UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
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Richmond, Virginia 23240

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ENGINEERING NO. 2

GUIDE FOR EVALUATING SCOPE AND EFFECT OF DRAINAGE ON WETLANDS

GUIDE FOR EVALUATING SCOPE AND EFFECT OF DRAINAGE ON WETLANDS

The optimum procedure for determining the effect an artificially created hydraulic gradient has upon a soil water table is to make physical measurements. The measurements must be for a period that includes all seasonal, weather and soil conditions. Time and/or cost may necessitate the use of a procedure less intense than the optimum.

Mathematical equations have been developed that, when applied within their limiting conditions, approximate actual effect on excess soil water. These equations cannot replace a knowledge of the field topography, location and quantity of water sources, stratigraphy and drain location. When, by field surveys and tests, the exact location of impermeable layers, the location and hydraulic head of all inflows, the outflow from the system and the permeability in all parts of the system are known, conditions would then be completely defined and subject to more exact solutions. A person equipped with the above knowledge and data can closely approximate the exact effect of drainage.

Unfortunately, most of the time, exact data for a specific location is not known or available. A feasible method using average data that is easily obtained must be used to provide landusers with a "best estimate" in a timely manner.

The "ellipse" equation, a fundamental equation for flow in saturated soil, is the equation chosen for use in this guide. The equation was developed for use in the design of relief drainage spacing. It is for evaluation of profile drainage. It has proven acceptable when providing protection for crop production. The equation was modified for maximum effect conditions.

ELLIPSE EQUATION AS MODIFIED

$$Le = 0.5\sqrt{4km(m+2a) * 7days/q}$$

Le = Lateral effect of drain (ft)
K = Average hydraulic conductivity (in/hr)
m = Vertical distance between water surface in drain and depth of required drawdown for soil to be a drained wetland (ft) (usually 1.5 ft)
a = Depth to barrier below drain (ft)
q = Amount of excess water to be removed in 7 days (in) (drainable porosity)
d = Depth of drain (ft)

Average Hydraulic Conductivity is determined by:

$$K = (KaDa+KbDb+KxDx)/Da+Db+Dx$$

where
Ka = Hydraulic conductivity of soil layer "a"
Da = Depth of soil layer "a"

Barrier - A barrier is considered to exist when the soil layer below has a permeability less than 10 percent of the permeability of the soil layer immediately above. If the drain depth cuts through a barrier layer into a more permeable layer, that barrier is considered to no longer exist. If no low permeability soil layer is measured, a barrier is considered to exist at 2 times the drain depth.

USE

The equation is provided as a tool. Its use should help a user familiar with the site, its soils and climate, estimate drainage effect. The value of the variables should be determined by actual measurements to the extent time and cost can be justified. The value of the variables K (hydraulic conductivity) and q (drainable porosity) can be estimated from a published soil report where time or cost do not allow more extensive measurements and testing.

The answer obtained is not intended to be the final judgment. Common sense and professional judgment must be used in its application. For example, if actual, observed, or known field conditions indicate that use of the ellipse equation has overestimated or underestimated the effect of drainage, the distance should be modified accordingly. All factors, including ponding of water, hydric soils and existence of hydrophytic vegetation should be taken in consideration. In the absence of any field observations that would seem to contradict the effective distance obtained, the calculated value should be used.

SPREAD SHEET USE

The supplied computations were generated using LOTUS 1 2 3 software. The variables used to compute the effective distances are documented on the table. The variables K and q, considered to be "best averages", were estimated from data published in soil survey reports. The estimates were made using "D M Soil" (SCS Soil Parameters Preparation Program for DRAINMOD) by Otto W. Baumer. Soil textures described for the lowest horizon were assumed to extend to the barrier when the assumed barrier was below the depth of the lowest described horizon.

The spreadsheet is available and has been supplied to each area engineer. A change in the variables; depth to barrier, drainable porosity, hydraulic conductivity or vertical distance of excess water drawdown will cause the spreadsheet to recalculate the effective distance.

THE USER OF THE SUPPLIED COMPUTATION SHEET AND/OR THE SPREADSHEET PROGRAM MUST BE ALERT TO ITS LIMITATIONS. All assumptions must be clearly documented with any values for effective distance that are supplied to landusers.

SPREAD SHEET "SET-UP"

1. Line 2 contains cells for computing effective distance when the user inputs all variables. This is provided should the user wish to test the effect of a change in any variable; also, should the user wish to estimate the effect for a variable not contained in the spreadsheet.

2. If the "depth to barrier" is less than depth of drain the effected distance will not compute.

Assumptions

1. Distances computed using average permeability rates provided from soil survey data. For more exact distance estimates, field measured conductivity rates should be used.

2. Distances apply to systems installed as "relief" drainage.

3. The soil "phase" having the greatest permeability rate was used for these estimates.

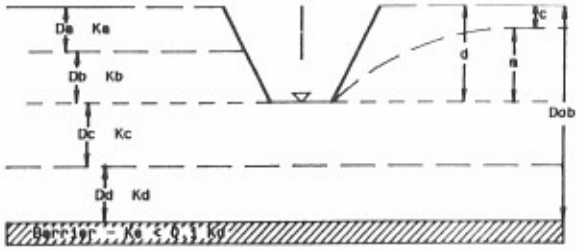
4. The computed distances are to be used as guide. More exact distance should be computed using measured permeability rates and the soil "phase" in question.

5. Removal of the excess water from the saturated soil profile is estimated assuming no evapotransportation, rainfall or surface flooding during the 7 day period.

6. Depth to barrier is assumed to be 2 times depth of drain unless noted to be less.

ESTIMATED MEAN EFFECTIVE DISTANCE
:NOTE:THESE VALUES SHOULD BE USED AS
"FIRST APPROXIMATIONS"

PLEASE REVIEW THE ASSUMPTIONS
USED IN PREPARING THIS TABLE

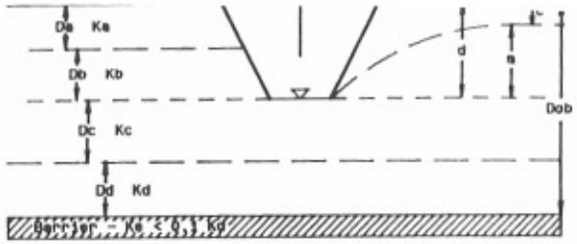


DoB: DEPTH OF BARRIER
q: POROSITY
K: HYDRAULIC CONDUCTIVITY
c: WATER TABLE DEPTH AT EFFECTIVE DISTANCE

SOIL HYDRIC	1.5 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	2 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	3 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	4 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	5 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT
ACREDALE	0 FT.	3.0	0.6	0.8	1.5	22 FT.	4.0	0.6	0.8	1.5	59 FT.	6.0	0.6	1.1	1.5	101 FT.	8.0	0.6	1.4	1.5	141 FT.	10.0	0.6	1.5	1.5
ADEN	0 FT.	3.0	0.4	0.25	1.5	15 FT.	4.0	0.4	0.25	1.5	28 FT.	5.0	0.4	0.2	1.5	33 FT.	5.0	0.4	0.2	1.5	64 FT.	5.0	0.4	0.8	1.5
ALBANO	0 FT.	3.0	0.3	0.5	1.5	25 FT.	4.0	0.3	0.5	1.5	38 FT.	4.0	0.3	0.5	1.5	42 FT.	4.0	0.3	0.5	1.5	DoB ? FT.	4.0	0.3	0.5	1.5
ALDERFLATS	0 FT.	3.0	0.3	0.9	1.5	34 FT.	4.0	0.3	0.9	1.5	75 FT.	6.0	0.3	0.9	1.5	115 FT.	8.0	0.3	0.9	1.5	154 FT.	10.0	0.3	0.9	1.5
ARAPAHOE (L)	0 FT.	3.0	1.1	5.4	1.5	43 FT.	4.0	1.1	5.4	1.5	96 FT.	6.0	1.1	5.4	1.5	147 FT.	8.0	1.1	5.4	1.5	197 FT.	10.0	1.1	5.4	1.5
ARAPAHOE (LS)	0 FT.	3.0	1.1	5.7	1.5	44 FT.	4.0	1.1	5.7	1.5	99 FT.	6.0	1.1	5.7	1.5	151 FT.	8.0	1.1	5.7	1.5	203 FT.	10.0	1.1	5.7	1.5
ARGENT (SL)	0 FT.	3.0	0.5	3.4	1.5	51 FT.	4.0	0.5	3.4	1.5	113 FT.	6.0	0.5	3.4	1.5	173 FT.	8.0	0.5	3.4	1.5	232 FT.	10.0	0.5	3.4	1.5
ARGENT (CL)	0 FT.	3.0	0.6	3.2	1.5	45 FT.	4.0	0.6	3.2	1.5	100 FT.	6.0	0.6	3.2	1.5	153 FT.	8.0	0.6	3.2	1.5	206 FT.	10.0	0.6	3.2	1.5
ATKINS	0 FT.	3.0	0.4	0.9	1.5	29 FT.	4.0	0.4	0.9	1.5	65 FT.	6.0	0.4	0.9	1.5	100 FT.	8.0	0.4	0.9	1.5	134 FT.	10.0	0.4	0.9	1.5
AXIS	0 FT.	3.0	1.0	1.1	1.5	20 FT.	4.0	1.0	1.1	1.5	46 FT.	6.0	1.0	1.1	1.5	70 FT.	8.0	1.0	1.1	1.5	93 FT.	10.0	1.0	1.1	1.5
BACKBAY	0 FT.	3.0	2.1	0.9	1.5	13 FT.	4.0	2.1	0.9	1.5	28 FT.	6.0	2.1	0.9	1.5	43 FT.	8.0	2.1	0.9	1.5	58 FT.	10.0	2.1	0.9	1.5
BAILE	0 FT.	3.0	0.5	1.0	1.5	27 FT.	4.0	0.5	1.0	1.5	61 FT.	6.0	0.5	1.0	1.5	94 FT.	8.0	0.5	1.0	1.5	126 FT.	10.0	0.5	1.0	1.5
BAYDORO(FSL)	0 FT.	3.0	0.9	0.6	1.5	16 FT.	4.0	0.9	0.6	1.5	35 FT.	6.0	0.9	0.6	1.5	54 FT.	8.0	0.9	0.6	1.5	73 FT.	10.0	0.9	0.6	1.5
BEACHES SANDY	37 FT.	3.0	1.3	6.0	1.0	62 FT.	4.0	1.3	6.0	1.0	111 FT.	6.0	1.3	6.0	1.0	160 FT.	8.0	1.3	6.0	1.0	208 FT.	10.0	1.3	6.0	1.0
BELHAVEN	0 FT.	3.0	1.6	6.3	1.5	39 FT.	4.0	1.6	6.3	1.5	86 FT.	6.0	1.6	6.3	1.5	132 FT.	8.0	1.6	6.3	1.5	177 FT.	10.0	1.6	6.3	1.5
BETHERA	0 FT.	3.0	0.6	0.5	1.5	18 FT.	4.0	0.6	0.5	1.5	40 FT.	6.0	0.6	0.5	1.5	61 FT.	8.0	0.6	0.5	1.5	81 FT.	10.0	0.6	0.5	1.5
BIBB(L)	0 FT.	3.0	0.5	2.0	1.5	39 FT.	4.0	0.5	2.0	1.5	87 FT.	6.0	0.5	2.0	1.5	133 FT.	8.0	0.5	2.0	1.5	178 FT.	10.0	0.5	2.0	1.5
BIBB(S)	39 FT.	3.0	0.4	2.1	1.0	66 FT.	4.0	0.4	2.1	1.0	119 FT.	6.0	0.4	2.1	1.0	171 FT.	8.0	0.4	2.1	1.0	222 FT.	10.0	0.4	2.1	1.0
BLADEN	0 FT.	3.0	0.6	2.1	1.5	36 FT.	4.0	0.6	2.1	1.5	81 FT.	6.0	0.6	2.1	1.5	124 FT.	8.0	0.6	2.1	1.5	167 FT.	10.0	0.6	2.1	1.5
BOHICKET(MUCK)	0 FT.	3.0	1.2	0.1	1.5	6 FT.	4.0	1.2	0.1	1.5	13 FT.	6.0	1.2	0.1	1.5	17 FT.	7.0	1.2	0.1	1.5	19 FT.	7.0	1.2	0.1	1.5
BOHICKET	0 FT.	3.0	1.1	0.1	1.5	6 FT.	4.0	1.1	0.1	1.5	13 FT.	6.0	1.1	0.1	1.5	18 FT.	7.0	1.1	0.1	1.5	20 FT.	7.0	1.1	0.1	1.5
BOWMANSVILLE	0 FT.	3.0	0.5	2.3	1.5	42 FT.	4.0	0.5	2.3	1.5	93 FT.	6.0	0.5	2.3	1.5	142 FT.	8.0	0.5	2.3	1.5	191 FT.	10.0	0.5	2.3	1.5
CAMOCCA	77 FT.	3.0	1.0	20.0	1.0	130 FT.	4.0	1.0	20.0	1.0	232 FT.	6.0	1.0	20.0	1.0	333 FT.	8.0	1.0	20.0	1.0	434 FT.	10.0	1.0	20.0	1.0
CHASTAIN(C)	0 FT.	3.0	0.5	6.1	1.5	68 FT.	4.0	0.5	6.1	1.5	152 FT.	6.0	0.5	6.1	1.5	232 FT.	8.0	0.5	6.1	1.5	311 FT.	10.0	0.5	6.1	1.5
CHASTAIN(L)	0 FT.	3.0	0.5	6.2	1.5	68 FT.	4.0	0.5	6.2	1.5	153 FT.	6.0	0.5	6.2	1.5	234 FT.	8.0	0.5	6.2	1.5	314 FT.	10.0	0.5	6.2	1.5
CHATUGE	0 FT.	3.0	0.6	7.0	1.5	66 FT.	4.0	0.6	7.0	1.5	148 FT.	6.0	0.6	7.0	1.5	227 FT.	8.0	0.6	7.0	1.5	304 FT.	10.0	0.6	7.0	1.5
CHICKAHOMINY P	0 FT.	3.0	0.4	0.1	1.5	10 FT.	4.0	0.4	0.1	1.5	22 FT.	6.0	0.4	0.1	1.5	30 FT.	7.0	0.4	0.1	1.5	33 FT.	7.0	0.4	0.1	1.5
CHICKAHOMINY	0 FT.	3.0	0.4	0.1	1.5	10 FT.	4.0	0.4	0.1	1.5	22 FT.	6.0	0.4	0.1	1.5	30 FT.	7.0	0.4	0.1	1.5	33 FT.	7.0	0.4	0.1	1.5
CHINCOTEAGUE	0 FT.	3.0	0.9	1.5	1.5	25 FT.	4.0	0.9	1.5	1.5	28 FT.	6.0	2.2	0.9	1.5	86 FT.	8.0	0.9	1.5	1.5	115 FT.	10.0	0.9	1.5	1.5
CLUBCAF	0 FT.	3.0	0.4	1.1	1.5	32 FT.	4.0	0.4	1.1	1.5	72 FT.	6.0	0.4	1.1	1.5	110 FT	8.0	0.4	1.1	1.5	148 FT.	10.0	0.4	1.1	1.5
COXVILLE	0 FT.	3.0	0.4	0.4	1.5	19 FT.	4.0	0.4	0.4	1.5	43 FT.	6.0	0.4	0.4	1.5	66 FT.	8.0	0.4	0.4	1.5	89 FT.	10.0	0.4	0.4	1.5
CROTON	0 FT.	3.0	0.3	0.3	1.5	19 FT.	4.0	0.3	0.3	1.5	37 FT.	5.0	0.3	0.3	1.5	43 FT.	5.0	0.3	0.3	1.5	45 FT.	5.0	0.3	0.3	1.5
DALEVILLE	0 FT.	3.0	0.6	0.8	1.5	22 FT.	4.0	0.6	0.8	1.5	43 FT.	5.0	0.6	0.8	1.5	50 FT.	5.0	0.6	0.8	1.5	52 FT.	5.0	0.6	0.8	1.5
DELOSS	38 FT.	3.0	0.7	3.4	1.0	64 FT.	4.0	0.7	3.4	1.0	114 FT.	6.0	0.7	3.4	1.0	164 FT.	8.0	0.7	3.4	1.0	214 FT.	10.0	0.7	3.4	1.0
DOROVAN	0 FT.	3.0	1.1	4.8	1.5	41 FT.	4.0	1.1	4.8	1.5	91 FT.	6.0	1.1	4.8	1.5	139 FT.	8.0	1.1	4.8	1.5	186 FT.	10.0	1.1	4.8	1.5
DUCKSTON	0 FT.	3.0	1.2	20.0	1.5	118 FT.	4.0	1.2	20.0	1.0	212 FT.	6.0	1.2	20.0	1.0	304 FT.	8.0	1.2	20.0	1.0	396 FT.	10.0	1.2	20.0	1.0

ESTIMATED MEAN EFFECTIVE DISTANCE
:NOTE:THESE VALUES SHOULD BE USED AS
"FIRST APPROXIMATIONS"

PLEASE REVIEW THE ASSUMPTIONS
USED IN PREPARING THIS TABLE

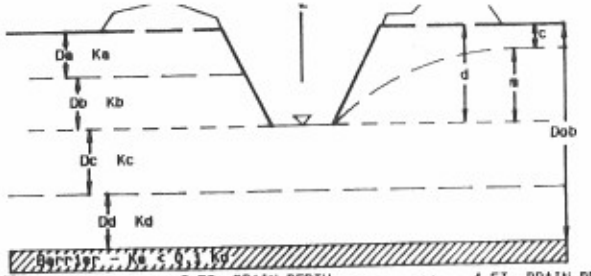


DoB: DEPTH OF BARRIER
q: POROSITY
K: HYDRAULIC CONDUCTIVITY
c: WATER TABLE DEPTH AT EFFECTIVE DISTANCE

SOIL HYDRIC	1.5 FT. DRAIN DEPTH					2 FT. DRAIN DEPTH					3 FT. DRAIN DEPTH					4 FT. DRAIN DEPTH					5 FT. DRAIN DEPTH				
		INPUT VALUES					INPUT VALUES					INPUT VALUES					INPUT VALUES					INPUT VALUES			
	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.
DUNNING	0 FT.	3.0	0.7	0.3	1.5	13 FT.	4.0	0.7	0.3	1.5	28 FT.	6.0	0.7	0.3	1.5	43 FT.	8.0	0.7	0.3	1.5	58 FT.	10.0	0.7	0.3	1.5
ELBERT	32 FT.	3.0	0.2	0.3	0.5	46 FT.	4.0	0.2	0.3	0.5	73 FT.	6.0	0.2	0.3	0.5	81 FT.	6.0	0.2	0.3	0.5	86 FT.	6.0	0.2	0.3	0.5
ELKTON	0 FT.	3.0	0.5	0.4	1.5	17 FT.	4.0	0.5	0.4	1.5	39 FT.	6.0	0.5	0.4	1.5	59 FT.	8.0	0.5	0.4	1.5	80 FT.	10.0	0.5	0.4	1.5
EVANSHAM	0 FT.	3.0	1.2	0.2	1.5	8 FT.	4.0	1.2	0.2	1.5	18 FT.	6.0	1.2	0.2	1.5	27 FT.	8.0	1.2	0.2	1.5	36 FT.	10.0	1.2	0.2	1.5
FALLSINGTON	0 FT.	3.0	0.3	3.0	1.5	61 FT.	4.0	0.3	3.0	1.5	137 FT.	6.0	0.3	3.0	1.5	210 FT.	8.0	0.3	3.0	1.5	282 FT.	10.0	0.3	3.0	1.5
FEATHERSTONE	0 FT.	3.0	1.1	1.1	1.5	19 FT.	4.0	1.1	1.1	1.5	43 FT.	6.0	1.1	1.1	1.5	66 FT.	8.0	1.1	1.1	1.5	89 FT.	10.0	1.1	1.1	1.5
FORESTDALE	0 FT.	3.0	0.2	0.3	1.5	24 FT.	4.0	0.2	0.3	1.5	53 FT.	6.0	0.2	0.3	1.5	81 FT.	8.0	0.2	0.3	1.5	109 FT.	10.0	0.2	0.3	1.5
HATBORO	0 FT.	3.0	0.6	2.4	1.5	39 FT.	4.0	0.6	2.4	1.5	87 FT.	6.0	0.6	2.4	1.5	133 FT.	8.0	0.6	2.4	1.5	178 FT.	10.0	0.6	2.4	1.5
HYDE	0 FT.	3.0	0.9	0.4	1.5	13 FT.	4.0	0.9	0.4	1.5	29 FT.	6.0	0.9	0.4	1.5	44 FT.	8.0	0.9	0.4	1.5	50 FT.	8.0	0.9	0.4	1.5
HYDE (MUCK)	0 FT.	3.0	1.1	1.1	1.5	19 FT.	4.0	1.1	1.1	1.5	43 FT.	6.0	1.1	1.1	1.5	66 FT.	8.0	1.1	1.1	1.5	75 FT.	8.0	1.1	1.1	1.5
JOHNSTON	0 FT.	3.0	1.1	9.0	1.5	56 FT.	4.0	1.1	9.0	1.5	124 FT.	6.0	1.1	9.0	1.5	190 FT.	8.0	1.1	9.0	1.5	255 FT.	10.0	1.1	9.0	1.5
KENANSVILLE	65 FT.	3.0	0.7	10.0	1.0	110 FT.	4.0	0.7	10.0	1.0	196 FT.	6.0	0.7	10.0	1.0	281 FT.	8.0	0.7	10.0	1.0	367 FT.	10.0	0.7	10.0	1.0
KINKORA	0 FT.	3.0	0.4	2.6	1.5	50 FT.	4.0	0.4	2.6	1.5	111 FT.	6.0	0.4	2.6	1.5	169 FT.	8.0	0.4	2.6	1.5	227 FT.	10.0	0.4	2.6	1.5
KINSTON	0 FT.	3.0	0.6	2.0	1.5	35 FT.	4.0	0.6	2.0	1.5	79 FT.	6.0	0.6	2.0	1.5	121 FT.	8.0	0.6	2.0	1.5	163 FT.	10.0	0.6	2.0	1.5
LANEXA	0 FT.	3.0	0.4	0.6	1.5	24 FT.	4.0	0.4	0.6	1.5	53 FT.	6.0	0.4	0.6	1.5	81 FT.	8.0	0.4	0.6	1.5	109 FT.	10.0	0.4	0.6	1.5
LAWNES	0 FT.	3.0	0.4	1.3	1.5	35 FT.	4.0	0.4	1.3	1.5	78 FT.	6.0	0.4	1.3	1.5	120 FT.	8.0	0.4	1.3	1.5	161 FT.	10.0	0.4	1.3	1.5
LEAF	0 FT.	3.0	0.4	0.1	1.5	10 FT.	4.0	0.4	0.1	1.5	22 FT.	6.0	0.4	0.1	1.5	33 FT.	8.0	0.4	0.1	1.5	28 FT.	6.0	0.4	0.1	1.5
LEAKSVILLE	0 FT.	3.0	0.8	0.5	1.5	11 FT.	3.0	0.8	0.5	1.5	15 FT.	3.0	0.8	0.5	1.5	DoB ? FT.	3.0	0.8	0.5	1.5	DoB ? FT.	3.0	0.8	0.5	1.5
LENOIR P. (FSL)	0 FT.	3.0	0.6	0.4	1.5	16 FT.	4.0	0.6	0.4	1.5	35 FT.	6.0	0.6	0.4	1.5	54 FT.	8.0	0.6	0.4	1.5	73 FT.	10.0	0.6	0.4	1.5
LENOIR P. (L)	0 FT.	3.0	0.6	0.2	1.5	11 FT.	4.0	0.6	0.2	1.5	25 FT.	6.0	0.6	0.2	1.5	38 FT.	8.0	0.6	0.2	1.5	51 FT.	10.0	0.6	0.2	1.5
LEON	43 FT.	3.0	0.7	4.5	1.0	73 FT.	4.0	0.7	4.5	1.0	131 FT.	6.0	0.7	4.5	1.0	189 FT.	8.0	0.7	4.5	1.0	246 FT.	10.0	0.7	4.5	1.0
LEVY	0 FT.	3.0	1.2	0.2	1.5	8 FT.	4.0	1.2	0.2	1.5	18 FT.	6.0	1.2	0.2	1.5	27 FT.	8.0	1.2	0.2	1.5	31 FT.	8.0	1.2	0.2	1.5
LUMBEE	0 FT.	3.0	0.5	11.0	1.5	91 FT.	4.0	0.5	11.0	1.5	204 FT.	6.0	0.5	11.0	1.5	311 FT.	8.0	0.5	11.0	1.5	418 FT.	10.0	0.5	11.0	1.5
MAGOTHA (LFS)	0 FT.	3.0	0.5	8.0	1.5	78 FT.	4.0	0.5	8.0	1.5	207 FT.	6.0	0.5	8.0	1.0	298 FT.	8.0	0.5	8.0	1.0	383 FT.	10.0	0.5	8.0	1.0
MAGOTHA (SL)	0 FT.	3.0	0.8	7.0	1.5	58 FT.	4.0	0.8	7.0	1.5	129 FT.	6.0	0.8	7.0	1.5	196 FT.	8.0	0.8	7.0	1.5	264 FT.	10.0	0.8	7.0	1.5
MATTAN	0 FT.	3.0	0.5	1.3	1.5	31 FT.	4.0	0.5	1.3	1.5	70 FT.	6.0	0.5	1.3	1.5	107 FT.	8.0	0.5	1.3	1.5	144 FT.	10.0	0.5	1.3	1.5
MAURERTOWN	0 FT.	3.0	0.4	0.2	1.5	14 FT.	4.0	0.4	0.2	1.5	26 FT.	5.0	0.4	0.2	1.5	31 FT.	5.0	0.4	0.2	1.5	32 FT.	5.0	0.4	0.2	1.5
MEGGETT (SL)	0 FT.	3.0	1.0	0.5	1.5	14 FT.	4.0	1.0	0.5	1.5	26 FT.	5.0	1.0	0.5	1.5	31 FT.	5.0	1.0	0.5	1.5	32 FT.	5.0	1.0	0.5	1.5
MEGGETT (CL)	0 FT.	3.0	0.9	0.3	1.5	11 FT.	4.0	0.9	0.3	1.5	25 FT.	6.0	0.9	0.3	1.5	38 FT.	8.0	0.9	0.3	1.5	51 FT.	10.0	0.9	0.3	1.5
MELVIN (FSL)	0 FT.	3.0	0.5	1.3	1.5	31 FT.	4.0	0.5	1.3	1.5	70 FT.	6.0	0.5	1.3	1.5	107 FT.	8.0	0.5	1.3	1.5	144 FT.	10.0	0.5	1.3	1.5
MELVIN (SICL)	0 FT.	3.0	0.3	1.1	1.5	37 FT.	4.0	0.3	1.1	1.5	83 FT.	6.0	0.3	1.1	1.5	127 FT.	8.0	0.3	1.1	1.5	171 FT.	10.0	0.3	1.1	1.5
MUCKALEE (L)	0 FT.	3.0	0.4	1.1	1.5	32 FT.	4.0	0.4	1.1	1.5	72 FT.	6.0	0.4	1.1	1.5	110 FT.	8.0	0.4	1.1	1.5	148 FT.	10.0	0.4	1.1	1.5
MUCKALEE (LS)	0 FT.	3.0	1.0	1.2	1.5	21 FT.	4.0	1.0	1.2	1.5	48 FT.	6.0	1.0	1.2	1.5	73 FT.	8.0	1.0	1.2	1.5	98 FT.	10.0	1.0	1.2	1.5
MYATT (FSL)	0 FT.	3.0	0.2	2.4	1.5	67 FT.	4.0	0.2	2.4	1.5	151 FT.	6.0	0.2	2.4	1.5	230 FT.	8.0	0.2	2.4	1.5	309 FT.	10.0	0.2	2.4	1.5
MYATT (SL)	0 FT.	3.0	0.5	1.5	1.5	34 FT.	4.0	0.5	1.5	1.5	75 FT.	6.0	0.5	1.5	1.5	115 FT.	8.0	0.5	1.5	1.5	154 FT.	10.0	0.5	1.5	1.5
MYATT (LFS)	42 FT.	3.0	0.4	2.4	1.0	71 FT.	4.0	0.4	2.4	1.0	127 FT.	6.0	0.4	2.4	1.0	182 FT.	8.0	0.4	2.4	1.0	238 FT.	10.0	0.4	2.4	1.0

ESTIMATED MEAN EFFECTIVE DISTANCE
:NOTE:THESE VALUES SHOULD BE USED AS
"FIRST APPROXIMATIONS"

PLEASE REVIEW THE ASSUMPTIONS
USED IN PREPARING THIS TABLE



DoB: DEPTH OF BARRIER
q: POROSITY
K: HYDRAULIC CONDUCTIVITY
c: WATER TABLE DEPTH AT EFFECTIVE DISTANCE

SOIL HYDRIC	1.5 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	2 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	3 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	4 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	5 FT. DRAIN DEPTH INPUT VALUES EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT
NANNEY (SIL)	0 FT.	3.0	0.4	1.1	1.5	32 FT.	4.0	0.4	1.1	1.5	72 FT.	6.0	0.4	1.1	1.5	99 FT.	7.0	0.4	1.1	1.5	110 FT.	7.0	0.4	1.1	1.5
NANNEY P.(SL)	0 FT.	3.0	0.7	1.0	1.5	23 FT.	4.0	0.7	1.0	1.5	52 FT.	6.0	0.7	1.0	1.5	71 FT.	7.0	0.7	1.0	1.5	79 FT.	7.0	0.7	1.0	1.5
NEWARK	38 FT.	3.0	0.5	1.1	0.5	55 FT.	4.0	0.5	1.1	0.5	89 FT.	6.0	0.5	1.1	0.5	122 FT.	8.0	0.5	1.1	0.5	155 FT.	10.0	0.5	1.1	0.5
NEWMARC	0 FT.	3.0	0.3	1.1	1.5	71 FT.	4.0	0.3	1.1	0.5	114 FT.	6.0	0.3	1.1	0.5	157 FT.	8.0	0.3	1.1	0.5	200 FT.	10.0	0.3	1.1	0.5
NIMMO	0 FT.	3.0	1.0	1.7	1.5	25 FT.	4.0	1.0	1.7	1.5	87 FT.	6.0	1.0	4.0	1.5	176 FT.	8.0	1.0	7.0	1.5	236 FT.	10.0	1.0	7.0	1.5
NOLIN	0 FT.	3.0	0.5	1.5	1.5	34 FT.	4.0	0.5	1.5	1.5	75 FT.	6.0	0.5	1.5	1.5	115 FT.	8.0	0.5	1.5	1.5	154 FT.	10.0	0.5	1.5	1.5
OSIER	71 FT.	3.0	0.7	12.0	1.0	120 FT.	4.0	0.7	12.0	1.0	215 FT.	6.0	0.7	12.0	1.0	308 FT.	8.0	0.7	12.0	1.0	402 FT.	10.0	0.7	12.0	1.0
OTHELLO	0 FT.	3.0	0.5	1.0	1.5	27 FT.	4.0	0.5	1.0	1.5	61 FT.	6.0	0.5	1.0	1.5	94 FT.	8.0	0.5	1.0	1.5	126 FT.	10.0	0.5	1.0	1.5
PAMILCO	0 FT.	3.0	1.0	6.0	1.5	48 FT.	4.0	1.0	6.0	1.5	106 FT.	6.0	1.0	6.0	1.5	163 FT.	8.0	1.0	6.0	1.5	218 FT.	10.0	1.0	6.0	1.5
PARTLOW	0 FT.	3.0	0.4	2.6	1.5	50 FT.	4.0	0.4	2.6	1.5	111 FT.	6.0	0.4	2.6	1.5	169 FT.	8.0	0.4	2.6	1.5	227 FT.	10.0	0.4	2.6	1.5
PASQUOTANK	0 FT.	3.0	0.4	2.3	1.5	47 FT.	4.0	0.4	2.3	1.5	104 FT.	6.0	0.4	2.3	1.5	159 FT.	8.0	0.4	2.3	1.5	214 FT.	10.0	0.4	2.3	1.5
PINEYWOODS	0 FT.	3.0	0.4	0.3	1.5	17 FT.	4.0	0.4	0.3	1.5	32 FT.	5.0	0.4	0.3	1.5	38 FT.	5.0	0.4	0.3	1.5	39 FT.	5.0	0.4	0.3	1.5
POCATY	0 FT.	3.0	1.5	0.8	1.5	14 FT.	4.0	1.5	0.8	1.5	32 FT.	6.0	1.5	0.8	1.5	48 FT.	8.0	1.5	0.8	1.5	65 FT.	10.0	1.5	0.8	1.5
POCOMOKE P.(LS)	0 FT.	3.0	1.1	2.9	1.5	32 FT.	4.0	1.1	2.9	1.5	71 FT.	6.0	1.1	2.9	1.5	108 FT.	8.0	1.1	2.9	1.5	145 FT.	10.0	1.1	2.9	1.5
POCOMOKE P.(SL)	0 FT.	3.0	0.9	2.7	1.5	34 FT.	4.0	0.9	2.7	1.5	75 FT.	6.0	0.9	2.7	1.5	115 FT.	8.0	0.9	2.7	1.5	154 FT.	10.0	0.9	2.7	1.5
POLAWANA	0 FT.	3.0	0.5	13.0	1.5	99 FT.	4.0	0.5	13.0	1.5	222 FT.	6.0	0.5	13.0	1.5	339 FT.	8.0	0.5	13.0	1.5	454 FT.	10.0	0.5	13.0	1.5
POOLER	0 FT.	3.0	0.4	0.4	1.5	19 FT.	4.0	0.4	0.4	1.5	43 FT.	6.0	0.4	0.4	1.5	66 FT.	8.0	0.4	0.4	1.5	89 FT.	10.0	0.4	0.4	1.5
PORTSMOUTH(MK)	0 FT.	3.0	1.0	10.0	1.5	61 FT.	4.0	1.0	10.0	1.5	137 FT.	6.0	1.0	10.0	1.5	210 FT.	8.0	1.0	10.0	1.5	282 FT.	10.0	1.0	10.0	1.5
PORTSMOUTH	0 FT.	3.0	0.9	9.0	1.5	61 FT.	4.0	0.9	9.0	1.5	137 FT.	6.0	0.9	9.0	1.5	210 FT.	8.0	0.9	9.0	1.5	282 FT.	10.0	0.9	9.0	1.5
POUNCEY	0 FT.	3.0	0.4	0.4	1.5	14 FT.	3.0	0.4	0.4	1.5	19 FT.	3.0	0.4	0.4	1.5	DoB ? FT.	3.0	0.4	0.4	1.5	DoB ? FT.	3.0	0.4	0.3	1.5
PUNGO	0 FT.	3.0	1.1	0.8	1.5	17 FT.	4.0	1.1	0.8	1.5	37 FT.	6.0	1.1	0.8	1.5	57 FT.	8.0	1.1	0.8	1.5	76 FT.	10.0	1.1	0.8	1.5
PURDY	0 FT.	3.0	0.4	0.5	1.5	22 FT.	4.0	0.4	0.5	1.5	42 FT.	5.0	0.4	0.5	1.5	49 FT.	5.0	0.4	0.5	1.5	51 FT.	5.0	0.4	0.5	1.5
RAINS (L)	0 FT.	3.0	0.4	1.3	1.5	35 FT.	4.0	0.4	1.3	1.5	78 FT.	6.0	0.4	1.3	1.5	120 FT.	8.0	0.4	1.3	1.5	161 FT.	10.0	0.4	1.3	1.5
RAINS (S)	38 FT.	3.0	0.5	2.5	1.0	65 FT.	4.0	0.5	2.5	1.0	116 FT.	6.0	0.5	2.5	1.0	166 FT.	8.0	0.5	2.5	1.0	217 FT.	10.0	0.5	2.5	1.0
RAINS (SL)	0 FT.	3.0	0.5	1.6	1.5	35 FT.	4.0	0.5	1.6	1.5	78 FT.	6.0	0.5	1.6	1.5	119 FT.	8.0	0.5	1.6	1.5	159 FT.	10.0	0.5	1.6	1.5
RAPPAHANNOCK	0 FT.	3.0	0.5	1.3	1.5	31 FT.	4.0	0.5	1.3	1.5	70 FT.	6.0	0.5	1.3	1.5	107 FT.	8.0	0.5	1.3	1.5	144 FT.	10.0	0.5	1.3	1.5
RIVERWASH GRV.	59 FT.	3.0	1.0	12.0	1.0	100 FT.	4.0	1.0	12.0	1.0	180 FT.	6.0	1.0	12.0	1.0	258 FT.	8.0	1.0	12.0	1.0	336 FT.	10.0	1.0	12.0	1.0
ROANOKE (FSL)	0 FT.	3.0	0.8	0.5	1.5	15 FT.	4.0	0.8	0.5	1.5	34 FT.	6.0	0.8	0.5	1.5	173 FT.	8.0	0.8	5.4	1.5	194 FT.	8.0	0.8	5.4	1.5
ROANOKE (CL)	0 FT.	3.0	0.2	0.4	1.5	27 FT.	4.0	0.2	0.4	1.5	61 FT.	6.0	0.2	0.4	1.5	94 FT.	8.0	0.2	0.4	1.5	183 FT.	8.0	0.2	1.2	1.5
ROANOKE (L)	0 FT.	3.0	0.4	0.6	1.5	35 FT.	4.0	0.4	0.6	1.0	63 FT.	6.0	0.4	0.6	1.0	274 FT.	8.0	0.4	5.4	1.0	301 FT.	8.0	0.4	5.4	1.0
ROANOKE P.(SICL)	0 FT.	3.0	0.4	1.4	1.5	36 FT.	4.0	0.4	1.4	1.5	97 FT.	6.0	0.4	1.4	1.0	139 FT.	8.0	0.4	1.4	1.0	181 FT.	10.0	0.4	1.4	1.0
ROBERTSVILLE	0 FT.	3.0	0.3	0.4	1.5	22 FT.	4.0	0.3	0.4	1.5	50 FT.	6.0	0.3	0.4	1.5	77 FT.	8.0	0.3	0.4	1.5	103 FT.	10.0	0.3	0.4	1.5
TODDSTAV	0 FT.	3.0	0.4	0.9	1.5	29 FT.	4.0	0.4	0.9	1.5	65 FT.	6.0	0.4	0.9	1.5	100 FT.	8.0	0.4	0.9	1.5	134 FT.	10.0	0.4	0.9	1.5
TOMOTLEY (LS)	0 FT.	3.0	0.6	2.3	1.5	57 FT.	4.0	0.6	2.3	1.0	101 FT.	6.0	0.6	2.3	1.0	146 FT.	8.0	0.6	2.3	1.0	160 FT.	8.0	0.6	2.3	1.0
TOMOTLEY(L)	0 FT.	3.0	0.5	1.8	1.5	37 FT.	4.0	0.5	1.8	1.5	82 FT.	6.0	0.5	1.8	1.5	126 FT.	8.0	0.5	1.8	1.5	142 FT.	8.0	0.5	1.8	1.5
TORHUNTA (FSL)	0 FT.	3.0	1.0	8.4	1.5	56 FT.	4.0	1.0	8.4	1.5	126 FT.	6.0	1.0	8.4	1.5	192 FT.	8.0	1.0	8.4	1.5	258 FT.	10.0	1.0	8.4	1.5

ESTIMATED MEAN EFFECTIVE DISTANCE
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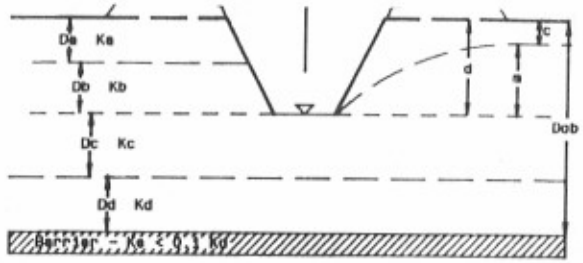
"FIRST APPROXIMATIONS"

PLEASE REVIEW THE ASSUMPTIONS
USED IN PREPARING THIS TABLE



DoB: DEPTH OF BARRIER
q: POROSITY
K: HYDRAULIC CONDUCTIVITY
c: WATER TABLE DEPTH AT EFFECTIVE DISTANCE

SOIL HYDRIC	1.5 FT. DRAIN DEPTH					2 FT. DRAIN DEPTH					3 FT. DRAIN DEPTH					4 FT. DRAIN DEPTH					5 FT. DRAIN DEPTH				
		INPUT VALUES					INPUT VALUES					INPUT VALUES					INPUT VALUES					INPUT VALUES			
	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.	EFFECTIVE DISTANCE	DoB FT.	q IN.	K IN/HR	c FT.
TORHUNTA(MK)	0 FT.	3.0	1.1	8.0	1.5	52 FT.	4.0	1.1	8.0	1.5	117 FT.	6.0	1.1	8.0	1.5	179 FT.	8.0	1.1	8.0	1.5	240 FT.	10.0	1.1	8.0	1.5
TOXAWAY	0 FT.	3.0	0.5	4.9	1.5	61 FT.	4.0	0.5	4.9	1.5	136 FT.	6.0	0.5	4.9	1.5	208 FT.	8.0	0.5	4.9	1.5	279 FT.	10.0	0.5	4.9	1.5
WAXPOOL	32 FT.	3.0	0.2	0.3	0.5	46 FT.	4.0	0.2	0.3	0.5	73 FT.	6.0	0.2	0.3	0.5	285 FT.	8.0	0.2	2.4	0.5	363 FT.	10.0	0.2	2.4	0.5
WEEKSVILLE	0 FT.	3.0	0.6	2.4	1.5	39 FT.	4.0	0.6	2.4	1.5	87 FT.	6.0	0.6	2.4	1.5	133 FT.	8.0	0.6	2.4	1.5	178 FT.	10.0	0.6	2.4	1.5
WEHADKEE(SL)	0 FT.	3.0	0.7	2.2	1.5	34 FT.	4.0	0.7	2.2	1.5	77 FT.	6.0	0.7	2.2	1.5	118 FT.	8.0	0.7	2.2	1.5	132 FT.	8.0	0.7	2.2	1.5
WEHADKEE(SIL)	0 FT.	3.0	0.6	2.0	1.5	35 FT.	4.0	0.6	2.0	1.5	79 FT.	6.0	0.6	2.0	1.5	121 FT.	8.0	0.6	2.0	1.5	136 FT.	8.0	0.6	2.0	1.5
WESTON	0 FT.	3.0	1.0	4.0	1.5	39 FT.	4.0	1.0	4.0	1.5	87 FT.	6.0	1.0	4.0	1.5	133 FT.	8.0	1.0	4.0	1.5	178 FT.	10.0	1.0	4.0	1.5
WOODINGTON(LS)	0 FT.	3.0	0.4	6.0	1.5	112 FT.	4.0	0.4	6.0	1.0	201 FT.	6.0	0.4	6.0	1.0	288 FT.	8.0	0.4	6.0	1.0	376 FT.	10.0	0.4	6.0	1.0
WOODINGTON(SL)	0 FT.	3.0	0.7	5.7	1.5	55 FT.	4.0	0.7	5.7	1.5	124 FT.	6.0	0.7	5.7	1.5	189 FT.	8.0	0.7	5.7	1.5	254 FT.	10.0	0.7	5.7	1.5
WORSHAM(SL)	0 FT.	3.0	0.7	0.6	1.5	18 FT.	4.0	0.7	0.6	1.5	27 FT.	4.0	0.7	0.6	1.5	30 FT.	4.0	0.7	0.6	1.5	DoB ? FT.	4.0	0.7	0.5	1.5
WORSHAM(L)	0 FT.	3.0	0.4	0.2	1.5	14 FT.	4.0	0.4	0.2	1.5	21 FT.	4.0	0.4	0.2	1.5	23 FT.	4.0	0.4	0.2	1.5	DoB ? FT.	4.0	0.4	0.3	1.5
	ERR FT.	3.0		0.6		51 FT.	4.0	0.6	4.2	1.5	ERR FT.	6.0				ERR FT.	8.0				DoB ? FT.				