SOP 20: Evaluation of design and operation of a surface drip system

Updated 7/1/2010

Estimated completion time: field: 8 person hours, data analysis: 4 person hours

Materials and equipment needed:

1. Data sheet
2. Clipboard
3. Sharpie pen
4. Flags
5. Calibrated pressure gauge with Schrader valve adapter
6. Flow meter with adapters
7. GPS / measuring wheel/tape (for measuring length of beds and submains)
8. Calipers
9. Tape measure (measure diameter of pipe, width of beds, etc)
10. 15 Schrader valves that fit on drip tape or drip hose (10 fit in middle of laterals and 5 fit at end of laterals) number each Schrader valve for reference to location in field.
11. 5 Flush valves with adapters for drip tape and drip hose (number each flush valve for reference to location in field)
12. 10, ¼ inch threaded Schrader valves
13. Teflon tape
14. Small adjustable open ended wrench (crescent)
15. Cordless drill, drill bit, tap
16. Hand held EC and pH meter
17. Plastic bottle for water sample
18. White or clear cup for evaluating water for suspended material

Procedures:

A. Characterize soil and irrigation water:
   1. Determine soil type and texture from NRCS on line soil map or laboratory report.
   2. Determine source of irrigation water (surface, ground, recycled, blend)
   3. Determine water chemistry from water suitability analysis report

B. Describe crop and field dimensions (sketch map of field and irrigation system):
   1. Determine crop
   2. Determine number of plant rows per bed
   3. Determine plant row spacing
   4. Determine in row spacing of plants
   5. Determine bed spacing
   6. Measure longest and shortest row
   7. Determine width of field
   8. Determine area of field and area monitored with flow meter (if areas are different)
   9. Estimate slope (percent change in elevation per 100 ft)

C. Describe irrigation system design (sketch map of field and irrigation system):

1. Determine number of drip lines per bed
2. Determine manufacturers tape discharge rate (gpm/100 ft) or emitter discharge rate (gallons/hour) and if pressure compensating
3. Determine diameter of drip tape/hose
4. Determine drip tape/hose wall thickness
5. Determine emitter spacing
6. Determine if polyethylene leads are used to connect lateral drip line with submain
7. Determine the length and diameter of polyethylene leads
8. Determine number drip lines per lead
9. Determine if flush valves are present
10. Determine diameter of submains
11. Count number of submains in field
12. Determine length of submain (from connection with main to end of submain)
13. Count number of drip rows per submain line
14. Determine main line diameter
15. Determine type of filter present
16. Determine where and if backflow prevention device is present
17. Determine where air/vacuum release is present
18. Determine if low pressure drain is present near well
19. Determine if low pressure drain is present near lowest point in drip system
20. Determine locations where pressure can be monitored by operator
21. Determine if pressure regulators are present at main/submain connections and if functional

D. Before starting irrigation system:
1. Install flow meter on main or submain, record the initial gallons, and determine area irrigated after flow meter
2. Install Schrader valves before and after filter if possible
3. Install Schrader valves at 5 locations near submain (near mainline connection , middle, and end of submain)
4. Install Schrader valves at 5 locations in middle of irrigation block (Note: this step Is not necessary if also completing SOP 13)
5. Install Schrader valves at 5 locations at end of drip line
6. Install 5 flush valves at end of tape or drip hose
7. Map locations of all valves with a number reference for each valve.
8. Determine the distance of valves from reference point (main/submain connection, bed number, and distance from submain)

E. At start of irrigation:
1. Record start time of irrigation

F. During the irrigation (at least 30 minutes after pressurizing system):
1. Measure pressure at all locations with Schrader valves (note time and valve number) 3 times during the irrigation
2. Read flow meter(s) at least 4 times and record time read.
3. Count number of significant leaks per submain (big wet spots, standing water in furrows)

4. Count number of leaks per length of lateral line (drip tape or hose) on 10 laterals
5. Collect water from flush valves and determine if materials is collecting at end of lateral lines
6. Measure electrical conductivity and pH of irrigation water

G. After irrigation ends:
   1. Record end time of irrigation
   2. Record ending flow meter reading
   3. Remove Schrader valves, flush valves, and flow meter, and reassemble drip system.

H. Reporting:
   1. Enter data into “Irrigation evaluation drip” spreadsheet

Comments:
   1. Distribution uniformity can also be evaluated during the irrigation. Refer to SOP 11: “determining distribution uniformity of surface drip systems)

Notes:

Field Map

Grower _____ Date _____

Ranch _____ Block _____

crop and field dimensions

crop	
plant rows per bed	
between row spacing (feet)	
In row plant spacing (feet)	
bed width or spacing (feet)	
shortest bed length (feet)	
longest bed length (feet)	
field width (feet)	
field area (acres)	
slope of field (%)	

soil properties (from NRCS online soil map)

Texture	
% clay	
% sand	
% silt	
soil saturated paste SAR	
soil saturated paste EC (dS/m)	

water properties (from report unless specified differently)

field measured pH	
field measured EC (dS/m)	
pH	
EC (dS/m)	
SAR	
bicarbonate (meq/L)	
Iron (ppm)	
Manganese (ppm)	
Boron (ppm)	
Chloride (meq/L)	
Magnesium (meq/L)	
Calcium (meq/L)	
Sodium (meq/L)	

Water source (check all that apply)

well	☐
project water (blue pipeline)	☐
reservoir/pond	☐
potable district water	☐
other	☐

if other please specify _____

Grower _____ Date _____

Ranch _____ Block _____

Pump (check all that apply)

none	☐
electric	☐
diesel	☐
gasoline	☐
variable drive	☐
booster in addition to well pump	☐

Flow meter (check all that apply)

none present	☐
present at water source/pump	☐
present at irrigation block/field	☐

	flowmeter 1	flowmeter 2
initial flow meter reading (gallons/acre-ft)	_____	_____
start time	_____	_____
end flow meter reading (gallons/acre-ft)	_____	_____
end time	_____	_____
flowmeter monitored acreage:	_____	_____

Backflow prevention (check all that apply)

not present	☐
check valve	☐
low pressure drain	☐
vacuum release	☐

Air/Vacuum release

not present	☐
number of locations	☐
notes	_____
	_____

Filtration (check all that apply)

not present	☐
disk	☐
sand media	☐
screen	☐
automatic back flush	☐

Filtering capacity (manufacturer's specifications)

max flow rate (gal per minute)	_____
filtering mesh	_____

Grower _____ Date _____

Ranch _____ Block _____

Mainline description

diameter (inches) _____

length (feet) _____

material (PVC, aluminum, concrete, etc) _____

Submain (Pipe between main line and laterals)

diameter (inches) _____

length (feet) _____

material (PVC, polyethylene, layflat, aluminum, other) _____

Pressure regulators at submains (check all that

not present ☐

gate valve (not a regulator) ☐

not adjustable ☐

adjustable ☐

Adjustable regulating valve ☐

regulator diameter (inches) _____

Description of drip lines

drip lines per bed _____

tape discharge rate (gpm/100 ft) _____

pressure compensating (yes/no) _____

drip tape diameter (inches) _____

drip tap wall thickness (mil) _____

emitter spacing (inches) _____

lead diameter (inches) _____

lead length (inches) _____

number of driplines per lead _____

Drain down at low end of block (check all that

low pressure drain ☐

flush valves ☐

other _____

Pressure check (check all that apply)

not present ☐

number of locations ☐

before filter ☐

after filter ☐

submain ☐

other _____

Leaks and plugging potential

Grower _____ Date _____

Ranch _____ Block _____

leaks on drip system

# of leaks along submain 1	
# of leaks along submain 2	
# of leaks along submain 3	
# of leaks on lateral line 1	
# of leaks on lateral line 2	
# of leaks on lateral line 3	
# of leaks on lateral line 4	
# of leaks on lateral line 5	
# of leaks on lateral line 6	
# of leaks on lateral line 7	
# of leaks on lateral line 8	
# of leaks on lateral line 9	
# of leaks on lateral line 10	
% of furrows with signficant amounts of ponded water	

flush valve water		Description of material (bacterial/algal/mineral/iron etc)
material present in valve 1 (yes/no)		
material present in valve 2		
material present in valve 3		
material present in valve 4		
material present in valve 5		

Pressure measurements

Grower _____ Date _____

Ranch _____ Block _____

Location	Description	Time 1	Pressure (psi)	Time 2	Pressure (psi)	Time 3	Pressure (psi)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

System flow rate check

Grower _____ Date _____

Ranch _____ Block _____

Flowmeter 1		Flowmeter 2	
Time	Reading (gal/acre-ft)	Time	Reading (gal/acre-ft)