRADE	The final grade created as a part of the project.
GRAVEL BASE COURSE	A base course composed of naturally occurring gravel with a specified gradation.
HEAVE	Upward movement.
NATIVE GRADE	The naturally occurring ground surface.
NATIVE SOIL	Naturally occurring on-site soil.
ROCK	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
SAND AND GRAVEL BASE	A base course of sand and gravel of a specified gradation.
SAND BASE COURSE	A base course composed primarily of sand of a specified gradation.
SCARIFY	To mechanically loosen soil or break down existing soil structure.
SETTLEMENT	Downward movement.
SOIL	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
STRIP	To remove from present location.
SUBBASE	A layer of specified material placed to form a layer between the subgrade and base course.
SUBBASE GRADE	Top of subbase.
SUBGRADE	Prepared native soil surface.

METHOD OF SOIL CLASSIFICAT
(ASTM D 2487)

COARSE-GRAINED SOILS

LESS THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	
SC	CLAYEY SANDS, SAND CLAY MIXTURES, MORE THAN 12% FINES	

NOTE:
Coarse-grained soils receive dual symbols if they contain 5 to 12% fines (e.g. SW-SM, GP-GC, etc.)

FINE-GRAINED SOILS

MORE THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS Liquid limit less than 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILTY-CLAYS OF LOW PLASTICITY	
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit more than 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK, AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

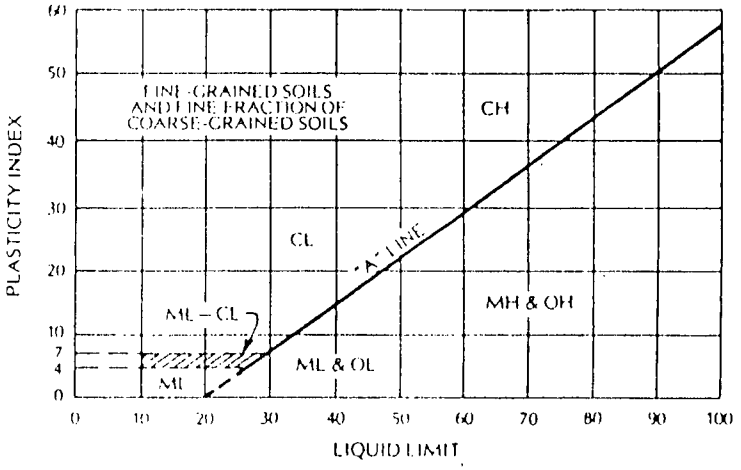
NOTE:
Fine-grained soils receive dual symbols if their limits plot in the hatched zone on the Plasticity Chart (ML-CL)

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 in
COBBLES	3 in. to 12 in
GRAVEL	No. 4 to 3 in.
Coarse	¾ in. to 3 in.
Fine	No. 4 to ¾ in.
SAND	No. 200 to No. 4
Coarse	No. 10 to No. 4
Medium	No. 40 to No. 10
Fine	No. 200 to No. 40
*FINES (Silt or Clay)	BELOW No. 200

NOTE:
Only sizes smaller than three inches are used to classify soils.

PLASTICITY CHART



SOIL PROPERTIES

Job No. 3128J013

Boring No.	Depth, ft	Soil Class.	Soil Property: Initial Dry Density pcf	Soil Property: Initial Water Content, %	Compression/Consolidation: Surcharge KSF	Compression/Consolidation: Total Comp. %	Compression/Consolidation: Void Ratio	Expansion: Surcharge KSF	Expansion: Expansion %	Expansion: Max. Swell Pressure KSF	Shear Strength: Test Method	Shear Strength: C KSF	Shear Strength: ϕ Deg.	Water Soluble Matter, PPM: Salts	Water Soluble Matter, PPM: Sulfates	Remarks
1	6 - 7.5	CL	107(1)	16.0							DS	0.4	15			
1	8 - 11	SM	108	2.8							DS	0	26			
1	15 - 16	SM	105	3.1	0.4	-0.8										
					1.7	-1.7										
					3.3	-3.0										
					3.3(3)	-3.8										

Boring No.	Depth, ft	Comments

Note: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted

LEGEND

Shear Strength Test Method
- DS Direct Shear
- DS Direct Shear (saturated)
- UC Unconfined Compression
- UU Unconsolidated Undrained
- CU Consolidated Undrained w/pore press
- CU Consolidated Undrained
- CD Consolidated Drained

REMARKS

1 Compacted density (approx. 95% of ASTM D698 max. density at moisture content slightly below optimum).
2 Compacted density (approx. 95% of ASTM D1557 max. density at moisture content slightly below optimum).
3 Submerged to approximate saturation
4

Type of Material: Sandy Clay — Job No. 3128J013

Source of Material: Pond

Test Procedure: ASTM — Tested/Calc. By L. Waresback/WT — Date 03/14/88

Reviewed By L. Cynova/WT — Date 03/16/88

Hole No.	Location	Depth	Classification		LL	PI	Sieve Analysis - Accum % Passing													Lab No./I.D.
			AASHTO	Unified			200	100	40	16	10	4	¼	⅜	½	1	1½	2	3	
1		6-7.5		CL	34	17	66	84	93	99	100									

TABULATION OF TEST RESULTS

WESTERN TECHNOLOGIES INC.

400 South Lorena Avenue
Farmington, New Mexico 87401
(505) 327-4966

LABORATORY REPORT

Client: Southwest Water Disposal
Post Office Box 10734
Farmington, New Mexico 87499

Job No. 31173
Lab./Invoice No. 31470911
Date of Report 10/05/87
Reviewed By D. A. Madrid

Project: Water Disposal Pond
Location: Blanco, New Mexico
Material/Specimen: Sandy Clay (visual classification)
Source: Native
Test Procedure: As Shown

Sampled By B. Franks/Client Date 09/06/87
Submitted By B. Franks/Client Date 09/08/87
Authorized By B. Franks/Client Date 09/06/87

RESULTS

Sample I.D.	ASTM D698 A Proctor Values	Constant Head Permeability Rate, cm/sec
Primary Liner	115.2 pcf @ 16.7% m/c	2.7 x 10 - 9
Test Hole #4	110.8 pcf @ 16.0% m/c	6.1 x 10 - 9
Test Hole #5, 8' Depth	119.6 pcf @ 11.4% m/c	2.2 x 10 - 7

Note: Permeability specimens molded to 95% compaction at optimum moisture content.

Copies to: Client (3)
/pp

LOG OF BORING NO. 1

Project Water Disposal Pond — Job No. 3128J013

Elevation 5692 — Datum Sea Level - Project Contour Drawing

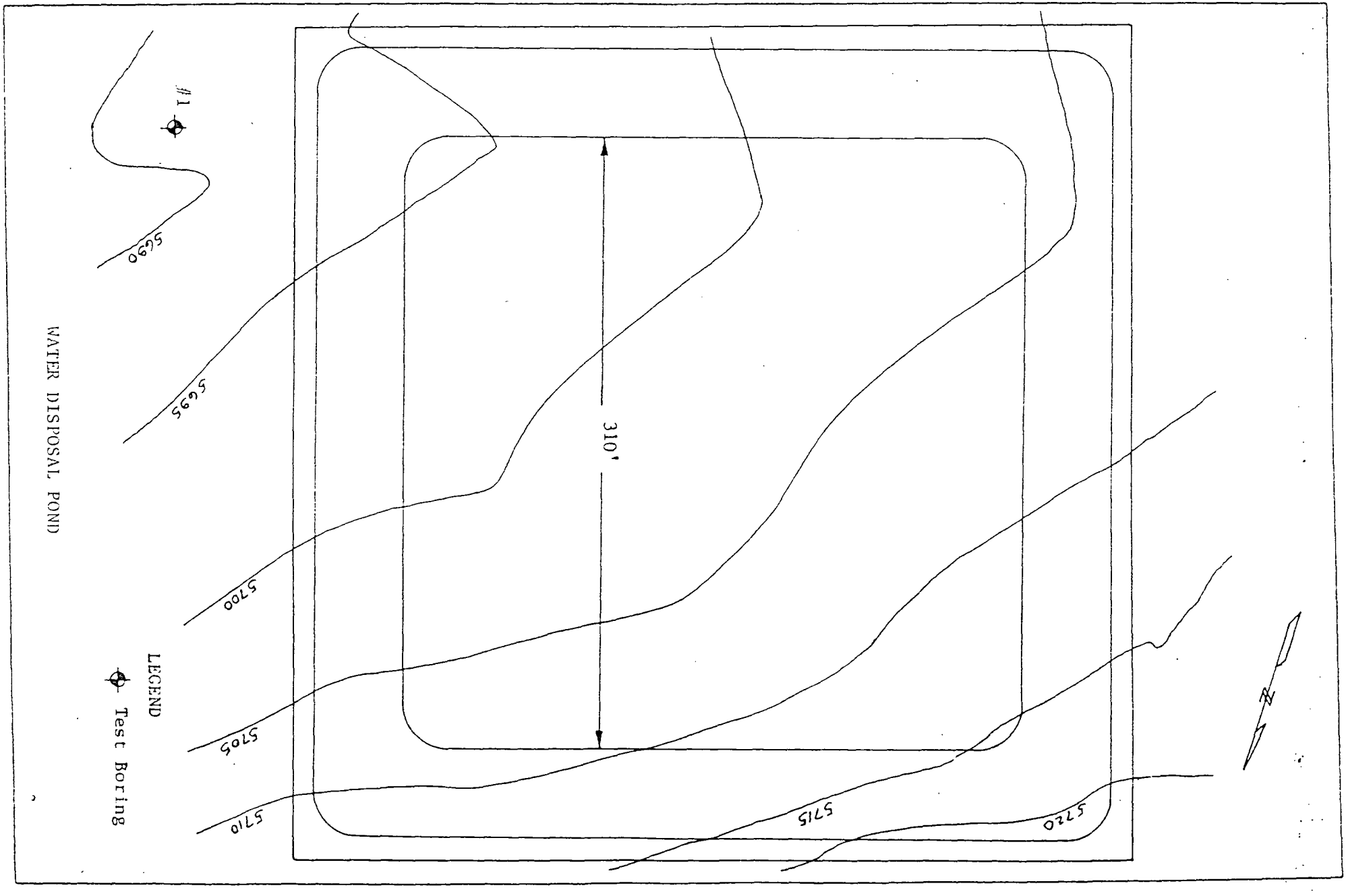
Type/Size Boring 7" Auger — Rig Type CME-55

Groundwater Conditions No groundwater encountered on 03/03/88 — Date 03/03/88

Depth, feet	Blows/Foot C	Blows/Foot N/R	Sample Type	Dry Density pcf	Water Content, %	Unified Classification	Description
			G		VERY MOIST	SM	SILTY SAND; tan, fine grained sand. Loose.
					LL	CL	SANDY CLAY; brown to tan, soft.
					DAMP	SC	CLAYEY SAND; tan, fine to coarse grained sand. Medium dense. Light cementation.
5		50/5"	R	105	5.3		
		36	S				
					SL-PL	CL	SANDY CLAY; tan, fine grained sand. Stiff.
		24	R	107	2.4	SM	SAND; tan, loose to medium dense. Fine to coarse grained sand. Trace of silt.
10		21	R				
		27	R	108	2.8		
		11	S				
15							
		17	R	105	3.1		
		12	R				
20							
			R	102	4.2		
		16	S				
25							
30							Stopped at 25 feet.

Prepared By L. E. C. Date 03/18/88 Job No. 3128J013

Checked By _____ Date _____ Client David B. Swezey



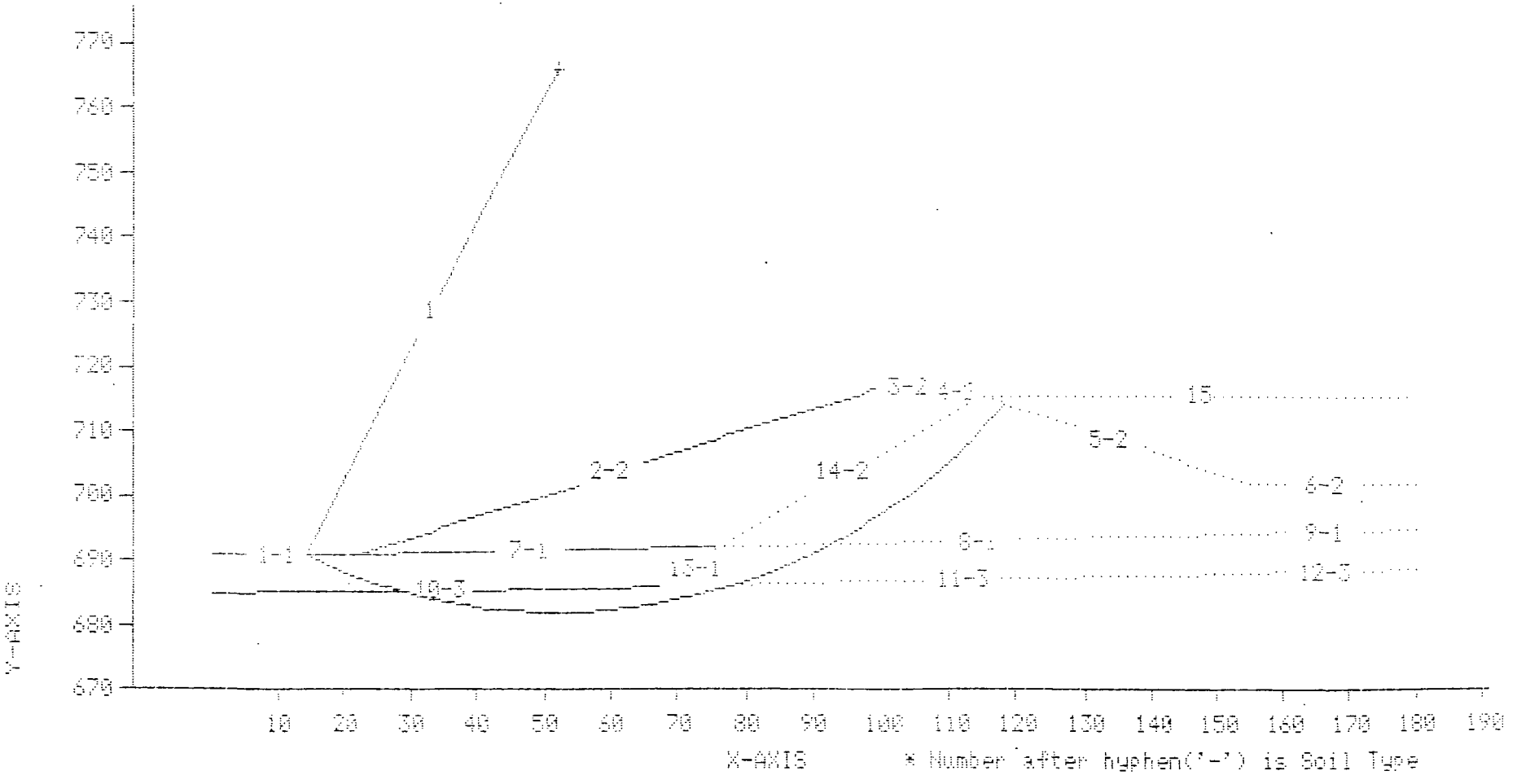
SB-SLOPE

Simplified Bishop Slope Stability Analysis

PROJECT: WATER DISPOSAL POND
LOCATION: BLANCO,NEW MEXICO
FILE: BLANCO
COMPLETE SLOPE CROSS SECTION

CIRCLE	X	Y	RADIUS	FS
1	52.0	762.0	84.0	2.13

SOIL*	DENSITY	COHESION	PHI
1	105.0	400.0	15.0
2	107.0	400.0	16.0
3	108.0	0.0	26.0



* Number after hyphen('-') is Soil Type

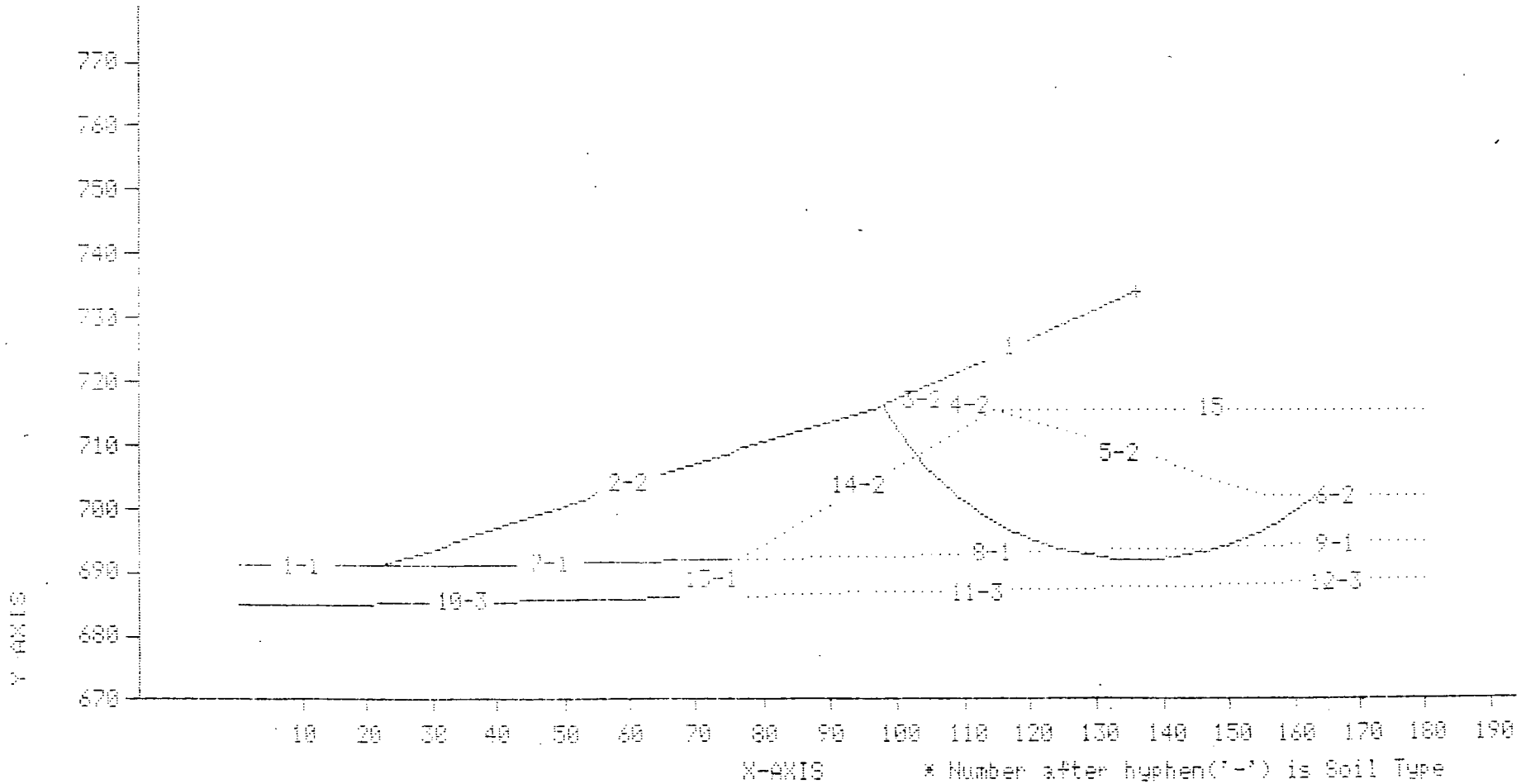
SB-SLOPE

Simplified Bishop Slope Stability Analysis

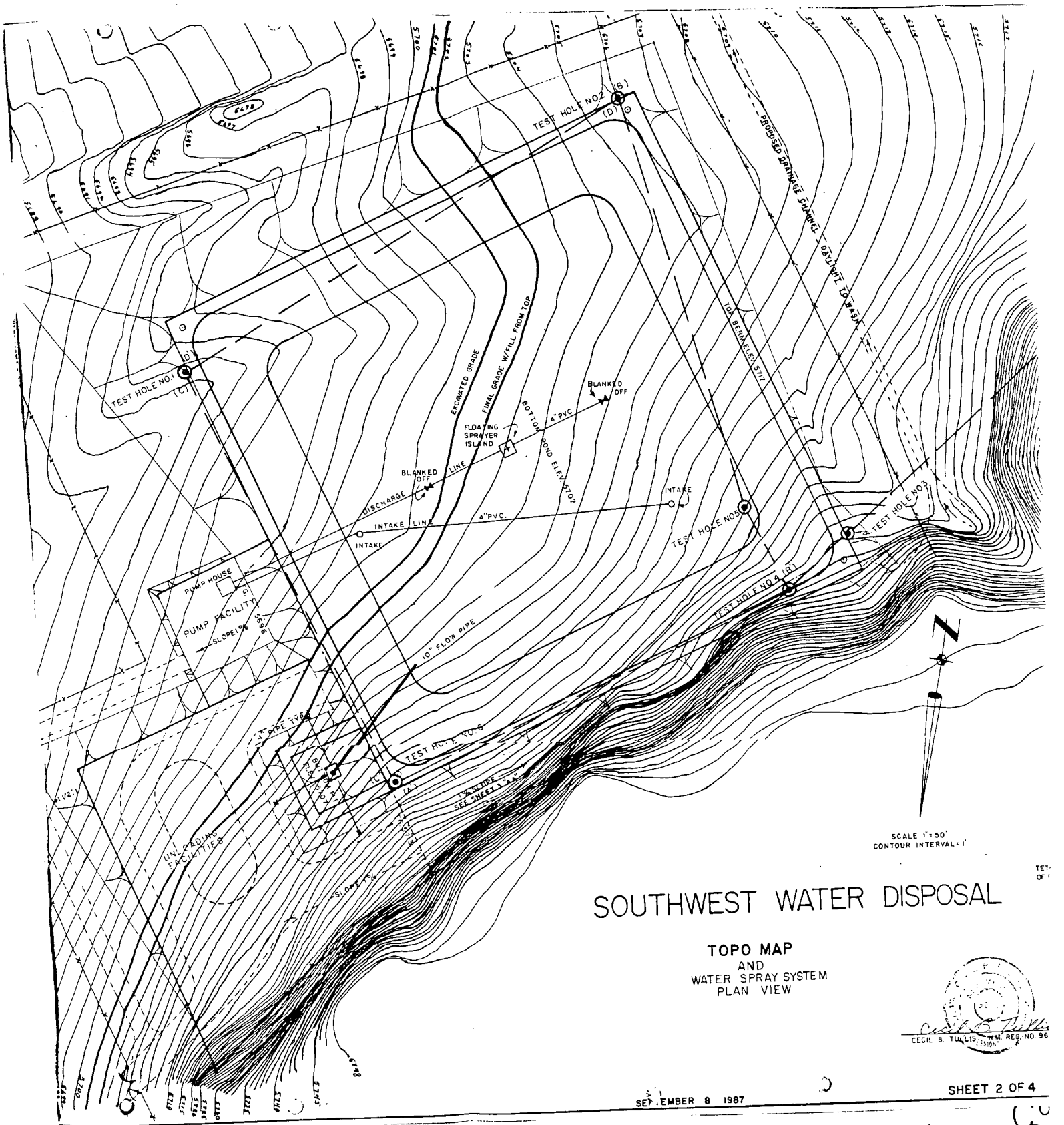
PROJECT: WATER DISPOSAL POND
LOCATION: BLANCO,NEW MEXICO
FILE: BLANCO
COMPLETE SLOPE CROSS SECTION

SOIL*	DENSITY	COHESION	PHI
1	105.0	400.0	15.0
2	107.0	400.0	15.0
3	100.0	0.0	26.0

CIRCLE	X	Y	RADIUS	FS
1	175.0	734.0	42.0	5.10



* Number after hyphen('-') is Soil Type



SOUTHWEST WATER DISPOSAL

TOPO MAP
AND
WATER SPRAY SYSTEM
PLAN VIEW

CECIL B. TULLIS N.M. REG. NO. 96

SEPTEMBER 8 1987

SOUTHWEST WATER DISPOSAL
P.O. Box 10734
Farmington, NM 87499
505-325-8729

SW WD

October 28, 1987

Ms. Jami Bailey
N. M. Oil Conservation Division
P. O. Box 2088
Santa Fe, New Mexico 87501-2088

Re: Application for Unlined Commercial Surface Disposal Facility, SE/4, SW/4, Section 32-T30N-R9W, San Juan County, New Mexico

Dear Jami,

We have reviewed your letter and obtained the data necessary to demonstrate that the pond will be impermeable and that all of your operational concerns will be answered. I would like to address each of your comments on a line by line basis.

1) The accumulated oil, after separation of water and of pipeline quality, will be transferred to the Mancos Corporation. It is our understanding that this corporation is being used by another waste water disposal company for disposing of waste oil.

2) The skimmer pit will be made of the native clay and constructed the same as the main pit. In your letter of August 27, 1987 you requested that the skimmer pit must be lined. I have read Rule 310 and would like to make a few points for you to consider prior to insisting on a lined skimmer pit. The skimmer pit will be lined with one foot of clay that has a permeability of 2.7×10^{-9} cm/sec (357 years) and a minimum of two feet of another clay with a permeability of 6.1×10^{-9} cm/sec (316 years). This brings the minimum time for fluid to permeate through the clay to 673 years. There are a lot of pluses to having an unlined skimmer pit as it will be the primary solids settling pond and the unlined pond facilitates solids cleaning. One other thing to consider is that most synthetic liners have warranties for only 30 years, and these liners hamper the periodic cleaning that is necessary with any type of skimmer pit. In essence, a synthetic liner has a planned obsolescence.

There are approximately 18,000 wells in the San Juan Basin, most of which have an unlined and uncompacted primary dump pit. Most of these pits, the same pits from which we will receive water, have a skim of oil. These dump pits are not considered as oil storage pits as their primary function is to retain produced water. As I read Rule 310, there is not to be any oil stored in an open receptacle. It appears that a lined skim pit would not be permitted as it would be an open pit. Our primary

desire in using a skim pit is that we would like to visually examine and test every load received at the facility (open system). If the loads are placed in a tank (closed system), the fluids are not visible and will be in our custody prior to inspection. In addition, tanks are susceptible to freezing problems, harder to clean, smaller in volume and, therefore, the separation time is shorter and draining the water off of the bottom is not as efficient in keeping oil out of the main pit as a siphon system is. In keeping with the intent of your request, we offer this solution: (1) allow SWWD to utilize an unlined skimmer pit that is constructed to have a minimum of one foot of clay with a permeability of 2.7×10^{-9} cm/sec and two feet of clay with a permeability of 6.1×10^{-9} cm/sec. (2) SWWD will mechanically skim the oil from the skimmer pit on a weekly basis as oil is accumulated. The oil will be picked up by vacuum truck and transported to a tank where it may be further treated prior to sale. The records of this skimming operation will be kept for inspection.

constant flow insulation

If SWWD is allowed to use an unlined skimmer pit, the berms will be constructed by ripping out the natural clay and replacing and compacting the clay to 95% of proctor. The slopes of the dike will be 2:1. The siphon will be constructed of 10" iron pipe and will be set into the walls of the dike. The fluid will enter the skimmer pond through 4" pipe stands. The pipe stands will be perforated on the top side as they lay on the dike wall. This will allow visual inspection of the fluid as it enters the pond. A plastic liner will be placed under the perforated sections to prevent erosion of the dike. There will be no piping or pumps other than those associated with the pipe stands and siphon. This pond will gravity feed into the main pond.

If an unlined skimmer pond is not permitted, we will most likely not use any skimmer pond. Instead we would use tanks. A minimum of two tanks will be used. The tanks will be rigged so that all fluid will enter the first tank and the oil will be allowed to overflow from the first tank into the second tank. Water will be drained from the bottom of the first tank into the main pond. The water from the tank will be discharged into the pond through perforated pipe with a plastic liner underneath.

We feel very strongly that an unlined skimmer pit, with the oil removed weekly, would be a better solution than tanks or a lined pond. This proposal would be consistent with existing practices and is an easier and more effective means of separating oil and water.

3) As mentioned earlier, the fluids entering the skim pit will be through perforated pipe. The pipe will be laid on plastic so as to prevent erosion of the dike. The siphon pipe from the skimmer pit to the evaporation pond will be laid on the dike and the only discharge will be from the bottom. A concrete pad will be placed under the discharge point. With a 10" siphon and gravity feed, there will be minimal erosion of the pond bottom. The outside of all berms will be seeded with native grasses. The inside slope will be graded or rebuilt by adding additional clay if erosion should become a problem. Significant erosion of the inside of the dike is unlikely as only very minimal wave action is possible with this size of pond, and the sprayer will be located in the center of the pond.

4) We were unaware that H2S limits had been set at 0.2 ppm at the fence line. After reviewing H2S detection equipment, I was able to find only one company that makes a system compatible with these detection limits. We would like to propose a different method to detect H2S around the pit. A hand-held H2S monitor will be utilized by the field personnel unloading each load into the skimmer pit, and in addition the dike top will be walked once in the morning and once in the evening at closing. The hand-held monitor has a detection range of 0-99 ppm; however, the display is in 1 ppm increments. This detection limit is higher than permitted. However, the dike is a variable distance from the fence, and although this is not a quantitative means to measure the concentration at the fence line, it will be less than what is detected at the dike.

We realize that H2S is not present in most of the San Juan Basin produced waters. The problem of H2S generation at Basin Disposal was caused by an anaerobic bacteria giving off H2S as a waste product. We intend to eliminate any anaerobic conditions from ever existing as an aeration system will be installed and in operation from startup. The system will be capable of circulating both gaseous and liquid mediums. In addition, once the sprayers are operational the pump will circulate the entire freeboard pond capacity every 12 days.

We feel that with the aeration system in place and operational from startup that the H2S detection procedure will be adequate to prevent and monitor any H2S emissions. The best H2S detection at low thresholds is ones' own nose. All company personnel will be trained to recognize H2S by smell and instructed to turn on the aeration system if it is ever detected. If desired, we will notify the O.C.D. whenever H2S is detected. Please be assured that SWWD does not desire to become embroiled in a situation similar to Basin Disposal's, and we feel that if there ever is a problem with H2S or any

other liquids, we will have a means to readily treat the problem. We are also very aware of the situation the O.C.D. has been in due to H2S emissions, and would like to work out a mutually agreed upon H2S detection plan. As we have not selected any equipment to date, we are unable to give you the specific information you have requested.

5) See design plans.

6) See attached. The dikes will be constructed in 6" lifts or as necessary to ensure 95% proctor compaction.

7) The geologic information you have requested is attached. Cross sections have been made and revealed a 2^{o} apparent SE dip. Three different samples were taken from the three soil types to be utilized in the construction of the pond. As mentioned earlier, the pond will have a minimum permeability life of 673 years. The point that is most vulnerable to a leak is that point in the bottom of the pond where there is only cut, as the compacted clay depth will be only three feet deep. However, this is the area where there will only be natural in-situ clay.

8) The monitor wells will be constructed from 4" PVC and will be installed pursuant to the attached diagrams.

9) Once the sprayers are installed, an anemometer and wind direction gauge will be installed. The spray system will be centered in the middle of the pond and will, therefore, be less likely to have mist travel outside of the pond. A shut down policy will be developed as the data necessary for a rational decision is obtained.

10) An aeration system will be installed and operational prior to start up (see details).

11) The property boundaries and property owners are shown on the attached plats.

12) The names and mailing addresses of the residences visible from the site are as follows:

V. Archuletta
282 C.R. 4599
Blanco, NM 87412

V. Archuletta
284 C.R. 4599
Blanco, NM 87412

Occupant*
318 C.R. 4599
Blanco, NM 87412

"Skip" Miller
292 C.R. 4599
Blanco, NM 87412

*Name not available from County Assessor. Blanco Post Office does not deliver to this address.

I believe that all of your questions have been answered and I would like to set up a meeting to discuss the proposal. I will contact you in about a week or two as this will give you time to review the proposal. If I may of any further assistance, please advise.

Very truly yours,

David B. Swezey

David B. Swezey
General Manager

TEST HOLES

#1 25' N 76° E of SE Corner

0-2	Loess material, top soil
2-9	Brown grey clay; 10% silt; 0-15% sand; very hard
9-10	50% sand and clay unconsolidated
10-12	Light brown to tan clay with 45% sand

#2 10' S 35° W of SW Corner

0-2	Loess material
2-10	Brown grey clay; 10-25% silt; 0-10% sand
10-12.5	Tan to light brown clay with 30-45% sand; 0-15% silt

#3 20' S 85° W of NW Corner

0-12	Unconsolidated clay with 35-45% sand; 0-15% silt; adjacent to existing surface drainage

#4 50' NE of NW Corner on-line with NE Corner

0-3	Loess material
3-4	Sandstone boulder, float material
4-8.5	Brown grey clay; 25% sand, 15% silt; trace alkali; very compactible
8.5-10	Grey clay; powdery
10-12	Dark grey clay; mottled with red brown clay

#5 75' SW of Hole #4 parallel to dike orientation

0-2	Top soil
2-4	Brown grey clay; 20-25% sand; 15% silt, very hard; trace alkali
4-5	Brown grey clay; 25% silt; very compactible
5-12	Brown grey clay; 25% sand; 15% silt; very hard to dig; sample taken at 8'

#6 5' N 45° E of NE Corner

0-2	Loess material
2-12	Grey brown clay; 0-20% silt; sample taken at 10' may be contaminated from surface material

#7 Primary liner, taken from bench above pond

0-1	Cobble
1-2	Grey green clay
2-10	Dark grey clay; sample taken at 6'
10-12	Orange brown clay; 10% sand
12	Light grey sandstone; friable

WESTERN TECHNOLOGIES INC.

400 South Lorena Avenue
Farmington, New Mexico 87401
(505) 327-4966

LABORATORY REPORT

Client: Southwest Water Disposal
Post Office Box 10734
Farmington, New Mexico 87499

31173

Job No.

Lab./Invoice No. 31470911

Date of Report 10/05/87

Reviewed By D. A. Madrid

Project: Water Disposal Pond

Location: Blanco, New Mexico

Material/Specimen: Sandy Clay (visual classification) Sampled By B. Franks/Client Date 09/06/87

Source: Native Submitted By B. Franks/Client Date 09/08/87

Test Procedure: As Shown Authorized By B. Franks/Client Date 09/06/87

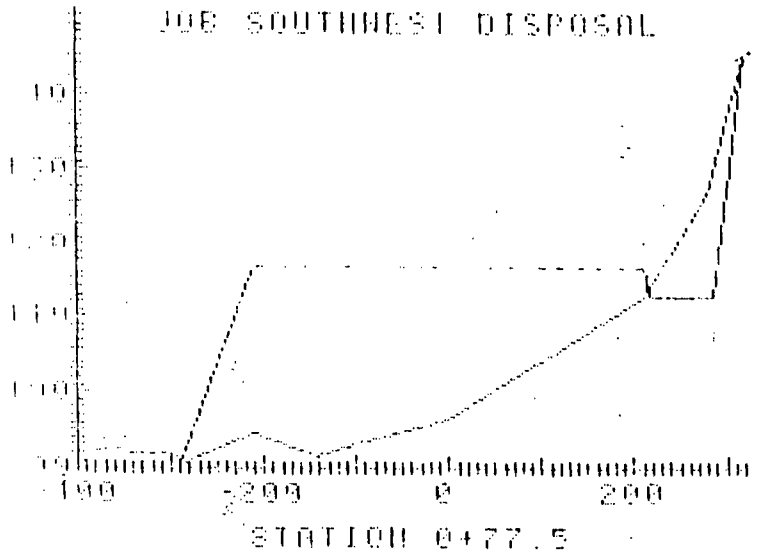
RESULTS

Sample I.D.	ASTM D698 A Proctor Values	Constant Head Permeability Rate, cm/sec
Primary Liner	115.2 pcf @ 16.7% m/c	2.7 x 10 - 9
Test Hole #4	110.8 pcf @ 16.0% m/c	6.1 x 10 - 9
Test Hole #5, 8' Depth	119.6 pcf @ 11.4% m/c	2.2 x 10 - 7

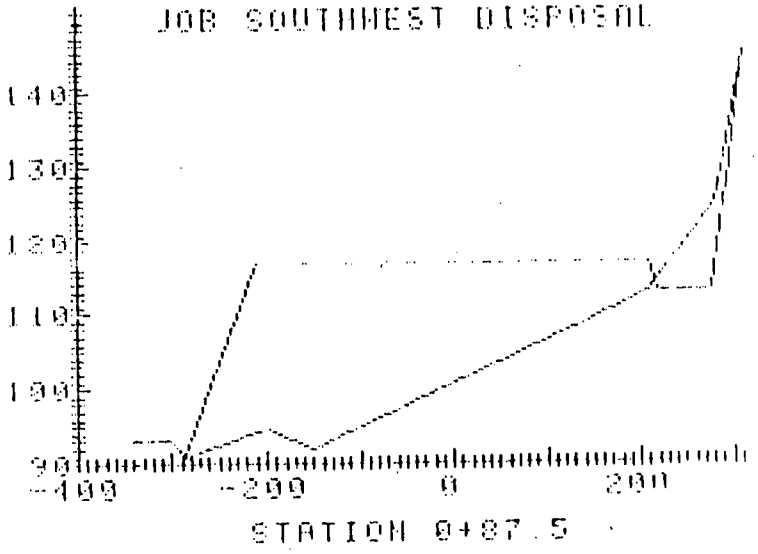
Note: Permeability specimens molded to 95% compaction at optimum moisture content.

Copies to: Client (3)
/pp

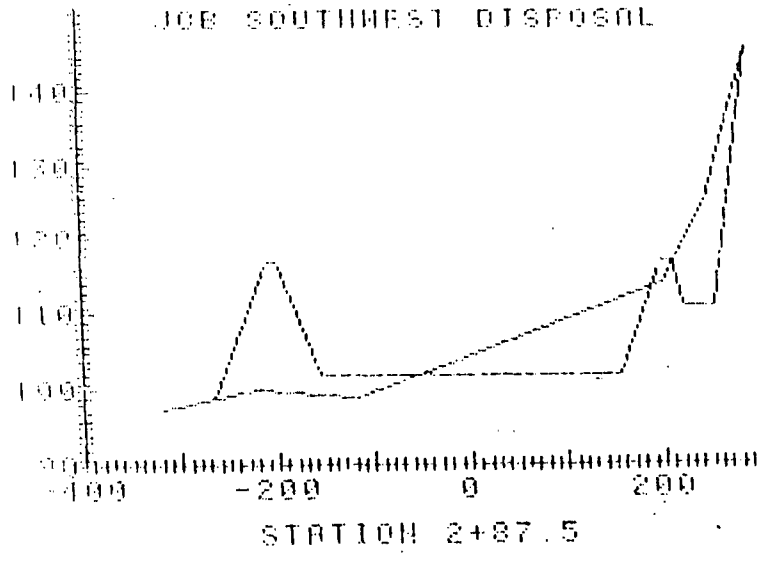
SOUTHWEST WATER DISPOSAL



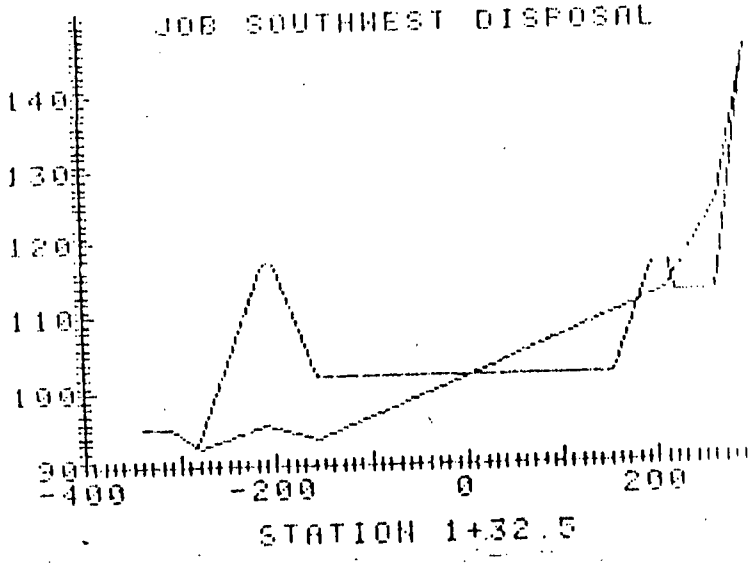
STATION 0+77.5



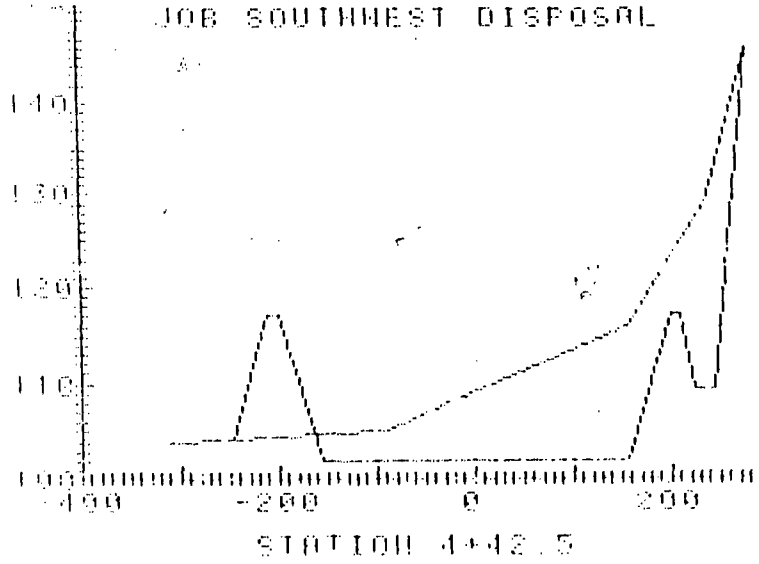
STATION 0+87.5



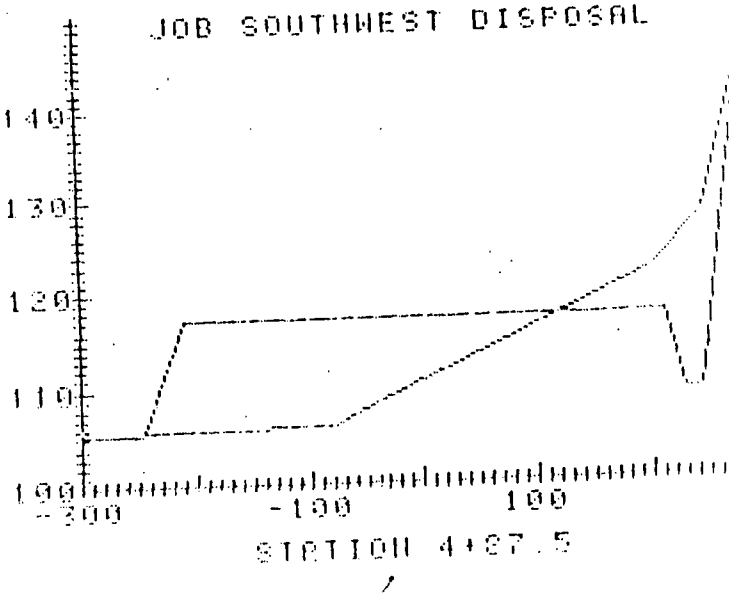
STATION 2+87.5



STATION 1+32.5

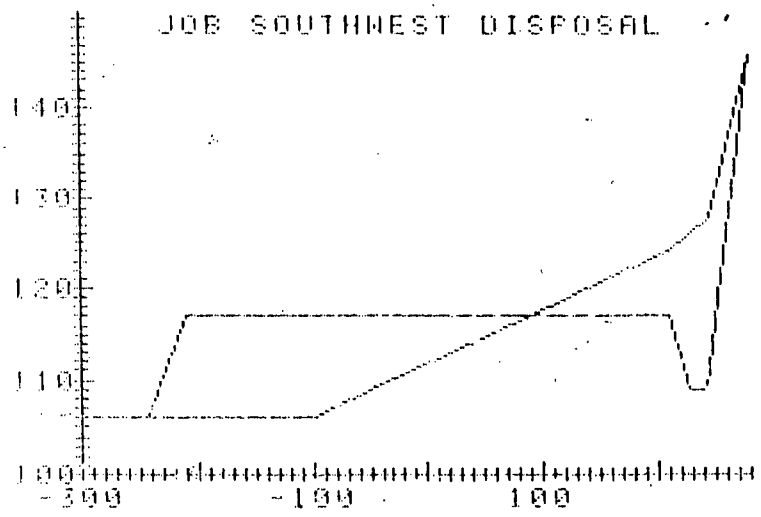


STATION 4+42.5

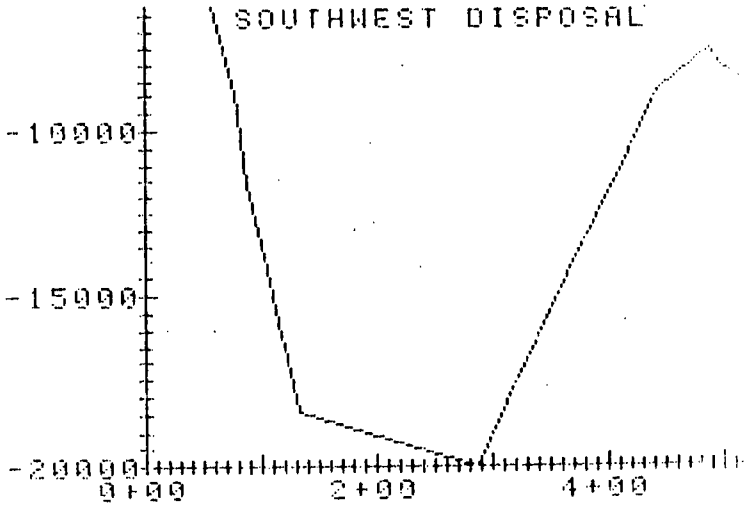


STATION 4+87.5

SOUTHWEST WATER DISPOSAL



STATION 4+97.5



MASS DIAGRAM

JOB
SOUTHWEST DISPOSAL

****
***** QUANTITY TOTALS ******
****

ACCUMULATED QUANTITIES
(cubic yards)

CUT	FILL UNCOMPACTED	FILL COMPACTED
33600.0	42040.0	42040.0

****

MASS DIAGRAM ORDINATE
(cubic yards)

STATION	UNCOMPACTED	COMPACTED
0+13	0.0	0.0
0+77.5	-8889.6	-8889.6
0+87.5	-11559.7	-11559.7
1+32.5	-18421.5	-18421.5
2+87.5	-19998.5	-19998.5
4+42.5	-8812.9	-8812.9
4+87.5	-7496.6	-7496.6
4+97.5	-8013.3	-8013.3
5+17	-8440.0	-8440.0

AREAS & VOLUMES

STATION	CUT AREA (sf) VOL (cy)	FILL AREA (sf) VOL (cy)
0+13	0.0	0.0
	1054.4	9944.0
0+77.5	882.7	8325.2
	265.7	2935.9
0+87.5	552.3	7528.4
	1463.3	9325.1
1+32.5	1203.7	2461.7
	9230.3	10807.2
2+87.5	2012.0	1303.4
	16637.0	5451.4
4+42.5	3784.1	595.8
	4063.3	3747.0
4+87.5	1091.9	2700.6
	434.0	950.7
4+97.5	1251.8	2433.4
	452.0	878.7
5+17	0.0	0.0

STATION	COMPACTION RATIO
0+77.5	1.000
0+87.5	1.000
1+32.5	1.000
2+87.5	1.000
4+42.5	1.000
4+87.5	1.000
4+97.5	1.000
5+17	1.000