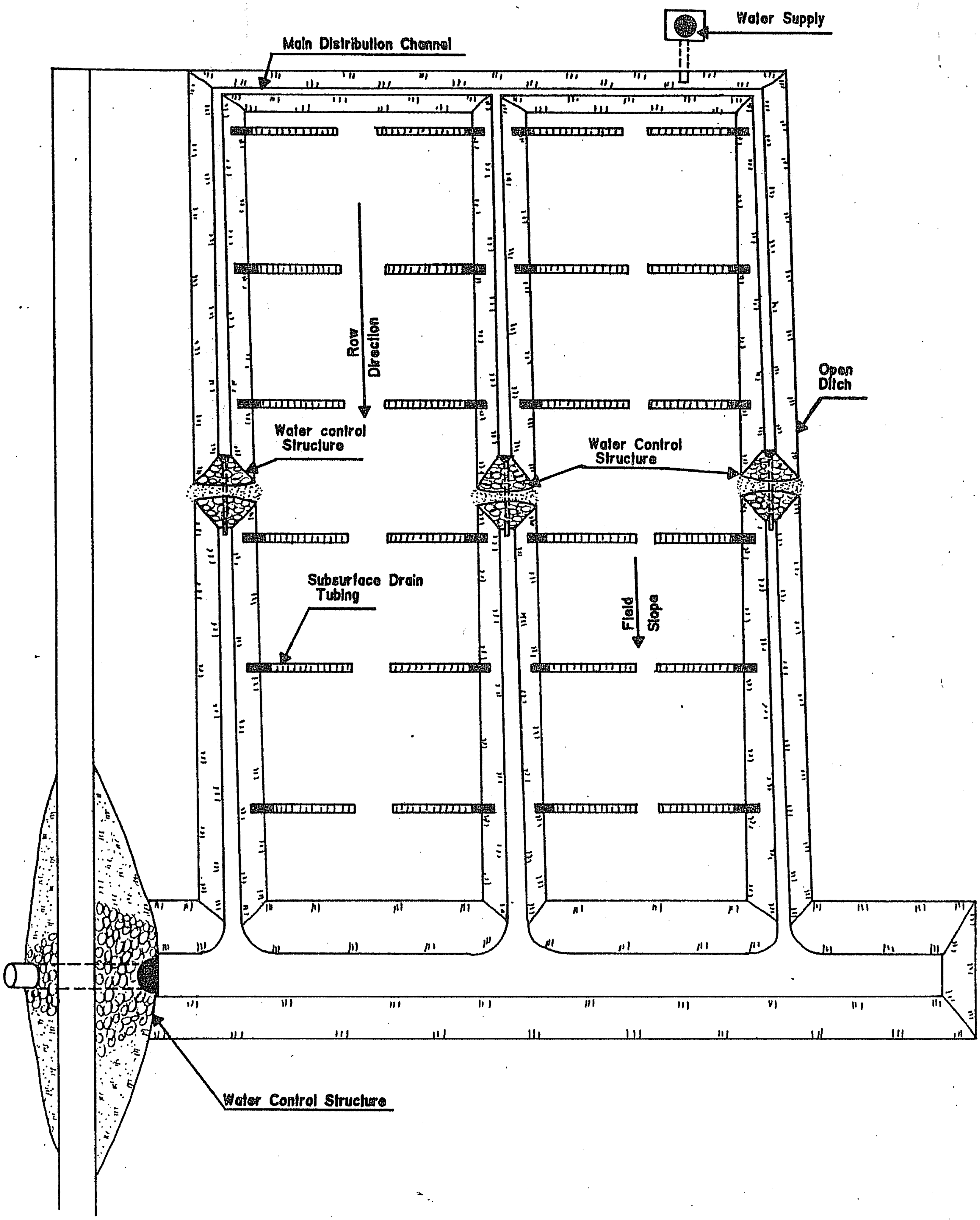
TYPICAL PLAN LAYOUT



SOILS SUITABILITY FOR SUBIRRIGATION
(COASTAL PLAIN)

The table below is to be used as a general guide in planning subirrigation systems. The soils are grouped into two (2) general classifications considering the following limiting factors:

(1) Permeability
(2) Texture
(3) Hardpans
(4) Depth to Water Table
(5) Landscape
(6) Organic Content

The Field Drainage Guide in Section II-G of the Technical Guide provides technical soils information for spacing of subsurface drains. Hydraulic conductivity tests are recommended on individual fields for determining best water table elevations for specific crops to be grown. In the absence of permeability tests, a general guide would be to decrease the recommended spacing for tile drainage by 25-40 percent for subirrigation. The two general soils groupings in the following table are made with the assumption that underground tubing will be used in the water management system.

SOILS WHERE SUBIRRIGATION CAN BE SUCCESSFUL

Altavista	Dragston	Meggett	Rains
Arapahoe	Dunbar	Munden	Roanoke
Argent	Duplin	Nahunta	Roper
Augusta	Emporia	Nimmo	Rutlege
Ballahack	Englehard	Nixonton	Scuppernong
Barclay	Exum	Osier	Seabrook
Bayboro	Foreston	Ousley	Stallings
Bladen	Fork	Pactolus	Stockdale
Brookman	Fortescue	Pantego	Tetotum
Byars	Grantham	Pamlico	Tomotley
Cape Fear	Grifton	Pasquotank	Torhunta
Chapanoke	Hyde	Paxville	Trebloc
Chewacla	Icaria	Pender	Tuckerman
Conaby	Johns	Perquimans	Wahee
Coxville	Leaf	Pettigrew	Wasda
Craven	Lenoir	Plummer	Weeksville
Croatan	Lumbee	Pocomoke	Woodington
Deloss	Lynchburg	Polawana	Wysocking
Dogue	McColl	Ponzer	Yeopim
		Portsmouth	Yonges

SOILS WHERE SUBIRRIGATION IS NOT BELIEVED TO BE PRACTICAL

Belhaven	(organic)	Mattamuskeet	(organic)
Bibb	(flood plain)	Masontown	(flood plain)
Chastain	(flood plain)	Muckalee	(flood plain)
Chowan	(organic)	Murville	(hard pan)
Dare	(organic)	Pottsburg	(hard pan)
Dorovan	(organic)	Pungo	(organic)
Johnston	(flood plain)	Seagate	
Kinston	(flood plain)	Toisnot	
Leon	(hard pan)	Wehadkee	(flood plain)
Lynn Haven	(hard pan)		

FLASHBOARD RISER DESIGN

EXAMPLE

PROBLEM:

Design a flashboard riser to hold back water in a ditch with a drainage area of 240 acres. Landowner wants to control water for corn and soybeans. Discharge pipe is to be used as a farm road crossing.

SOLUTION:

(A) Design discharge pipe portion of structure. Design with boards removed from structure so that it acts as a culvert.

(1) Determine discharge (Q) for corn and soybeans use a removal rate of $Q = 45m^{5/6}$

$Q = 45\ (240/640)^{5/6} = 45\ (0.375)^{5/6}$
$Q = 19.9$ CFS

Use $Q = 20$ CFS or
Use p. 14 - 90 .a in EFM on
$45m^{5/6}$ curve for 240 acres

$Q = 20$ CFS

(2) Next determine pipe size. Area is very flat, therefore use hydraulic head loss of $H = 0.2$ ft.

From SCS Culvert Capacity Charts for CMP... 40 ft. long
$Q = 20$ CFS
$H = 0.20$ ft.

Requires a 42" CMP

(B) DESIGN OF RISER

(1) A flashboard riser, with boards in place, acts as a rectangular contracted weir. The formula for discharge over a weir of this type is:

$Q = 3.33\ H^{3/2}\ (L - 0.2H)$ EFM, p. 3-56

WHERE

Q = Discharge in CFS
L = Length of weir
H = Head on weir as measured at no less than 4 H upstream from weir. A Head of 1.0 ft. is normally used.

$$Q = 3.33\ (1)^{3/2}\ (L-0.2)\ (1)$$
$$Q = 3.33\ (1)\ (L - 0.2)$$
$$20 = 3.33\ L - 0.66$$

$$20 + 0.66 = 3.33\ L$$
$$20.66/3.33 = L$$
$$6.20' = L$$

Try 6' wide flashboard riser

$$Q = 3.33\ (1)^{3/2}\ (6 - 0.2)$$
$$Q = 3.33\ (1)\ (5.8)$$
$$Q = 19.3\ CFS$$

Try H = 1.05 ft.

$$Q = 3.33\ (1.05)^{3/2}\ (5.8)$$
$$Q = (3.33)\ (1.08)\ (5.8)$$
$$Q = 20.8\ CFS$$

A 72 inch wide riser with a 42 inch stub and pipe will be satisfactory. This will probably have to be a special order. If standard stock sizes are to be used, the sizes calculated are minimum. A standard size 72 inch riser with 48 inch stub is available. Height of riser will depend on depth of the ditch and standard riser heights available.

NOTES:

(1) Design discharge pipe as a culvert because this is the way it will be used during most critical times. (boards out and ditch full flow).

(2) It is usually better to keep design head on weir at 1.0' or less, because with higher design heads the normal water level might be too low to provide adequate irrigation.

(3) This method of sizing risers will allow design removal rates to be handled by the structure without removing the flashboards. When flashboards can always be removed during storms smaller risers may be used.

COST - COMPARISON FOR PLANNING A DRAINAGE SYSTEM VS A WATER MANAGEMENT SYSTEM

DRAINAGE SYSTEM	Cost/Acre
1. Drain tubing (4" plastic) 100' spacing	$261.60
2. Precision land forming (Light)..............	125.00
3. Shaped field borders $1500.00/acr........... 2% land surface)	30.00
4. Miscellaneous 10% of above cost.............. (drop pipes, headwalls, etc.)	41.60
	$458.60

WATER MANAGEMENT SYSTEM	
1. Drain tubing (4" plastic) 60' spacing..................	$435.00
2. Precision land leveling (Light)..............	125.00
3. Shaped field borders $1500.00/ac.............. (2% land surface)	30.00
4. Water supply (well) $50.00/gpm (7 gpm/ac).....	350.00
5. Miscellaneous (10% of above cost)............. (Water Control Structure, drop pipes, etc.)	94.60
	$1,034.60

INITIAL COST OF SUBSURFACE DRAINS PER ACRE (4 inch plastic tubing)

DRAIN SPACING (FT.)	DRAIN PER AC. (FT.)	INITIAL COST (INSTALLED) PER AC. W/FILTER	WO/FILTER
50	871	$775.00	$679.00
75	581	517.00	453.00
100	435	387.00	339.00
125	348	309.00	271.00
150	290	258.00	226.00

INITIAL COST FOR WATER CONTROL STRUCTURES

(Flashboard risers, 6' above outlet, 2' stub, bottom for concrete installation)

Weir Width	Aluminum	Corrugated Steel
24"	$ 417.20	$ 400.00
30"	477.06	480.00
36"	536.23	590.00
42"	600.83	706.00
48"	701.14	815.00
60"	994.49	1,175.00
72"	1,188.66	1,399.00

The prices on the previous page are 1983 cost figures derived from contractors and distributors for determining average costs for the seven RCA Demonstration Sites in Camden, Hyde, and Pamlico Counties. The prices for the water control structures were secured from Kaiser Aluminum and Armco Steel. They are f.o.b prices, but do not include the cost of tubes, bands, or installation. This cost data should be used as a guide only in assisting landusers interested in installing water management systems. Variables such as (1) source and location of water supplies, (2) land grading requirements, and (3) drain spacings will have a significant effect on the actual cost for each system.

YIELDMOD can be used to compare crop responses to the different water management alternatives to specific field conditions. For example, on a "tight" rains sandy loam soil, YIELDMOD predicted long term average corn yields of 80 bu/ac on conventional drainage. (Ditches spaced 330' apart). With good internal drainage (tile spaced 80' apart) yields increased to over 130 bu/ac. With the drains spaced 50' apart, to provide for drainage plus irrigation needs, predicted yields increased to over 170 bu/ac.

The yields predicted by YIELDMOD can be used with the above cost information to evaluate economic feasibility of installing water management systems.

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