FEE$ 100 RECEIPT# 1199

SEWAGE SYSTEM PERMIT

COOK COUNTY HEALTH DEPARTMENT
COURTHOUSE, BOX 1150, GRAND MARAIS, MN 55604
218-387-300 Fax 387-3042

PERMIT NO 99-59

APPLICANT'S NAME: LEE ANDERSON
MAILING ADDRESS: 10441 BLUFF CIRCLE CHASKA, MN

TAX PARCEL NO. 51-016-1140
Phone No.

LEGAL DESCRIPTION: Lot ____ Block ____ Plat Name 4274 CASCADE BEACH RD
Or:
In Gov't Lot ____ ,or ____ 1/4 of ____ 1/4; Sec 16 Twn 60 Range 2W

1. WORK CATEGORY
- ___ a. New system
- X b. Replacement of existing system
- ___ c. Repair of existing system

2. TYPE OF WORK TO BE DONE
- ___ a. Septic tank only
- ___ b. Drainfield only
- X c. Septic Tank and Drainfield
- ___ d. Holding Tank
- ___ e. Alternative System

(specify) ____

3. SOILS DATA
- a. Soil type: LOAM / BLACK / ROCKS
- b. Perc Rate ____
- c. Depth to Saturated Soil: ~~30"~~ 30"
- d. Depth to Mottled soil 30"
- e. Depth to Bedrock ____
- f. Date of Soil Testing 8-23-99

4. ANTICIPATED USE
- X a. Single Family
- ___ b. Commercial
- ___ c. Other

(specify) ____

5. TYPE OF DRAINFIELD
- ___ a. Bed
- X b. Mound
- ___ c. Trenches
- ___ d. Other

(specify) ____

6. PROVIDE A SKETCH PLAN
SHOW BUILDINGS, WELLS, ROADS, SEPTIC SYSTEMS, LAKES, RIVERS, DRAINAGE, ALL APPLICABLE SET-BACKS. WETLANDS, STATE LOCATION OF PROPERTY (Fire #, Road No., Route)

7. SYSTEM DESIGN DATA

	FIELD	TANK
a. Distance to Well from	103'	125'
b. Distance to Building from	110'	20'
c. Distance to Property Line from	401	60'
d. Distance to Lake or Stream from	1201	20' / 130'
e. Separation from bottom of drain rock to saturated soil or mottling	42"	LIFT station
f. Distance from Well to Buried sewer line ___		

8. WATER SOURCE:
- ___ Lake
- ___ Shallow well
- X Drilled Well
- ___ Other

(specify) ____

9. PROVIDE TANK/DRAINFIELD DESIGN CALCULATIONS AND SOIL DATA ON A SEPARATE SHEET OF PAPER.

10. Have all setbacks from dwellings, lot lines, lakes, rivers and wells (including neighboring wells), been met? ___
yes If not, explain: ____

11. Will all old sewer systems be terminated and filled in? If not, explain: ____

I HEREBY CERTIFY WITH MY SIGNATURE THAT ALL DATA ON MY APPLICATION, FORMS, PLANS AND SPECIFICATIONS ARE TRUE AND CORRECT TO THE BEST OF MY KNOWLEDGE.

Signature of DESIGNER: Larry R Ham PCA License # 000651

Signature of INSTALLER: Larry R Ham PCA License # 000651

Signature of OWNER/AGENT: DATE: 8/24/99

PERMISSION IS HEREBY GRANTED TO: Lee Anderson to install a sewage system in accordance with the application, plans, specifications and all other supporting data.

BY ORDER OF: Jeffrey B Hallberg Date: 8/25/99

MOUND DESIGN WORKSHEET
(For Flows up to 1200 gpd)

A. FLOW
Estimated 300 gpd
or measured _____ x 1.5 = _____ gpd.

Estimated Sewage Flows in Gallons per day (gpd)				
Number of Bedrooms	Type I	Type II	Type III	Type IV
2	300	225	180	60% of the values in Type I, II or III columns
3	450	300	218	
4	600	375	256	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

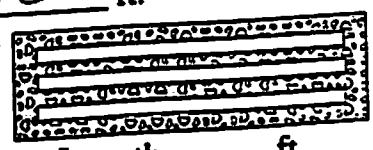
B. SEPTIC TANK LIQUID VOLUMES
1000/500 gallons

Septic Tank Capacities (in gallons)		
Number of Bedrooms	Minimum Liquid Capacity	Liquid capacity with garbage disposal
2 or less	750	1125
3 or 4	1000	1500
5 or 6	1500	2250
7, 8 or 9	2000	3000

C. SOILS (refer to site evaluation)
1. Depth to restricting layer = 30 inches _____ feet
2. Depth of percolation tests = _____ inches
3. Texture _____ Percolation rate _____ mpi
4. Land slope 4 %

D. ROCK LAYER DIMENSIONS
1. Multiply flow rate by 0.83 to obtain required area of rock layer: A x 0.83 =
300 gpd x 0.83 sq. ft./gpd = 250 sq. ft.
2. Select width of rock layer (max 10' if <120 mpi max 5') = 10 ft.
3. Length of rock layer = area ÷ width =
250 sq. ft. ÷ 10 ft. = 25 ft.

Width _____ ft
<120mpi <10'
>120mpi <5'



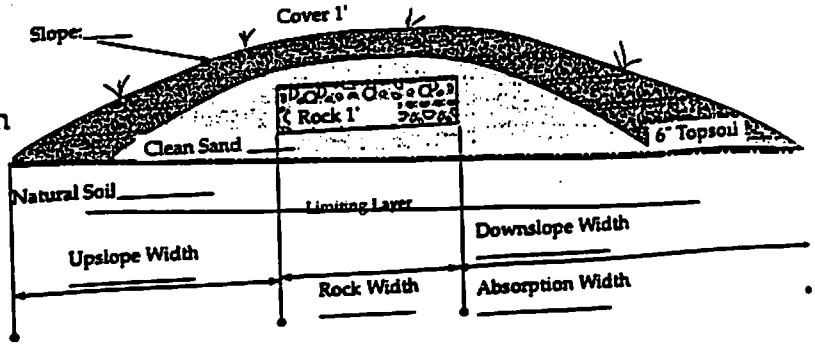
Length _____ ft

E. ROCK VOLUME
1. Multiply rock area by rock depth to get cubic feet of rock; ____ sq. ft. x ____ ft. = ____ cu. ft.
2. Divide cu. ft. by 27 cu. ft./cu. yd. to get cubic yards;
____ cu. ft. ÷ 27 = ____ cu. yd.
3. Multiply cubic yards by 1.4 to get weight of rock in tons; ____ cu. yd. x 1.4 ton/cu. yd. = ____ tons.

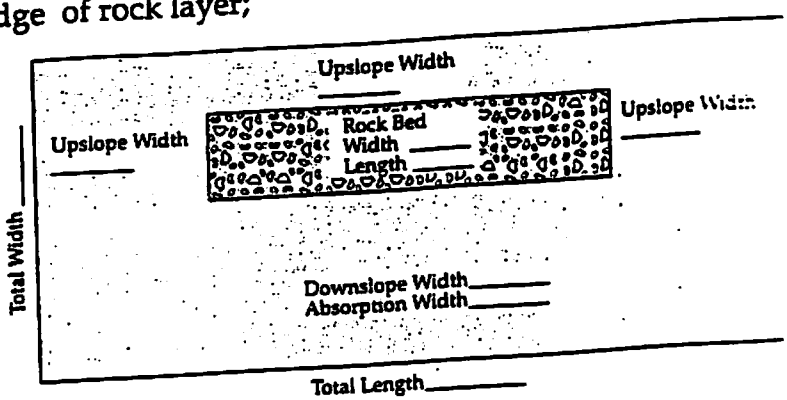
F. ABSORPTION WIDTH
1. Percolation rate in top 12 inches of soil is _____ mpi
Texture _____
2. Select allowable soil loading rate from table;
_____ gpd/ft²
3. Calculate adsorption width ratio by dividing rock layer loading rate of 1.20 gpd/ft2 by allowable soil loading rate;
1.20 gpd/ft² ÷ _____ gpd/ft² = _____.
4. Multiply adsorption width ratio by rock layer width to get required adsorption width;
_____ x _____ ft = _____ ft

Absorption Width Sizing Table			
Percolation Rate in Minutes per Inch (MPI)	Soil Texture	Gallons per day per square foot	Ratio of Absorption width to Rock Layer Width
Faster than 0.1	Coarse Sand	1.20	1.00
0.1 to 5	Sand	1.20	1.00
0.1 to 5	Fine Sand	0.60	2.00
6 to 15	Sandy Loam	0.79	1.52
16 to 30	Loam	0.60	2.00
31 to 45	Silt Loam	0.50	2.40
46 to 60	Clay Loam	0.45	2.67
60 to 120	Clay	0.24	5.00
Slower than 120	Clay	0.20	6.00

G. DOWNSLOPE BERM WIDTH



1. If landslope is 1% or more, subtract rock layer width from adsorption width to obtain minimum downslope berm toe
_____ ft - _____ ft = _____ feet
2. Calculate Minimum mound Size
a. Determine depth of clean sand fill at upslope edge of rock layer:
Separation 3' -_____ ft = _____ feet
b. Add depth of clean sand for separation (2a) at upslope edge, depth of rock layer (1 foot) to depth of cover (1 foot) to find the mound height at the upslope edge of rock layer;
_____ ft + 1ft + 1ft = _____ feet
c. Enter table with landslope and upslope berm ratio. Select berm multiplier of _____.
d. Multiply berm multiplier by upslope mound height to find upslope berm width:
_____ x _____ = _____ feet
e. Multiply rock layer width by landslope to determine drop in elevation;
_____ x _____% ÷ 100 = _____ feet
f. Add depth of clean sand for slope difference (2e)at downslope edge, to the mound height at the upslope edge of rock layer (2d) to find the downslope height;
_____ ft + _____ ft = _____feet
g. Enter table with landslope and downslope berm ratio. Select berm multiplier of _____.
h. Multiply berm multiplier by downslope mound height to get downslope berm width:
_____ x _____ = _____ feet
i. Compare the values of step G.1_____ and Step G.2h _____
Select the greater of the two values as the downslope berm width; _____ feet
j. Total mound width is the sum of upslope berm (G.2d) width plus rock layer width (D.2) plus downslope berm width(G.2i);
_____ ft + _____ ft + _____ ft = _____ feet
k. Total mound length is the sum of upslope berm width (G.2d) plus rock layer length (D.3) plus upslope berm width (G.2d);
_____ ft + _____ ft + _____ ft = _____ feet



BERM SLOPE MULTIPLIERS

Land Slope, in %	DOWNSLOPE berm multipliers for various berm slope ratios					UPSLOPE berm multipliers for various berm slope ratios					
	3:1	4:1	5:1	6:1	7:1	3:1	4:1	5:1	6:1	7:1	
0	3.0	4.0	5.0	6.0	7.0	3.0	4.0	5.0	6.0	7.0	
1	3.09	4.17	5.26	6.38	7.53	2.91	3.85	4.76	5.66	6.54	
2	3.19	4.35	5.56	6.82	8.14	2.83	3.70	4.54	5.36	6.14	
3	3.30	4.54	5.88	7.32	8.86	2.75	3.57	4.35	5.08	5.79	
4	3.41	4.76	6.25	7.89	9.72	2.68	3.45	4.17	4.84	5.46	
5	3.53	5.00	6.67	8.57	10.77	2.61	3.33	4.00	4.62	5.19	
6	3.66	5.26	7.14	9.38	12.07	2.54	3.23	3.85	4.41	4.93	
7	3.80	5.56	7.69	10.34	13.73	2.48	3.12	3.70	4.23	4.70	
8	3.95	5.88	8.33	11.54	15.91	2.42	3.03	3.57	4.05	4.49	
9	4.11	6.25	9.09	13.04	18.92	2.36	2.94	3.45	3.90	4.30	
10	4.29	6.67	10.00	15.00	23.33	2.31	2.86	3.33	3.75	4.12	
11	4.48	7.14	11.11	17.65	30.43	2.26	2.78	3.23	3.61	3.95	
12	4.69	7.69	12.50	21.43	43.75	2.21	2.70	3.12	3.49	3.80	

Note: The product of the multiplier and the height results in the horizontal distance to where the berm meets the original land slope. Example: Height at upper edge of rock layer is 3.0 feet; rock layer is 10 feet wide, land slope is 6% and berm slope ratio is 4:1. Upslope berm width is 3.0 x 4.0 = 9.7 ft; height at lower edge of rock layer is 3.0 + 10 x 0.06 = 3.6 ft and downslope berm width is 5.26 x 3.6 = 18.9 ft.

Final Dimesions:

_____ x _____

PRESSURE DISTRIBUTION SYSTEM

1. Select number of perforated laterals 3

2. Select perforation spacing = 3 feet.

3. Since perforations should not be placed closer than 1 ft. to the edge of the rock layer (see diagram), subtract 2 ft. from the rock layer length.

$$\frac{25}{\text{Rock layer length}} - 2 \text{ ft.} = 23 \text{ feet.}$$

4. Determine the number of spaces between perforations. Divide the length above by perforation spacing and round down to nearest whole number.

$$\text{Length perf. spacing} = \frac{23}{(3)} \text{ ft.} \div \frac{3}{(2)} \text{ ft.} = 7 \text{ spaces}$$

5. Number of perforations is equal to one plus the number of perforation spaces .

$$7 \text{ spaces} + 1 = 8 \text{ perforations/lateral}$$

6. Multiply perforations per lateral by number of laterals to get total number of perforations.

$$\frac{3}{\text{laterals}} \times \frac{8}{\text{perfs/lateral}} = 24 \text{ perforations.}$$

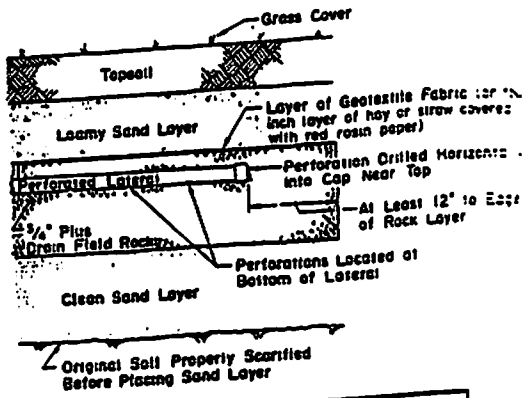
7. Determine required flow rate by multiplying number of perforations by flow per perforation

$$\frac{24}{\text{perfs}} \times \frac{.74}{\text{gpm/perf}} = 18 \text{ gpm.}$$

8. If laterals are connected to header pipe as shown on upper example, to select minimum required lateral diameter; enter table with perforation spacing and number of perforations per lateral. Select minimum diameter for perforated lateral = 2" inches.

9. If perforated lateral system is attached to manifold pipe near the center, lower diagram, perforated lateral length and number of perforations per lateral will be approximately one half of that in step 8. Using these values, select minimum diameter for perforated lateral = _____ inches.

END PERFORATION OF A PERFORATED LATERAL

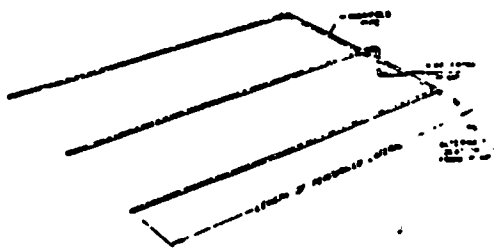


Required Perforation Discharge in gallons per minute (gpm)		
Discharge Head (feet)	7/32 inch perf	¼ inch perf
1.0a	0.56	0.74
2.0b	0.80	1.04

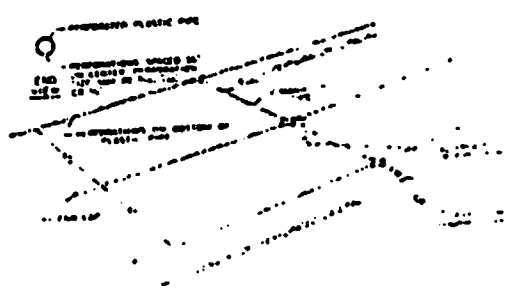
a. Use for single family homes
b. Use for all other applications

Maximum number of quarter inch perforations per lateral to guarantee < 10% discharge variance			
Perforation Spacing (feet)	1¼	1½	2
2.5	14	18	28
3.0	13	17	26
3.3	12	16	25
4.0	11	15	23
5.0	10	14	22

MANIFOLD LOCATED AT END OF PRESSURE DISTRIBUTION SYSTEM



LAYOUT OF PERFORATED PIPE LATERALS FOR PRESSURE DISTRIBUTION IN GROUND



PUMP SELECTION PROCEDURE

A. Determine pump capacity:

Gravity Distribution

1. Minimum suggested is 20 gpm
2. Maximum suggested is 45 gpm

Pressure Distibution

3. a. Select number of perforated laterals 3
   b. Select perforation spacing = 3 feet.
   c. Subtract 2 ft. from the rock layer length.
   25 (Rock layer length) - 2 ft. = 23 feet.
   d. Determine the number of spaces between perforations.
   Length perf. spacing = 23 ft. ÷ 3 ft. = 7 spaces
   e. 7 spaces + 1 = 8 perforations/lateral
   f. Multiply perforations per lateral by number of laterals to get total number of perforations. 3 (laterals) × 8 (perfs/lateral) = 24 perforations.
   g. 24 (perfs) × .74 (gpm/perf) = 18 gpm.

SELECTED PUMP CAPACITY 18 gpm

Perforation Discharges in GPM		
Head (feet)	Perforation diameter (inches)	
	7/32	1/4
1.0a	0.56	0.74
1.5	0.69	0.90
2.0b	0.80	1.04

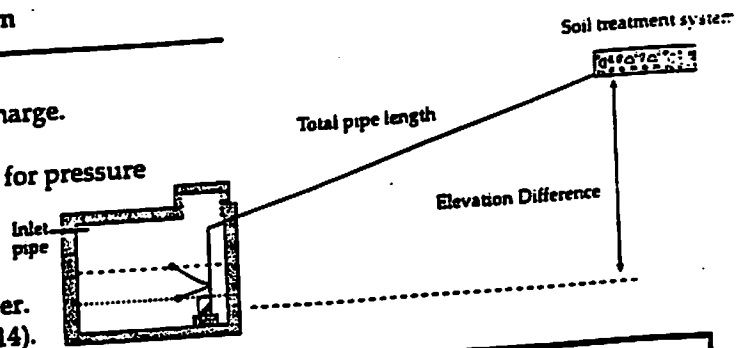
a Use 1.0 foot single homes.
b Use 2.0 feet for anything else.

B. Determine head requirements:

1. Elevation difference between pump and point of discharge. ~~5~~ 0 feet
2. If pumping to a pressure distribution system, five feet for pressure required at manifold if gravity system, zero. 5 feet
3. Friction loss
   a. Enter friction loss table with gpm and pipe diameter. Read friction loss in feet per 100 feet from table (F-14).
   F.L. = 1.11 ft./100 ft of pipe
   b. Determine total pipe length from pump to discharge point. Estimate by adding 25 percent to pipe length for fitting loss, or use a fitting loss chart (F-15 ____ feet).
   Equivalent pipe length - 1.25 times pipe length =
   30 × 1.25 = 37 feet
   c. Calculate total friction loss by multiplying friction loss in ft/100 ft by equivalent pipe length.
   Total friction loss = 37 × .74 ÷100 = .3 feet
4. Total head required is the sum of elevation difference, special head requirements, and total friction loss.

0 (1) + 5 (2) + .3 (3c)

TOTAL HEAD 5.3 feet

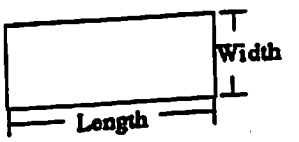


Friction Loss in Plastic Pipe			
	Nominal pipe dia.		
Flow Rate gpm	1.5"	2"	3"
20	2.47	0.73	0.11
25	3.73	1.11	0.16
30	5.23	1.55	0.23
35	6.96	2.06	0.30
40	8.91	2.64	0.39
45	11.07	3.28	0.48
50	13.46	3.99	0.58
55		4.76	0.70
60		5.60	0.82
65		6.48	0.95
70		7.44	1.09

C. Pump selection Myers ME 40 AC II

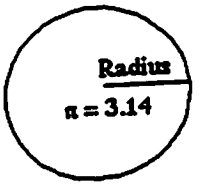
1. A pump must be selected to deliver at least 18 gpm (Step A) with at least 6 feet of total head (Step B).

Sizing of Dosing Chamber



1. Determine Surface Area
   Rectangle = Area = L x W
   _____ x _____ = _____ square feet

   Circle = Area = π x (Radius)²
   3.14 x _____ x _____ = _____ square feet



   Other = Get Surface Area from Manufacturer
   _____ square feet 500 gall ÷ 46" to outlet.

2. Calculate Gallons Per Inch
   There are 7.5 gallons per cubic foot of volume, therefore you must multiply the area times the conversion factor and divide by 12 inches per foot to calculate gallons per inch
   Area x 7.5 ÷ 12
   _____ x 7.5 ÷ 12 = 11 gallons/inch

3. Calculate Gallons to Cover Pump (with 2 inches of water covering pump)
   (Height (in) + 2 inches) x gallons/inch
   (15 + 2) x 11 = 187 gallons

4. Calculate Total Pumpout Volume
   A. To maximize pump life select sump size for 4 to 5 pump operations per day.
   350 gpd ÷ 4 = 75 gallons per dose
   B. Calculate drainback
      a. Determine total pipe length, 30 feet.
      b. Determine liquid volume of pipe, 17.4 gallons per 100 feet. (see page F-13)
      c. Multiply length by volume: Drainback quantity =
      30 feet x 0 gallons ÷ 100 ft. = 0 gallons.
   C. Total pump out volume equals dose volume + drainback
   75 gallons per dose + 0 gallons = 75 Total gallons

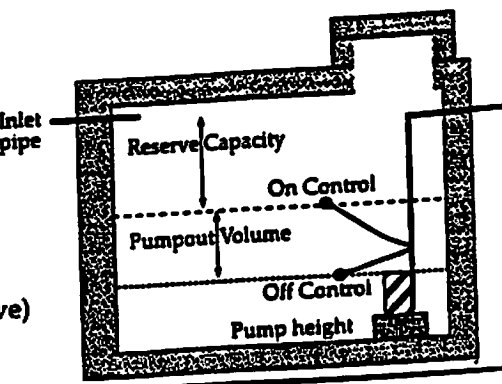
Estimated Sewage Flows in Gallons per day (gpd)

Number of Bedrooms	Type I	Type II	Type III	Type IV
2	300	225	180	60% of the values in Type I, II or III columns
3	450	300	218	
4	600	375	256	
5	750	450	294	
6	900	525	332	
7	1050	600	370	
8	1200	675	408	

1	4.49
1.25	7.77
1.5	10.58
2	17.43
2.5	24.87
3	38.4
4	66.1

5. Calculate Volume for Alarm (typically 2 to 3 inches)
   Depth (in) x gallons/inch =
   3 x 11 = 33 gallons

6. Recommended:
   Calculate Reserve Capacity (75% the daily flow)
   Daily flow x .75 =
   _____ x .75 = _____ gallons



7. Calculate total gallons
   gallons over pump + gallons pumpout + gallons alarm + (gallons reserve)
   3 + 4 + 5 + 6
   187 + 75 + 33 (+ ____) = 295 gallons

8. Total Depth (Total gallon divided by gallon per inch)
   Total Gallon ÷ gallon/inch
   295 ÷ 11 = 27 inches

9. Float Separation Distance (equal total pumpout volume)
   Total pumpout volume ÷ gallons/inch
   75 ÷ 11 = 7 inches

CUSTOMER LEE ANDERSON Sheet1
DATE 8/24/99 12:06
LOCATION 4274 CASCADE BEACH ROAD

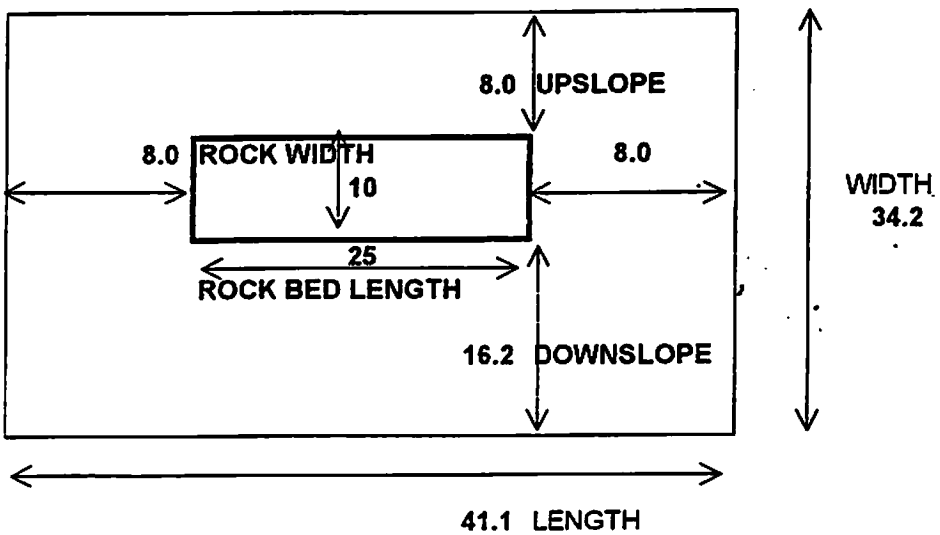
450
0.83 373.5

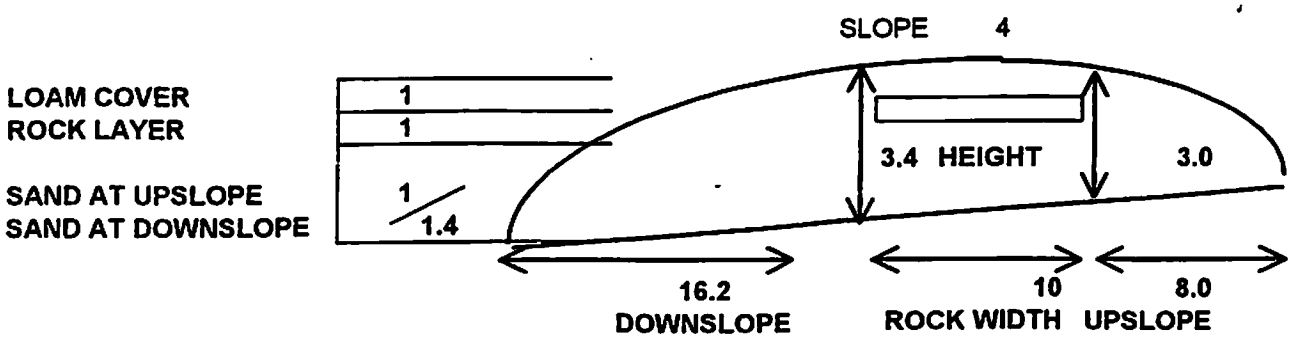
		Width	Length	Depth
	ROCK LAYER SIZE	10	25	1

MOUND WORKSHEET

2A	SAND SEPARATION UPSLOPE	1	Feet	Percent			
2B	SLOPE CALCULATION	10	4	100	0.4	Feet	
2C	MOUND HEIGHT AT UPSLOPE	1	1	1	3.0	Feet	
2D	UPSLOPE DIKE MULTIPLIER	3			2.68		
2E	UPSLOPE DIKE WIDTH		3	2.68	8.0	Feet	
2F	DOWNSLOPE HEIGHT		0.4	3	3.4		
2G	DOWNSLOPE MULTIPLIER	4			4.8		
2H	DOWNSLOPE DIKE WIDTH		3.4	4.76	16.2	Feet	
2J	MOUND WIDTH	10.0	16.2	8.0	34.2		
2K	MOUND LENGTH	25.0	8.0	8.0	41.1		

					CU FT	YARDS
GRAVEL NEEDED						
ROCK			10	25	1 250	9
SAND	UPSLOPES	61.1	1	8.0	2.0 589	22
	DOWNSLOPE	41.1	1	16.2	2.4 1,117	41
	MOUND CENTER		10	25	1.0 250	9
	TOTAL SAND					72
LOAM	COVER		1	34.2	41.1 1,406	52





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