# Micro Irrigation Design Data Worksheet

*Project Owner's Name & Address:*

| *Project Location* | | | |
|---|---|---|---|
| *Field No:* | *Legal Description:* _____, Section _____, T_____ , R_____ ; _____ *County, Colorado* | | |
| *Project Designer* | | | |
| *Design Prepared By:* | | *Representing: (name of agency, company, etc.)* | *Date:* |

***Attach Construction Drawings or other documentation that identify and locate:***
*(check all that apply)*

- ❑ **Site Specific Contour or Grid Elevation Map**
  Include map scale, legend, north arrow & critical elevations
- ❑ **Irrigation well(s) or Other Water Source**
  Indicate design capacity (gpm) and operating pressure (psi)
- ❑ **Delivery Pipeline** (from source to system controller)
  Indicate sizes, lengths, locations, material type, and pressure ratings
- ❑ **Control Station & Filter Station(s)**
- ❑ **Main Distribution Line & Sub-main Lines**
  Indicate sizes, lengths, locations, material type, pressure ratings
- ❑ **Manifolds, Headers, and Flush Lines**
  Indicate sizes, lengths, locations, material type, pressure ratings
- ❑ **Valves**
  Indicate type, make, model, & size
- ❑ **Zones or Blocks**
  Identify zones & provide drip tape layout, number of tapes, and material type

***Attach Supporting Documentation that includes:***

- ❑ **Construction Specifications**
- ❑ **Material List and Itemized Cost Estimate**
- ❑ **Recent (< 1 year old) Pump Test Data**
- ❑ **Filter Selection & Design Computations**
- ❑ **Hydraulic Design Computations**

## Micro-Irrigation Design Data Worksheet, cont.

*Project Owner's Name:*

### CROP & SOILS DATA SUMMARY

| ***Basic Crop Data*** | | | | | | |
|---|---|---|---|---|---|---|
| Crop to be Irrigated | Rooting Depth (feet) | Plant Spacing (feet) | Row Spacing (inches) | Threshold Salinity[1] (mmhos/cm) | Net Water Requirement (inches/yr) | Peak Daily $ET_c$ (inches /day) |
| | | | | | | |
| | | | | | | |
| | | | | | | |

[1] Threshold salinity, $EC_{e(ct)}$, is the maximum mean root zone soil salinity at which yield reductions will not occur.

Computed $Q_{max}$ = $23 \times ET_{max} = 23 \times$ _____ in/day = _____ gpm/acre

where: $Q_{max}$ = max. water requirement, gpm/day, and $ET_{max}$ = highest peak daily $ET_c$, inches/day, from above. (assumes a maximum operating period of 22 hours/day and a design efficiency of 90%)

| ***Basic Soil Data*** | | | | | |
|---|---|---|---|---|---|
| Soil Type/Name | Dominant Texture | Design Soil Intake Rate (Inches/hour) | Available Water Holding Capacity (inches/foot) | MAD[1] (%) | $EC_{e(ave)}$[2] (mmhos/cm) |
| | | | | | |
| | | | | | |
| | | | | | |

[1] MAD is Management Allowed Deficit [2] $EC_{e(ave)}$ is Average Soil Extract Electrical Conductivity

Irrigation Water Electrical Conductivity, $EC_w$ _____ mmhos/cm. Compute Leaching Fraction, LF, where:

$$LF = \frac{0.1794}{\left(EC_{e(ct)} / EC_w\right)^{3.0417}} = \frac{0.1794}{\left(\_\_\_\_ / \_\_\_\_\right)^{3.0417}} = \_\_\_\_\_ \therefore Use\ LF = \_\_\_\_\_$$

***Attach Supporting Documentation that includes:***
*(check all that apply)*

- ❑ **Method for determining net annual water requirement and peak daily $ET_c$**
- ❑ **Rationale for selected Management Allowed Deficit (MAD)**
- ❑ **Rationale for selected leaching fraction**
- ❑ **Laboratory analysis of irrigation water with suitability assessment for drip irrigation including analysis to determine filtration requirements**
- ❑ **Proposed chemical treatments of irrigation water**

## Micro-Irrigation Design Data Worksheet, cont.

*Project Owner's Name:*

### BASIC SYSTEM DATA

(Refer to NRCS Standard 441- Irrigation System, Micro Irrigation, for design requirements)

Total area irrigated ……..……..... [ ] (acres)

Available water supply flow rate ……..... [ ] (gpm) Available flow per acre: [ ] (gpm/acre)

System design flow rate ……..... [ ] (gpm) @ operating pressure of [ ] (psi)

# Zones Planned ……..... [ ] Area irrigated by each zone: [ ] (acres)

# Zones irrigated concurrently……..... [ ] Application rate per zone: [ ] (inches/hr)

Lateral line material: _____ Inside diameter: [ ] (inches)

Drip tape/line material: _____ Inside diameter: [ ] (inches)

Drip tape/line spacing: …….. [ ] (inches); Drip tape/line depth: [ ] (inches)

Flushing velocity: …… [ ] (ft/s); Flushing end pressure: [ ] (psi)

Flushing flow rate: [ ] (gpm)

**Describe Emitter** *(make, model, etc.)*: _____

Type (circle one): laminar laminar/turbulent turbulent Emitter spacing: [ ] (inches)

Emitter path width:……..... [ ] (inches); Emitter path height: [ ] (inches)

**Describe Filter system** *(type, model, capacity in gpm)*: _____

Pressure loss across filter: ……. [ ] (psi); Head required at filter: [ ] psi

Time required for backwash: ……. [ ] (hours); Backwash flow rate: [ ] gpm

**Describe Sand Separator** *(type, model, capacity in gpm)*: _____

**Describe Chemigation Valve** *(type, model, location)*: _____

**Describe Check Valve** *(type, model, location)*: _____

## Micro-Irrigation Design Data Worksheet, cont.

*Project Owner's Name:*

### ZONE/BLOCK DATA

Refer to NRCS Standard 441- Irrigation System, Micro Irrigation, for design requirements. If all zones/blocks are identical in all design considerations, including topography, submit only one set of data and indicate "ALL" for zone number. Otherwise, submit a complete data set for each zone/block. Use the following equations to calculate system characteristics for each zone:

$$\text{Flow Variation, \%, } = \frac{q_{max} - q_{min}}{q_{ave}} \times 100 \text{;}$$ where:

$q_{max}$ = the maximum emitter discharge in the zone;
$q_{min}$ = the lowest emitter discharge in the zone; and
$q_{ave}$ = the average emitter discharge in the zone.

$$\text{Emission Uniformity, (EU), \%, } = 100\left[1.0 - \frac{1.27C_v}{\sqrt{n}}\right]\frac{q_{min}}{q_{ave}} \text{;}$$ where:

$C_v$ = the manufacturer's coefficient of variation for the emitters;

n - for point source emitters = the number of emitters per plant; or
n - for line source emitters = the lateral plant rooting diameter divided by length of line used to calculate $C_v$, or 1, which ever is greater.

$q_{min}$ = the lowest emitter discharge in a lateral; and

$q_{ave}$ = the average emitter discharge in a lateral.

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**Zone Number:** [ ] Type of drip tape/line: _____

Emitter data (model, type, etc.) _____ Spacing: [ ] (inches)

Design manifold inlet pressure downstream of zone control valve: [ ] (psi)

Emitter discharge = $q = K_d H^x$ (gal/hr) $K_d$ = [ ] x = [ ]

Manufacturer's Coefficient of Variation, ($C_v$): [ ]

Average emitter design discharge, $q_{ave}$: [ ] (gal/hr) @ line pressure of [ ] (psi)

Maximum emitter discharge, $q_{max}$: [ ] (gal/hr) @ line pressure of [ ] (psi)

Location of maximum discharge emitter: _____

Minimum emitter discharge, $q_{min}$: [ ] (gal/hr) @ line pressure of [ ] (psi)

Location of maximum discharge emitter: _____

Flow Variation = _____ %  Emission Uniformity, (EU), = _____ %

**Micro-Irrigation Design Data Worksheet, cont.**

*Project Owner's Name:*

*(make additional copies of this page as needed)*

**Zone Number:** ____ Type of drip tape/line: _____

Emitter data (model, type, etc.) _____ Spacing: ____ (inches)

Design manifold inlet pressure downstream of zone control valve: ____ (psi)

Emitter discharge = $q = K_d H^x$ (gal/hr) $K_d$ = ____ x = ____

Manufacturer's Coefficient of Variation, ($C_v$): ____

Average emitter design discharge, $q_{ave}$: ____ (gal/hr) @ line pressure of ____ (psi)

Maximum emitter discharge, $q_{max}$: ____ (gal/hr) @ line pressure of ____ (psi)

Location of maximum discharge emitter: _____

Minimum emitter discharge, $q_{min}$: ____ (gal/hr) @ line pressure of ____ (psi)

Location of maximum discharge emitter: _____

Flow Variation = _____ %  Emission Uniformity, (EU), = _____ %

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**Zone Number:** ____ Type of drip tape/line: _____

Emitter data (model, type, etc.) _____ Spacing: ____ (inches)

Design manifold inlet pressure downstream of zone control valve: ____ (psi)

Emitter discharge = $q = K_d H^x$ (gal/hr) $K_d$ = ____ x = ____

Manufacturer's Coefficient of Variation, ($C_v$): ____

Average emitter design discharge, $q_{ave}$: ____ (gal/hr) @ line pressure of ____ (psi)

Maximum emitter discharge, $q_{max}$: ____ (gal/hr) @ line pressure of ____ (psi)

Location of maximum discharge emitter: _____

Minimum emitter discharge, $q_{min}$: ____ (gal/hr) @ line pressure of ____ (psi)

Location of maximum discharge emitter: _____

Flow Variation = _____ %  Emission Uniformity, (EU), = _____ %

**Micro-Irrigation Design Data Worksheet, cont.**

*Project Owner's Name:*

## Irrigation Water Management Plan

Describe (or attach) the planned irrigation schedule for each crop.
(*Include, frequency, set time, application depth, decision criteria for when to irrigate, etc.)*

- ❑ **Attach justification/explanation pertaining to deficit irrigation**
  *(When available irrigation flow rate is less than peak water requirement)*
- ❑ **Attach documentation describing supplemental irrigation requirements**
  *(If supplemental irrigation is necessary for germination, crop protection, or other purposes)*
- ❑ **Attach Operation & Management Plan**