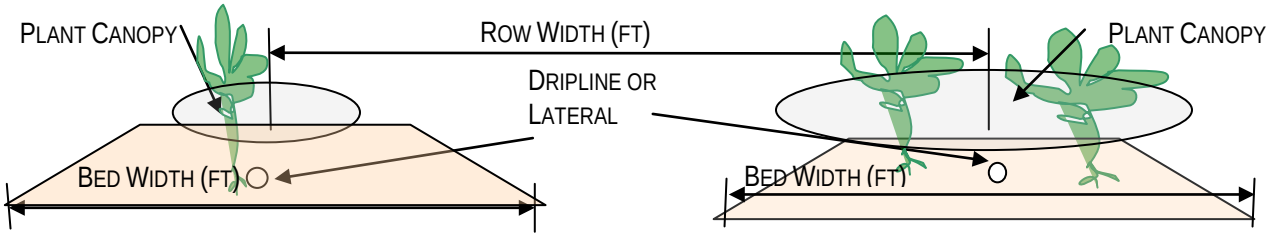
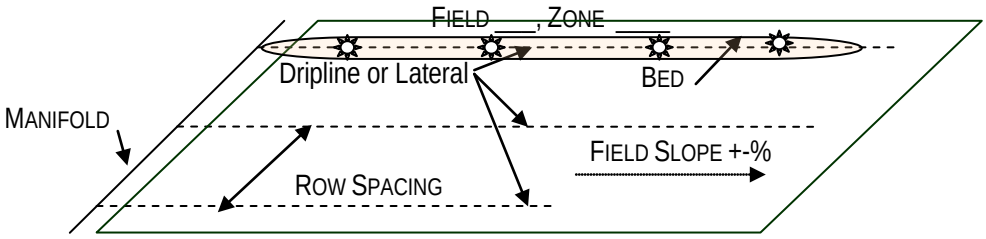
U.S. DEPARTMENT OF AGRICULTURE WV Natural Resources Conservation Service	**ESTIMATE AVERAGE DAILY CROP WATER USE, APPLICATION RATE AND DURATION FOR MICROIRRIGATION SYSTEM**	WVENG WS441C 08/09/09

Land Operator _____Date _____
District _____County _____ Service Center _____
Prepared By _____, _____, Checked By _____, _____, Approved By _____ , _____

DETERMINE THE AVERAGE DAILY PLANT CONSUMPTIVE WATER USE FOR A SPECIFIC CROP (WVENGWS441A), ZONE APPLICATION VOLUME (ZAV), ZONE APPLICATION RATE (ZAR) AND THE ZONE DURATION OF IRRIGATION (ZD) TO THE SYSTEM. REVIEW THE MAXIMUM APPLICATION RATE (GPM) FOR EACH ZONE AND COMBINATION OF ZONES, AS WELL AS THE MAXIMUM DURATION OF EACH ZONE. COMPARE THESE VALUES TO THE WATER SUPPLY PUMPING RATE. DETERMINE IF THE WATER SUPPLY WILL MEET THE DAILY CROP REQUIREMENTS. THE WATER SUPPLY SHALL SUPPLY 125% OF THE IRRIGATION REQUIREMENTS.



MANIFOLD, LATERAL AND FIELD LAYOUT



MICRO-IRRIGATION SYSTEM EMITTER OR DRIP TAPE MANUFACTURER INFORMATION
DRIP TAPE OR POINT EMITTER OR MANUFACTURER _____ ITEM # _____

TYPE OF EMITTER ___IN-LINE, ___ POINT SOURCE[1]; ___NON-PRESSURE COMPENSATING (NPC), ___PRESSURE COMPENSATING (PC)

LATERAL OR DRIPLINE : OUTSIDE DIAMETER _____INCH, WALL THICKNESS _____ MIL OR _____MM

ALLOWABLE LATERAL SLOPE (+ UPHILL, - DOWNHILL) _____%; MAXIMUM RUN LENGTH _____ FT

E (APPLICATION EFFICIENCY) __90__% (ASSUMED FOR MICROIRRIGATION)

ES (EMITTER SPACING) _____INCH, FILTER REQ. _____ MESH, _____ MICRONS,

EFR -(EMITTER FLOW RATE) _____GAL/HR @ ____ PSI ; $= \frac{\text{DLFR (GAL/MIN) X ES(IN) X 60(MIN/HR)}}{\text{100(FT) X 12(IN/FT)}}$

DLFR (DRIP LINE FLOW RATE) PER 100') _____ GAL/MIN /100' @ ____PSI $= \frac{\text{EFR(GAL/HR/100 FT) X 100 (FT) X 12 (IN/FT)}}{\text{ES(IN) X 60(MIN/HR)}}$

[1]NOTE: POINT SOURCE EMITTER- IF POINT SOURCE EMITTER(S) ARE USED FOR TREES OR PLANTS, DOCUMENT THE _____ GPM FLOW RATE @ ____ PSI AND THE _____NUMBER OF POINT EMITTERS PER PLANT

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REFERENCE SPECIFICATIONS FOR SELECTED MICROIRRIGATION (DATA REQUIRED) TO COMPLETE THE FOLLOWING ANALYSIS.	IN-LINE DRIP EMITTERS (ASSUME 90% APPLICATION EFFICIENT)					POINT EMITTERS	
FIELD # , ZONE #							
FIELD DIMENSIONS ;LENGTH -FT							
FIELD DIMENSIONS; WIDTH - FT							
VEG., FRUIT, BERRY, TREE ,ETC.							
PLANT MATURE ROOT DEPTH							
MULCH TYPE (PLASTIC, STRAW, ETC.)							
ADPCU (WVENGWS 441A) - IN/DAY							
CDC (WVENGWS441A)							
ADPSCSC (Average Daily Peak Consumption for Specific Crop) ; ADPCU* X CDC = _____IN/DAY							
BW (BED WIDTH)- FT							
RW (ROW WIDTH)- FT							
PC (PLANT OR TREE CANOPY WIDTH OR DIAMETER) -FT							
RL (AVERAGE ROW LENGTH – FT)							
ROW SLOPE (MAX.) +-%							
TYPE OF INLINE EMITTERS (N PC OR PC)							
NL/R (NUMBER OF LATERALS/ROW) - NO.							
NR- (NUMBER OF ROWS)							
TLL (TOTAL LATERAL LENGTH) =RL X NL/R X NR - FT							
PE- NO. OF POINT EMITTERS /ROW - #							
CIA- CROP IRRIGATION AREA =NR X RL X (BW OR PC)-SF							
CV -CROP VOL =ADPCUSC (in) /12 X CIA (SF) X 7.48 GAL/CF- GPD							
EFR- MICRO IN-LINE EFR OR PE FLOW RATE (GPH)							
ES-EMITTER SPACING (IN)							
ZAR (ZONE APP. RATE) –GPM = TLL(FT)/(ES/12) X EFR (GPH)/ 60 or # of Rows x #Trees/row x # PE/Tree * Emitter (GPH/60)							
ZD (ZONE DURATION HOURS)-HPD = CV (GPD)/(ZAR (GPM)X 60*0.9)							
ZAV-ZONE APPLICTION VOLUME = ZAR x ZD x 60 =GPD							

WILL THE PUMP DELIVER THE REQUIRED IRRIGATION WATER RATE (80% PUMPING RATE) FOR THE MAXIMUM ZONE(S)?_____ THIS MAY LIMIT THE NUMBER OF ZONES TO BE IRRIGATED AT ANY ONE TIME AND THE DURATION OF IRRIGATION. IF THE IRRIGATION WELL CANNOT DELIVER THE REQUIRED RATE OF WATER, THEN CONSIDER SPLITTING THE SYSTEM INTO MORE ZONES OR REDUCING THE AMOUNT OF AREA TO BE IRRIGATED.

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SUMMARY

Irrigation Zones to be irrigated at the same time; Field, Zones	Total ZAV (GPD)	MAX. ZAR (GPM)	Total ZD (HR/D)	Required Irrigation Pumping Rate (GPM)	Required Pumping Duration (Hr/day)	Existing Pump Rate (GPM) and TDH (Ft)*	Estimate Header, Submain(SM) and/or Main(M) Pipe Type and Pipe Dia. WVENG441A

Will the irrigation pump deliver 125% of the Maximum ZAR?
YES- OK;, NO- REZONE or REDUCE DELIVERABLE WATER

* refer to pumping plant information, WVENG WS 533B)

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Sketch micro irrigation system layout of pump station, location of fields, crop rows, zones, summits, lows, main, sub-main, manifold, lateral lines, valves, etc., length of rows, pipeline lengths, distance to water sources, north arrow and scale, etc. (or attach sheet):

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EXAMPLE

1) Irrigation Zone F1-1- Pepper crop planted in 2.0' beds with 4' wide rows and there are 8 rows; 180' long. The bed slope is 4% and will be 100% watered by one lateral with 12" emitter spacing per bed. A pressure compensated microirrigation line source emitter is chosen and drip line delivers 0.45 GPM/100' (DLF) or 0.27 GPH/emitter. System is irrigated from a well with a rate of 10 GPM @ 45 psi and well water quality is good.

a) What is the Zone Application Volume (ZAV) in gallons/day of water applied with a 90% application efficiency?
   - i) ADPCUSC= Peppers = 0.2"/day x 1.0 = 0.2"/D (WV ENG WS 441 A)
   - ii) TLL = 180' x 1 x 8 = 1,440 '
   - iii) CIA- = #Row * RL * BW = 8 x 180 ft x 2 ft 2,880 SF
   - iv) CV= 0.2/12 x 2,880 x 7.48 = 359 GPD
   - v) ZAR = 1,440'/(12/12) x 0.27/60 = 6.48 or 6.5 GPM
   - vi) ZD = 359/(6.5 x 60 x 0.9) = 1.0 HPD
   - vii) ZAV = 6.5 x 1.0 x 60 = 390 GPD

b) At what rate, duration and maximum GPD can the irrigation well supply (reference WV Conservation Practice Pumping Plant (533))?
   - i) Irrigation Pumping Plant= 10 GPM x 80% =9.6 GPM for a maximum of 8 hours per day = 5,760 GPD.

Note: Zone F1-1 requires 6.5 GPM which is less than 9.6 GPM and system is estimated to require 28 psi and used for 1.0 HPD, so system OK for irrigation

2) Irrigation Zone F1-2- Tomato crop (4.5' canopy two rows of tomato) planted in 4.0' beds with 6 wide rows and there are 8 rows; 180' long. The bed slope is 2% and will be 100% watered by two laterals with 12" emitter spacing per bed. A non-pressure compensated microirrigation line source emitter is chosen and drip line delivers 0.45 GPM/100' (DLF) or 0.27 GPH/emitter. System is irrigated from a well with a rate of 8 GPM @ 45 psi and well water quality is good.

a) What is the Zone Application Volume (ZAV) in gallons/day of water applied with a 90% application efficiency?
   - i) ADPCUSC= Tomato = 0.2"/day x 1.0 = 0.2"/D (WV ENG WS 441 A)
   - ii) TLL = 180' x 2 x 8 = 2,880 '
   - iii) CIA- = #Row * RL * BW(CW) = 8 x 180 ft x 4.5 ft = 6,484 SF
   - iv) CV= 0.2/12 x 6484 x 7.48 = 808 GPD
   - v) ZAR = 2880/(12/12) x 0.27/60 = 12.96 or 13 GPM
   - vi) ZD = 808/(13 x 60 x .9) = 1.15 HPD
   - vii) ZAV = 13 x 1.15 x 60 = 897 GPD

b) At what rate, duration and maximum GPD can the irrigation well supply (reference WV Conservation Practice Pumping Plant (533))?
   - i) Irrigation Pumping Plant= 10 GPM x 80% =9.6 GPM for a maximum of 8 hours per day = 5,760 GPD.

Note: Zone F1-2 requires 13 GPM which is more than 9.6 GPM, however the well supplies 5,760 GPD (more than adequate for crop) and when crop is watered in 2 zones (6.5 GPM for 1.15 hr each) the well will meet criteria. OK for irrigation.