



**Water Quantity Enhancement Activity – WQT03 – Irrigation pumping plant evaluation**

**State Criteria (same as NATIONAL CRITERIA)**

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).

**Documentation Requirements (SEE NATIONAL ENHANCEMENT ACTIVITY JOBSHEET)**

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	No. of pumping plants evaluated	Date of irrigation pumping plant evaluation
Ex. T100	2b	7.3		

Ex. = example. NRCS completes column 1, 2 & 3 (Tract, Field and Acres Planned). Operator completes remaining columns.

**Participant Acknowledgement Statement:**

I agree to apply this enhancement under the terms and conditions of my CSP contract and understand the requirements of the activity.

**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 for each pumping plant evaluated.
2. Copies of dated receipts for equipment or services purchased.

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.

**Certified by:** \_\_\_\_\_ **Date:** \_\_\_\_\_

## IRRIGATION PUMPING PLANT EVALUATION

Name \_\_\_\_\_ County \_\_\_\_\_ Tract No. \_\_\_\_\_  
 NDNR 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 D<sup>2</sup> = \_\_\_\_\_ 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)	×	100	=	(D) 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)	×	100	=	(D) 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