



## DETAILED CRANBERRY IRRIGATION SYSTEM ASSESSMENT

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### Detailed Evaluation Procedures for Cranberry Irrigation Systems:

The overall efficiency of sprinkler irrigation systems changes with time. Nozzles, sprinkler heads, and pumps wear, and pipes and joints develop leaks. Some systems are used in ways they were not designed. A sprinkler system evaluation is designed to identify problems and develop solutions.

Before a detailed evaluation is made, obvious operating and equipment deficiencies should be corrected by the water user. These deficiencies can be identified through less detailed evaluations of the irrigation system than are outlined in this procedure.

### I. Equipment needed:

- Catch containers (32-oz. deli cups are of sufficient size and durability)—minimum number equals:

$$\frac{\text{Lateral Spacing (ft)} \times \text{Sprinkler Spacing (ft)}}{100}$$

- 12" support stakes and rubber bands (one stake and 2 rubber bands for each catch container), if necessary
- Wire flags [to establish locations of rows]
- 100-foot measuring tape
- Pocket measuring tape or ruler
- 250-mL (cc) graduated cylinder
- Pressure gauge with Pitot tube, 0 to 100 psi pressure range (recommend liquid filled)
- Soil auger, soil probe, and/or sharpshooter shovel
- Feel and appearance guide or other appropriate technology for determining soil moisture [optional]
- Set of high speed twist drill bits, 1/16 to 1/4 inch (by 64ths) for measuring inside diameter of nozzles
- Stop watch or watch with second hand
- Wind velocity gauge [optional]
- Thermometer (for air temperature) [optional]
- Calibrated bucket of known volume (minimum: 1 gal.)
- ~5-foot length of 5/8 inch diameter or larger garden hose
- Manufacturer's sprinkler head performance charts
- Clipboard and pencil
- Soil Survey and/or soil texturing guide
- Rain gear and boots
- Notepad or attached worksheets

### II. Field procedures

#### General

Obtain pertinent information about irrigation system specifications from the irrigation decisionmaker and from visual observation. Observe general system operating condition, crop uniformity, wet areas, dry areas, and wind problems. Obtain information about the field and how it is irrigated. This information should include typical irrigation runtime, sprinkler head and lateral line spacing, number of irrigations per season, and whether chemigations are performed. Every effort should be made to conduct the evaluation under normal operating conditions (i.e. little to no wind).

#### Inventory and data collection

**Step 1:** Pick a location in the field where the crop appears to be representative of the overall conditions in the field, and make note of soil profile conditions including:

- Soil texture (use attached guide)
- Depth to water table
- Root development patterns and effective rooting depth
- Root and water restrictions, including compacted layers, bedrock, or soil textural change boundaries

**Step 2:** Repeat step 1 for additional, similar locations, to verify observations made in step 1. Consider inspecting locations where it is suspected that conditions differ from those observed in step 1 (i.e. wet or dry areas, thick or thin vines, etc.).

**Step 3:** If a flow meter is available, check that it is functioning properly and ensure that it is set up to record flow data throughout the test period.

**Step 4:** Choose a representative location along a pair of sprinkler laterals, where pressure is typical for the test field or bed. With one size of lateral pipe diameter, about half the pressure loss resulting from pipeline friction loss in a lateral occurs in the first 20 percent of the length. Over 80 percent of pressure loss occurs in the first half of the lateral length. On a flat field the most representative pressure occurs about 30 to 40 percent of the distance from the lateral inlet to the terminal end. See Figure 1 for examples of recommended irrigation system catch-can test locations.

Locate three heads on one lateral and two on an adjacent lateral (if triangular or diamond pattern layout) that are spaced in a manner that is representative of the test location. Insert a small stick or wire flag into the impact arm of the sprinkler heads to jam them open and prevent rotation. Disable all of the sprinkler heads that are capable of applying water to the test area—this will likely include 5 heads if the heads are arranged in a triangular or diamond pattern. Position the sprinkler heads in such a manner that water will not fall into the containers when the system is turned on and being brought up to operating pressure.

**Step 5:** Record sprinkler head makes/models, nozzle type, nozzle size, and riser height. (Note: The greatest cause of sprinkler irrigation application non-uniformity is mixed nozzle sizes.)

At several locations along the lateral, use the shank end of an unused, high speed drill bit to check for nozzle wear. Nozzle size generally is indicated on the side of the nozzle. Wear is considered excessive when the drill bit can be moved about in the nozzle 5° to 10° or more.

**Step 6:** Layout a 10-foot by 10-foot grid (maximum spacing distance = 10') by marking the rows using the measuring tape and wire flags. Set out catch containers on the grid, lining each container up with the flags on the ends of the rows. Catch containers on the end of each row and column should be 5 feet from the boundary of the catch area. Each container should be located at approximate plant canopy height, within a foot of its correct grid position, and set carefully in an upright position with its top parallel to the ground. Any surrounding vegetation that would interfere with a container should be removed. Fasten containers to short stakes with rubber bands.

Almost any container can be used. A sharp edge is desirable. Large-sized rain gauges can be used as catch containers and can be read directly. For straight-sided containers, the application depth can be measured directly, using a pocket measuring tape or ruler. For stackable, tapered-sided containers, a 250-mL graduated cylinder is used to volumetrically measure catch in the cans. The cross sectional area of the top of the container is used to calculate application depth, either in inches or millimeters. To convert the volume caught (in mL or cc) to inches of water depth when using a circular container, divide by the following conversion factor, where 'D' equals the opening diameter (inside diameter) in inches:

$$\text{Conversion factor} = [(\pi D^2) / 4] * 16.387$$

An evaporation container should be set upwind and away from the sprinklers during hot, dry weather or when rainfall is possible. The container should be filled with water at the start of the irrigation test, and the amount of water remaining should be measured at the same time the

rest of the containers are read. The original depth of water in the evaporation container should be approximately half of the anticipated average catch. The difference between the initial volume and final volume approximates the amount of evaporation (if less water is measured in the final container) or precipitation (if more water is measured) that occurred during the test period.

**Step 7:** Turn on the pump(s) to begin the test. Once the sprinklers are brought up to operating pressure, remove the wire flags [or sticks] from the sprinkler heads to allow them to start rotating and record the time of day.

**Step 8:** Observe sprinkler heads for hang-ups, weak springs, and leaks. Check the rotation times of the sprinklers in the test area and other sprinklers on the laterals to verify that they are working properly.

**Note:** All sprinklers on the laterals being tested should be discharging at a normal rate (i.e. no plugged nozzles).

**Step 9:** Measure and record the operating pressures of sprinklers at opposite ends of the laterals being tested, preferably at the beginning and end of the test period. If significant pressure loss occurs (i.e. >20% of the average pressure for the line), then measure and record pressure at all sprinklers contributing water to the test area.

**Note:** Pressure is most accurately measured with the tip of the Pitot tube centered in the jet stream, at a distance of approximately 1/8-inch from the nozzle. Inserting the tip of the Pitot tube inside the orifice restricts flow; thus, line pressure is measured rather than discharge pressure. Typically the difference is 1 to 2 psi. Line pressure is sufficient for most evaluations, provided all measurements are made in a similar method.

**Note:** Liquid-filled pressure gauges are more durable and provide dampening of the gauge needle, allowing pressure readings to be more easily obtained.

**Step 10:** Record how long it takes the sprinklers at the ends of the laterals to fill a calibrated bucket. A short length of garden hose over the sprinkler nozzle should be used to direct flow into the calibrated bucket. To avoid modifying nozzle hydraulics, the hose should fit rather loosely. To improve accuracy, test the sprinkler discharge several times and compute the average.

**Step 11:** Measure and record operating pressures and sprinkler discharge rates at sprinklers on various lateral lines on the irrigation set being tested. To determine the variation in operating characteristics across the irrigation set, measure pressure and output at sprinklers nearest to the pump and furthest from the pump.

**Step 12:** Record wind speed, air temperature, and whether humidity is low, medium, or high. Record these parameters before, during, and after the test.

**Step 13:** The test duration should be such that a minimum of 0.5 inches of water is collected in the catch containers, on average. For most cranberry irrigation systems, this will require approximately 4 hours of irrigation runtime to ensure accurate results. Terminate the test by simply shutting off the pumps. Record the time of day.

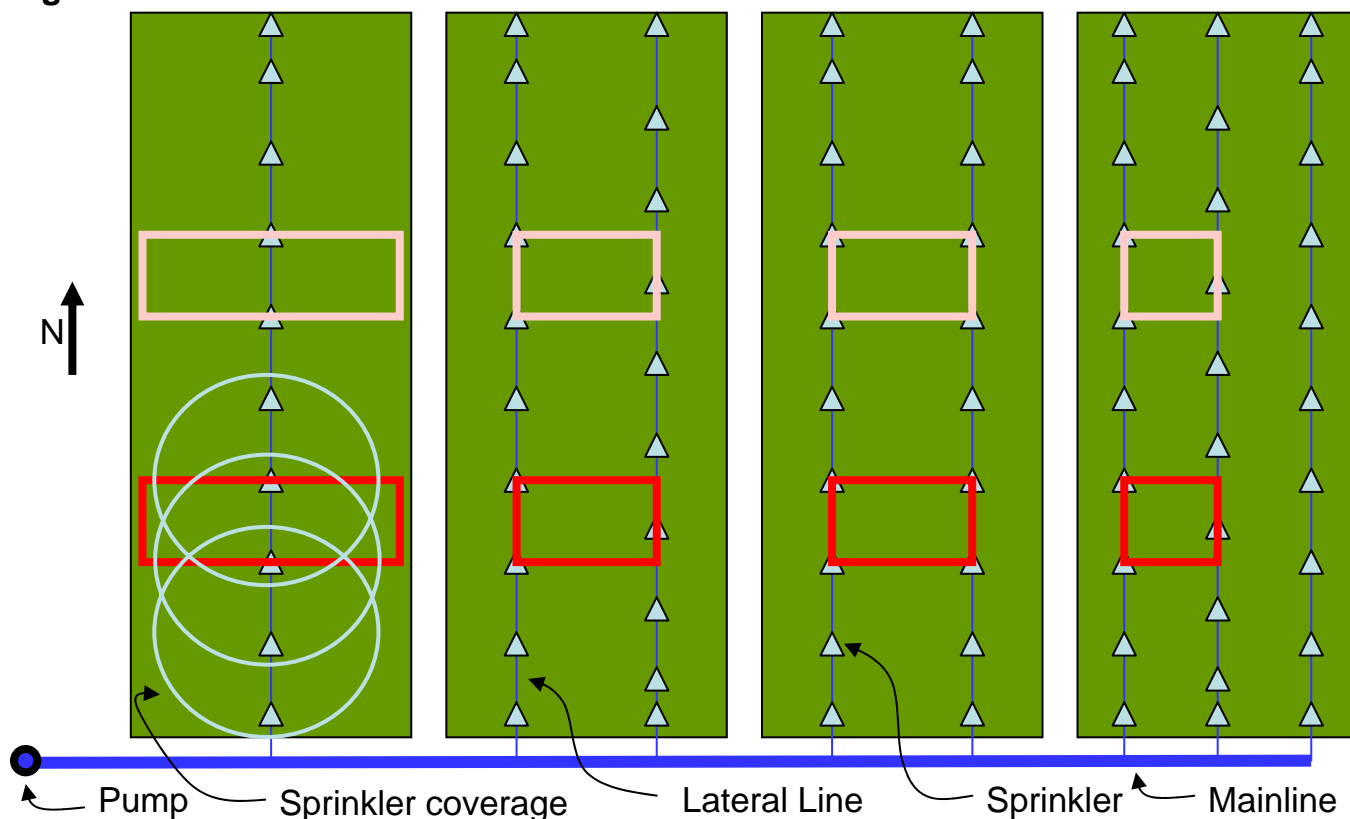
**Step 14:** Measure and record the amount of water caught in each container. Add the difference between the starting and ending amounts in the evaporation container to the results for each catch container.

**Step 15:** Sketch the locations of sprinkler heads and lateral pipeline in relation to catch containers. Show north direction, direction of pipeline flow, and prevailing wind direction.

### III. Evaluation computations

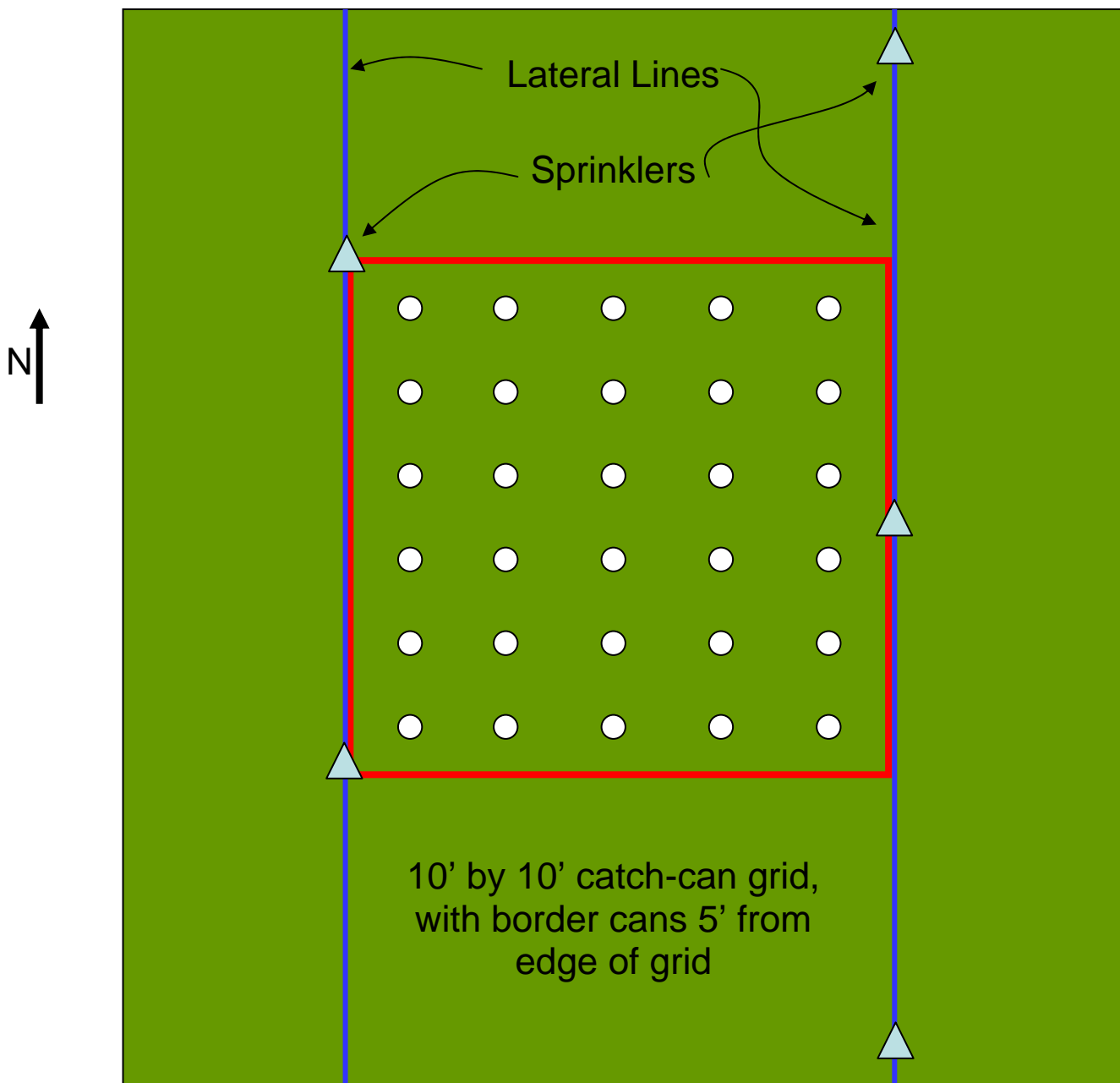
The information gathered in the field procedures is used in the detailed system evaluation computations. Refer to the attached worksheets.

**Figure 1**



**Figure 1** depicts catch-can test plots for various types of irrigation system layouts: (1) single line; (2) double line, triangular or diamond pattern; (3) double line, rectangular pattern; and (4) triple line, triangular or diamond pattern [not to scale]. If the lateral lines consist of a single diameter pipeline, a test pattern located 30% to 40% of the distance from the mainline to the end of the lateral (i.e. the red box) will likely be sufficient. If multiple lateral line diameters exist (i.e. an individual lateral line decreases in size from a 3-inch line down to a 2-inch line), or if the pressures at various sprinklers along the line(s) differ significantly (i.e. there's a pressure differential between two sprinklers on the same lateral line of >20%), dual test plots should be considered at approximately one-third and two-thirds of the distance from the mainline to the ends of the lateral lines (red and pink boxes).

**Figure 2**



**Figure 2** depicts the layout of the catch cans within a test plot [not to scale]. The cans should be spaced 10' apart, with the cans along the border of the plot spaced 5' from the edge of the plot. NOTE: All five of the sprinklers shown in this layout should be disabled when bringing the system up to pressure to prevent water from collecting in the cans before the actual start of the test.

Start

Place a heaping tablespoon of soil in palm. Add water a drop at a time and knead the soil to break down all aggregates. Soil is proper consistency when moldable, like moist putty.

Add dry soil to soak up water.

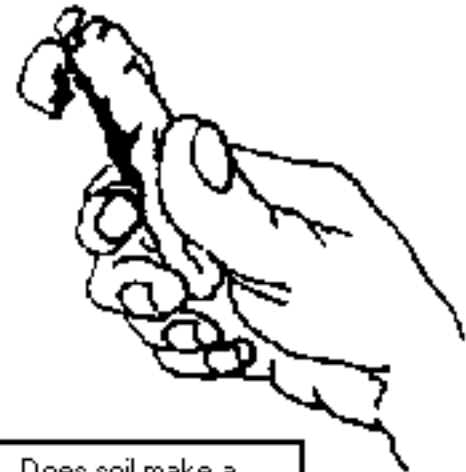
Does soil remain in a ball when squeezed?

Yes  
Is soil too dry?

Yes  
Is soil too wet?

SAND

Place ball of soil between thumb and forefinger and gently push it with thumb, squeezing it upward into a ribbon. Form a ribbon of uniform thickness and width. Allow the ribbon to emerge and extend over forefinger, breaking from its own weight.



LOAMY SAND

Does soil form a ribbon?

Does soil make a weak ribbon less than 1 inch long before breaking?

Does soil make a medium ribbon 1-2 inches long before breaking?

Does soil make a strong ribbon 2 inches or longer before breaking?



Excessively wet a small pinch of soil in palm and rub with forefinger.

Does soil feel very gritty?

Does soil feel very gritty?

Does soil feel very gritty?

SANDY LOAM

SANDY CLAY LOAM

SANDY CLAY

Does soil feel very smooth?

Does soil feel very smooth?

Does soil feel very smooth?

SILT LOAM

SILTY CLAY LOAM

SILTY CLAY

Neither grittiness nor smoothness predominates.

Neither grittiness nor smoothness predominates.

Neither grittiness nor smoothness predominates.

LOAM

CLAY LOAM

CLAY

**Cranberry Sprinkler Irrigation System  
Detailed Evaluation - Fixed Set Sprinkler System**

Landowner/Company: \_\_\_\_\_ Date: \_\_\_\_\_

County: \_\_\_\_\_ Prepared By: \_\_\_\_\_

**Irrigation system hardware inventory:**

Marsh (or group of beds): \_\_\_\_\_

Bed number or ID [for "bucket" test]: \_\_\_\_\_ Bed area: \_\_\_\_\_ acres

Sprinkler head: make \_\_\_\_\_ model \_\_\_\_\_ nozzle size(s) \_\_\_\_\_

Spacing of heads along lateral: \_\_\_\_\_ feet

Lateral spacing along mainline: \_\_\_\_\_ feet Total number of laterals: \_\_\_\_\_

Lateral lengths: max: \_\_\_\_\_ feet min: \_\_\_\_\_ feet avg: \_\_\_\_\_ feet

Lateral diameter: \_\_\_\_\_ feet of \_\_\_\_\_ inches, \_\_\_\_\_ feet of \_\_\_\_\_ inches

Manufacturer rated sprinkler discharge:

\_\_\_\_\_ gpm at \_\_\_\_\_ psi, giving \_\_\_\_\_ feet of wetted diameter

Total number of sprinkler heads per lateral: \_\_\_\_\_ Lateral #1: \_\_\_\_\_ heads Lateral #2: \_\_\_\_\_ heads

Sprinkler riser height: \_\_\_\_\_ feet Mainline material: \_\_\_\_\_

Lateral material: \_\_\_\_\_ Lateral type (buried or above ground?): \_\_\_\_\_

Typical operating pressure: \_\_\_\_\_ at pump: \_\_\_\_\_ psi at sprinkler: \_\_\_\_\_ to \_\_\_\_\_ psi

**Field Observations:**

Crop uniformity: \_\_\_\_\_

Water ponding: \_\_\_\_\_

Erosion (dike banks): \_\_\_\_\_

System leaks: \_\_\_\_\_

Fouled nozzles: \_\_\_\_\_

Other observations: \_\_\_\_\_

**Present irrigation practices:**

Typical irrigation duration: \_\_\_\_\_ hours Summer irrigation frequency: every \_\_\_\_\_ days

Typical number of irrigations per year: \_\_\_\_\_ irrigation events

Typical amount of irrigation pump hours per year: \_\_\_\_\_ frost: \_\_\_\_\_ hours irrigation: \_\_\_\_\_ hours

**Cranberry Sprinkler Irrigation System  
 Detailed Evaluation - Fixed Set Sprinkler System**

**Field data inventory & Computations:**

Soil-water data (typical for bed):

Soil Series (as mapped): \_\_\_\_\_

Soil texture in root zone: \_\_\_\_\_

Root zone depth: \_\_\_\_\_ inches × \*AWC (in/in): \_\_\_\_\_ = Total AWC (in): \_\_\_\_\_

Total AWC (in): \_\_\_\_\_ × †MAD (%): \_\_\_\_\_ = MAD (in): \_\_\_\_\_

\* Available Water Capacity (AWC) is defined as that portion of water in a soil that can be readily absorbed by the plant roots of most crops. It is the amount of water stored in the soil between field capacity and permanent wilting point. To calculate Total AWC, find the product of the effective rooting depth (depth of soil to which 70% of the root volume extends) and the available water capacity for the soil, expressed as inches of water per inch of soil. Refer to Table 2-1, from the NRCS *National Engineering Handbook*, Part 652 - "Irrigation Guide," for the AWC range for the soil texture found in the crop root zone. For organic soils, refer to the Soil Survey for an estimate of AWC for the parent soil. Field measurements of AWC (or water holding capacity) may be necessary to accurately establish Total AWC for the purposes of irrigation scheduling.

† MAD = Maximum Allowable Depletion. For the production of cranberries, it may be assumed that MAD ≈ 50% during periods of non-critical crop growth, and MAD ≈ 40% during critical growth (first blossom through fruit sizing or for the establishment of new plantings). When expressed as inches of water, MAD (in) = Total AWC (in) × MAD (%)

**Table 2-1** Available water capacity (AWC) by texture

Texture symbol	Texture	AWC range (in/in)	AWC range (in/ft)	Est. typical AWC (in/ft)
CCS	Coarse sand	.01 - .03	.1 - .4	.25
S	Sand	.01 - .03	.1 - .4	.25
FS	Fine Sand	.05 - .07	.6 - .8	.75
VFS	Very fine sand	.05 - .07	.6 - .8	.75
LCOS	Loamy coarse sand	.06 - .08	.7 - 1.0	.85
LS	Loamy sand	.06 - .08	.7 - 1.0	.85
LFS	Loamy fine sand	.09 - .11	1.1 - 1.3	1.25
LVFS	Loamy very fine sand	.10 - .12	1.0 - 1.4	1.25
CCSL	Coarse sandy loam	.10 - .12	1.2 - 1.4	1.3
SL	Sandy loam	.11 - .13	1.3 - 1.6	1.45
FSL	Fine Sandy Loam	.13 - .15	1.6 - 1.8	1.7
VFSL	Very fine sandy loam	.15 - .17	1.8 - 2.0	1.9
L	Loam	.16 - .18	1.9 - 2.2	2.0
SIL	Silt loam	.19 - .21	2.3 - 2.5	2.4
SI	Silt	.16 - .18	1.9 - 2.2	2.0
SCL	Sandy clay loam	.14 - .16	1.7 - 1.9	1.8
CL	Clay loam	.19 - .21	2.3 - 2.5	2.4
SICL	Silty clay loam	.19 - .21	2.3 - 2.5	2.4
SC	Sandy clay	.15 - .17	1.8 - 2.0	1.9
SIC	Silty clay	.15 - .17	1.8 - 2.0	1.9
C	Clay	.14 - .16	1.7 - 1.9	1.8

Comments about soils (including restrictions to root development and/or water movement): \_\_\_\_\_

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**Cranberry Sprinkler Irrigation System  
 Detailed Evaluation - Fixed Set Sprinkler System**

**Measured nozzle diameters (use shank of high speed drill bit to test for nozzle wear):**

	<u>Lateral #1</u>					<u>Lateral #2</u>				
Sprinkler No.:										
Diameter:										
*Size check:										

\* state whether t = tight, m = medium, or l = loose

**Actual sprinkler pressure and discharge data:**

	<u>Lateral #1</u>					<u>Lateral #2</u>				
Sprinkler No.:										
Initial pressure (psi):										
Final pressure (psi):										
Full rotation (sec):										
Discharge volume (gal):										
Discharge time (sec):										
Discharge (gpm):										

**Use the space below to sketch a map of the bed locations, bed ID numbers/names, and test locations:**



**Cranberry Sprinkler Irrigation System  
 Detailed Evaluation - Fixed Set Sprinkler System**

**Irrigation System Test Data:**

Start time: \_\_\_\_\_ Stop time: \_\_\_\_\_ Duration: \_\_\_\_\_ hours \_\_\_\_\_ minutes

**Atmospheric data:**

Wind: Direction: initial \_\_\_\_\_ during \_\_\_\_\_ final \_\_\_\_\_

Speed (mph): initial \_\_\_\_\_ during \_\_\_\_\_ final \_\_\_\_\_

Temperature: initial \_\_\_\_\_ final \_\_\_\_\_ Humidity: \_\_\_\_\_ (low, med, high)

Evaporation container: initial \_\_\_\_\_ final \_\_\_\_\_ change \_\_\_\_\_ (inches)

**Lateral flow data:**

Flow meter reading (if available): lateral #1: \_\_\_\_\_ gpm lateral #2: \_\_\_\_\_ gpm

Average discharge of laterals based on sprinkler head discharge:

$$= [1st\ gpm - .75 \times (1st\ gpm - last\ gpm)] = gpm/head \times no.\ of\ heads = gpm/lateral$$

Lateral #1:

$$= \underline{\hspace{2cm}} = \underline{\hspace{2cm}}\ gpm/head$$

$$= \underline{\hspace{2cm}}\ gpm/head \times \underline{\hspace{2cm}}\ heads = \underline{\hspace{2cm}}\ gpm/lateral$$

Lateral #2:

$$= \underline{\hspace{2cm}} = \underline{\hspace{2cm}}\ gpm/head$$

$$= \underline{\hspace{2cm}}\ gpm/head \times \underline{\hspace{2cm}}\ heads = \underline{\hspace{2cm}}\ gpm/lateral$$

**Calculations:**

$$\text{Gross application per test} = \frac{(\text{flow, gpm/head}) \times (\text{test duration, hr}) \times 96.3}{(\text{lateral spacing, ft}) \times (\text{head spacing, ft})}$$

$$\text{Lateral \#1:} = \frac{(\underline{\hspace{2cm}}\ gpm/head) \times (\underline{\hspace{2cm}}\ hr) \times 96.3}{(\underline{\hspace{2cm}}\ ft) \times (\underline{\hspace{2cm}}\ ft)} = \underline{\hspace{2cm}}\ \text{inches}$$

$$\text{Lateral \#2:} = \frac{(\underline{\hspace{2cm}}\ gpm/head) \times (\underline{\hspace{2cm}}\ hr) \times 96.3}{(\underline{\hspace{2cm}}\ ft) \times (\underline{\hspace{2cm}}\ ft)} = \underline{\hspace{2cm}}\ \text{inches}$$

$$\text{Gross application per test (avg. of both laterals):} = \underline{\hspace{2cm}}\ \text{inches}$$

$$\text{Gross average application rate} = \text{gross application per test, in} \div \text{test duration, hr}$$

$$= \underline{\hspace{2cm}}\ \text{inches} \div \underline{\hspace{2cm}}\ \text{hours} = \underline{\hspace{2cm}}\ \text{in/hr}$$

$$\text{Gross application per irrigation} = \text{gross avg. application rate, in} \times \text{typical irrigation duration, hr}$$

$$= \underline{\hspace{2cm}}\ \text{in/hr} \times \underline{\hspace{2cm}}\ \text{hours} = \underline{\hspace{2cm}}\ \text{inches}$$

**Cranberry Sprinkler Irrigation System  
 Detailed Evaluation - Fixed Set Sprinkler System**

Catch-can data:

Catch container type: \_\_\_\_\_ Inside diameter: \_\_\_\_\_ inches

\*Conversion factor (from volume to depth) =  $[(\pi D^2) / 4] \times 16.387$  = \_\_\_\_\_ mL/in

\* divide catch volume (in mL) by the conversion factor to get inches of water

Total number of containers: \_\_\_\_\_ Total number of low-1/4 containers (25% of total): \_\_\_\_\_

Total catch, all containers: Catch-can test #1: \_\_\_\_\_ mL = \_\_\_\_\_ inches

\*Catch-can test #2: \_\_\_\_\_ mL = \_\_\_\_\_ inches

Average catch, all containers = total catch, all containers, inches ÷ total no. of containers

Catch-can test #1: = \_\_\_\_\_ inches ÷ \_\_\_\_\_ = \_\_\_\_\_ inches

\*Catch-can test #2: = \_\_\_\_\_ inches ÷ \_\_\_\_\_ = \_\_\_\_\_ inches

\*Average catch, all containers: = \_\_\_\_\_ inches

Total catch, low-1/4 containers: Catch-can test #1: \_\_\_\_\_ mL = \_\_\_\_\_ inches

\*Catch-can test #2: \_\_\_\_\_ mL = \_\_\_\_\_ inches

Average catch, low-1/4 containers: = total catch, all containers, inches ÷ total no. of containers

Catch-can test #1: = \_\_\_\_\_ inches ÷ \_\_\_\_\_ = \_\_\_\_\_ inches

\*Catch-can test #2: = \_\_\_\_\_ inches ÷ \_\_\_\_\_ = \_\_\_\_\_ inches

\*Average catch, low-1/4 containers: = \_\_\_\_\_ inches

\* If two tests are performed on the same bed, summarize the results, here.

Average catch rate: = average catch, all containers, inches ÷ test duration, hours

= \_\_\_\_\_ inches ÷ \_\_\_\_\_ hours = \_\_\_\_\_ in/hr

**Cranberry Sprinkler Irrigation System  
 Detailed Evaluation - Fixed Set Sprinkler System**

**Irrigation System Test Results:**

Distribution Uniformity, Low-1/4 (DU):

$$DU = \frac{\text{Average catch, low-1/4 containers}}{\text{Average catch, all containers}} \times 100$$

$$= \frac{\text{_____ inches}}{\text{_____ inches}} \times 100 = \text{_____ \%}$$

Approximate Christiansen Uniformity (CU) = 100 - [0.63 × (100 - DU)] = \_\_\_\_\_ %

\*Effective portion of applied water (Re):

$$Re = \frac{\text{average catch, all containers, inches}}{\text{gross application per test, inches}}$$

$$= \text{_____ inches} \div \text{_____ inches} = \text{_____}$$

\* The Effective Portion of Water Applied (Re) may exceed 1.00 due to overlap from sprinklers adjacent to the test area. Consider using Re = 0.85 to calculate Eq. This factor attempts to account for potential losses during less than ideal operating conditions (hot, dry, windy, etc.) and for inefficiencies on bed edges.

Potential application efficiency of the low-1/4 (Eq):

$$Eq = DU \times Re = \text{_____} \times \text{_____} = \text{_____ \%}$$

Net average application rate [to the low-1/4 of the field] (in/hr)

$$= \text{Gross average application rate, in/hr} \times Eq$$

$$= \text{_____ in/hr} \times \text{_____ \%} = \text{_____ in/hr}$$

Irrigation runtime required to replace MAD [on the low-1/4 of the field] (hours)

$$= \frac{\text{MAD (in)}}{\text{Net average application rate, in/hr}}$$

$$= \text{_____ inches} \div \text{_____ in/hr} = \text{_____ hours}$$

Application efficiency (Ea):

$$Ea = \frac{\text{†Water stored in root zone, inches}}{\text{Gross application per irrigation, inches}} \times 100$$

$$= \frac{\text{_____ inches}}{\text{_____ inches}} \times 100 = \text{_____ \%}$$

Losses = Gross application per irrigation, inches - †Water stored in the root zone, inches

$$= \text{_____ inches} - \text{_____ inches} = \text{_____ inches}$$

† Refers to the amount of water that would be applied as irrigation water and stored as plant available soil water, during a typical irrigation event. Use MAD (in) for this calculation.

**Cranberry Sprinkler Irrigation System  
 Detailed Evaluation - Fixed Set Sprinkler System**

**Potential Water Savings:**

**Present Management:**

Present weekly gross water applied (per summer week):

$$= \text{Gross application per irrigation, inches} \times \frac{\text{No. of irrigations}}{\text{No. of days}} \times \frac{7 \text{ days}}{1 \text{ week}}$$

$$= \frac{\text{inches}}{\text{irrigation}} \times \frac{\text{irrigations}}{\text{days}} \times \frac{7 \text{ days}}{1 \text{ week}} = \text{in/wk}$$

**Potential Management:**

Weekly net irrigation requirement (mid-summer):

$$= \frac{*0.1 \text{ inches}}{\text{day}} \times \frac{7 \text{ days}}{\text{week}} = 0.7 \text{ in/wk}$$

\* Approximate average daily cranberry evapotranspiration (ET). Adjust if local conditions and/or historic data suggest a different value.

Potential weekly gross water applied:

$$= \frac{\text{Weekly net irrigation requirement, in/wk}}{\text{Potential application efficiency of the low-1/4 (Eq)}} \times 100$$

$$= \frac{\text{in/wk}}{\text{\%}} \times 100 = \text{in/wk}$$

Total weekly water conserved (per acre):

$$= \text{Present weekly gross water applied} - \text{Potential weekly gross water applied}$$

$$= \text{in/wk} - \text{in/wk} = \text{in/wk}$$

Total weekly water conserved:

$$= \text{Total weekly water conserved, in/wk} \times \text{Area, acres}$$

$$= \text{in/wk} \times \text{acres} = \text{ac-in/wk}$$

$$\text{ac-in/wk} \times \frac{1 \text{ ft}}{12 \text{ in}} = \text{ac-ft/wk}$$

**Cranberry Sprinkler Irrigation System  
Detailed Evaluation - Fixed Set Sprinkler System**

**Potential Fuel/Cost Savings:**

Pumping plant efficiency: \_\_\_\_\_ %

Kind of fuel: \_\_\_\_\_

Cost per unit of fuel: \$ \_\_\_\_\_

Fuel cost per acre-ft: \$ \_\_\_\_\_

Cost savings per summer week (per test bed):

= Fuel cost per acre-ft × Total weekly water conserved, ac-ft/wk

= \$ \_\_\_\_\_ per ac-ft × \_\_\_\_\_ ac-ft/wk = \$ \_\_\_\_\_ per wk

Marsh: \_\_\_\_\_

Date: \_\_\_\_\_

Bed ID: \_\_\_\_\_

Pressure at Pump: \_\_\_\_\_ psi

Test Start Time: \_\_\_\_\_

Test End Time: \_\_\_\_\_

$\Delta$  Evap. Container: \_\_\_\_\_ mL

1st Lateral ID (i.e. north, center, etc.): \_\_\_\_\_ Sprinkler Numbers [on test boundary]: \_\_\_\_\_

2nd Lateral ID (i.e. north, center, etc.): \_\_\_\_\_ Sprinkler Numbers [on test boundary]: \_\_\_\_\_

Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)

Test Start Time: \_\_\_\_\_

Test End Time: \_\_\_\_\_

$\Delta$  Evap. Container: \_\_\_\_\_ mL

1st Lateral ID (i.e. north, center, etc.): \_\_\_\_\_ Sprinkler Numbers [on test boundary]: \_\_\_\_\_

2nd Lateral ID (i.e. north, center, etc.): \_\_\_\_\_ Sprinkler Numbers [on test boundary]: \_\_\_\_\_

Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)	Can #	Vol. (mL)