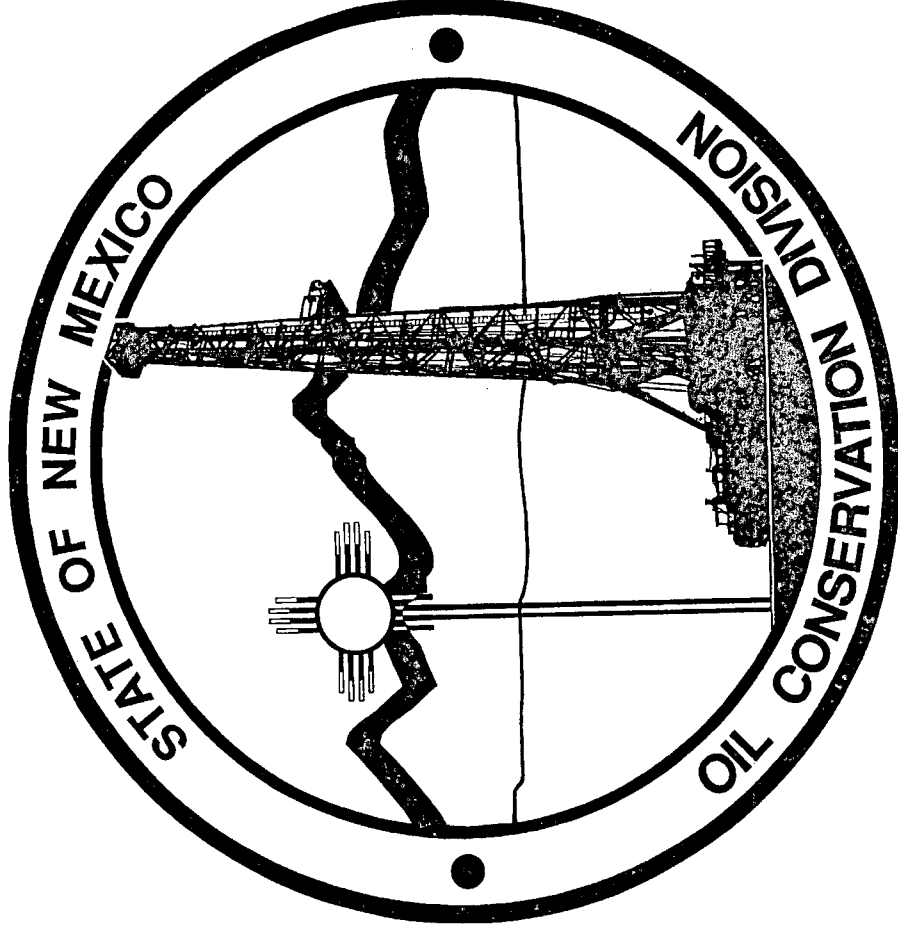


CASE NO. 14015
OCD EXHIBIT 30



Pit Liner Specifications and Requirements

**New Mexico Energy, Minerals and Natural Resources
Department, Oil Conservation Division**

TITLE 19 NATURAL RESOURCES AND WILDLIFE

CHAPTER 15 OIL AND GAS

PART 36 SURFACE WASTE MANAGEMENT FACILITIES

19.15.36.17 Specific requirements applicable to evaporation, storage, treatment and skimmer ponds

B. Construction, standards.

- (1)** In general. The operator shall ensure each pit, pond and below-grade tank is designed, constructed and operated so as to contain liquids and solids in a manner that will protect fresh water, public health, safety and the environment.
- (2)** Liners required.
- (3)** Liner specifications.
- (4)** Alternative liner media.

TITLE 19 NATURAL RESOURCES AND WILDLIFE
CHAPTER 15 OIL AND GAS

PART 36 SURFACE WASTE MANAGEMENT FACILITIES

- (5)** Each pit or pond shall have a properly constructed foundation or firm, unyielding base,
- (11)** The operator shall construct pits and ponds in a manner that prevents overtopping due to wave action or rainfall, and maintain a three foot freeboard at all times.
- (12)** The maximum size of an evaporation or storage pond shall not exceed 10 acre-feet.

Pit Rule – 19.15.2.50 NMAC

19.15.2.50 Pits and Below-Grade Tanks:

A. Permit required

B. Application

C. Design, construction and operational standards

(2) Special requirements for pits.

a) Location

b) Liners

i) Drilling pits, workover pits. Each drilling pit or workover pit shall contain at a minimum, a single liner.... The liner shall be designed, constructed and maintained to prevent the contamination of fresh water, and protect public health and the environment. Pits used to vent or flare gas during drilling or workover operations that are designed to allow liquids to drain to a separate pit do not require a liner.

ii) Disposal or storage pits.

iii) Alternative liner media.

c) Leak detection.

d) Drilling and workover pits.

Pit Rule – 19.15.2.50 NMAC

19.15.2.50 Pits and Below-Grade Tanks:

C. Design, construction and operational standards

2) Special requirements for pits

(g) Unlined pits.

i) General prohibition.

ii) Unlined pits exempted by previous order.

iii) Unlined pits shall be allowed in the following areas provided that the operator has submitted, and the division has approved,

D. Emergency actions.

1) Permit not required.

5) Emergency Pits.

E. Drilling fluids and drill cuttings.

F. Closure and restoration

G. Exemptions.

Liner Definitions:

"**composite liner**" is a liner that may consist of multiple layers of geosynthetics and low permeability soils. The different layers of a composite liner may have different material properties and may be applied at different stages of landfill liner installation. A composite liner is treated in a model exactly the same as a regular single-layer liner.

"**geosynthetic**" is the generic classification of all synthetic materials used in geotechnical applications, including all of the definitions below.

"**geocomposite**" is a manufactured material using geotextiles, geogrids, geomembranes, or combinations thereof, in a laminated or composite form.

"**geogrid**" is a deformed or non-deformed netlike polymeric material used to provide reinforcement to soil slopes.

"**geomembrane**" is an impermeable polymeric sheet material that is impervious to liquid and gas as long as it maintains its integrity and is used as an integral part of an engineered structure or system designed to limit the movement of liquid or gas in a system.

"**geonet**" is a type of a geogrid that allows planar flow of liquids and serves as a drainage system.

"**geosynthetic clay liner**" is a relatively thin layer of processed clay (typically bentonite) that is either bonded to a geomembrane or fixed between two sheets of geotextile.

"**geotextile**" is any sheet material that is less impervious to liquid than a geomembrane, but more resistant to penetration damage and is used as an integral part of an engineered structure or system to serve as a filter to prevent the movement of soil fines into a drainage system, to provide planar flow for drainage, or to serve as a cushion to protect geomembranes, or to provide structural support.

Exhibit 4-5. Types of Information Used to Demonstrate that the Performance Standards for Flexible Membrane Liners are Met

Information	Typical Parameters
Description of Flexible Membrane Liner (FML)	Descriptions of: • Type of FML • Material of construction • Thickness • Brand Name • Manufacturer • Detailed material specifications
Liner Compatibility Data	Results of liner/waste compatibility testing demonstrating strength and performance adequate after exposure to representative waste and to both primary and secondary leachates
Liner Strength	Demonstration that liner and seams will have sufficient strength to support expected loads/stresses after exposure to waste and leachates
Adequacy of Liner Bedding	Demonstration that sufficient bedding will be provided above and below FMLs to prevent rupture during installation and operation.
Construction Specifications -	Procedures for placement of FMLs including: • Inspection of liner bed for protrusions • Placement procedures • Liner seam bonding techniques • Procedures of protection of liner before and during covering • Placement of protective layers

LINER THICKNESS

1) English Units: One mil equals 1/1000 of an inch.
A 1/4 inch equals 250 mils.
For example: 20-mil equals 20/1000 of an inch.

2) SI Units:

$\text{mil} \times 0.0254 = \text{millimeter}$
 $\text{millimeter} / 0.0254 = \text{mil}$

*For example, if you have 20 mil:
20 mil $\times$ 0.0254 = 0.508 millimeter*

Note: Increased liner thickness results in increased liner strength

Liner Comparison

ATTRIBUTE	HDPE	LLDPE	CSPE-R	PVC	EPDM	EIA	FPP	GCL
General Chemical Exposure	Excellent	Good	Excellent (when cured)	Fair	Good	Excellent	Excellent	Fair
Hydrocarbon Exposure	Good	Good	Good (when cured)	Fair	Good	Excellent	Good	Poor
Weathering (UV Exposure)	Excellent	Fair	Excellent (when cured)	Poor	Excellent	Excellent	Excellent	Poor
Thermal Stability	Poor	Poor	Excellent	Good	Excellent	Good	Good - Excellent when reinforced	Good
Tensile Performance	Good	Good	Excellent	Good	Good	Excellent	Good - Excellent when reinforced	Good
Uni-Axial Elongation Performance	Excellent	Excellent	Good	Good	Good	Fair	Excellent	Fair
Multi-Axial Elongation Performance	Poor	Excellent	Good	Excellent	Good	Fair	Excellent	Fair
Puncture Performance	Fair	Excellent	Good	Excellent	Good	Excellent	Good	Good
Installation Damage Resistance	Fair	Fair	Good	Excellent	Excellent	Good	Excellent	Good
Seaming Methods	Thermal/Excellent	Thermal/Excellent	Thermal or solvent bonding/ Good	Thermal or solvent bonding/ Good	Tape seams/ Good	Thermal/ Excellent	Thermal/ Excellent	Overlap
Repair in Service	Good	Good	Poor/ requires adhesives	Good	Good	Good	Excellent	NA
Stress Cracking	Fair	Good	Does not occur	Does not occur	Does not occur	Does not occur	Does not occur	Does not occur
Flexibility in Detailing	Fair	Excellent	Good	Good	Good	Good	Excellent	NA

Source: www.geosynthetica.net/tech_docs/LinerComparison.asp

Descriptions:

HDPE: High Density Polyethylene
 CSPE-R: Chlorosulfonated Polyethylene- Reinforced
 PVC: Poly Vinyl Chloride
 EIA: Ethylene Interpolymer Alloy
 LLDPE: Linear Low-Density Polyethylene
 GCL: Geosynthetic Clay Liner
 EPDM: Ethylene Propylene Diene Monomer
 FPP: Flexible Polypropylene

String Reinforced LLDPE VS Comparable Liners (Typical Values)

10-03-07

Property	Test Method	20 mil String Reinforced LLDPE	20 mil Woven Coated	20 mil PVC	20 mil LLDPE	Comment
Thickness-Nominal	ASTM D1593	20 mil	20 mil	20 mil	20 mil	Good thickness for short to mid term applications. Most 20 mil materials can be field welded except woven coated.
Weight (Lbs / 1000 sq. ft.)		74	68	112	93	Lighter = ease of installation.
Maximum Panel Size (sq. ft.) (Based on 4000 lb rolls.)		54,000	59,000	35,000	43,000	One piece factory welded panels greatly reduce installation time & assure quality seams.
Material Type & Construction		5.5 mil LLDPE Solid Outer Film Layers, Extrusion Laminated on Both Sides of a 1000 Denier Polyester Reinforcement with a Fourth Inner Layer of Hot Molten MDPE	2 mil LDPE Coated on Both Sides of a HDPE Woven Reinforcement	Mono-Layer Calendared or Extruded Poly Vinyl Chloride (66%) and Plasticizers (33%)	Mono-Layer Extruded LLDPE	Select a polymer type that provides the chemical resistance and UV resistance required for the application.
Break Strength (lb/ft/in)	ASTM D7003 or D6693 or D882	70	N/A	48	75	Enables a liner to bridge roughly prepared surface areas.
Break strength Grab (lb/ft)	ASTM D7004 or D751	114	348	N/A	N/A	Important property for steep side slopes (controls creep).
Elongation at Break (%)	ASTM D7003	750	<40	360	800	A benefit for differential settlement in poorly prepared pits.
Tear Resistance (lbs)	ASTM D4533	90	105	N/A	65	Essential when installing in rough environments & high winds (dragging over sharp rocks ect).

String Reinforced LLDPE VS Comparable Liners (Typical Values)

10-03-07

Property	Test Method	20 mil String Reinforced LLDPE	20 mil Woven Coated	20 mil PVC	20 mil LLDPE	Comment
Tear Resistance (lbs)	ASTM D4533	90	105	N/A	65	Essential when installing in rough environments & high winds (dragging over sharp rocks ect).
Hydrostatic Resistance (PSI)	ASTM D751	136	90	68	100	A physical property that becomes more important as the liquid depth increases.
Seam Peel Strength Heat Seal (lbs/in)	ASTM-D882	20	6	12.5	25	A crucial factor for a successful lining system.
Minimum Use Temp/ Cold Crack (°F)		-70	-70	-15	-70	Important in cold climates especially during installation.
Chemical Resistance to Hydrocarbons		LLDPE - Fair	LDPE - Fair	PVC - Poor	LLDPE - Fair	Important factor based on pit contents.
Advantages		Good Chemical Resistance, Excellent UV Resistance, Very Flexible, Very Tear Resistant, Excellent Seam Strength, Pin Hole Free, Wind Resistant	Light Weight, Very Flexible, Very Tear Resistant	Very Flexible, Good for Differential Settlement, Can Be Glued in Favorable Temperatures	Good Chemical Resistance, Very Good UV Resistance, Flexible, Excellent Seam Strength	
Disadvantages		Cannot be Glued	Coating Pin Holes Easily, Poor Seams Peel Strength (Only 2 mil Coating, Cannot be Glued	Poor Chemical Resistance, Low Tear Resistance, Poor UV Resistance - Must Cover, Physical Properties Diminish in Time Due to Loss of Plasticizer.	Fair Tear Resistance, Not Reinforced, Cannot be Glued	

20-MIL STRING REINFORCED LLDPE vs. LLDPE LINER

- Good chemical resistance
- Excellent UV resistance
- Very flexible
- Very tear resistant
- Excellent seam strength
- Pin hole free
- Lighter than LLDPE
- Wind resistant w/ bigger seamless panel size (400' x 135' based on max. roll weight of 4,000 lbs.)

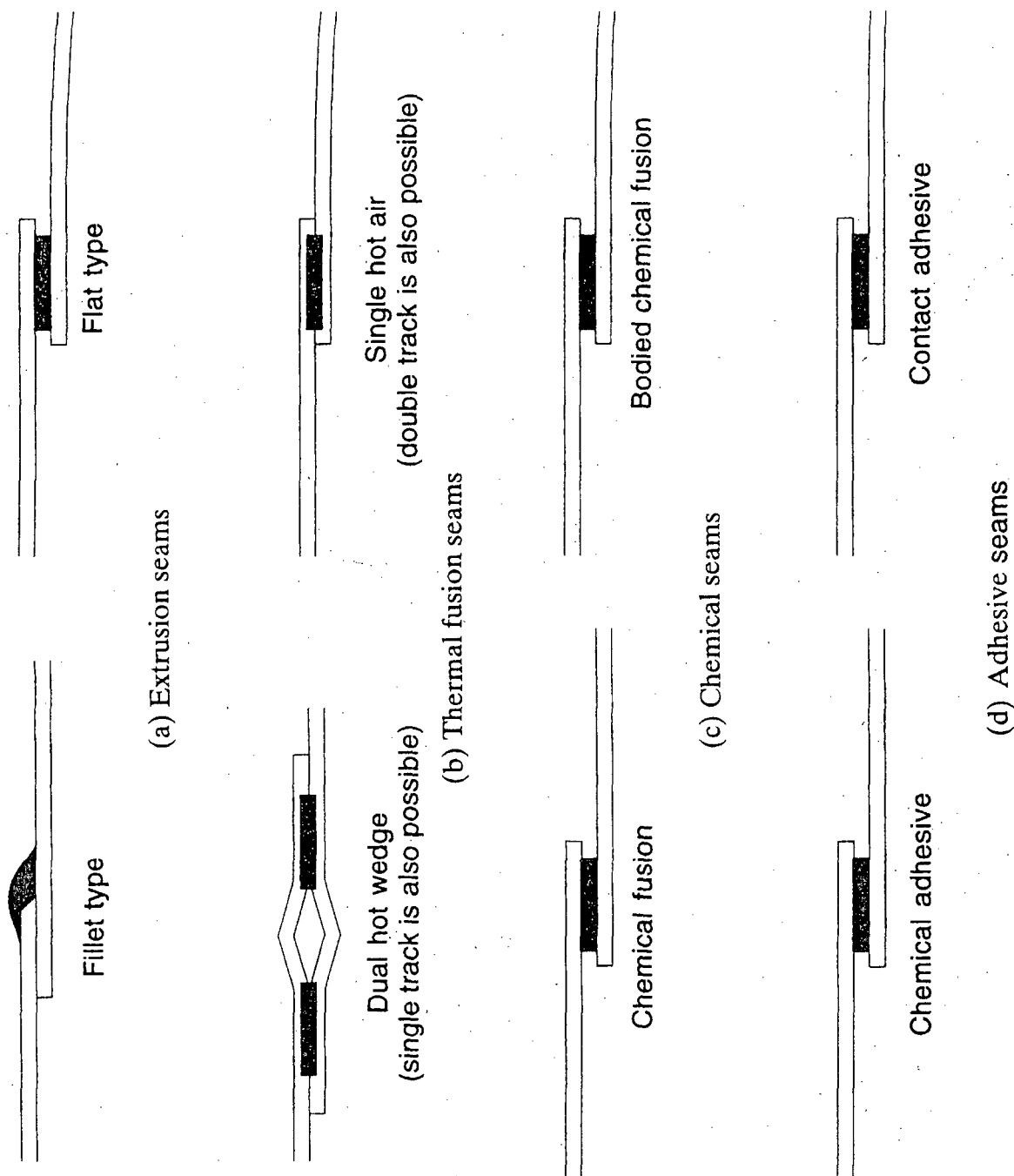


Figure 5.63 Various methods available to fabricate geomembrane seams.

TABLE 5.25 POSSIBLE FIELD-SEAMING METHODS FOR VARIOUS GEOMEMBRANE TYPES

Seaming Method	Type of Geomembrane						
	HDPE	VFPE	PP	PP-R	PVC	CSPE-R	EIA-R
Extrusion (fillet and flat)	A	A	A	A	n/a	n/a	n/a
Thermal fusion (hot wedge and hot air)	A	A	A	A	A	A	A
Chemical fusion (chemical and bodied chemical)	n/a	n/a	n/a	n/a	A	A	A
Adhesive (chemical and contact)	n/a	n/a	n/a	n/a	A	A	A

A = method is applicable

TABLE 5.5a TENSILE BEHAVIOR PROPERTIES OF HDPE, VLDPE, PVC, AND CSPE-R

Test Property	Index Tension Tests (Figure 5.2)				
	Unit	HDPE	VLDPE	PVC	CSPE-R
Maximum stress and corresponding strain	(kPa)	18,600	8,300	21,000	54,500
Modulus	(%)	17	500 ⁺	480	19
	(MPa)	330	76	31	330
Ultimate stress and corresponding strain	(kPa)	13,800	8,300	20,700	5,700
	(%)	500 ⁺	500 ⁺	480	110

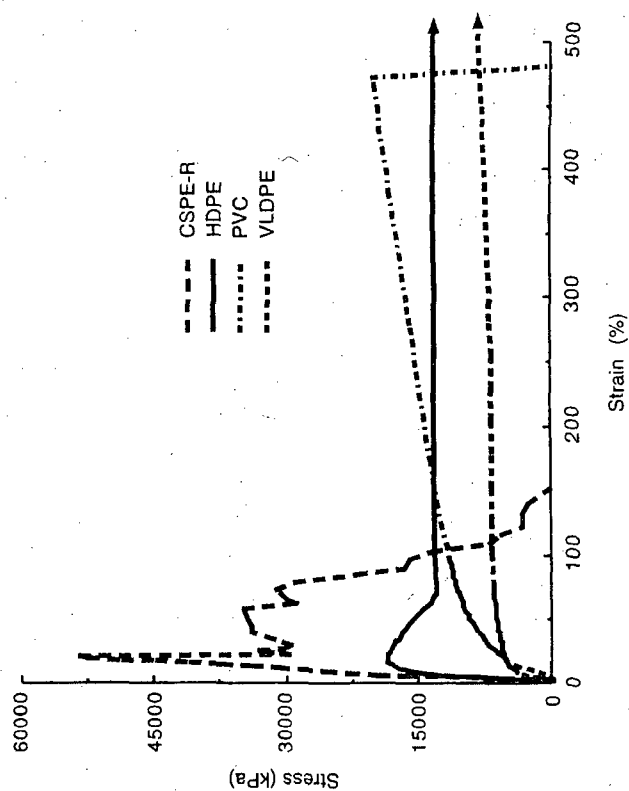


Figure 5.2 Index tensile test results of commonly used geomembranes using criteria given in Table 5.4.

GENERAL PIT SPECIFICATIONS AND REQUIREMENTS

19.15.17.11 DESIGN AND CONSTRUCTION SPECIFICATIONS:

- A.** General specifications. An operator shall design and construct a pit, closed-loop system, below-grade tank or sump to contain liquids and solids and prevent contamination of fresh water and protect public health and the environment.
- B.** Stockpiling of topsoil. Strip and stockpile topsoil for final cover during closure prior to construction of pit or closed-loop system.

TEMPORARY PIT SPECIFICATION AND REQUIREMENTS

19.15.17.11 DESIGN AND CONSTRUCTION SPECIFICATIONS:

- F.** Temporary pits. The operator shall design and construct a temporary pit in accordance with the following requirements
- (1)** Design to prevent uncontrolled releases
 - (2)** Properly construct foundation and interior slopes
 - (3)** Construct with geomembrane liner (20-mil String Reinforced LLDPE) or equivalent liner material
 - (4)** Use factory seamed liners; minimize liner seams (orient them up and down); and install w/ qualified personnel.

TEMPORARY PIT SPECIFICATION AND REQUIREMENTS

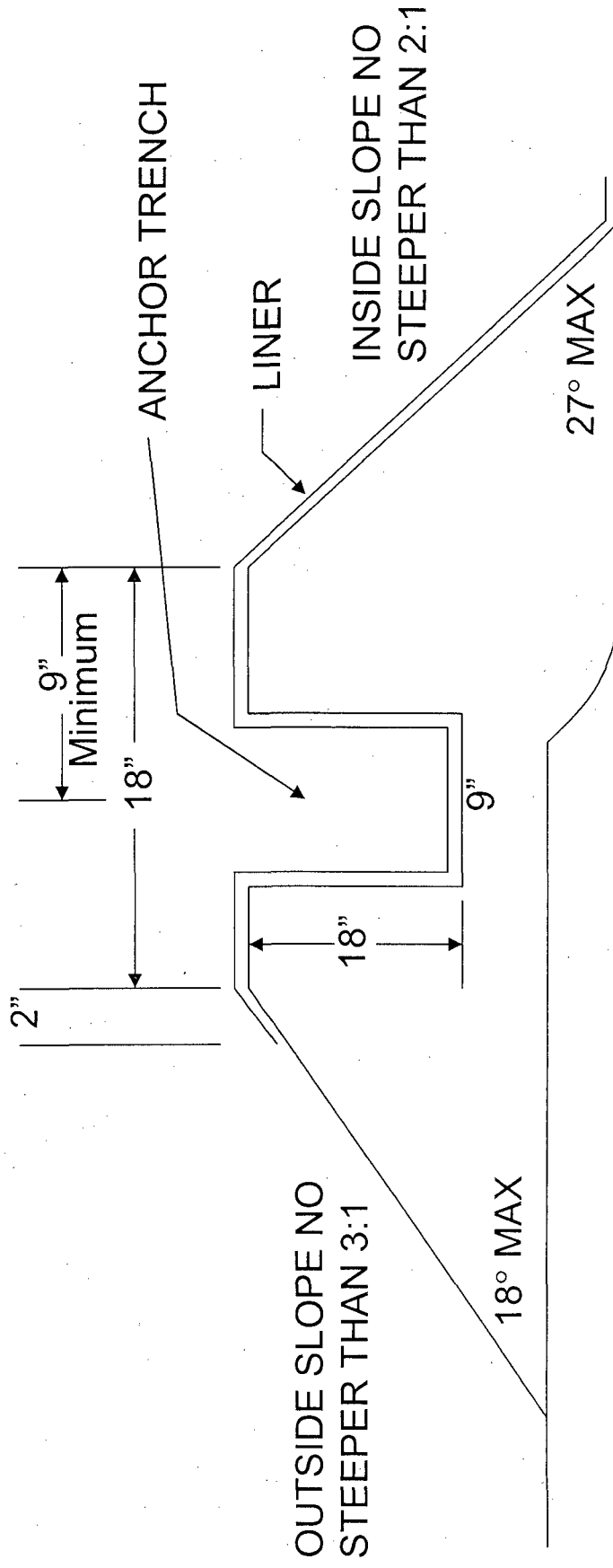
19.15.17.11 DESIGN AND CONSTRUCTION SPECIFICATIONS:

- (5)** Avoid excess stress-strain on liner
- (6)** Use geotextile under liner to protect liner integrity
- (7)** Anchor trench (min. 18 in.) liner at edges
- (8)** Liner protection from fluid forces
- (9)** Prevent run-on conditions (temporary pit, berm, ditch, etc.)
- (10)** Pit not to exceed 10 acre-feet including freeboard
- (11)** Part of pit used to vent or flare gas during drilling or workover that provides for drainage is not required to have a liner unless the appropriate division district office requires an alternative design in order to protect surface water, ground water and the environment.

PITS USED TO VENT/FLARE GAS DURING DRILLING OR WORKOVER OPERATIONS

- Currently under OCD Rule 19.15.2.50 NMAC (C2b(i)) pits designed to allow liquids to drain to a separate pit do not require a liner
- Proposing in new rule to allow District Office option to require liner

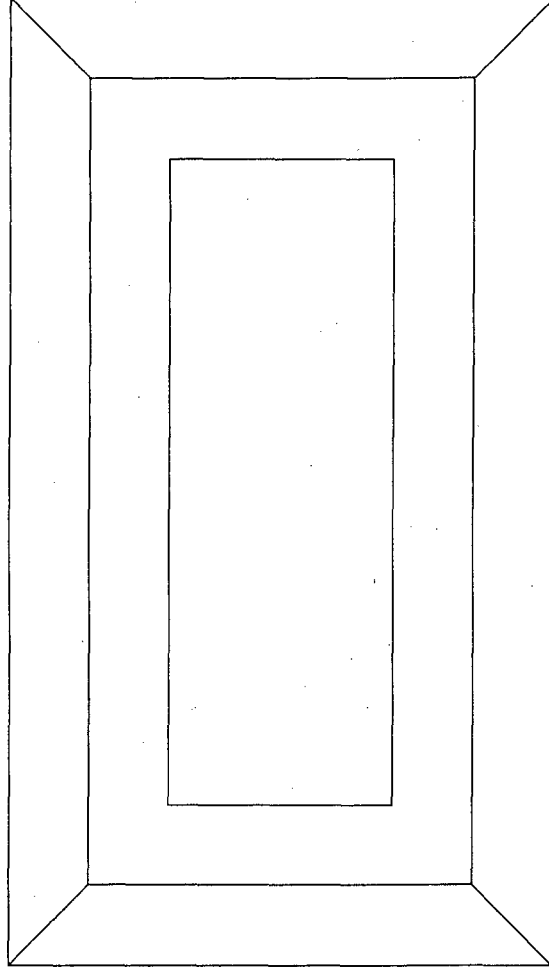
PIT BERM CONSTRUCTION



NOTE: LEVEE TO BE CONSTRUCTED IN A MANNER THAT DESIGN COMPACTION AND DIMENSIONS PROVIDE FOR A MIN. SAFETY FACTOR OF TWO FOR FORCES ACTING AGAINST THE LEVEE

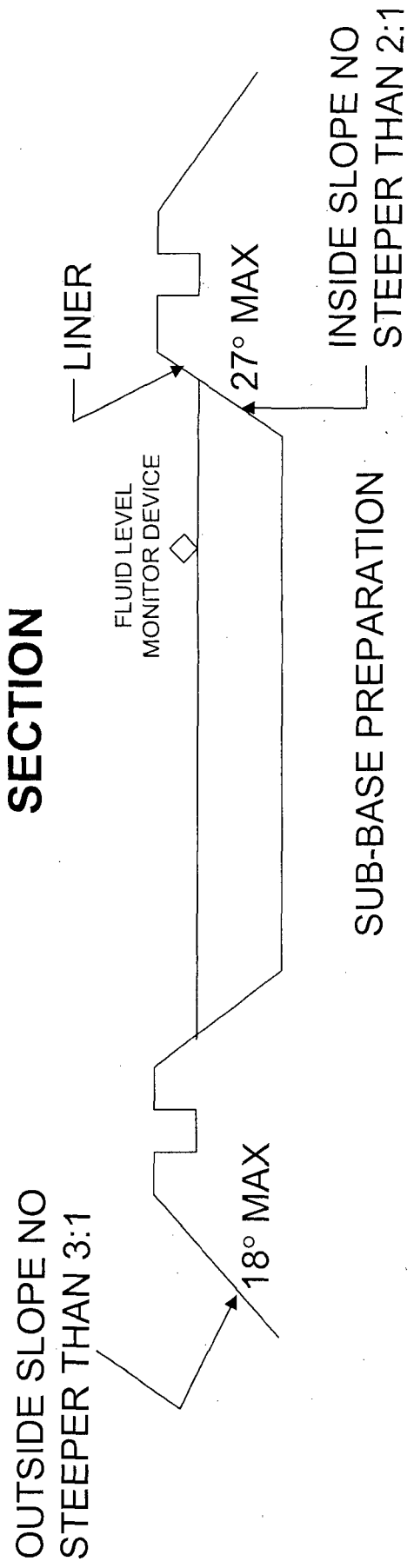
TEMPORARY PIT

PLAN



LINER TYPE:
20-MIL
SR-LLDPE

SECTION



PERMANENT PIT SPECIFICATIONS AND REQUIREMENTS

G. Permanent pits. The operator shall design and construct a permanent pit in accordance with the following requirements.

- (1) Properly constructed foundation. Levee's top wide enough for anchor trench and adequate room for inspection and maintenance.
- (2) Shall contain primary (upper) liner and secondary (lower) liner with leak detection system. Edges of all liners shall be anchored at bottom of compacted earth-filled trench. Anchor trench shall be at least 18 inches deep.
- (3) Primary (upper) liner and secondary (lower) liners shall be geomembrane liners with hydraulic conductivity $\leq 1 \times 10^{-9}$ cm/s. Liners shall consist of 30-mil flexible PVC or 60-mil HDPE or equivalent liner approved by the EB.

PERMANENT PIT SPECIFICATIONS AND REQUIREMENTS

G. Permanent pits. The operator shall design and construct a permanent pit in accordance with the following requirements.

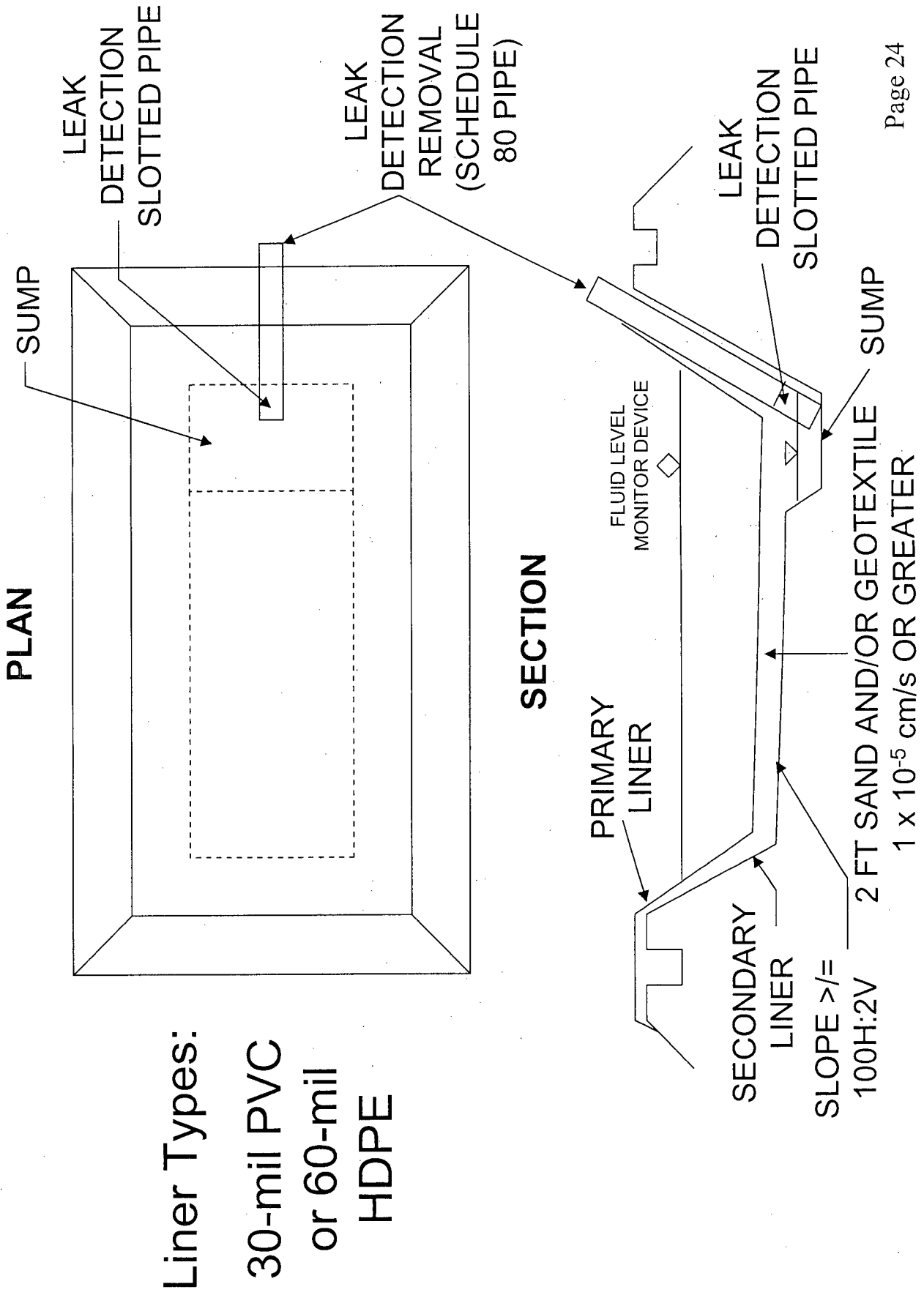
- (4)** OCD may approve other liners
- (5)** Minimize thermal liner seams (hot wedge w/ double track weld) with orientation up and down slope. Overlap liners 4 – 6 in. before seaming. Qualified personnel must perform seaming.
- (6)** Ensure liner protected at point of discharge/suction
- (7)** Leak detection system between lower and upper liners shall consist of 2 ft. compacted soil w/ saturated hydraulic conductivity of 1 x 10⁻⁵ cm/s or greater for drainage. Pipe shall be a Schedule 80 sealed riser pipe to convey fluids to collection, observation and disposal system outside of pit perimeter.

PERMANENT PIT SPECIFICATIONS AND REQUIREMENTS

G. Permanent pits

- (8)** Notification at least 72 hrs. prior to primary liner installation to inspect the leak detection system.
- (9)** Construction shall prevent overtopping due to wave action or rainfall and maintain ≥ 3 ft. of freeboard at all times.
- (10)** Pit shall not exceed 10 acre-ft including freeboard.
- (11)** Surface water run-on shall be prevented by berms, ditch or other diversion.

PERMANENT PIT W/ LEAK DETECTION



OCD MAXIMUM PIT SIZE

10 Acre-ft (including 3 ft. of freeboard)

= 3,259,000 gal.

= 77,595.24 bbls.

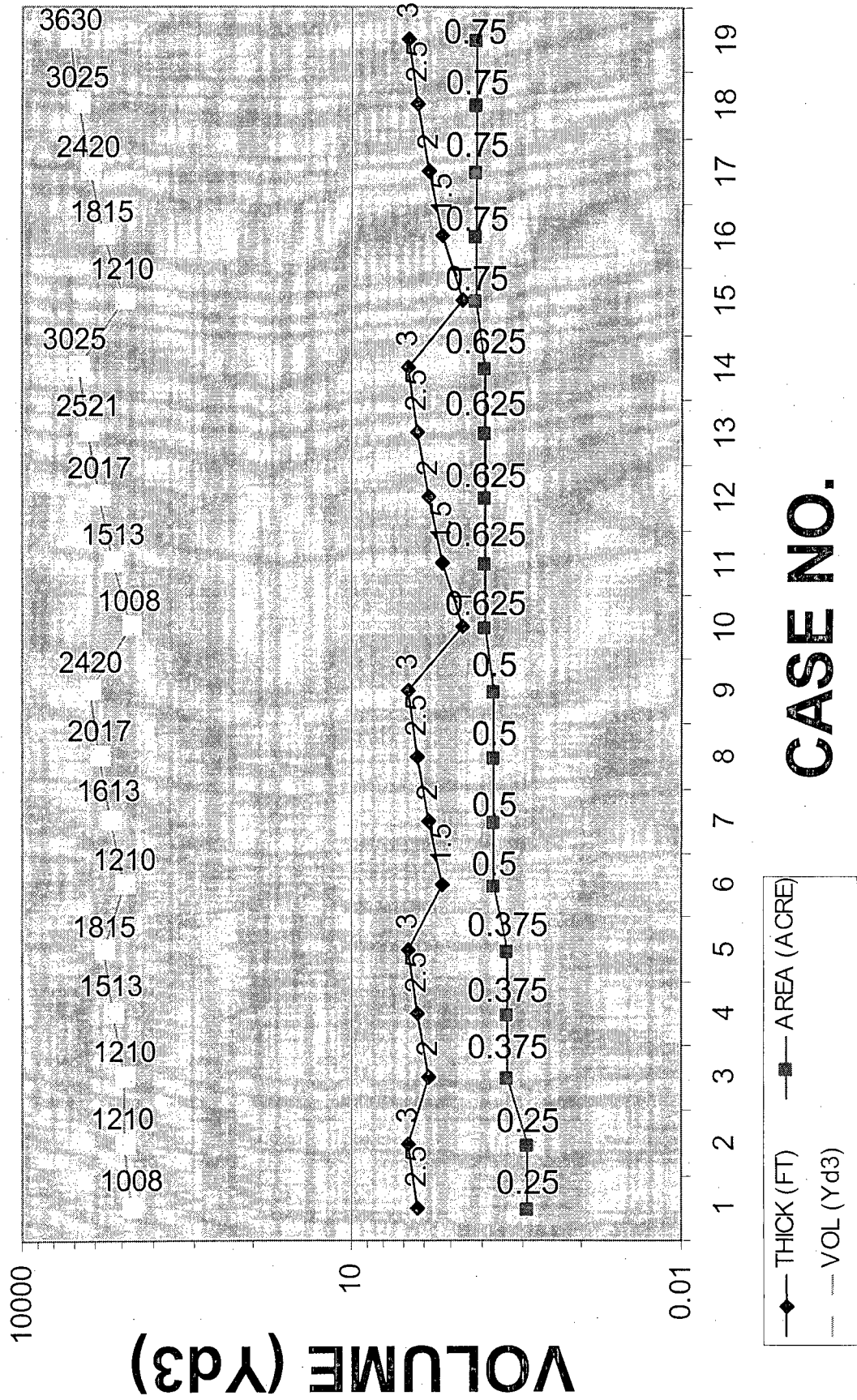
= 435,600 ft³

= 16,133.33 Yd³

ESTIMATED DRILL PIT LAND DISTURBANCE

CASE NO.	LENGTH (FT)	WIDTH (FT)	THICK (FT)	AREA (ACRE)	AREA (FT2)	VOL (FT3)	VOL (Yd3)
1	104.4	104.4	2.5	0.25	10890	27225	1008.33
2	104.4	104.4	3	0.25	10890	32670	1210.00
3	127.8	127.8	2	0.375	16335	32670	1210.00
4	127.8	127.8	2.5	0.375	16335	40837.5	1512.50
5	127.8	127.8	3	0.375	16335	49005	1815.00
6	147.6	147.6	1.5	0.5	21780	32670	1210.00
7	147.6	147.6	2	0.5	21780	43560	1613.33
8	147.6	147.6	2.5	0.5	21780	54450	2016.67
9	147.6	147.6	3	0.5	21780	65340	2420.00
10	165	165	1	0.625	27225	27225	1008.33
11	165	165	1.5	0.625	27225	40837.5	1512.50
12	165	165	2	0.625	27225	54450	2016.67
13	165	165	2.5	0.625	27225	68062.5	2520.83
14	165	165	3	0.625	27225	81675	3025.00
15	180.7	180.7	1	0.75	32670	32670	1210.00
16	180.7	180.7	1.5	0.75	32670	49005	1815.00
17	180.7	180.7	2	0.75	32670	65340	2420.00
18	180.7	180.7	2.5	0.75	32670	81675	3025.00
19	180.7	180.7	3	0.75	32670	98010	3630.00

ESTIMATED DRILL PIT LAND DISTURBANCE



19.15.17.11 Design and Construction

Specifications:

J. On-site deep trenches for closure. The operator shall design and construct an on-site deep trench for closure in accordance with the following requirements.

(1) Excavate to an appropriate depth that allows for the installation of the geomembrane bottom liner, geomembrane liner cover and the division-prescribed soil cover

19.15.17.11 Design and Construction Specifications:

J. On-site deep trenches for closure.

(2) Properly constructed foundation and side walls consisting of a firm, unyielding base, smooth and free of rocks, debris, sharp edges or irregularities to prevent the liner's rupture or tear

(3) Geotextile is required under the liner where needed to reduce localized stress-strain or protuberances

19.15.17.11 Design and Construction Specifications:

J. On-site deep trenches for closure.

(4) Shall be constructed w/ a geomembrane liner. Liner shall consist of a 20-mil string reinforced LLDPE liner or equivalent liner that the appropriate division district office approves. Liner shall be composed of an impervious, synthetic mtl. resistant to petroleum hydrocarbons, salts and acidic and alkaline solutions. Liner shall be resistant to ultraviolet light. Liner compatibility shall comply with EPA SW-846 method 9090A.

19.15.17.11 Design and Construction Specifications:

J. On-site deep trenches for closure.

(5) Minimize liner seams and orient them up and down, not across a slope. Use factory seams where possible. Overlap liners 4 to 6 inches before seaming, and orient seams parallel to the line of max. slope, i.e., oriented along, not across the slope. Minimize the number of field seams in corners and irregularly shaped areas. Qualified personnel shall perform field seaming.

19.15.17.11 Design and Construction Specifications:

J. On-site deep trenches for closure

- (6) Install sufficient liner material to reduce stress-strain on liner**
- (7) Ensure that outer edges of liners secured for placement of excavated waste material into trench**
- (8) Fold outer edges of trench liner to overlap waste material in the trench prior to installation of geomembrane cover**

19.15.17.11 Design and Construction Specifications:

J. On-site deep trenches for closure

(9) Install cover over excav. mtl. in lined trench. Install cover that prevents collection of infiltration water in lined trench and on the cover after soil cover is in place.

(10) Cover shall consist of 20-mil string reinforced LLDPE liner or equivalent cover that district office approves. It shall be composed of an impervious, synthetic mtl. that is resistant to petroleum hydrocarbons, salts, acidic and alkaline solutions. Cover compatibility shall comply w/ EPA SW-846 method 9090A.

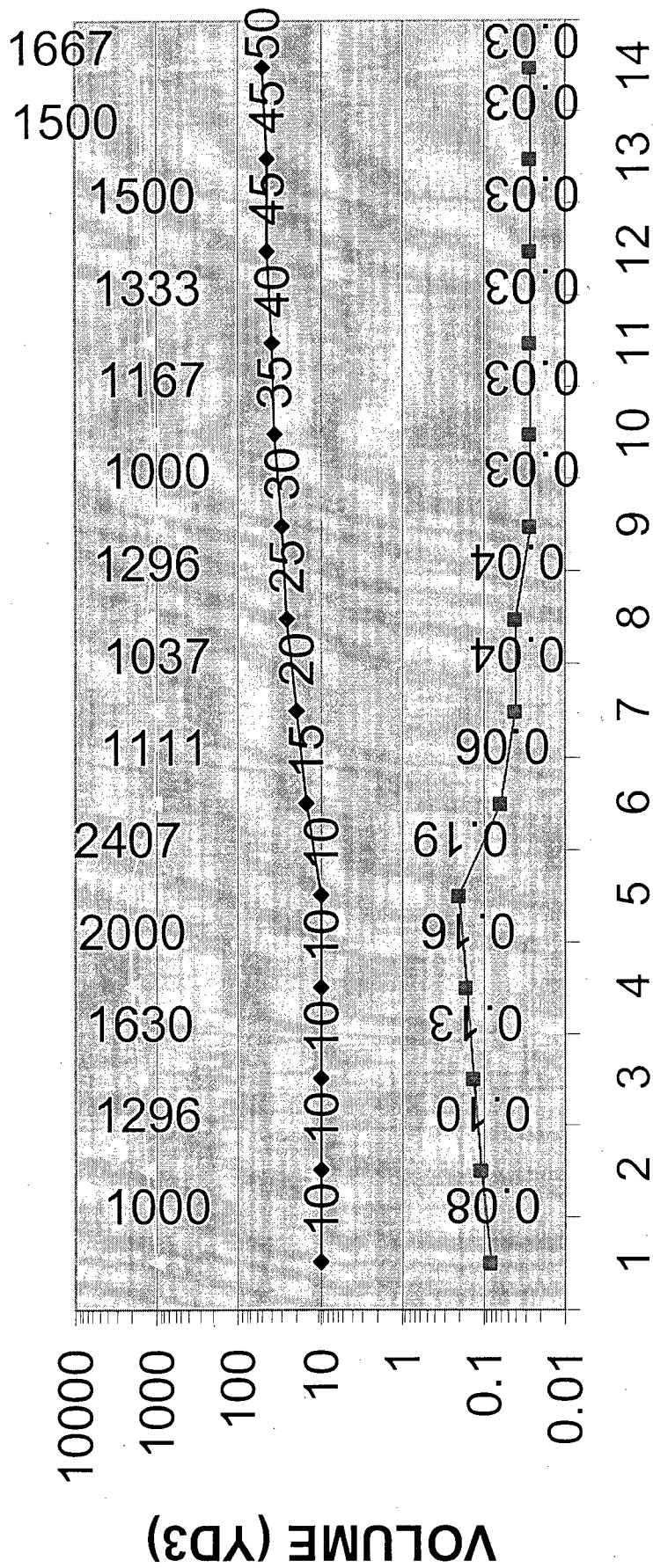
OCD ON-SITE DEEP TRENCH MAXIMUM SIZE

Currently no size limitation

ESTIMATED ON-SITE DEEP TRENCH LAND DISTURBANCE DIMENSIONS

CASE NO.	WIDTH (FT)	LENGTH (FT)	THICK (FT)	AREA (FT2)	ACRE	VOL (FT3)	VOL (Yd3)
1	30	90	10	2700	0.08	27000	1000.00
2	35	100	10	3500	0.10	35000	1296.30
3	40	110	10	4400	0.13	44000	1629.63
4	45	120	10	5400	0.16	54000	2000.00
5	50	130	10	6500	0.19	65000	2407.41
6	25	80	15	2000	0.06	30000	1111.11
7	20	70	20	1400	0.04	28000	1037.04
8	20	70	25	1400	0.04	35000	1296.30
9	15	60	30	900	0.03	27000	1000.00
10	15	60	35	900	0.03	31500	1166.67
11	15	60	40	900	0.03	36000	1333.33
12	15	60	45	900	0.03	40500	1500.00
13	15	60	45	900	0.03	40500	1500.00
14	15	60	50	900	0.03	45000	1666.67

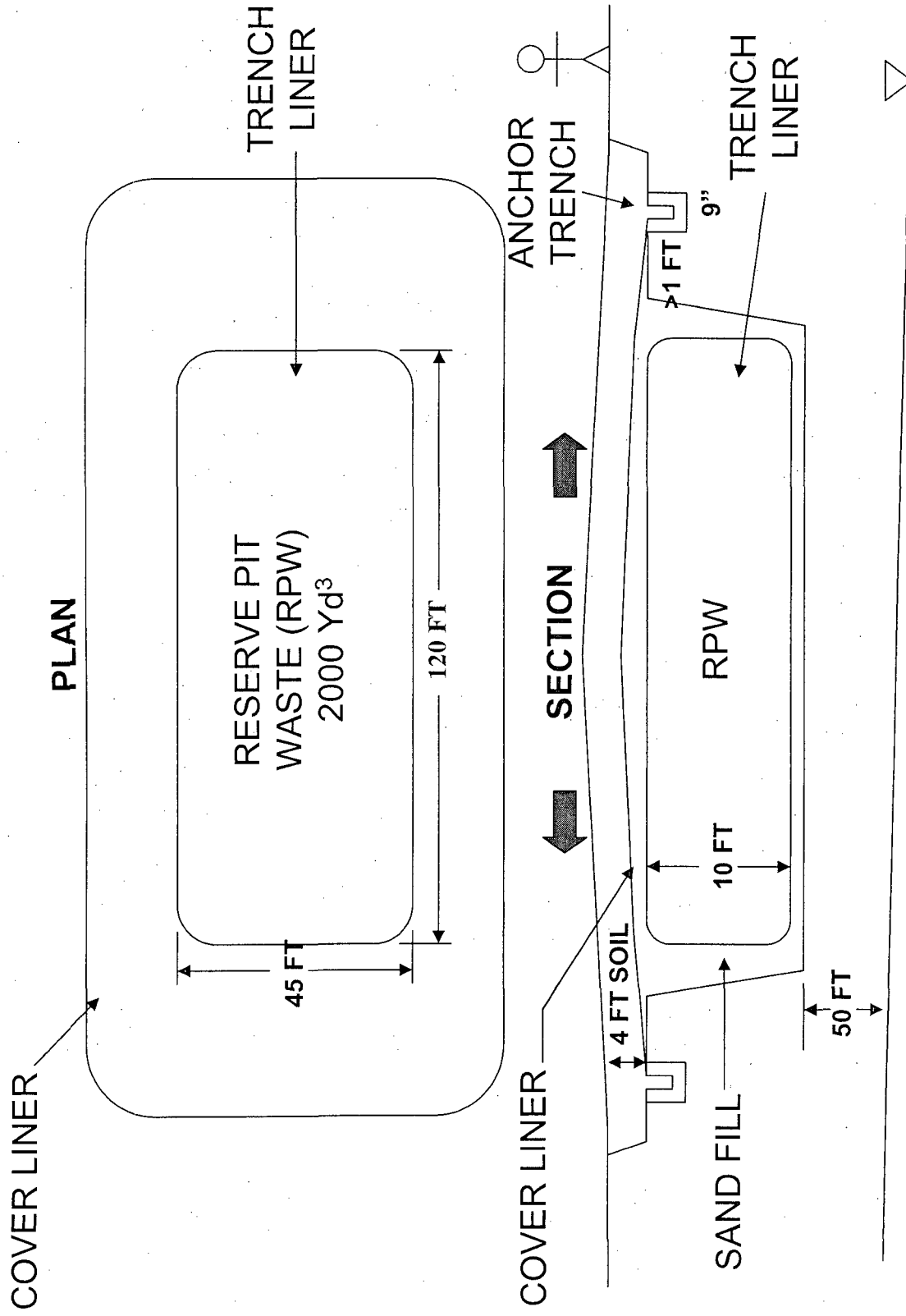
ESTIMATED ON-SITE DEEP TRENCH LAND DISTURBANCE DIMENSIONS



CASE NO.

—◆— THICK (FT) —■— VOL (Yd3)

ON-SITE DEEP TRENCH SYSTEM



LEGEND

- ☐ STABILIZED RPW WRAPPED IN SEAMLESS WRINKLE-FREE 20mil SR-LLDPE
- ☐ SEAMLESS WRINKLE-FREE 20mil SR-LLDPE LINER COVER SPREAD OVER RPW

EXAGGERATED
SCALE
Page 37

COMMON PIT LINER PROBLEMS

- Non-anchored and/or breached liners (loose/staked liner)
- Lack of proper sub-base and berm construction
- Free product or oil in pits
- Liner wrinkles w/ steep slopes (exceedance of shear angles on liners)
- Rips/tears in liner (non-repaired/replaced/not reported)

COMMON PIT LINER PROBLEMS

- Exceedance of liner elastic limit (over strained)
- Liner seam problems (orientation, threaded seams...)
- Sediment run-on/off problems into and under liners or off-site
- Lack of fencing to prevent trespassers from waste
- Lack of netting to prevent habitat access
- Unlined pits
- Improper siting (convenience of placement in arroyos or against hillsides in tributaries...)

DRILL/WORKOVER PIT CONCLUSIONS

- The OCD concurs with the recommendations of the “STRONGER” report dated August, 2001 and is following up with regulations to satisfy the recommendations of the IOGCC to prevent pollution
- “Performance based standards” for drilling and workover pit construction in O&G E&P Operations have failed
- Current OCD requirement of 12-mil thickness (OCD Guidelines) for liners is not working

DRILL/WORKOVER PIT CONCLUSIONS

- Liner imperfections during manufacturing cause concern
- Improper sub-base preparation, construction and liner emplacement or installation increases the percentage of leaky liner systems
- Land disturbance issues: agricultural land w/ organic soil deposits are being stripped with each pit installation and will take many years to regenerate

DRILL/WORKOVER PIT CONCLUSIONS

- Lack of sub-base preparation was evident in most cases w/ lack of reporting, reconstruction, repairing and/or replacing damaged liners in the field while drilling - business as usual
- Some pits were never closed properly and appeared to have been forgotten or used for illegal dumping

DRILL/WORKOVER PIT CONCLUSIONS

- Folds or wrinkles in liners exceed shear stress of liner mtl. and under load may result in stress cracking and leakage soon after installation or over time- especially HDPE
- The OCD observed that while many of the liners were torn, there was very little effort to report, repair or replace damage liners
- Contamination beneath existing and/or closed sites w/ pits probably exists today, but no sampling has been conducted to verify this

DRILL/WORKOVER PIT CONCLUSIONS

- Property devaluation issues
- New Mexico Taxpayer dollars may end up paying for some of the cleanups
- Liners fail without proper construction (structural integrity)
- Liners fail without proper operations and maintenance procedures

DRILL/WORKOVER PIT CONCLUSIONS

- Current liner requirements do not appear to be adequate as many liners tore or split during construction and emplacement or developed tears soon afterward
- Run-on or run-off drainage: there was poor berm construction, drainage from the well head beneath liner systems and lack of silt fencing around disturbed soils/sediments

PITS ASSOCIATED W/ VENTING OR FLARING CONCLUSIONS

- OCD Rule 50 allows these pits to be
unlined
- Proposed OCD Rule 17 allows the above
with discretion of the OCD DO to require
lined pits in sensitive areas
- OCD Pit Sampling in the NW showed lined
open channel pits seamed into drill pits-
addresses BTEX contamination concerns

PERMANENT PIT CONCLUSIONS

- Permanent pit liners require more durable primary and secondary liners (e.g., 30-mil PVC or 60-mil HDPE)
- Permanent pits with secondary containment and properly constructed leachate collection systems will help prevent contamination of the ground water
- Leak detection removal system piping should not breach liner(s) within the high fluid level mark

DEEP TRENCH DISPOSAL

CONCLUSIONS

- The preferred liner for deep-trench burial systems should be seamless or thermal seams from the factory installed in the field by experts w/ proper equipment
- There are **imperfections** in liner manufacturing to consider
- Neutral pH of 7 makes reserve pit waste less apt to leach out metals and impact ground water

DEEP TRENCH DISPOSAL

CONCLUSIONS

- Shallow depths to ground water (~65 Ft) results in greater land disturbance dimensions for trench
- Eventually, reserve pit waste will impact ground water (modeling)
- Currently, there is no size limitation

CLOSED-LOOP DRILLING SYSTEM CONCLUSION

The Oil and Gas Industry of New Mexico should decide to embrace the national pollution prevention initiative and save a lot of money in seeking the most efficient and cost effective ways of exploring for and producing oil or gas while protecting the environment. It could do this by implementing a BMP (*i.e.*; closed-loop systems) as the preferred drilling method.

CLOSED-LOOP DRILLING SYSTEM CONCLUSION

Closed-loop systems are in application today and may actually reduce the cost of drilling, minimize, reuse or recycle drill cutting waste at other drill sites while protecting the environment and sustaining the economy. The main obstacle is the behavior of today's oil and gas companies and their drillers who are used to drilling with pits and are not trained in or accustomed to closed-loop drilling applications that will best protect the environment.

CLOSED-LOOP DRILLING SYSTEM CONCLUSION

- Closed-loop systems will reduce the need for pits and disturbances of the soil and landscapes of New Mexico while realizing cost savings and protecting the environment
- The new proposed Pit Rule encourages the use of closed-loop drilling systems in all drilling and workover operations regardless of sensitive resources - it is the most efficient way, and the Oil and Gas Industry will save \$ millions while protecting New Mexico's valuable natural resources

IT IS THE SOLUTION!

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