U.S. Department of Agriculture
Natural Resources Conservation Service

Sprinkler Irrigation System Planning/Design Worksheet

NAME _____ DATE _____ PREPARED BY _____

DISTRICT _____ COUNTY _____ ENGR JOB CLASS _____

Inventory

Water source _____ Amount available _____ ft^3/sec _____ gpm _____ acre-ft Seasonal variation _____

Power source: Electric _____ volts, _____ phase; Internal combustion engine _____ fuel type; Other _____

Soils Data

Design Soil Series	Available water capacity, AWC (in/ft depth)					Depth to [1]		Sprinkler intake rate (in/hr)
	0-1	1-2	2-3	3-4	4-5	Inhibiting layer (ft)	Water table (ft)	

[1] Actual observed depth in the field.

Crop Evapotranspiration (Monthly)

Crops	Acres	Month		Month		Month	
		Depth (in)	Volume (ac-in)	Depth (in)	Volume (ac-in)	Depth (in)	Volume (ac-in)
Totals (1)		(2)		(3)		(4)	

Crop Weighted Evaportranspiration (Monthly) (Note: Maximum Monthly Total ET is greatest of nos. 2, 3, or 4 above)

ET, depth = $\frac{\text{Maximum Total Monthly ET, ac-in/mo}}{\text{Total Acres, A (1)}}$ = _____ = _____ in /mo

Irrigation Requirements

Crops	Root zone depth [2] (ft)	Total AWC (in)	Management allowed depletion (%)	Max Net replacement (in)	Peak daily ET (in)	Max freq @ peak E T @ max net (days)

[2] Use weighted peak monthly ET and net irrigation to determine weighted peak daily E T.

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Design Data — (Based on weighted crop ET, _____ % irrigation efficiency)

	Application		Weighted [2] peak daily crop ET (in)	Frequency, F (days)	System requirements	
	Net, D (in)	Gross F_g (in)			Total gpm, Q	gpm/ac

[2] Use weighted peak monthly ET and net irrigation to determine weighted peak daily E T.

Q = system requirements–gpm
H = Total operating hours/day
(suggest using 23 hours for one move per day)
(suggest using 22 hours for two moves per day)

$$Q = \frac{453\ A\ D}{F\ H\ Eff/100} = \_\_\_\_\_\ gpm = \_\_\_\_\_\ gpm$$

Sprinkler head spacing, (S_L) _____ ft, Lateral spacing on mainline (S_M) _____ ft, Minimum Required wetted diameter = _____ft

Sprinkler head: make _____; model _____; nozzle size _____; lb/in^2 _____ gpm _____; wetted dia _____ ft

Application rate _____ in/hr, Application time _____ hr/set. Net application = (_____ in/hr) (_____ eff) (_____ hr/set) = _____ in

Maximum irrigation cycle = Net applcation _____ in/peak ET in/d = _____ days

Minimum number of laterals = _____ number of lateral sites _____

(irrigation frequency, _____ days) (moves/day, _____)

Designed laterals: Number _____, Diameter _____ in, Type _____ , Moves/day _____

Total number of sprinkler heads = (number of laterals) (number of heads/lateral) = _____

System capacity = (Total number of sprinkler heads _____) (gpm/head _____) = _____ gpm

Lateral design

Allowable pressure difference along lateral = 0.2 (sprinkler head operating pressure in lb/in^2) = _____ lb/in^2

Actual head loss (worst condition) _____ lb/in^2

Pressure required at mainline: P = (sprinkler head lb/in^2 _____) + (0.75) (Lateral friction lb/in^2 _____) +/- (ft elev) / (2) (2.31) = _____ lb/in^2

(plus for uphill flow in lateral, minus for downhill flow). Use sprinkler head lb/in^2 only if elevation difference along lateral is = or > 0.75 (lateral friction loss lb/in^2)

(2.31). Under this condition, flow regulation may be required at some sprinkler heads to maintain proper sprinkler head operating near the mainline.

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Mainline Design

Mainline material _____ (IPS, PIP, SDR, CLASS) lb/in^2 rating _____, other description, _____

Friction factor used _____. Formula (check one) ☐ Hazen-Williams ☐ Manning's ☐ Darcy-Weibach ☐ Other (name) _____

Station		Diameter pipe (in)	Flow (gpm)	Velocity (fps)	Distance (ft)	Friction loss (ft/100 ft)	Friction loss this section (ft)	Accumulated friction loss (ft)	Remarks
From	To								

NOTE: desirable velocities–5 ft/sec or less in mainlines, 7 ft/sec or less in sprinkler laterals.

Determination of Total Dynamic Head (TDH)

Pressure required at main	_____ lb/in^2	_____ ft	
Friction loss in main	_____ lb/in^2	_____ ft	
Elevation raise/fall in main	_____ lb/in^2	_____ ft	(2.31 feet = 1 psi pressure)
Lift (water surface to pump)	_____ lb/in^2	_____ ft	
Column friction loss	_____ lb/in^2	_____ ft	
Miscellaneous loss	_____ lb/in^2	_____ ft	
Total (TDH)	0 lb/in^2	0 ft	(NOTE; TDH must be in feet for horsepower equation)

Approximate brake horsepower = $\frac{\text{TDH (ft) X Q (gpm)}}{\text{3960 X Eff / 100}} = \frac{\text{\_\_\_\_\_ ft X \_\_\_\_\_ gpm}}{\text{3960 X \_\_\_\_\_ \% / 100}} =$ _____ HP

Mean sea level elevation of pump _____ ft (NOTE: check required versus available NPSL for centrifugal pumps)

Pump curve data attached yes ☐ no ☐ If not, pumping plant efficiency assumed = _____% (recommended using 65-75%)

Bill of materials attached yes ☐ no ☐

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Other Design Considerations

Item	Evaluation performed	NOT needed	Location	Size
Measuring device				
Expansion couplers				
Reducers				
Enlargers (expanders)				
Manifolds				
Bends & elbows				
Tees				
Valved outlets				
Surge facilities (valves, chambers)				
Control valves				
Check non-return flow valves				
Pressure relief valves				
Air-vacuum valves				
Drain facilities				
Thrust blocks				
Anchors				
Pipe supports				
Other				

Remarks

Special drawing(s) attached _____

Irrigation system design by _____ Date _____

Reviewed and approved by _____ Date _____

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Irrigation System Location and Layout Map

SHOW:

- ☐ Area irrigated with sprinklers
- ☐ Direction of prevailing wind
- ☐ Elevations, contours
- ☐ High and low points
- ☐ Water source and pump location
- ☐ Mainline and submain locations
- ☐ Layout: lateral(s), travelers, guns
- ☐ Direction of move
- ☐ North arrow

Scale	Community	Section	Township	Range