

Practice: 533 - Pumping Plant

Scenario: #1 - Pump <= 1.5 HP

Scenario Description:

Typical application of a less than or equal to 1.5 HP pump at water source (well or spring) in order to pump water to appropriate locations within the prescribed grazing system. Pump enables the development of new watering sites that are removed from hydrologically sensitive areas and provide for a better distribution of animal wastes and associated nutrients. Cattle exclusion from surface water results in improved surface water quality, reduced erosion. Also used for pressurizing a small irrigation system; or for transferring liquid waste in a waste transfer system. Scenario typically includes a pressure tank.

Resource Concerns: Livestock Production Limitation - Inadequate livestock water; Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water.

Associated Practices include: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 516 - Livestock Pipeline; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.

Before Situation:

Livestock: A pump is needed to move water to provide proper flow rate for watering facility which is used as part of a prescribed grazing system.

After Situation:

A 1 HP pump is installed at water source (well or spring) in order to pump water uphill to appropriate locations within the prescribed grazing system. Pump enables the development of new watering sites that are removed from hydrologically sensitive areas and provide for a better distribution of animal wastes and associated nutrients. Cattle exclusion from surface water results in improved surface water quality, reduced erosion. Associated practices: Fence (382), Prescribed Grazing (528), Water Well (642), Pipeline (516), Spring Development (574), Watering Facility (614)

Scenario Feature Measure: Pump

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$2,385.82

Scenario Cost/Unit: \$2,385.82

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$155.72	0.6	\$93.43
Backhoe, 80 HP	926	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$55.14	4	\$220.56
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$36.60	2	\$73.20
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.70	8	\$149.60
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$20.08	4	\$80.32
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$23.91	8	\$191.28
Materials						
Pressure Tank, 40 gallon	1038	Pressure Tank, 40 gallon. Includes materials and shipping only.	Each	\$432.13	1	\$432.13
Pump, ≤ 5 HP, pump and motor, variable cost portion	1010	Variable cost portion of a pump less than or equal to 5 HP pump and motor. This portion IS dependent on the total horsepower for the pump. The total cost of any pump will include this variable cost plus the fixed cost portion. The completed pump and moto	Horsepower	\$382.80	1	\$382.80

Materials

Pump, ≤ 5 HP, pump and motor, fixed cost portion	1009	Fixed cost portion of a pump less than or equal to 5 HP pump and motor. This portion is a base cost and is not dependant on horsepower. The total cost of any pump will include this fixed cost plus a variable cost portion. The completed pump and motor will	Each	\$508.62	1	\$508.62
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Mobilization

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$253.88	1	\$253.88
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Scenario: #2 - Water Ram

Scenario Description:

A water ram is used to transfer water from a live stream to a Watering Facility (614) or small Irrigation Reservoir (436) utilizing the energy of moving water to transfer a portion of that water to a higher elevation. It is anchored to a small concrete pad. Bypass water (which could easily be 90% of the water diverted from the stream) is returned to the stream or transferred in a pipe, to a lower elevation tank (614 or 436), without erosion or impairment to water quality. In the livestock scenario, the objective is to provide water to the cattle outside of a live stream or other natural water source thereby eliminating a significant erosion situation while also improving water quality. The cattle thus have access to drinking water without having to enter the stream. The water ram may need to be fenced for protection from curious bovines. While it is generally not considered practical for irrigation, in the irrigation scenario, water can be retrieved from a stream and stored in a small 436 to provide water for a very small (0.1 acre) irrigation system. A Nose Pump is a diaphragm pump located in a pasture for the purpose of providing water to cattle. For a permanent installation, it is typical to also install Heavy Use Area Protection (561) (separate contract item) where the cattle congregate around the pump. It is powered and operated by cattle to transfer water from a stream to a drinking bowl. The objective is to provide water to the cattle outside of a live stream or other natural water source thereby eliminating a significant erosion situation and while also improving water quality. The cattle thus have access to drinking water without having to enter the stream. Generally one nose pump is adequate for 20 cattle.

Resource Concerns: Insufficient stockwater.

Associated Practices: 374 - Farmstead Energy Improvement; 382 - Fence; 430 - Irrigation Pipeline; 436 - Irrigation Reservoir; 516 - Livestock Pipeline; 561 - Heavy Use Area Protection; and, 614 - Watering Facility.

Before Situation:

Water in a nearby stream is not available at the desired location, pressure and/or flow rate.

After Situation:

A 2" diameter inlet pipe is installed and connected to a water ram pump with all appurtenances and anchored to a concrete pad (9 ft x 4 ft x 5 in) or other appropriate secure base. Depending upon the application, either a 1-inch diameter Livestock Pipeline (516) or an Irrigation Pipeline (430) is installed from the water ram to a 5,000 gallon storage facility. Improved water quantity or quality, grazing management, plant diversity, animal health, and/or irrigation purposes as outlined in the appropriate NRCS irrigation system standard. A 2" water ram, with 10 gpm of inlet flow and 10 feet of drop, can supply about 1.0 gpm to a location about 50 feet higher than the water ram.

Scenario Feature Measure: Number of Pumps

Scenario Unit: Each

Scenario Typical Size: 1

Scenario Cost: \$1,493.80

Scenario Cost/Unit: \$1,493.80

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-placed as a slab on grade by chute placement. Typical strength is 3000 to 4000 psi. Includes materials, labor and equipment to transport, place and finish.	Cubic yard	\$155.72	0.5	\$77.86
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$36.60	4	\$146.40
Labor						
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.51	12	\$438.12
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.70	16	\$299.20
Materials						
Pump, Ram	1114	Ram pump kit, 2 inch. Includes materials and shipping only.	Each	\$532.22	1	\$532.22

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Scenario: #4 - Pump >1.5 HP and <= 5 HP

Scenario Description:

The typical scenario supports replacement of a pump in an existing micro irrigation system on cropland using a typical 4 HP pump. Size of pump is determined by required GPM derived from a design for specific irrigation system on cropland. Scenario could also be used for a 4 HP for silage leachate, barnyard runoff, and milkhouse waste (as part of a waste transfer system) at farm headquarters.

Irrigation Setting: existing micro irrigation system employs an inefficient, improperly sized pump that leads to inefficient water delivery resulting in high energy costs; or Waste Transfer Setting: various types of liquid waste at the headquarters is uncollected causing surface and ground water issues. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.

Also can be used as Livestock Water Pump for systems requiring larger than 1 HP.

Before Situation:

Irrigation Setting: existing micro irrigation system employs an inefficient, improperly sized pump that leads to inefficient water delivery resulting in high energy costs; or

Waste Transfer Setting: various types of liquid waste at the headquarters is uncollected causing surface and ground water issues. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system.

After Situation:

Irrigation Setting: For micro irrigation system, a properly designed pump is installed reducing water and energy usage. Waste Transfer

Setting: For liquid waste, wastes that have been collected through a waste transfer system are now efficiently transferred to appropriate treatment or storage facilities. Associated practices: Waste Transfer (634), Irrigation Pipeline (430), Irrigation System, Micro-Irrigation (441), Heavy Use Area Protection (561), Irrigation Water Management (449), Waste Storage Facility (313), Vegetated Treatment Area (635)

Scenario Feature Measure: Pump Power Requirement

Scenario Unit: Brake Horse Power

Scenario Typical Size: 4

Scenario Cost: \$4,741.41

Scenario Cost/Unit: \$1,185.35

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$36.60	3	\$109.80
Backhoe, 80 HP	926	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$55.14	3	\$165.42
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$23.91	8	\$191.28
Equipment Operators, Heavy	233	Includes: Cranes, Hydraulic Excavators >=50 HP, Dozers, Paving Machines, Rock Trenchers, Trenchers >=12", Dump Trucks, Ag Equipment >=150 HP, Scrapers, Water Wagons.	Hour	\$22.21	3	\$66.63
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.70	16	\$299.20
Materials						
Manhole, 4' x 4'	1053	Precast Manhole with base and top delivered. 4' diameter x 4' depth. Materials only.	Each	\$1,615.38	1	\$1,615.38
Pump, ≤ 5 HP, pump and motor, variable cost portion	1010	Variable cost portion of a pump less than or equal to 5 HP pump and motor. This portion IS dependent on the total horsepower for the pump. The total cost of any pump will include this variable cost plus the fixed cost portion. The completed pump and moto	Horsepower	\$382.80	4	\$1,531.20

Materials

Pump, ≤ 5 HP, pump and motor, fixed cost portion	1009	Fixed cost portion of a pump less than or equal to 5 HP pump and motor. This portion is a base cost and is not dependant on horsepower. The total cost of any pump will include this fixed cost plus a variable cost portion. The completed pump and motor will	Each	\$508.62	1	\$508.62
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Mobilization

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$253.88	1	\$253.88
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Scenario: #5 - Pump >5 and <= 10 HP

Scenario Description:

The typical scenario supports replacement of a pump in an existing irrigation system (includes backflow prevention device or water meter as appropriate) on cropland with a typical 8 HP permanent pump. Size of pump is determined by required GPM derived from a design for specific irrigation system on cropland. Scenario could also be used for a 8 HP pump for silage leachate, barnyard runoff, and milkhouse waste (as part of a waste transfer system) at farm headquarters. The combination of higher solids content and volume require a larger horse power pump. This liquid manure pump is used to transfer semi-solid manure from a small reception pit located either below a barnyard or at the end of a free-stall barn or scrape alley.

Before Situation:

Irrigation Setting: Either an existing irrigation system employs an inefficient, improperly sized pump that leads to inefficient water delivery resulting in high energy costs; or

Waste Transfer Setting: various types of semi-solid or liquid waste at the headquarters is uncollected causing surface and ground water issues.

After Situation:

Irrigation Setting: For irrigation system, a properly designed pump is installed reducing water and energy usage. Waste Transfer Setting: For semi-solid or liquid waste, wastes that have been collected through a waste transfer system are now efficiently transferred to appropriate treatment or storage facilities or crop application. Due to topography, gravity transfer is not possible and a properly sized pump is needed to transfer waste as part of a waste transfer system. Associated practices: Waste Transfer (634), Irrigation Pipeline (430), Irrigation System, Micro-Irrigation (441), Heavy Use Area Protection (561), Irrigation Water Management (449), Waste Storage Facility (313), Vegetated Treatment Area (635)

Scenario Feature Measure: Pump Power Requirement

Scenario Unit: Brake Horse Power

Scenario Typical Size: 8

Scenario Cost: \$5,464.64

Scenario Cost/Unit: \$683.08

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Backhoe, 80 HP	926	Wheel mounted backhoe excavator with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$55.14	3	\$165.42
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$36.60	3	\$109.80
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.70	16	\$299.20
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$23.91	8	\$191.28
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$20.08	3	\$60.24
Materials						
Pump, > 5 HP to 30 HP, pump and motor, variable cost portion	1012	Variable cost portion of a pump between 5 and 30 HP, including the pump and motor. This portion is dependent on the total horsepower for the pump. The total cost will include this variable cost plus a fixed cost portion. Includes material and shipping	Horsepower	\$116.80	8	\$934.40
Pump, > 5 HP to 30 HP, pump and motor, fixed cost portion	1011	Fixed cost portion of a pump between 5 and 30 HP, including the pump and motor. This portion is a base cost for the pump and is not dependant on horsepower. The total cost will include this fixed cost plus a variable cost portion. Includes material and	Each	\$1,835.04	1	\$1,835.04

Materials

Manhole, 4' x 4'	1053	Precast Manhole with base and top delivered. 4' diameter x 4' depth. Materials only.	Each	\$1,615.38	1	\$1,615.38
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Mobilization

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$253.88	1	\$253.88
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