CONSTRUCTION REPORT
SECOND PHASE
TAILINGS MANAGEMENT SYSTEM

White Mesa Uranium Project
Energy Fuels Nuclear, Inc.
March, 1983

SUA-1358, Docket 40-8681

TABLE OF CONTENTS

List of Tables

List of Figures

1.0 Introduction and Summary

This report provides a summary of the construction activities undertaken by Energy Fuels Nuclear, Inc. (Energy Fuels) at the White Mesa Uranium Mill for the construction of the Second Phase Tailings Management System. The White Mesa Uranium Project is located approximately six miles south of Blanding, Utah and is situated at a relatively flat mesa between Corral Creek on the east and Westwater Creek on the west.

The design of the Initial Phase Tailings Management System was done by D'Appolonia Consulting Engineers and upon the successful completion of the first phase, D'Appolonia was asked to continue with the design for the Second Phase. The Second Phase system is composed of the excavation and lining of Cell 3 between Cell 2 Dike and the Safety Dike (Cell 3 dike) and the construction of the next Safety Dike (Cell 4 dike). Just prior to the completion of the lining and cover placement in Cell 3, a request was made to the NRC to forgo the construction of the Safety Dike (Cell 4 dike). The basis of this request was that the Cell 3 dike had previously been shown to meet NRC Regulatory Guide 3.11 criteria, and therefore a redundant system would not be necessary. The request was approved in the form of Amendment No. 15 to License No. SUA-1358, which added item "g" to Condition No. 26.

With the elimination of the construction of the Cell 3 Safety Dike, the Second Phase constrution consisted only of the excavation of the Cell 3 pond, bottom preparation, Cell lining, and installation of the underdrain system and slimes drain system. The construction of the Cell 3 Dike is not covered in this report as it was a part of the Phase One construction and was addressed in the Initial Phase covered in this report as it was a part of the Phase One construction and was addressed in the Initial Phase Construction Report.

Construction of the Initial Phase System was completed on July 14, 1981. Construction of the Second Phase System was started during July of 1981 and was completed September 15, 1982. All construction was performed by equipment owned and operated by Energy Fuels.

In general, the Second Phase of the Tailings Management System was constructed according to the design plans and specifications as outlined in the Engineer's Report (D'Appolonia, May 1981.) All operations were monitored by qualified Energy Fuels personnel with any changes to the approved design noted in the description, tables or figures of this report.

Harold R. Roberts
Harold R. Roberts, P.E.

2.0 Dike Construction

Construction of the Second Phase Tailings Management System for the White Mesa Uranium Project initially called for the construction of the Cell 3 Safety Dike (Cell 4 Dike) as well as the excavation and lining of Cell 3. The Engineer's Report, D'Appolonia, May 1981 was approved to include the construction of the Safety Dike. During the completion of the Cell 3 lining installation and just prior to the scheduled start of activities for the construction of the Safety Dike, a request was made to the NRC to forgo the completion of this phase of the approved plan due to the existing Cell 3 Dike having been previously shown to meet NRC Regulatory Guide 3.11 criteria, and therefore a redundant system would not be necessary. The request was approved in the form of Amendment No. 15 to License No. SUA-1358, which adds item "g" to License Condition No. 26.

All details pertaining to the construction and operation of the Cell 3 Safety Dike referred to in the approved plans and specifications should be ignored for purposes of the "as-built" system.

No actual work was completed on the construction of the Safety Dike, with the exception of a small amount of topsoil removal.

2.1 License Amendment

A copy of License Amendment No. 15 is attached as Appendix A, which authorized Energy Fuels to exclude the Cell 3 Safety Dike as a part of the completed Second Phase Tailings Management system.

3.0 Cell Construction

Construction activities for the Second Phase of the Tailings Management System at the White Mesa Mill involved the excavation and lining of the Cell 3 tailings storage pond. Energy Fuels personnel were involved throughout the construction and the actual work was done by equipment owned and operated by Energy Fuels.

3.1 Intoduction

In general, the construction of Cell 3 was performed according to the drawings and specifications as set forth in the Engineer's Report (D'Appolonia, May 1981). Variations from these specifications are described herein and drawings of the revised conditions, where appropriate, are included in the Appendices. Construction of Cell 3 began during July 1981 and was completed by September 15, 1982. Major elements of the construction described herein include:

- Topsoil removal
- Soil excavation
- Rock excavation
- Plugging of existing monitor wells
- Preparation of liner bedding
- Underdrain installation
- Liner installation
- Cover placement
- Installation of slimes drain system

Monitoring of the construction operations was performed by authorized and qualified personnel employed by Energy Fuels. These personnel either observed or actually supervised the Cell construction including topsoil stripping, soil excavation, rock excavation, liner bedding preparation, liner placement, joint seaming and cover placement. The liner related operations were supervised by a qualified engineer as well as a respresentative of Watersaver Company, Inc., Denver, Colorado (Watersaver). All individual liner panels were inspected for physical integrity and all factory seams were inspected for minimum bonding requirements. Supervision and inspection of the liner installation and testing of factory and field seams were performed by Watersaver.

3.2 Topsoil Removal

Removal of the topsoil in the Cell 3 area shown on Figure 1 was performed by excavating to a depth of approximately 12 inches below the ground surface. Two 637-D and one 633-D Cat scrapers were utlized to excavate the soil and place it in areas designated as topsoil storage. Signs were placed on the completed topsoil stockpiles for later identification and removal during the reclamation process. The original topsoil stockpiles utilized during the construction of Cell 1-I and Cell 2 were utilized for storage of the topsoil from Cell 3.

3.3 Soil Excavation

Soil, other than topsoil, from within the Cell area was utilized as fill for dike construction and liner cover. Approximately 80,000 yd^3 of soil was used in the construction of Cell 3 Dike (at that time designated Cell 2 Safety Dike) which was constructed in the spring of 1980 prior to mill startup. An additional 145,000 yd^3 of soil excavated from Cell 3 was used as liner cover for the Cell 1-I Evaporation Pond. The remainder of the soil excavated from Cell 3 was stockpiled in areas to the east and west of Cell 3 tailings pond. Care was taken in the removal and stockpiling of the soil to avoid any contamination by large rocks or boulders in order that this soil could be used later for cover material for the Cell 3 liner.

3.4 Rock Excavation

Excavation of rock began upon completion of soil excavation. The rock consisted primarily of sandstone with localized pockets of weathered claystone. Excavation was performed by ripping the surface of the rock in sucessive stages with rippers attached to a Fiat-Allis HD-31 dozer. The rock was then removed with Cat 769 haul trucks and a Cat 988 frontend loader. The rock encountered in Cell 3 was very similar to the material that was excavated from Cell 1-I and Cell 2. Some changes were made in the removal techniques in Cell 3 in order to construct the Cell with contours closer to the original design and to maintain a much more consistent, sloping bottom toward the center and low point of the pond. This involved some work of a drill and blast nature in order to remove the "hard caps" that were encountered. Although the blasting was done only on a limited basis and is not considered to be the preferred method for sandstone removal, it is felt that the method was justified by the end result. The Cell 3 bottom was more consistent and level than the Cell 2 or Cell 1-I bottom and thus enabled the liner installation and cover operations to go more smoothly. This also prevented any unusual amount of liner damage due to the covering operations taking place over erratic surfaces. As experienced in the previous construction, the size of the rock removed from this Cell varied from approximately 6' to coarse sand size. The final Cell contours after completion of excavation are presented on Figure 2.

3.5 Plugging of Existing Monitoring Wells

A total of six existing monitor wells were plugged during the Cell bottom preparation period and after the excavation of the sandstone rock. During the excavation period the well casings were preserved in order to prevent any foreign material from entering the well and jeopardizing the integrity of the plugging operations. After the final excavation each well casing was removed and an area approximately 2 feet deep and 10 feet in diameter was excavated around each of the pairs of monitor wells. This excavation was done in order to install a clay-type cap over the monitor well area after the plugging operations were complete. A concrete grout mixture was then prepared and poured down each of the monitor wells and vibrated into place. Additional concrete was used as any settling occurred and further vibrating was done on each of the wells. After the placement of the concrete, sufficient time was allowed for the concrete to set up and then a clay-type soil was brought in and used to fill each of the previous excavations over the pairs of monitor wells. The surface area was then rolled with the smooth-drum vibrating roller to match the existing contours of the Cell bottom. A seventh well, a water supply well previously used by the landowners for stock watering, was also plugged in a similar manner.

3.6 Preparation of Liner Bedding

After the Cell was excavated to the final contours, a gravel-sand mixture from the rock excavation operation was used in the preparation of the Cell bottom for liner installation. A Ray-Go Ram-Pak Model 65 Self-propelled sheep's foot compacter was used to crush the loose sandstone material down to a consistency of coarse sand. The Ray-Go compacter is equivalent in fuction and weight to a Cat 825 sheep's foot compacter. The final compaction and smoothing of the bedding material was performed with an Ingersoll-Rand SP 48DD, smooth-drum vibratory roller. This method was developed during the construction of Cell 1-I and Cell 2 and proved very successful in establishing a firm, smooth final bedding layer for the liner installation. The Cell bottom was continually inspected during these operations. Work was approved only after numerous passes of the smooth drum roller and sometimes recrushing of the sandstone rock in order to obtain the desired bottom surface. The entire bottom and side slopes of Cell 3 were inspected prior to any placement of lining material. Some areas required the use of washed concrete sand to fill in voids created during the rock removal operations in order to obtain the desired Cell bottom.

3.7 Underdrain Installation

The installation of the underdrain system used for collection and detection of leakage below the liner consisted of:

(1) A 12 inch thick compacted sand layer on the upstream face of the Cell 3 Dike.

(2) A three inch diameter PVC slotted pipe installed at the toe of the sand layer and capped at both ends.

(3) A 12 inch diameter Driscopipe access riser.

The sand blanket placed on the upstream face of the Cell 3 Dike consisted of gravely sand material from the same source as the sand that was installed on the Cell 1-I and Cell 2 tailings dams. The sand was placed on the dam face using a Cat D-6 LGP tractor and then compacted and smoothed using the Ingersoll-Rand smooth-drum vibratory roller. In-place density tests were performed on the compacted sand using a Troxler Model 3411B Nuclear Density Gauge. Three sets of tests were performed along the length of the Cell 3 Dike. These compaction test results are shown as Table 1a, 1b, and 1c. The dry densities ranged from 111.9 to 114.7, and averaged 113.7 pounds per cubic foot. The moisture content ranged from 3.2 to 4.8, and averaged 4.1 percent.

The three inch diameter PVC slotted pipe was installed at the toe of the upstream face of the Cell 3 Dike. At the lowest invert elevation of the drain pipe, a T-connection was installed and an extension to the access riser was made via an additional 90° bend and flanged connection. After the piping connections were complete, large rocks were hand-placed at the bottom of the access riser in order to stablize the installation and avoid having the riser creep down the slope of the dam face. Project photos attached as Appendix E to this report show the installation and rock-fill operations for the underdrain system. Details are also provided on Figure 4, which shows changes made where piping connections were different than the original approved plans and specifications. All piping installation and connections were made prior to any liner installation.

3.8 PVC Liner Installation

Installation of the PVC liner for Cell 3 began on August 17, 1982 and was completed on September 2, 1982 with two full days lost installation time due to inclement weather. Qualified inspection personnel from Energy Fuels and Watersaver were on-site during installation. Actual field supervision of the installation was provided through a cooperative effort between Energy Fuels and Watersaver personnel. During the liner installation, daily inspections were made each morning as to the adequacy of the Cell bottom bedding preparation. All areas were walked and thoroughly inspected prior to any liner installation. Any unusual areas or unacceptable places were repaired prior to placement of any liner material. All field seams were air lanced using a portable 125 cfm air compressor and a full time operator. The air lancing revealed some inadequate field seams which were immediately repaired. The air lancing was conducted 12 to 24 hours after the field seams were made.

Factory seam tests, quality control tests and field seam tests for the liner used in Cell 3 are presented in Appendix B. In addition, Figure 3 shows the numbered panel layout of each specific panel in order to correlate the test results to the actual installed location of a specific panel.

Also included in this construction report are results recently received from B. F. Goodrich of outdoor aging tests for samples of the 30-mil PVC liner material installed in Cell 1-I and Cell 2. These test results are included under Appendix C.

3.9 Liner Cover Placement

As outlined in the Engineer's Report (D'Appolonia May, 1981), the liner cover was to be made up of dewatered tailings sands from the White Mesa Uranium Mill process. The dewatered tailings sands were obtained by the installation of a 24-inch Linatex Separater cyclone and the use of a stacking conveyor. The stacking conveyor was used in order to deposit the dewatered sands into the Cell 3 pond area and still allow for the overflow from the cyclone to drop directly into Cell 2. Due to the high slime content and low sand percentage contained in the ores being run through the White Mesa Mill during the summer of 1982, the quantity of dewatered sand material was not as great as originally hoped for. The dewatering operations were started during July, 1982 and progressed through September. During this period, sufficient quantities of sand were recovered to enable Energy Fuels to cover approximately 30% of the Cell bottom with the tailings sands and also allowed additional material for installation around the slimes drain piping network. In order to facilitate the storage of the dewatered sands prior to the actual Cell completion and lining operations, the northeast corner of Cell 3, covering an area of approximately 5 acres, was lined with PVC liner and the sands directly deposited in this area from the stacking conveyor. This area was then tied into the remaining liner installation during the actual lining operations. The remaining 70% of the tailings Cell liner, as well as all side slopes of the Cell 3 pond, were covered with excavated soil removed from stockpiles located to the east and west of Cell 3. All cover operations, using both dewatered tailings sands and excavated soil, were conducted using frontend loaders and 769 Cat haul trucks. The equipment gained access to the Cell 3 tailings pond by use of a ramp at the southwest corner. The PVC liner for this area was not installed until the covering operation was complete. This was to avoid any mechanical damage to the liner by the continuous travel of the haul trucks. Appendix E, containing project photographs, shows the installation of the tailings sand dewatering system as well as the final installation of the PVC liner on the ramp area of the pond. The cover material was spread onto the pond liner by use of a Cat D-6 LGP dozer with a progressing pad of dewatered tailings sands or soil to protect the PVC liner from damage. An inspector was provided at all times to observe the action and movement of the soil at the dozer blade in order to detect any possible damage that may have occurred to the liner due to the inadvertent placement of large rocks or cemented clumps of soil. Any damaged areas were immediately repaired. During the cover pacement, periodic checks were made to insure that the proper depth of cover was maintained on the Cell bottom and side slopes. Any areas showing substandard cover depths were marked and additional cover was added.

3.10 Installation of Drain System

The slimes drain system is designed to dewater and consolidate the tailings sands. The system was designed similar to the one installed in Cell 2 and consists of 1-1/2 inch and 3 inch diameter slotted PVC pipe connected to a 12 inch diameter Driscopipe riser installed up the slope of the Cell 3 Dike. All slotted sections of the PVC pipe were covered with a 12 inch thick berm of dewatered tailings sands. Attached as Figure 5 is a screen analysis of the cyclone product versus the tailings feed indicating the percentage increase in the sand fraction of the dewatered sand versus the total tailings sands. The 12 inch diameter Driscopipe riser was connected to the PVC pipe via 90° fittings and a flanged connection utilizing 316 stainless steel bolts. Figure 4 is a revised drawing showing the actual layout and installation of the slimes drain system. Just prior to installation, a problem was encountered in that the original design would not allow for gravity flow throughout one-half of the system. Therefore the changes illustrated on Figure 4 were made in order to establish gravity flow throughout the entire system.

4.0 Installation of Monitor Wells

Construction activities for the Second Phase Tailings Management system also included the installation of three additional monitor wells to replace the ones plugged during the construction of the Cell 3 pond.

4.1 Installation Report

Attached as Appendix D is the monitor well Installation Report from D'Appolonia. The wells were drilled by a local contractor with D'Appolonia personnel supervising the installation. The well locations were modified in accordance with the Leak Detection System Evaluation Report (D'Appolonia December, 1981). The monitor well specified as No. 14 in the Second Phase design was renamed No. 13 at the time of installation in order to preserve the number sequence and prevent future confusion. The original No. 13 well was eliminated in the revised well layout in the Leak Detection System Evaluation Report. This renumbering change is incorporated into Figure 1, Second Phase As-Built Construction Plan and D'Appolonia's Installation Report.

LIST OF REFERENCES

D'Appolonia Consulting Engineers, Inc., May 1981, "Engineer's Report, Second Phase Design - Cell 3 Tailings Management System, White Mesa Uranium Project, Blanding, Utah," for Energy Fuels Nuclear, Inc., Denver, Colorado.

D'Appolonia Consulting Engineers, Inc., February, 1982, "Construction Report, Initial Phase - Tailings Management System, White Mesa Uranium Project, Blanding, Utah," for Energy Fuels Nuclear, Inc., Denver, Colorado.

D'Appolonia Consulting Engineers, Inc., December, 1981, "Letter Report, Leak Detection System Evaluation, White Mesa Uranium Project, Blanding, Utah," for Energy Fuels Nuclear, Inc., Denver, Colorado.

TABLE 1a

COMPACTION
TEST DATA

TANDARD COUNTS	
ensity	Moisture
948	449

ENERGY FUELS NUCLEAR, INC.
White Mesa Uranium Project
Taken By [signature]
Date 8/17/82

EST NUMBER	1	2	3	4	5
Area	Cell 3 Dam	Cell 3 Dam	Cell 3 Dam		
Location	400' east of western edge	400' east of western edge	400' east of western edge		
levation	+ 20'	+ 30'	+ 50'		
ode & Depth	DT-12"	DT-12"	DT-12"		
ens. Cnt.	467	646	657		
tre. Cnt.	54	58	47		
oisture	4.5	5.4	3.6		
ry Dens.	114.7	112.8	111.9		
Moisture	3.9	4.8	3.2		
d. Dens.	—	—	—		
t. Mstre.	—	—	—		
Comp.	—	—	—		

ST NUMBER	6	7	8
Area			
ocation			
levation			
de & Depth			
ens. Cnt.			
tre. Cnt.			
oisture			
ry Dens.			
Moisture			
d. Dens.			
. Mstre.			
Comp.			

REMARKS:

Cell 3 Drain Blanket – Leak Detection System

TABLE 1b

COMPACTION TEST DATA

TANDARD COUNTS	
ensity	Moisture
951	451

ENERGY FUELS NUCLEAR, INC
White Mesa Uranium Projec
Taken By [illegible]
Date 8/23/82

EST NUMBER	1	2	3	4	5
Area	Cell 3 dike	Cell 3 dike	Cell 3 dike		
Location	℄ dike	℄ dike	℄ dike		
levation	+ 20'	+ 40'	+ 80'		
de & Depth	DT = 12"	DT - 12"	DT - 12"		
Dens. Cnt.	502	490	473		
tre. Cnt.	48	60	58		
oisture	3.6	5.5	5.4		
ry Dens.	114.2	114.3	114.5		
Moisture	3.2	4.8	4.7		
d. Dens.	—	—	—		
pt. Mstre.	—	—	—		
Comp.	—	—	—		

EST NUMBER	6	7	8
Area			
ocation			
levation			
de & Depth			
ens. Cnt.			
tre. Cnt.			
oisture			
ry Dens.			
Moisture			
d. Dens.			
t. Mstre.			
Comp.			

REMARKS:

Cell 3 Leak Detection System

TABLE 1c

COMPACTION TEST DATA

ENERGY FUELS NUCLEAR, INC.
White Mesa Uranium Project
Taken By [signature]
Date 8/23/82

ANDARD COUNTS	
nsity	Moisture
951	451

ST NUMBER	1	2	3	4	5
Area	Cell 3 dike	Cell 3 dike	Cell 3 dike		
ocation	250' from east	250' from east end	250' from east end		
levation	+ 20'	+ 40'	+ 60'		
de & Depth	DT - 12"	DT - 12"	DT - 12"		
ens. Cnt.	623	505	584		
re. Cnt.	51	53	57		
oisture	4.1	4.6	5.3		
y. Dens.	113.1	114.2	113.8		
Moisture	3.6	4.0	4.7		
. Dens.	—	—	—		
t. Mstre.	—	—	—		
Comp.	—	—	—		

ST NUMBER	6	7	8
Area			
ocation			
evation			
de & Depth			
ens. Cnt.			
re. Cnt.			
oisture			
y Dens.			
Moisture			
. Dens.			
. Mstre.			

REMARKS:

Cell 3 Leak Detection System

[illegible]

SCALE

200 0 200 400 FEET

CONTOUR INTERVAL = 10 FEET

FIGURE 1

AS BUILT

SECOND PHASE GENERAL ARRANGEMENT

BASE MAP TAKEN FROM D'APPOLONIA, SHEET 2 OF 5

SECOND PHASE TAILS SYSTEM DESIGN

ENERGY FUELS NUCLEAR, INC.

DENVER, COLORADO

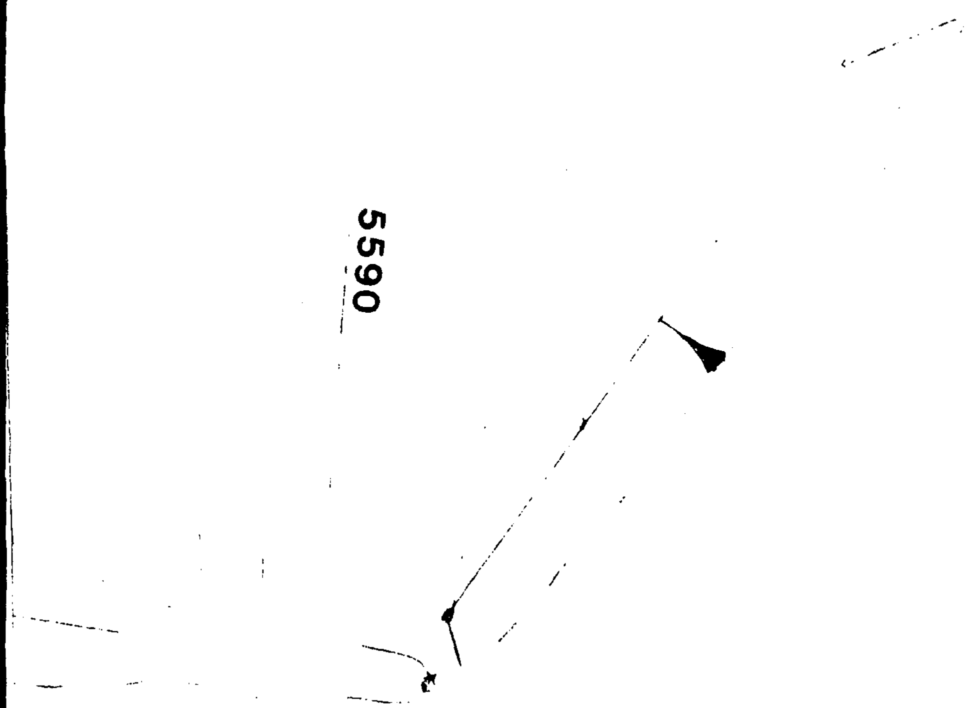


FIGURE 2

ENERGY FUELS NUCLEAR , INC

SECOND PHASE TAILINGS MANAGEMENT SYSTEM

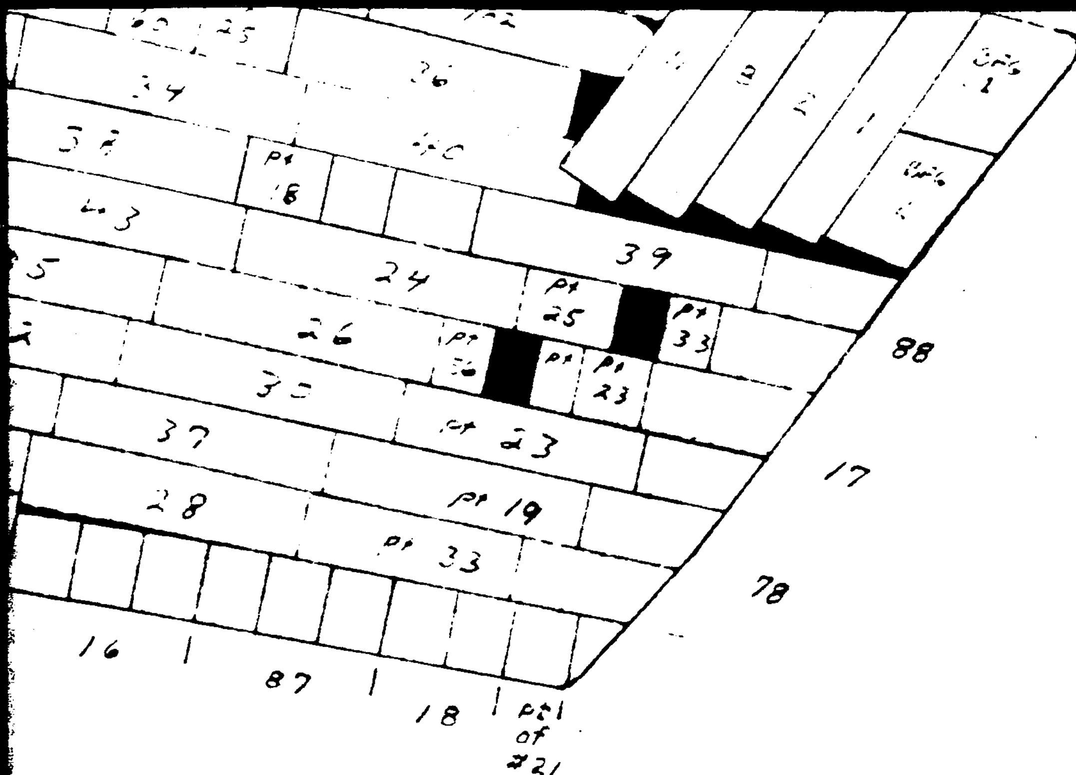


FIGURE 3

SHADED AREA = REMNANTS USED
PT. = PART OF A PANEL

WATERSAVER COMPANY, INC.		
ENERGY FUELS NUCLEAR INC. PVC .030 PANEL NO. LAYOUT		
DATE 9/10/82	DRAWN BY BBJ.	DRAWING NO. CELL #3
APPROVED	SCALE 200-1	1

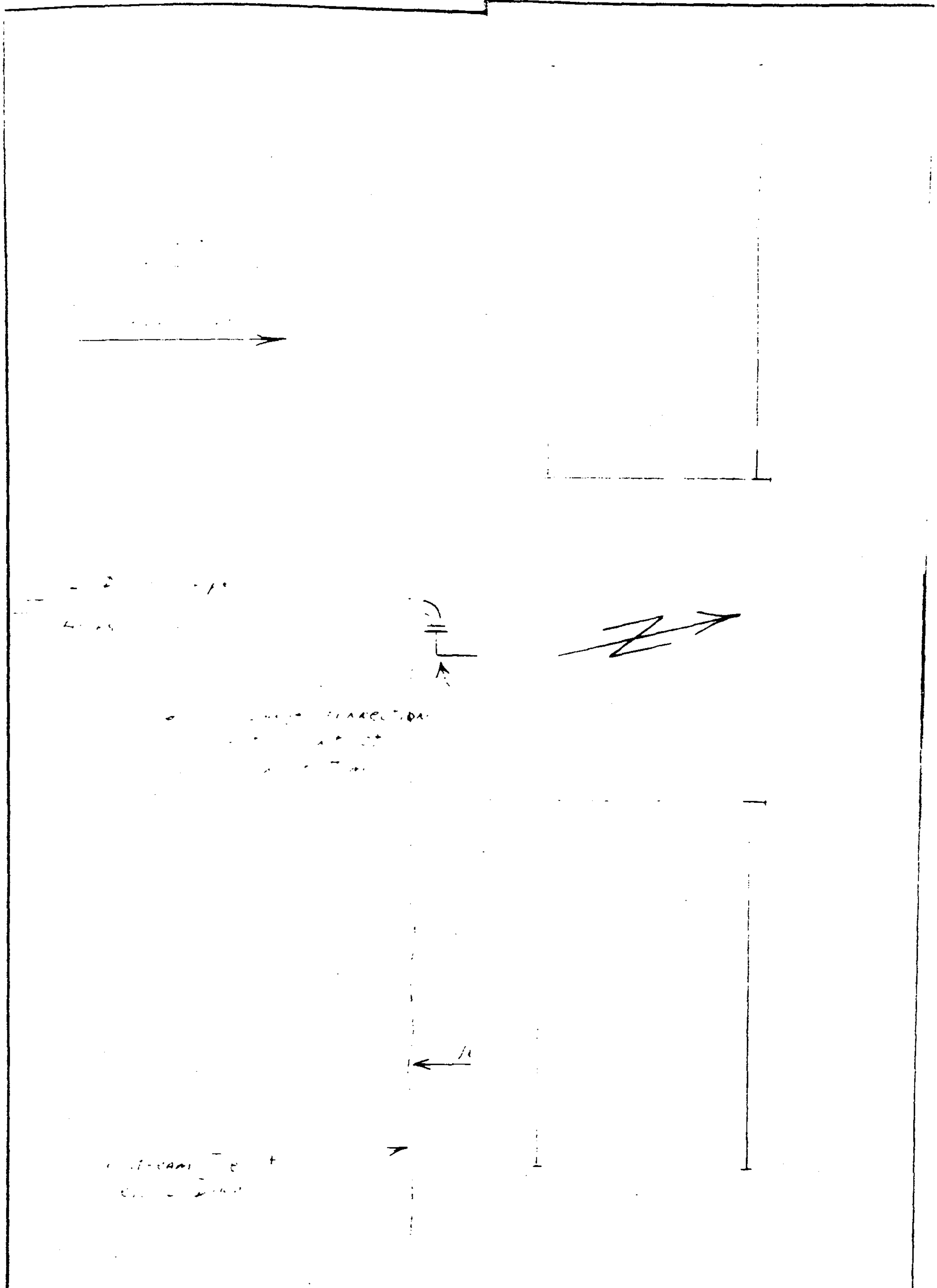
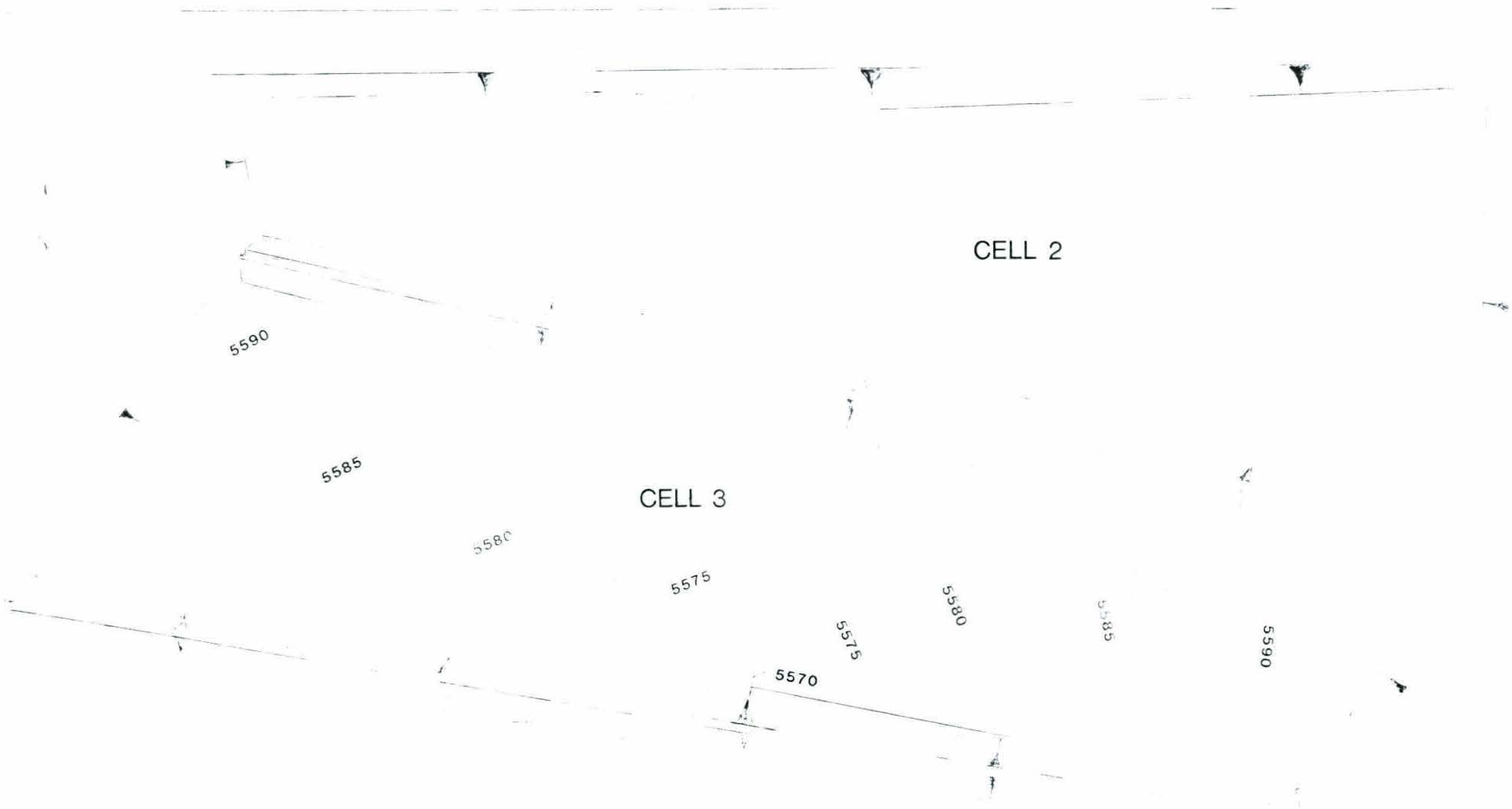


FIGURE 4

FIGURE 1
AS BUILT
SECOND PHASE
GENERAL ARRANGEMENT

BASE MAP TAKEN FROM D'APPOLONIA,SHEET 2 OF 8
SECOND PHASE TAILS SYSTEM DESIGN

ENERGY FUELS NUCLEAR, INC.
DENVER, COLORADO



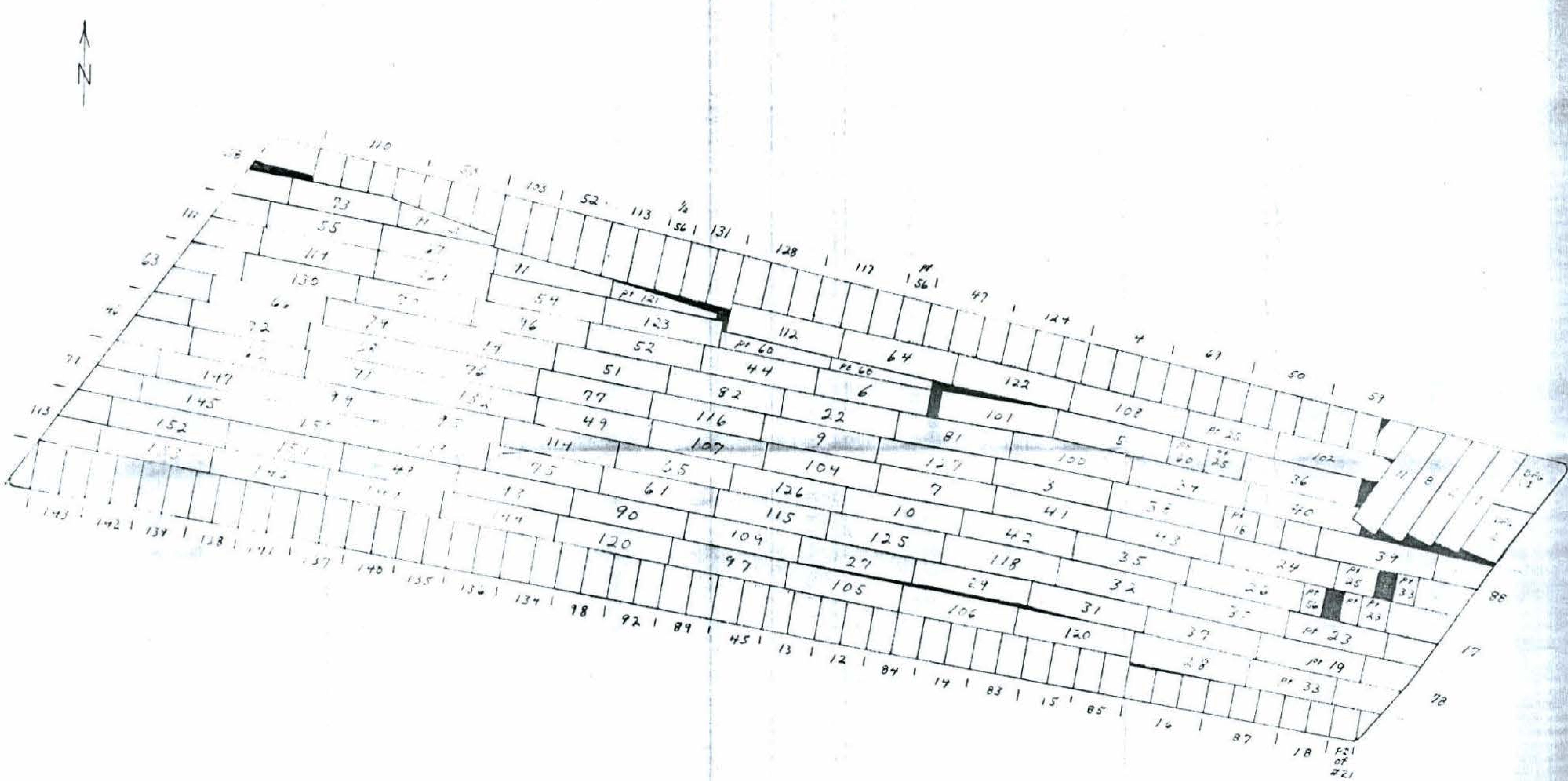
CELL 3 FINAL EXCAVATION CONTOURS

SCALE 1 INCH = 200 FEET

FIGURE 2

ENERGY FUELS NUCLEAR , INC

SECOND PHASE TAILINGS MANAGEMENT SYSTEM



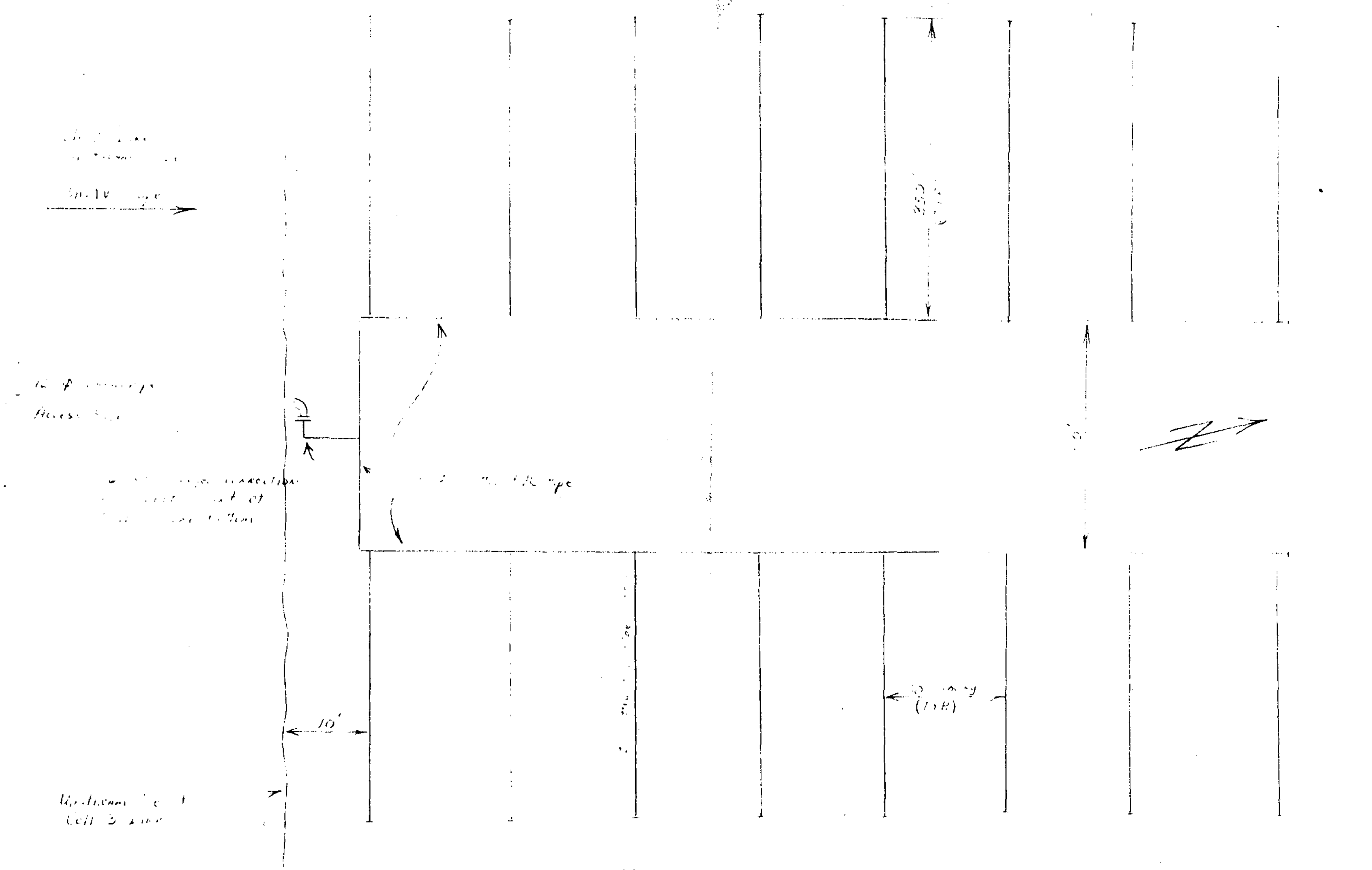
30 MIL PVC LINER

PANEL NO. LAYOUT

FIGURE 3

SHADED AREA = REMNANTS USED
PT. = PART OF A PANEL

WATERSAVER COMPANY, INC.		
ENERGY FUELS NUCLEAR INC.		
PVC .030 PANEL NO. LAYOUT		
DATE 9/10/82	DRAWN BY DBJ.	DRAWING NO. CELL #3
APPROVED	SCALE 200=1	1



PLAN VIEW

SLIMES DRAIN SYSTEM

REVISED PIPING LAYOUT

NO SCALE

FIGURE 4

FIGURE 5

MEMORANDUM

DATE: SEPTEMBER 27, 1982

TO: G. F. RICHARDS, MILL SUPERINTENDENT

FROM: PERRY ALLEN, MILL METALLURGIST

SUBJECT: TAILINGS CYCLONE.

A sample of the tailings cyclone was taken on September 22, 1982, and a screen analysis run. Samples of the overflow, underflow, and CCD underflow were taken.

	- % On Screen -			- Tons/Hr. In Stream* -	
	FEED	OVERFLOW	UNDERFLOW	OVERFLOW	UNDERFLOW
+ 50	14.0	1.1	51.6	.7	20.4
+100	30.9	23.1	32.6	14.0	12.9
+200	28.7	35.0	10.5	21.1	4.2
+325	6.6	8.5	1.5	5.1	.6
-325	19.8	32.2	3.9	19.5	1.5
TOTAL:	100.0	99.9	100.1	60.4	39.6
% Solids Measured	52%	29%	82%		
% Solids Actual	44.6%	21.9%	79.2%		

% solids were measured with a Marcy bucket as shown in the table. However, a feed solution density of 1.090 means that the % solids measured should be changed to actual % solids as shown. Tons/Hr. in the overflow and underflow streams were based on a 100 Ton/Hr. feed rate.

Perry Allen, Mill Metallurgist

PA/nch

xc: D. K. Sparling
M. W. Gallagher
S. Palmer

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 30 1982

WMUR:DMG
Docket No. 40-8681
SUA-1358, Amendment No. 15

Energy Fuels Nuclear, Inc.
Three Park Central, Suite 900
1515 Arapahoe
Denver, Colorado 80202

Gentlemen:

Pursuant to Title 10, Code of Federal Regulations, Part 40, and in accordance with your submittal dated September 2, 1982, and conclusions reached during our meeting with Energy Fuels Nuclear (EFN) on September 13, 1982, Source Material License No. SUA-1358 is hereby amended by adding item "g" to License Condition No. 26 as follows:

26 (g) Notwithstanding any conflicting information in the submittals referenced in items "f" and "g" of License Condition No. 25, the licensee shall be allowed to forgo the construction of the Cell 3 Safety Dike (Cell 4 Dike). This construction change shall not affect the installation or the location of groundwater monitoring well No. 14.

The rest of License Condition No. 26, and all other conditions of the license shall remain the same.

The above addition to the license has been discussed between Mr. C. E. Baker of EFN and Mr. D. Gillen of my staff in a September 20, 1982 telephone conversation. The effect of this amendment is to authorize the elimination of the Cell 3 Safety Dike (Cell 4 Dike) from the second phase of the tailings retention system. The existing Cell 3 Dike has previously been shown to meet NRC Regulatory Guide 3.11 criteria, and therefore a redundant system is not necessary.

FOR THE NUCLEAR REGULATORY COMMISSION

R. Dale Smith, Chief
Uranium Recovery Licensing Branch
Division of Waste Management

CC: Mr. Dee C. Hansen, Utah
State Engineers Office

WATERSAVER DENVER

Established 1948

WATERSAVER COMPANY, INC.

P.O. BOX 16465 DENVER, COLORADO 80216 (303) 623-4111

Plant and Office — 5870 E. 56th Avenue, Commerce City, Colorado 80022

TWX 910-931-0433

September 20, 1982

Mr. Harold Roberts
Energy Fuels Nuclear, Inc.
3 Park Central, Suite 900
Denver, Colorado 80202

Dear Mr. Roberts:

Attached are the field seam test results from Cell #3. Also, the panel no. layout drawing.

Tests were made from a 1" wide die cut specimen. These samples were cut to a length so the jaw separation was 2" from either side of the seam edge. Tester was run at 20" per min.

The attached test results are based on percent of specified material strength.

I want to take this opportunity to thank you, Lynn, and the entire staff and crew at Blanding for the exceptional cooperation and help to make a job of this magnitude run so smoothly, and the desired results accomplished in the scheduled time.

Thank you.

Very truly yours,

WATERSAVER COMPANY, INC.

Bill B. Lambert
Bill B. Lambert
Chief Engineer

BBL:la

attachment:

WATERSAVER COMPANY, INC.

TENSILE TEST REPORT

JOB: ENERGY FUELS NUCLEAR, INC. DATE: 8/24/82

MATERIAL: PVC .030 BY: Bill B. Lambert

TEST #	PANEL NUMBER	PANEL NUMBER	SEAM PULL	MATERIAL VALUE	SEAM % OF MATERIAL VALUE
1	139	153	66	66	100
2	48	149	55.5	66	84
3	97	90	56	66	85
4	132	95	59	66	89
5	147	99	60.5	66	92
6	74	70	60	66	91
7	111	130	59.5	66	90
8	62	72	58	66	88
9	79	145	56	66	85
10	129	96	62	66	94
11	121	69	65	66	98
12	91	57	59.5	66	90
13	51	116	58	66	88
14	90	61	62.5	66	95
15	47	64	53.5	66	81
16	107	9	67.5	66	102
17	101	100	58.5	66	89
18	7	42	68	66	103
19	41	38	64	66	97
20	125	36	69	66	105

NOTES:

WATERSAVER COMPANY, INC.

TENSILE TEST REPORT

JOB: ENERGY FUELS NUCLEAR, INC. DATE: 9-10-82

MATERIAL: PVC .030 BY: Bill B. Lambert

TEST #	PANEL NUMBER	PANEL NUMBER	SEAM PULL	MATERIAL VALUE	SEAM % OF MATERIAL VALUE
21	34	5	65.5	66	99
22	43	35	66	66	100
23	109	115	60.5	66	92
24	84	14	63	66	95
25	104	126	57.5	66	87
26	33	25	67	66	102
27	17	78	65	66	98
28	12	13	62	66	94

NOTES: 28 field seam tests, job average 93.32%

CUSTOMER: Watersaver Co.

THICKNESS: .030

TEST REPORT DATE: 8/13/82

HARTE ORDER NO: 100424 *

COLOR NO: 97 black

PRODUCED WEEK OF: 7/31/82

PRODUCT NO: 450-1952

PROPERTY		SPECIFICATION	TEST VALUE	TEST METHOD
Thickness, inches		.030 ± 5%	.0296	ASTM D-1593
Specific Gravity		1.23 min	1.24	ASTM D-792
Tensile Strength (psi)	MD	2200	2673	ASTM D-882
	TD	2200	2452	
100% Modulus (psi)	MD	1000	1222	ASTM D-882
	TD	1000	1142	
Elongation %	MD	325	409	ASTM D-882
	TD	325	417	
Elmendorf Tear (gms/mil)	MD	6000	6091	ASTM D-689
	TD	6000	6182	
Graves Tear	MD	8.25	11.1	ASTM D-1004
	TD	8.25	11.8	
Low Temperature Impact		-20°F	pass	ASTM D-1790
Volatility % loss max		0.75	0.74	ASTM D-1203
Water Extraction % loss max		0.15	0.1	ASTM D-1239
Dimensional Stability	MD	5.0	-2.2	ASTM D-1204
% change max	TD		+0.6	(15 min @ 100°C)

RHD/cc

* Rolls tested - #2150, 2170, 2190, 2210, 2230, 2250, 2270, 2290, 2305, 2330, 2355

Richard H. Dickinson

Richard H. Dickinson
Technical Marketing Manager
9/3/82

CUSTOMER: Watersaver Co.

THICKNESS: 30 mils

TEST REPORT DATE: 8/23/82

HARTE ORDER NO: 47521 *

COLOR NO: 97 black

PRODUCED WEEK OF: 8/3/82

PRODUCT NO: 450-1952

PROPERTY		SPECIFICATION	TEST VALUE	TEST METHOD
Thickness, inches		.030 ± 5%	.0303	ASTM D-1593
Specific Gravity		1.23 min	1.24	ASTM D-792
Tensile Strength (psi)	MD	2200	2530	ASTM D-882
	TD	2200	2361	
100% Modulus (psi)	MD	1000	1119	ASTM D-882
	TD	1000	1045	
Elongation %	MD	325	413	ASTM D-882
	TD	325	429	
Elmendorf Tear (gms/mil)	MD	6000	6110	ASTM D-689
	TD	6000	6440	
Graves Tear	MD	8.25	10.8	ASTM D-1004
	TD	8.25	10.6	
Low Temperature Impact		-20°F	pass	ASTM D-1790
Volatility % loss max		0.75	0.45	ASTM D-1203
Water Extraction % loss max		0.15	0.10	ASTM D-1239
Dimensional Stability % change max	MD	5.0	-2.0	ASTM D-1204
	TD		+0.6	(15 min @ 100°C)

RHD/cc

* Rolls tested - #2360, 2400, 2420, 2440, 2459, 2483

Richard H. Dickinson

Richard H. Dickinson
Technical Marketing Manager

Dynamit Nobel

DYNAMIT NOBEL OF AMERICA INC. 10 LINK DRIVE, ROCKLEIGH, NEW JERSEY 07647 PHONE (201) 767-1660 TELEX 135-240

February 18, 1983

Mr. Jim Bryan
Watersaver Company, Inc.
P.O. Box 16465
Denver, Colorado 80216

Dear Jim:

Attached is the addendum to test reports dated 8-13-82 and 8-23-82, re, Harte order number 100424 and 47521 respectively, both of which were signed and reported on 9-3-82.

Very truly yours,

Richard H. Dickinson

Richard H. Dickinson
Technical Marketing Manager

RHD:la

attachment

r	Roll #	Specific Gravity	Tensile Strength,psi	Modulus,psi MD/TD	Elongation %	Volatility % loss	Water Extraction % loss	Low Temp Impact C-20^{o}F	Graves Tear lbs MD/TD	Dimensional Stability % change MD/TD
4	2150	1.24	2676/ 2410	1201/ 1051	410/ 440	0.70	0.58	Pass	10.9/ 11/3	-2.0/ +0.5
	2170	1.24	2772/ 2593	1338/ 1186	402/ 424	0.63	0.43	"		-2.0/ +0.5
	2190	1.25	2749/ 2469	1277 1166	406/ 414	0.75	0.43	"	11.5/ 12.0	-2.5/ +0.5
	2210	1.25	2694/ 2442	1299 1136	386 422	0.71	0.42	"		-3.7/ +1.2
	2230	1.24	2693/ 2495	1272/ 1208	390/ 400		0.49	"	10.8/ 11.8	-2.0/ +0.5
	2250	1.24	2533/ 2442	1186/ 1130	406/ 410	0.59	0.65	"		-2.5 +0.5
	2270	1.27	2757/ 2473	1130/ 1216	410/ 428	0.71	0.53	"	11.4/ 11.8	-2.0/ +0.5
	2290	1.24	2554/ 2350	1096/ 1083	428/ 422		0.38	"		-2.5/ +0.5
	2305	1.24	2632/ 2355	1158/ 1132	419/ 408	0.65	0.61	"	12.1/ 12.9	-2.0/ +2.0
	2330	1.25	2680/ 2458	1205/ 1125	416/ 422		0.54	"		-2.0/ +0.5
	2355	1.24	2619/ 2577	1160/ 1070	428/ 455	0.74	0.12	"	13.9/ 13.5	-2.5/ 0.5
1	2360	1.23	2457/ 2171	1060/ 1016	430/ 414	0.43	.38	Pass	12.8/ 12.1	-2.5/ +0.5
	2400	1.25	2656/ 2514	1209/ 1145	406/ 426	0.47	.41	"		-2.0/ +0.5

Roll #	Specific Gravity	Tensile Strength,psi	Modulus,psi MD/TD	Elongation %	Volatility % loss	Water Extraction % loss	Low Impact C-20°F	Graves Tear lbs MD/TD	Dimensional Stability % change MD/TD
2420	1.24	2552/ 2307	1131/ 1024	402/ 428	0.41	0.33	Pass	12.1/ 11.4	-2.5/ +0.5
2440	1.24	2376/ 2322	1040/ 960	414/ 448	0.48	0.55	"		-2.0 +0.5
2459	1.24	2420/ 2540	1084/ 1018	412/ 463	0.72	0.51	"	10.7/ 10.0	-2.0/ +0.5
2483	1.24	2633/ 2451	1074/ 1020	463/ 432	0.71	0.55	"	10.8/ 11.2	-2.0/ +0.5

Dynamit Nobel-Harte, Inc.

16 EAST 34TH STREET • NEW YORK, N.Y. 10016
(212) 481-1200 • CABLE AQUASILK, N.Y.

WATERSAVER MEMBRANE LINER SEAM STRENGTH DETERMINATIONS

LINER PANEL NUMBER	DATE TESTED*	AVERAGE SEAM STRENGTH**
EM12	8/5/82	90.2%
EM36	8/5/82	86.3%
EM24	8/7/82	89.9%
EM48	8/7/82	89.7%
EM60	8/7/82	90.2%
EM72	8/11/82	89.1%
EM153	8/23/82	87.3%
EM84	8/24/82	94.4%
EM96	8/25/82	92.6%
EM144	8/25/82	93.4%
EM120	8/27/82	84.2%
EM108	8/30/82	92.1%
EM132	8/31/82	84.5%

* Dynamit Nobel - Harte, Inc's Laboratory is approved by the United States Federal Government under the auspices of the Defense Logistics Agency, Headquarters Defense, Personnel Support Center, 2800 South 20th Street, Philadelphia, PA 19101 to perform these tests.

** Test specimens were selected at random from the 10 seams in each panel sample that was submitted. The seam strengths are expressed as a percentage of specified material strength and were tested per ASTM D-882 "modified". This modification to the ASTM procedure was to allow for the width of the seam, i.e., the Instrom tensile test machine grip separation was set at 4" plus the seam width. The seam sample was positioned so that each edge of the seam was 2" from the edge of both sides of the seam. The strain rate was set at 20"/min per ASTM D-882 for .030" thick PVC.

Certified for Dynamit Nobel - Harte, Inc. by

Richard H Dickinson 9-3-82

Richard H. Dickinson
Technical Marketing Manager
9/3/82

RHD/cc/9-3-82

BFGoodrich

The BFGoodrich Company
Engineered Products Group
500 South Main Street
Akron, Ohio 44318

Address Reply To:
Dept. 1914
Bldg. WHB-3

January 21, 1983

Mr. Harold Roberts
Energy Fuels Nuclear, Inc.
3 Park Central - Suite 900
Denver, CO 80202

Dear Mr. Roberts:

LABORATORY TEST REPORTS - BLANDING, UTAH PROJECT

Please find enclosed two (2) copies of lab testing reports after one year of outdoor aging on samples of 30 mil unsupported PVC pond liner sheet used in the Energy Fuels Nuclear installation.

If you have any questions on these results, please feel free to contact Mr. T. R. Ward at 614/373-6611 or myself at 216/374-3565.

Very truly yours,

L. N. Cifoni

L. N. Cifoni
Product Specialist
Environmental Products

jms
Enc.

cc: K. J. Gray
T. R. Ward

BFGoodrich

The BFGoodrich Company
Engineered Products Group
Oak Grove
P.O. Box 657
Marietta, Ohio 45750
373-6611

December 28, 1982

CERTIFICATION

I certify that the attached test report reprsents the testing of the BFGoodrich Company on samples of 30 mil unsupported PVC pond liner sheet used in the Energy Fuels Nuclear installation after one year of outdoor aging in Arizona at forty-five degrees due South. The exposure was for 1945 sun hours (184,706 Langleys).

BFGoodrich Company
Industrial Products Division

Thomas R. Ward
Sr. Product Engineer

TRW:mbf

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 28th day of December 1982.

Notary Public in and for said County

Mary M. Farnsworth
My Comm. Expires August 31, 1987

BFGoodrich

The BFGoodrich Company
Engineered Products Group

Oak Grove
P.O. Box 657
Marietta, Ohio 45750
373-6611

December 28, 1982

LABORATORY TEST REPORT

ONE YEAR ARIZONA OUTDOOR EXPOSURE

Product Number: 64-03-3730-92-3
Description : 30 Mil Unsupported PVC
Customer : Energy Fuels Nuclear

Roll Number		Tensile Strength(psi)	100% Modulus(psi)	Elongation(%)
170012	L	2731	1498	445
	T	2480	1412	437
170053	L	2785	1520	450
	T	2634	1466	468
178181	L	2618	1352	433
	T	2499	1282	453
178222	L	2723	1475	443
	T	2588	1443	465
263412	L	2424	1402	427
	T	2695	1526	438
271181	L	2446	1478	390
	T	2516	1426	450
271223	L	2714	1412	510
	T	2442	1229	497
271265	L	2708	1771	430
	T	2472	1375	458
271307	L	3164	1455	580
	T	2603	1455	477
271349	L	2795	1532	560
	T	2549	1352	495
271391	L	2651	1482	453
	T	2514	1487	427
281739	L	2497	1324	427
	T	2448	1278	475
281789	L	2775	1588	453
	T	2750	1553	460

BFGoodrich

The BFGoodrich Company
Engineered Products Group
Oak Grove
P.O. Box 657
Marietta, Ohio 45750
373-6611

December 28, 1982

LABORATORY TEST REPORT

ONE YEAR ARIZONA OUTDOOR EXPOSURE

Roll Number		Tensile Strength(psi)	100% Modulus(psi)	Elongation(%)
281831	L	2768	1507	460
	T	2499	1486	430
282857	L	2611	1615	403
	T	2525	1524	410
282875	L	2779	1633	425
	T	2594	1579	430
282917	L	2665	1638	402
	T	2655	1571	445
284049	L	2672	1430	620
	T	2525	1262	500
284091	L	2537	1422	480
	T	2441	1293	487
285138	L	2658	1555	440
	T	2450	1350	460
285175	L	2430	1271	415
	T	2375	1193	490
286303	L	2610	1337	450
	T	2424	1274	463
286344	L	2385	1226	475
	T	2388	1277	475

Results are average of 3 test specimens.

BFGoodrich Company
Industrial Products Division

Thomas R. Ward

Thomas R. Ward
Sr. Product Engineer

THE STATE OF OHIO, COUNTY OF WASHINGTON, SS:

Subscribed in my presence and sworn to before me this 28th day of December, 1982.

Mary M. Farnsworth

D'APPOLONIA
CONSULTING ENGINEERS, INC.

November 1, 1982

Project No. RM82-2039

Dr. C. E. Baker
Energy Fuels Nuclear, Inc.
Three Park Central, Suite 900
1515 Arapahoe Street
Denver, Colorado 80202

Well 11, 12 and 13 Installation Report
White Mesa Uranium Project
Blanding, Utah

Dear Dr. Baker:

Ground water monitoring Wells 11, 12 and 13 were installed downgradient of tailings Cell 3 during October 20-25, 1982. These wells constitute the Cell 3 operational phase ground water monitoring program requirements as given in the Second Phase Design - Cell 3 Report (D'Appolonia, May 1981) and modified in the Leak Detection System Evaluation Report (D'Appolonia, December 1981). The wells were planned with the same installation details as existing Well 5. Orders for well materials and arrangements for the drilling contractor were made by Energy Fuels and installation of the wells was directed and monitored by D'Appolonia. Wells 11 and 12 are located on Cell 3 Dike about 700 feet east and 1000 feet west of Well 5, respectively. Well 13 is located near the center of the previously proposed Cell 4 Dike. Surveyed coordinates and elevations of these wells are not available at this time.

Drilling and logging of all three boreholes and the installation and development of Wells 11 and 13 occurred between October 20 and 22, 1982. The installation details and brief subsurface descriptions for Wells 11 and 13 are given on Figures 1 and 3, respectively. Completion of Well 12 was delayed until October 25, 1982 due to a lack of supplies. Completion details were specified by D'Appolonia prior to leaving the site on October 22, 1982. Completion was performed by mill personnel and the details are given on Figure 2.

With regard to water quality sampling and well longevity, the following recommendations are made:

- o Additional cleaning of the wells, prior to sampling, is recommended; this should be done by air lifting to avoid undue wear on a pump from suspended solids in the water.

- o A protective steel casing, similar to that around the other wells should be installed on each new well. The steel casings protect against losing the well.

- o The well casing should be capped to keep foreign materials from falling in and contaminating the water or plugging the well.

If you have any questions or require additional information, please contact us.

Very truly yours,

Kathleen M. Maddock
Kathleen M. Maddock
Hydrogeologist

Corwin E. Oldweiler
Corwin E. Oldweiler
Project Engineer

CEO:KMM:par

cc: H.R. Roberts, Energy Fuels, Denver
D.K. Sparling, Energy Fuels, Blanding
B.K. Reaveau, Energy Fuels, Blanding

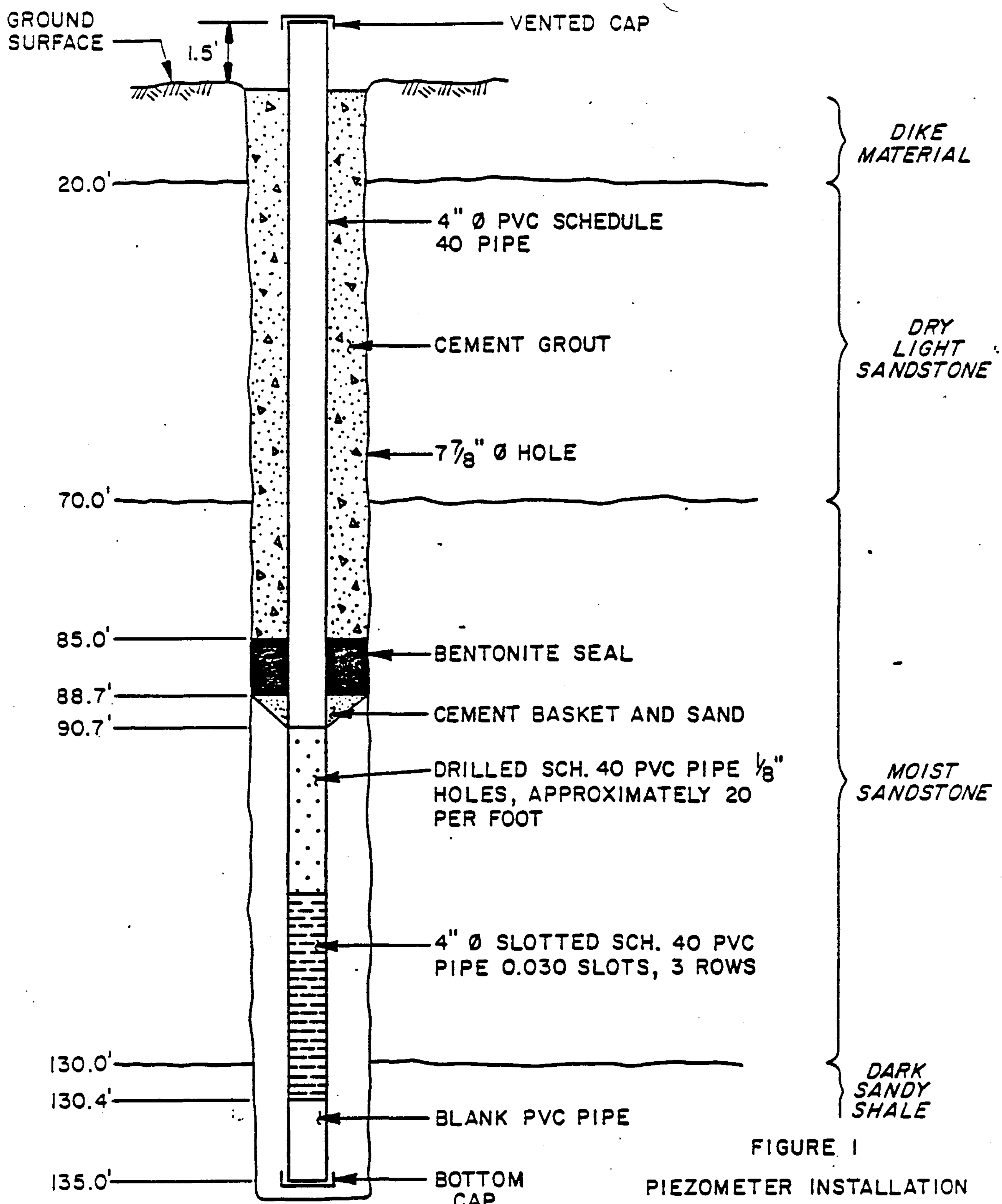


FIGURE I

PIEZOMETER INSTALLATION

WELL NO. 11

CONSTRUCTION DETAILS

PREPARED FOR

ENERGY FUELS NUCLEAR, INC.

DENVER, COLORADO

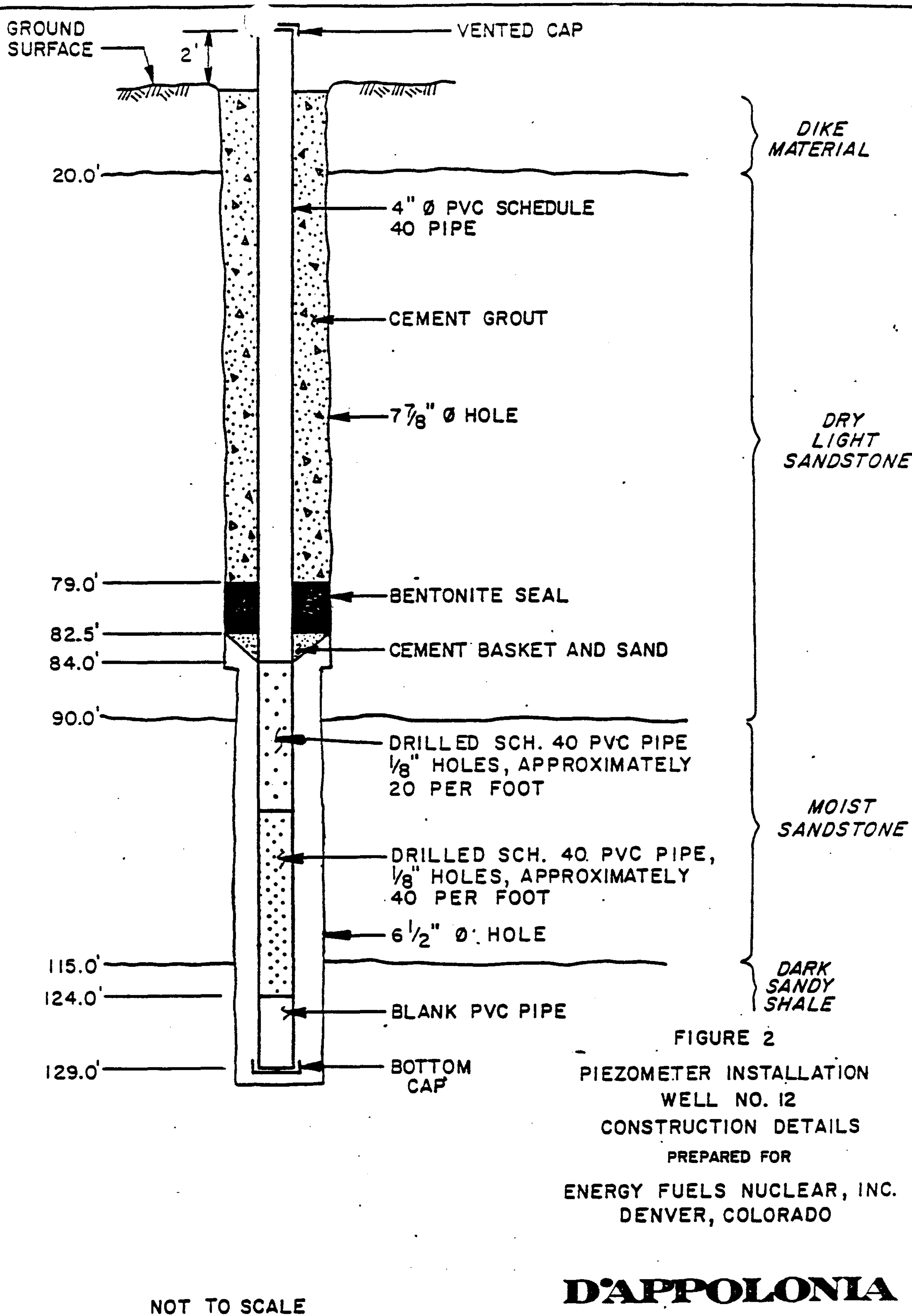


FIGURE 2

PIEZOMETER INSTALLATION
WELL NO. 12
CONSTRUCTION DETAILS

PREPARED FOR

ENERGY FUELS NUCLEAR, INC.
DENVER, COLORADO

D'APPOLONIA

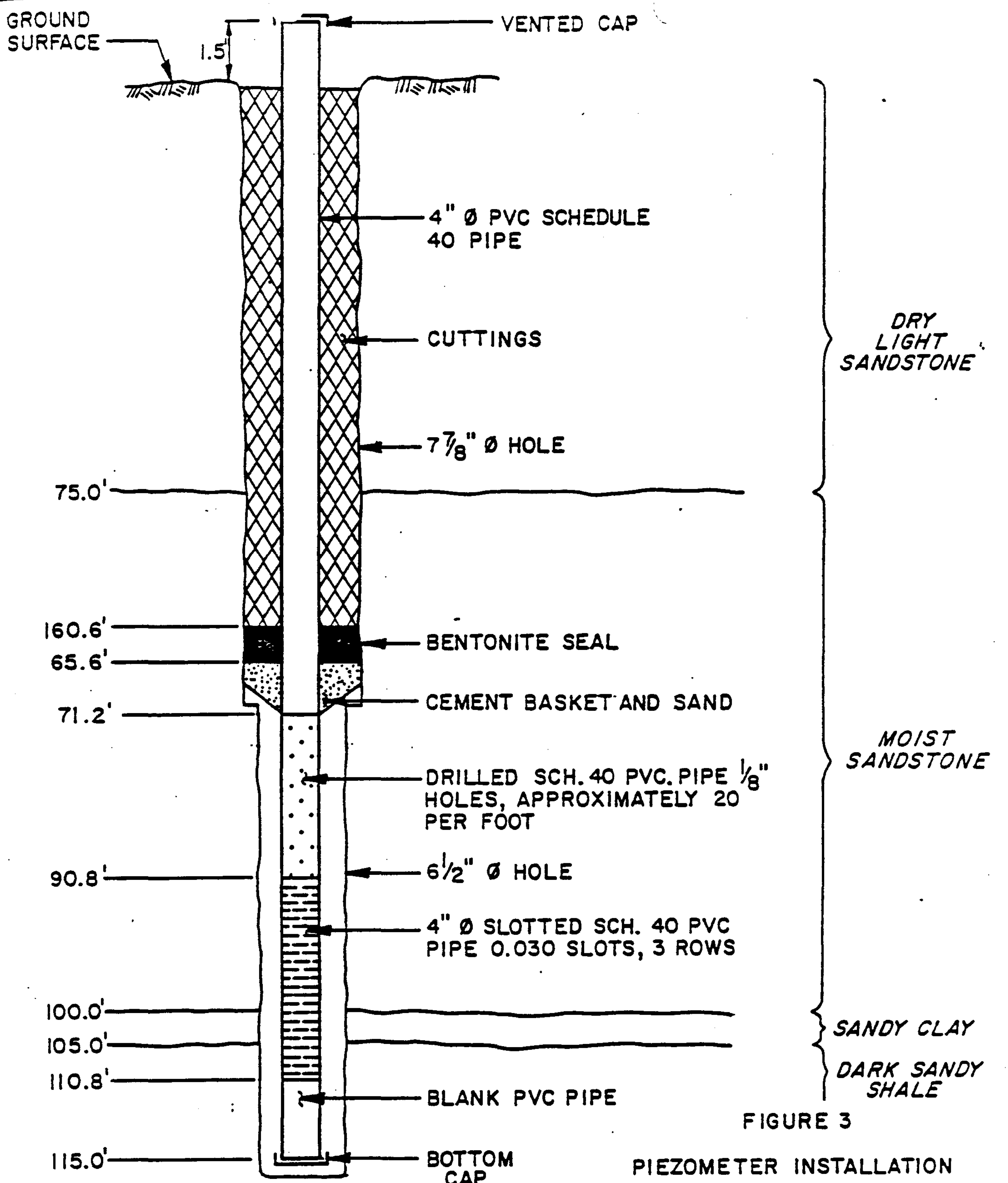


FIGURE 3

PIEZOMETER INSTALLATION
WELL NO. 13
CONSTRUCTION DETAILS

PREPARED FOR

ENERGY FUELS NUCLEAR, INC.
DENVER, COLORADO

D'APPOLONIA

NOT TO SCALE

APPENDIX E

Cell 3 Tailings Pond - Bottom Preparation

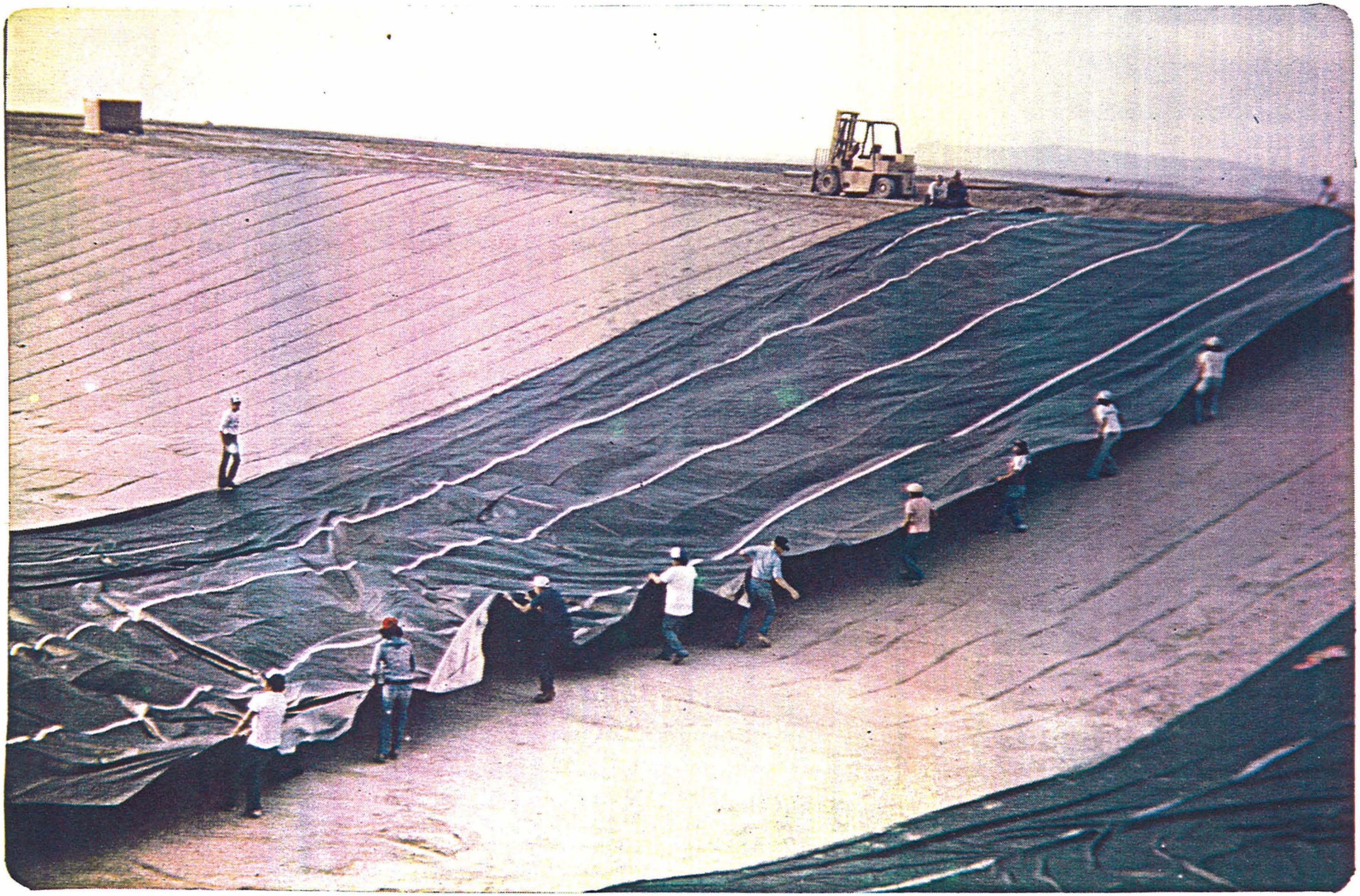
Cell 3 - Underdrain Installation

Cell 3 - Underdrain Installation and Bottom Preparation

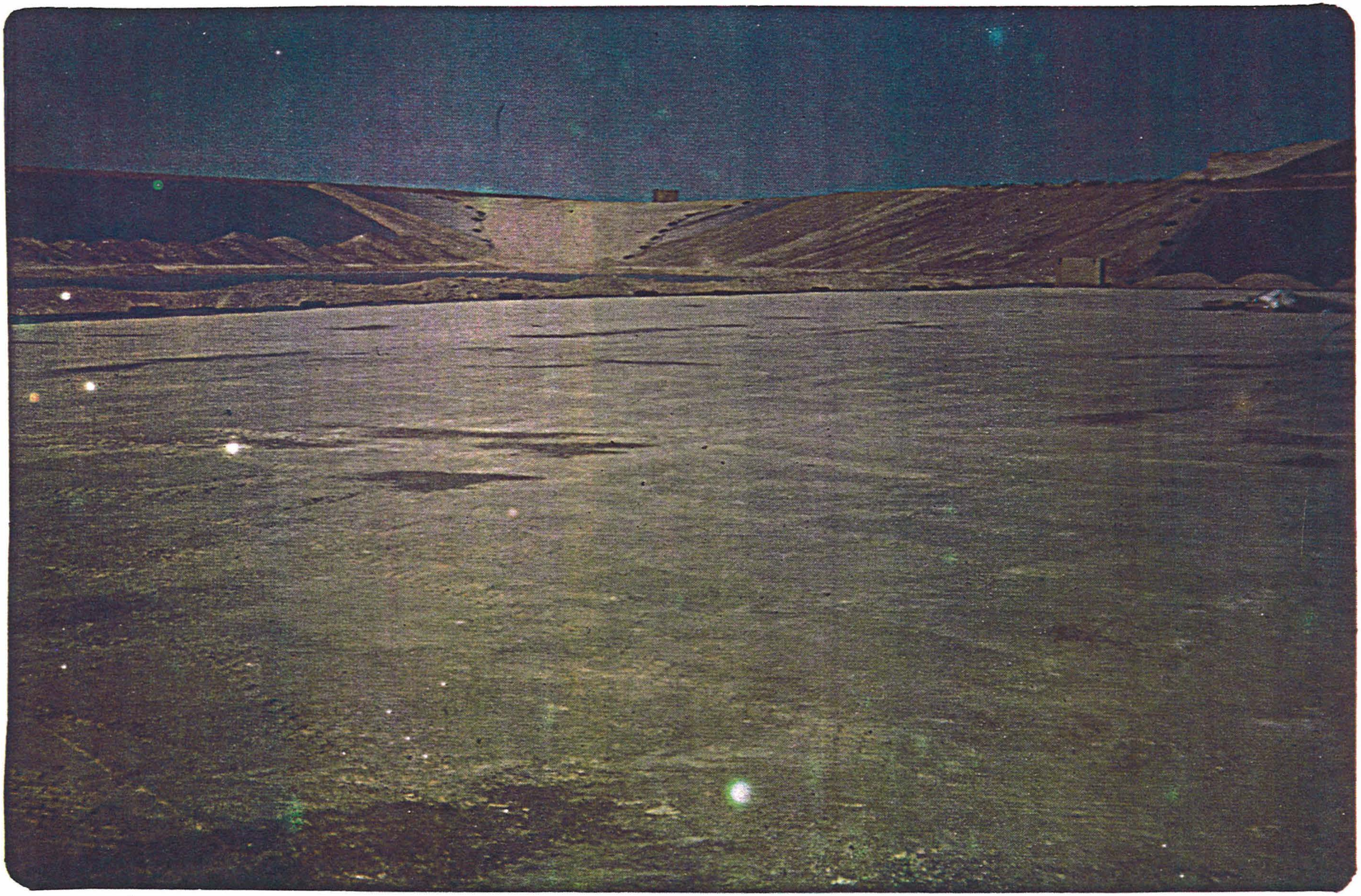
Cell 3 - Underdrain Installation

Cell 3 - Installation of Underdrain Access Riser

Cell 3 - Underdrain System, Final Piping Tie-in and Rock Stabilization



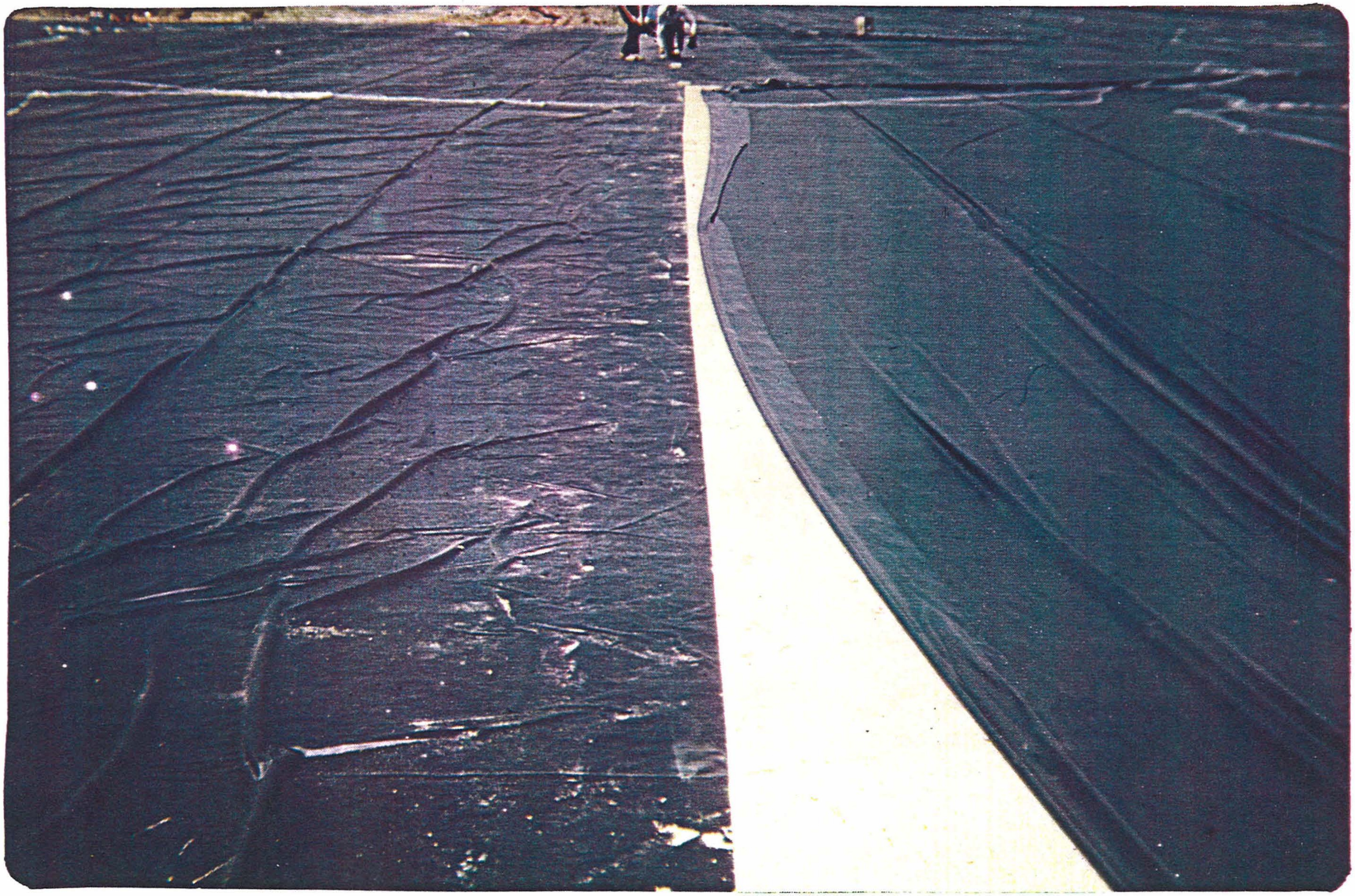
Cell 3 - PVC Liner Installation on Dike Face



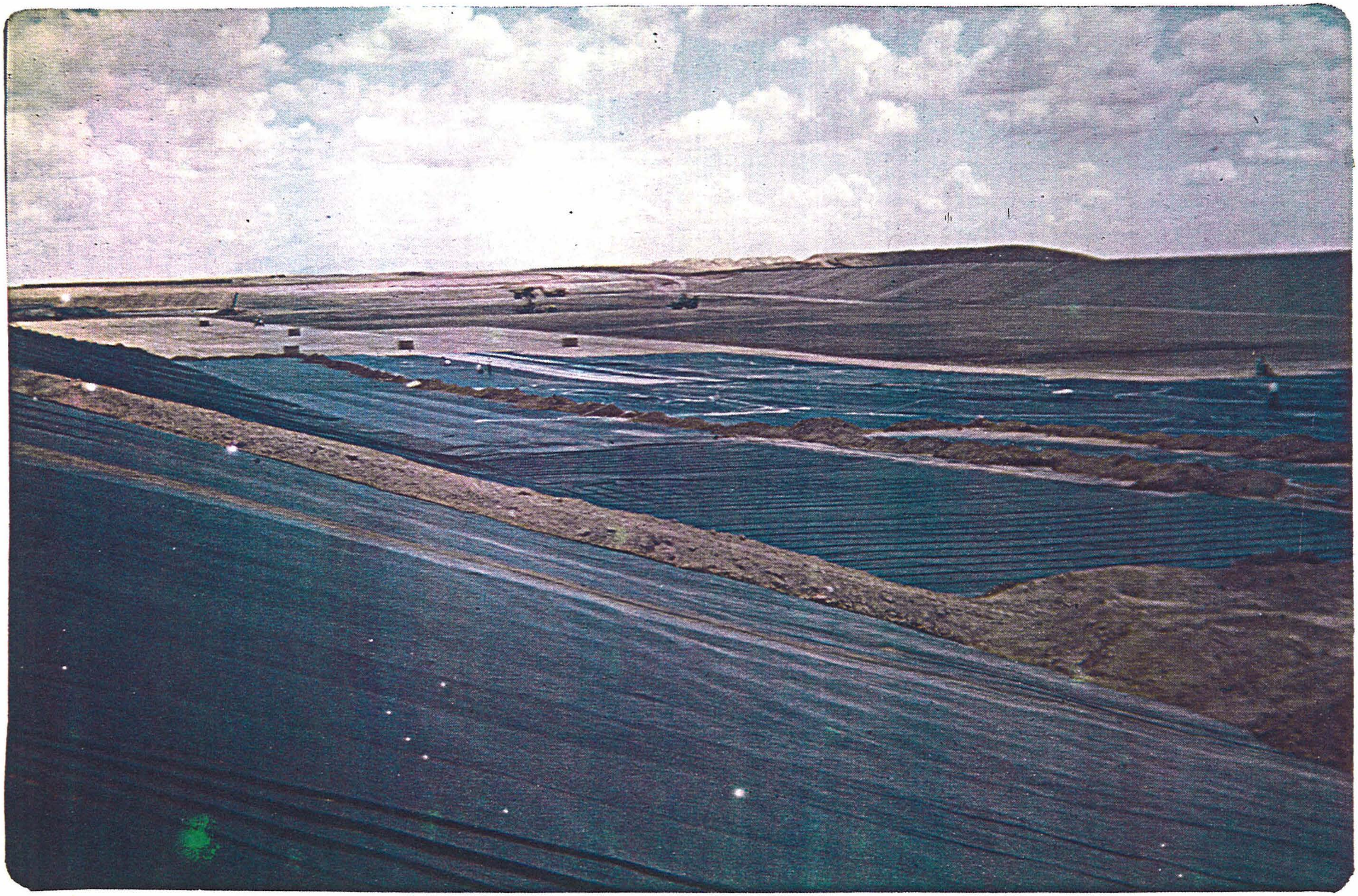
Cell 3 - Liner Installation and Start of Covering Operations

Cell 3 - Liner Installation, approximately 50% complete.
(Note storage area for dewatered tailings sands - lower right)

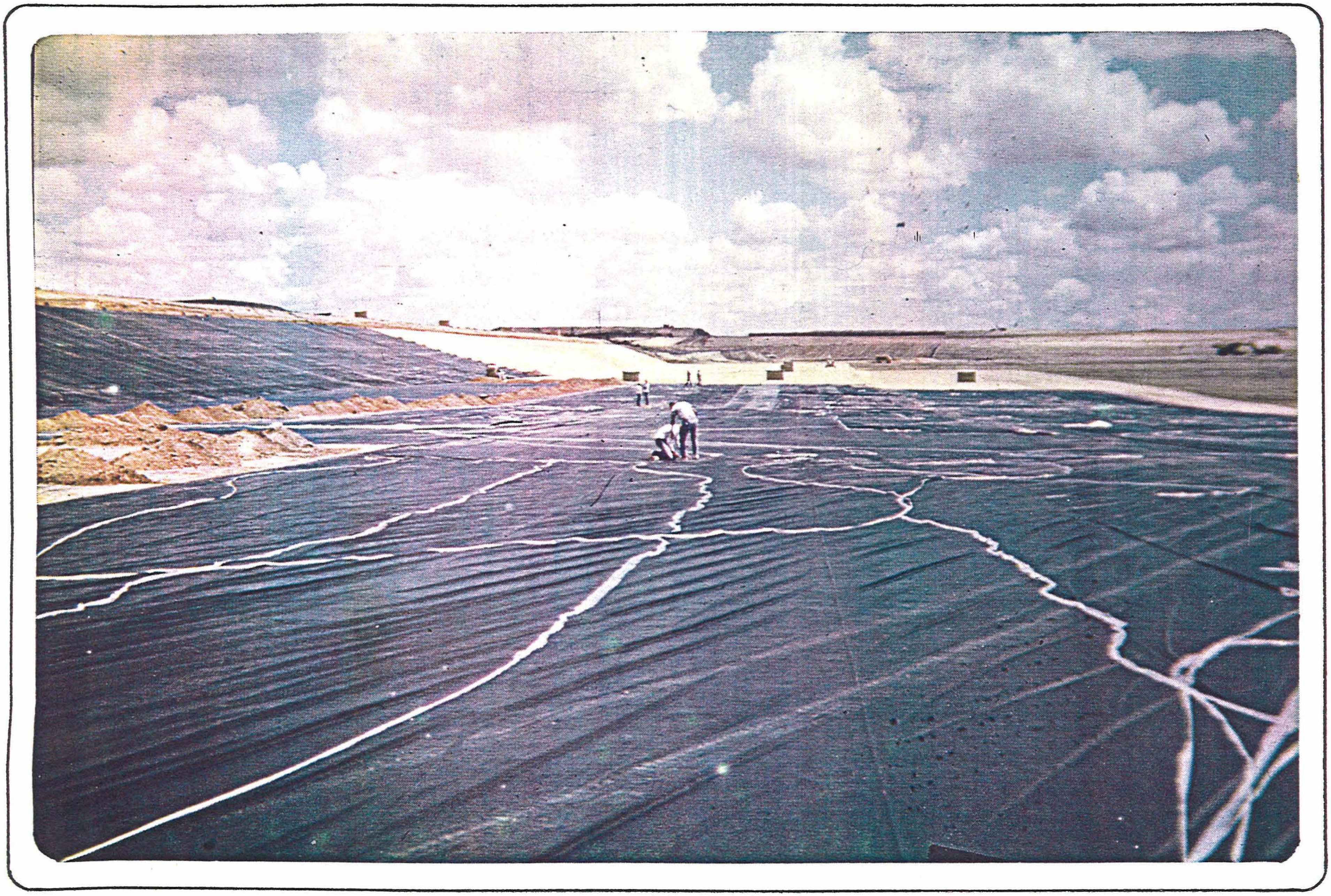
Cell 3 - Liner Installation and Cover Operations



Cell 3 - Liner Installation, Typical Seaming Operation.

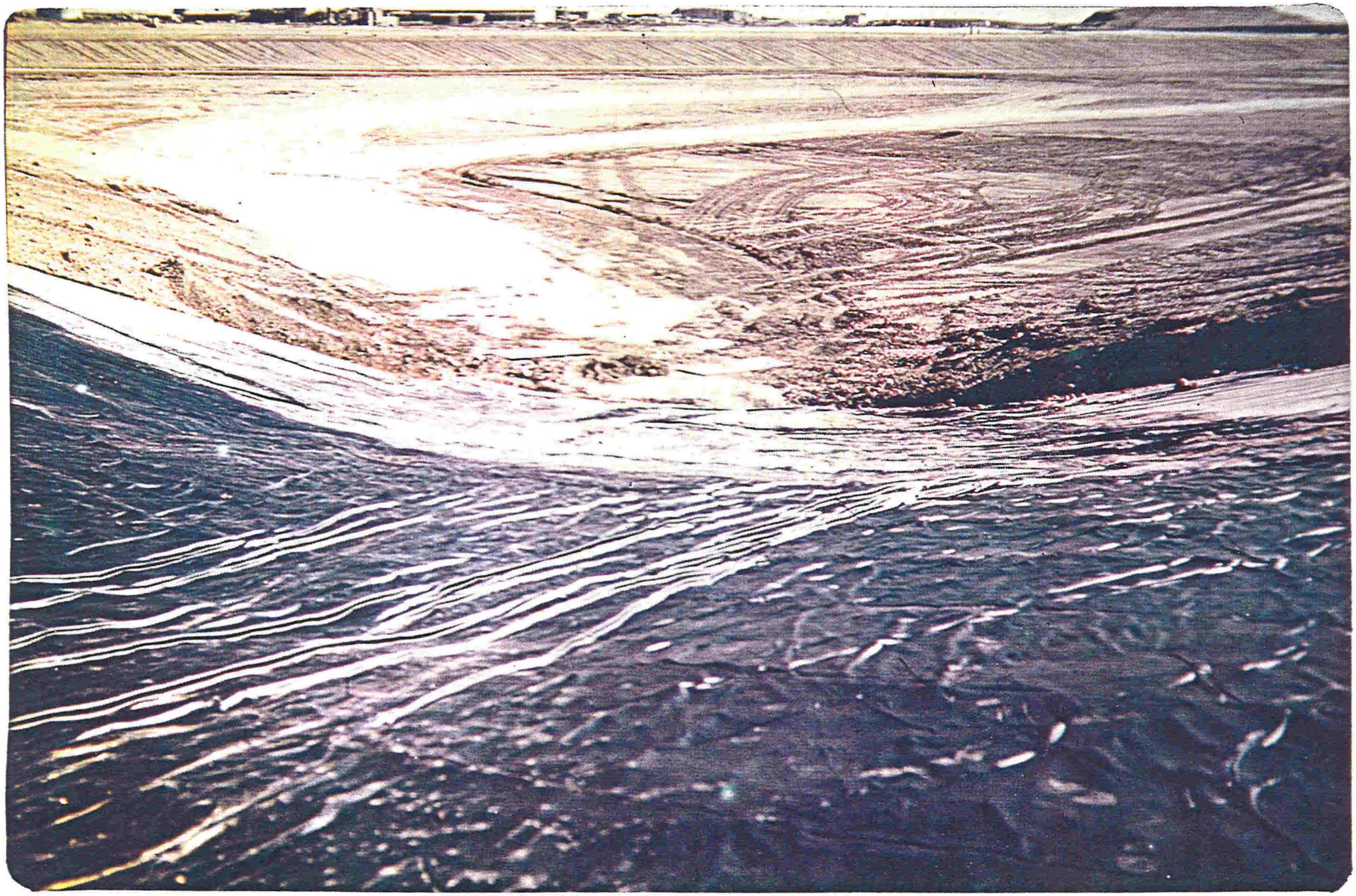


Cell 3 - Various Stages of Bottom Preparation, Liner Installation and Covering Operations



Cell 3 - Liner Installation and Seaming

Cell 3 - Air Lancing of Liner Field Seams



Cell 3 - Installation of PVC Liner Over Access Ramp