



WQT03 – Montana Supplement

Irrigation Pumping Plant Evaluation - (Water Quantity Enhancement Activity)

Montana Clarification

No additional clarifications other than those described in the national enhancement.

Montana Specifications

Irrigation Pumping Plant Evaluation shall be conducted in accordance with the Technical Irrigation Pumping Plant Test Procedure Manual (1982, University of Nebraska Institute of Agriculture and Natural Resources).

Incompatible Enhancements

Some enhancements are not compatible with other enhancements. If you have a question, contact your local NRCS office.

Eligible Land

Cropland and pasture

Applicable Acres

Applies to all pumping plants in the crop or pasture and use.

Documentation Requirements

(Complete the Table below)

To be completed by NRCS and Producer during planning			To be completed by Producer during certification process	
1	2	3	4	5
Tract	Field(s)	Acres Planned	Number of Pumping Plants Evaluated	Date of Irrigation Pumping Plant Evaluation

Operator completes columns 1-5.

A full and complete report must be completed by the trained service provider. This should address:

1. Age and condition of the components of the irrigation system and pumping plant.
2. Water levels during pumping, a pressure/discharge curve **of the existing pump.**
3. Pump and engine speed (rpm)
4. Actual pumping plant performance versus the Nebraska Performance Criteria
5. Actual pump efficiency versus Manufacturers Published efficiency
6. Recommendations for improvements to the overall system efficiency

7. Estimate of energy savings **if pump runs at Nebraska Performance Criteria** or if improvements are implemented

I certify that the Irrigation Pumping Plant Evaluation on the field(s) listed in the table above meets these specifications and that the following documentation has been provided to NRCS:

1. Documentation must include a completed Irrigation Pumping Plant Analysis Worksheet (**Pgs. MT-WQT03-3 through 6 below**) for each pumping plant evaluated.
2. **If the Trained Service Provide received a CID certification from the Irrigation Association, and it is documented on IA website, they can substitute their own form in place of the worksheet as long as it covers what is asked in the worksheet. <http://www.irrigation.org/hirecertified/>**

I understand that it is my responsibility to obtain all necessary permits and to comply with all laws, regulations and ordinances pertaining to the application of these activities.

I acknowledge that I have read and understand all that is required for the implementation of this CSP Enhancement Activity.

Contract participant

Date

IRRIGATION PUMPING PLANT EVALUATION

Name _____ County _____ Tract No. _____
 DNRC Well Registration Number _____
 Static Water Level (ft) _____ Pumping Water Level (ft) _____
 Pump Brand _____ Stages _____ Serial No. _____
 Pump Setting _____ Pump Shaft Dia. _____ Threads/in _____
 Pump RPM _____ Motor RPM _____

Pumping Head

Pumping Head											
Pressure at Pump Outlet (psi)		Pressure Conversion		Elevation Difference Between Pump Outlet and Pumping Water Surface (ft)			Estimated Friction Loss in Column or Suction Pipe (ft)		Miscellaneous Friction Loss (ft)		(A) Pumping Head (ft)
x		2.31	+		+		+		=		

Flow Test

Flow Meter Test										
Meter Type	Minutes	Seconds	Time of Test (min)	Gallons at End of Test	Gallons at Beginning of Test	Total Gallons	Time of Test (min)	(B) Flow (gpm)		
Propeller		=		-	=	÷	=			
Ultra Sonic or Magnetic										

Collins Flow Gauge:

10 Pt. Setting	Setting Position	Right		Left	
.158D					
.275D					
.354D					
.420D					
.475D					

Pipe I.D. _____ Average Velocity _____ x 2.45 x D² = _____ gpm (B)

General Power Unit Inventory

- Internal combustion engine, diesel, gasoline, or propane (complete page 3, Tables 1 and 2)
- Internal combustion engine, natural gas (complete page 3, Tables 3 and 4)
- Electric Motor (complete page 4, Tables 5-7)

Diesel, Gasoline, or Propane Energy Use Test

Table 1. Diesel, Gasoline, or Propane Energy Use Test											
Fuel Type	Weight at Start of Test (lbs)		Weight at Stop of Test (lbs)		Net Weight Used (lbs)		Unit Weight of Fuel (lbs/gal)		Total Time of Test (hrs)		(C) Energy Use (gal/hr)
Diesel		-		=		÷	7.10	÷		=	
Gasoline		-		=		÷	6.00	÷		=	
Propane		-		=		÷	4.25	÷		=	

Table 2. Diesel, Gasoline, or Propane Performance Rating													
Fuel Type	(A) Pumping Head (ft)	(B) Flow (gpm)	Horsepower Conversion		Water horsepower (whp)	(C) Energy Use (gal/hr)	Actual Plant Performance (whp hr/gal)		NPPPC (whp hr/gal)		Performance Rating (%)		
Diesel	×	÷	3960	=	÷	=	÷	12.5	×	100	=		
Gasoline	×	÷	3960	=	÷	=	÷	8.66	×	100	=		
Propane	×	÷	3960	=	÷	=	÷	6.89	×	100	=		

Natural Gas Energy Use Test

Table 3. Natural Gas Energy Use Test										
Dial Capacity		Dial Revolutions		Time of Test (sec)		Correction Factor		(C) Energy Use (mcf/hr)	Gas Pressure (psi)	Elevation
3.6	×	×	÷		=	×	=			

Table 4. Natural Gas Performance Rating													
Fuel Type	(A) Pumping Head (ft)	(B) Flow (gpm)	Horsepower Conversion		Water horsepower (whp)	(C) Energy Use (mcf/hr)	Actual Plant Performance (whp hr/mcf)		NPPPC (whp hr/mcf)		Performance Rating (%)		
Natural Gas	×	÷	3960	=	÷	=	÷	66.7	×	100	=		

Electric Energy Use Test

Table 5. Electric Energy Use Test									
Meter Type			Disc Revolutions	Kh		Time of Test (sec)		(C) Energy Use (kW)	
Dial	3.6	×		×		÷		=	
Digital									

Table 6. Electrical Characteristics				
	Leg 1	Leg 2	Leg 3	Average
Volts				
Amps				

Table 7. Electric Performance Rating											
Energy Source	(A) Pumping Head (ft)	(B) Flow (gpm)	Horsepower Conversion	Water horsepower (whp)	(C) Energy Use (kW)	Actual Plant Performance (whp hr/(kWh))	NPPPC (whp hr/kWh)		(D) Performance Rating (%)		
Electric	×	÷	3960 =	÷	=	÷	0.885 ×	100 =			

Potential Savings

If the performance rating calculated for the pumping plant is less than 100 %, potential annual savings can be estimated using Tables 8 and 9. A performance rating at, or above 100% indicates that the pumping plant is operating at, or above the expected performance level as defined by the Nebraska Pumping Plant Performance Criteria (NPPPC). A performance rating below 100% indicates the pumping plant is using more energy than the criteria calls for.

Table 8. Potential Energy Savings Estimated from Annual Hours											
(D) Performance Rating (%)				(C) Energy Use (unit/hr)	(E) Excess Energy Consumed (unit/hr)	Annual Hours of Operation (hr/season)	Excess Energy (unit/season)	Unit Cost of Energy (\$/unit)	Potential Annual Savings (\$/season)		
100 -	=	÷	100 =	×	=	×	=	×	=		

Table 9. Potential Energy Savings Estimated from Annual Inches Applied											
(B) Flow (gpm)	(F) Water Application Capacity (ac-in/hr)	(E) Excess Energy Consumed (unit/hr)	Unit Cost of Energy (\$/unit)	Excess Energy Cost (\$/hr)	(F) Water Application Capacity (ac-in/hr)	Cost per Acre-Inch (\$/Ac-in)	Irrigated Acres	Annual Inches Applied (in/season)	Potential Annual Savings (\$/season)		
÷	452 =	×	=	÷	=	×	×	=			

Field Pump Test Data

While performing the energy use test it is required to document field pump test data. Document current pump configuration and if adjustments were made below.

Observation No.	Flow (GPM)	Well Pressure (psi)	Drawdown Pumping Level (ft)	Constant RPM	
				<input type="checkbox"/> Motor RPM	<input type="checkbox"/> Pump RPM
1					
2					
3					
4					

Note: Field pump test data must show data for all columns above. Flow points should be documented at a constant RPM.

Pump Adjustments*

_____ Pumping Head x _____ Downthrust = _____ Total Downthrust
 _____ Shaft Stretch x _____ Shaft Length/100 = _____ Total Stretch x _____ Threads/in
 = _____ Turns of Nut

Age and Condition of Pumping Plant and Components _____

	<u>Current Configuration</u>	<u>After Adjustments*</u>
Pumping Water Level	_____ Feet	_____ Feet
Operating Pressure	_____ psi	_____ psi
Operating Flow Rate	_____ gpm	_____ gpm
Power Requirements	_____ Whp	_____ Whp
Pump RPM	_____ RPM	_____ RPM
Engine RPM	_____ RPM	_____ RPM
Performance Rating	_____ %	_____ %

Adjustments, remarks and recommendations

Date of Test: _____
 Test completed by: _____
 Contact Number of Tester: _____

* It is recommended that the pump adjustment be made only by trained professionals. Adjustments are not required to meet the requirements of the Conservation Security Program Enhancement Water Quality Enhancement Activity WQT03, Irrigation Pumping Plant Evaluation.

Copies of this Field Data form should be completed for each test performed and submitted to NRCS.
 Form modified from Cooperative Extension Service Agricultural Engineering Department, University of Nebraska – Lincoln