

**Practice:** 533 - Pumping Plant

**Scenario:** #1 - Electric-Powered Pump Less than or Equal to 5 HP , no pressure tank

**Scenario Description:** A 2.5 Hp submersible electric-powered pump is installed in a well or structure; or a close-coupled 2.5 Hp electric-powered centrifugal pump is mounted on a platform. It is used for watering livestock as part of a prescribed grazing system; or for pressurizing a small irrigation system; or for transferring liquid waste in a waste transfer system. 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: The present gravity flow system is inadequate to provide the proper flow rate for a prescribed grazing system. Irrigation: Available water is at an insufficient pressure to allow for even distribution of water. Waste Transfer: Contaminated water needs to be moved to a containment facility.

**After Situation:** Livestock: Water is transferred at a sufficient rate and pressure to meet the requirements of a prescribed grazing system. Irrigation: A properly designed pump is installed to improve irrigation efficiency and reduce energy usage. Waste Transfer: Liquid wastes that have been collected through a waste transfer system are now efficiently transferred to an appropriate treatment or storage facility.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 2.5

**Total Scenario Cost:** \$2,398.34

**Scenario Cost/Unit:** \$959.34

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-place 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	\$219.05	1	\$219.05
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	1	\$19.39

**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	\$22.04	6	\$132.26
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	\$39.85	6	\$239.09

**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	\$549.88	2.5	\$1,374.70
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	\$413.86	1	\$413.86

**Practice:** 533 - Pumping Plant

**Scenario:** #2 - Electric-Powered Pump Less than or Equal to 5 HP, with pressure tank

**Scenario Description:** A 1 Hp submersible electric-powered pump is installed in a well or structure; or a close-coupled 1 Hp electric-powered centrifugal pump is mounted on a platform. It is used for watering livestock as part of a prescribed grazing system; or for pressurizing a small irrigation system. Resource Concerns: Livestock Production Limitation - Inadequate livestock water; 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.

**Before Situation:** Livestock: The present gravity flow system is inadequate to provide the proper flow rate for a prescribed grazing system. Irrigation: Available water is at an insufficient pressure to allow for even distribution of water.

**After Situation:** Livestock: Water is transferred at a sufficient rate and pressure to meet the requirements of a prescribed grazing system. Irrigation: A properly designed pump is installed to improve irrigation efficiency and reduce energy usage.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 1

**Total Scenario Cost:** \$1,892.29

**Scenario Cost/Unit:** \$1,892.29

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-place 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	\$219.05	0.25	\$54.76
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	2	\$38.77

**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	\$22.04	6	\$132.26
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	\$39.85	6	\$239.09

**Materials**

Pressure Tank, 40 gallon	1038	Pressure Tank, 40 gallon. Includes materials and shipping only.	Each	\$463.67	1	\$463.67
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	\$549.88	1	\$549.88
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	\$413.86	1	\$413.86

**Practice:** 533 - Pumping Plant

**Scenario:** #3 - Electric-Powered Pump >5 HP<=30 hp, with L-pipe

**Scenario Description:** This is a close-coupled, 3-phase, 20 Hp electric-powered mixed-flow pump mounted in a steel L-pipe for large microirrigation (1,000 gpm and 30 psi) system or a large-sized surface irrigation system (1,200 gpm) or a medium-sized (1,000 gpm and 25 psi) waste transfer system. . The pump lifts water out of a stream, bayou, or tailwater pit through a discharge pipe into an irrigation reservoir directly or irrigation pipeline with either a dog-leg or closed stand pipe connection. Resource Concerns: 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; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use or is currently using ground water wells as irrigation supply.

**After Situation:** Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 20

**Total Scenario Cost:** \$18,184.01

**Scenario Cost/Unit:** \$909.20

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$219.05	2	\$438.09
Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$101.21	8	\$809.71
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	16	\$290.61
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	56	\$1,085.60

**Labor**

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	\$27.99	8	\$223.88
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	\$22.04	56	\$1,234.42
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	\$28.79	8	\$230.35
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	\$39.85	56	\$2,231.49

**Materials**

Pipe, Steel, 12", Std Wt, USED	1356	Materials: - USED - 12" - Steel Std Wt	Foot	\$22.18	20	\$443.60
Pipe, Steel, 20", Std Wt, USED	1359	Materials: - USED - 20" - Steel Std Wt	Foot	\$41.56	40	\$1,662.56
Pipe, Steel, 24", Std Wt, USED	1360	Materials: - USED - 24" - Steel Std Wt	Foot	\$49.98	14	\$699.75
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	Each	\$1,968.95	1	\$1,968.95

		dependant on horsepower. The total cost will include this fixed cost plus a variable cost portion. Includes material and shipping only.				
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 only.	Horsepower	\$125.33	20	\$2,506.57
Swing Check Valve, metal, 12"	2082	12" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$4,130.78	1	\$4,130.78

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	1	\$227.64
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**Practice:** 533 - Pumping Plant

**Scenario:** #4 - Electric-Powered Pump >30 hp <=75, with L-pipe

**Scenario Description:** This is a close-coupled, 3-phase, 50 Hp electric-powered mixed-flow pump mounted in a steel L-pipe for large microirrigation (2,000 gpm and 30 psi) system or a very large-sized surface irrigation system (3,000 gpm) or a large-sized (2,000 gpm and 25 psi) waste transfer system. The pump lifts water out of a stream, bayou, or tailwater pit through a discharge pipe into an irrigation reservoir directly or irrigation pipeline with either a dog-leg or closed stand pipe connection. This is a close-coupled, 3-phase, 50 Hp electric-powered centrifugal pump mounted on a platform for pressurizing a large-sized 1,000 gpm and 50 psi) sprinkler or very large microirrigation (2,000 gpm and 30 psi) system or a very large-sized surface irrigation system (3,000 gpm) or a large-sized (2,000 gpm and 25 psi) waste transfer system. Resource Concerns: 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; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use or is currently using ground water wells as irrigation supply.

**After Situation:** A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Horsepower

**Scenario Typical Size:** 50

**Total Scenario Cost:** \$30,013.42

**Scenario Cost/Unit:** \$600.27

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-place 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	\$219.05	2	\$438.09
Crane, truck mounted, hydraulic, 12 ton	1734	12 ton capacity truck mounted hydraulic crane. Equipment cost only.	Hour	\$81.44	16	\$1,303.01
Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$101.21	16	\$1,619.42
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	16	\$290.61
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	56	\$1,085.60

**Labor**

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	\$27.99	24	\$671.65
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	\$22.04	16	\$352.69
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	\$28.79	56	\$1,612.47
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	\$39.85	56	\$2,231.49

**Materials**

Pipe, Steel, 16", Std Wt, USED	1357	Materials: - USED - 16" - Steel Std Wt	Foot	\$29.25	20	\$584.93
Pipe, Steel, 24", Std Wt, USED	1360	Materials: - USED - 24" - Steel Std Wt	Foot	\$49.98	40	\$1,999.28

Pipe, Steel, 30", Std Wt, USED	1361	Materials: - USED - 30" - Steel Std Wt	Foot	\$78.57	14	\$1,099.96
Pump, > 30 HP, pump and motor, fixed cost portion	1013	Fixed cost portion of a pump greater than 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 shipping only.	Each	\$4,657.54	1	\$4,657.54
Pump, >30 HP, Pump and motor, variable cost portion	1014	Variable cost portion of a pump greater than 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 only.	Horsepower	\$95.62	50	\$4,781.02
Swing Check Valve, metal, 16"	2084	16" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$7,058.01	1	\$7,058.01

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	1	\$227.64
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**Practice:** 533 - Pumping Plant

**Scenario:** #5 - Electric-Powered Pump >75 HP, with L-Pipe

**Scenario Description:** This is a close-coupled, 3-phase, 100 Hp electric-powered mixed-flow pump mounted in a steel L-pipe for a very large-sized surface irrigation system (5,000 gpm) . The pump lifts water out of a stream, bayou, or tailwater pit through a discharge pipe into an irrigation reservoir directly or irrigation pipeline with either a dog-leg or closed stand pipe connection. Resource Concerns: 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; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use or is currently using ground water wells as irrigation supply.

**After Situation:** Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 100

**Total Scenario Cost:** \$53,060.02

**Scenario Cost/Unit:** \$530.60

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$219.05	4	\$876.19
Crane, truck mounted, hydraulic, 12 ton	1734	12 ton capacity truck mounted hydraulic crane. Equipment cost only.	Hour	\$81.44	16	\$1,303.01
Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$101.21	8	\$809.71
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	16	\$290.61
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	56	\$1,085.60

**Labor**

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	\$27.99	12	\$335.82
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	\$22.04	56	\$1,234.42
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	\$28.79	12	\$345.53
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	\$39.85	56	\$2,231.49

**Materials**

Pipe, Steel, 20", Std Wt, USED	1359	Materials: - USED - 20" - Steel Std Wt	Foot	\$41.56	20	\$831.28
Pipe, Steel, 36", Std Wt, USED	1362	Materials: - USED - 36" - Steel Std Wt	Foot	\$100.31	50	\$5,015.74
Pipe, Steel, 42", Std Wt, USED	1363	Materials: - USED - 42" - Steel Std Wt	Foot	\$115.43	14	\$1,615.99

Pump, > 30 HP, pump and motor, fixed cost portion	1013	Fixed cost portion of a pump greater than 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 shipping only.	Each	\$4,657.54	1	\$4,657.54
Pump, >30 HP, Pump and motor, variable cost portion	1014	Variable cost portion of a pump greater than 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 only.	Horsepower	\$95.62	100	\$9,562.04
Swing Check Valve, metal, 20"	2086	20" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$22,637.40	1	\$22,637.40

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	1	\$227.64
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**Practice:** 533 - Pumping Plant

**Scenario:** #6 - Electric-Powered Pump >5 HP<=30 hp

**Scenario Description:** This is a close-coupled, 3-phase, 20 Hp electric-powered centrifugal pump mounted on a platform for pressurizing a medium-sized (500 gpm and 50 psi) sprinkler or large microirrigation (1,000 gpm and 30 psi) system or a large-sized surface irrigation system (1,500 gpm) or a medium-sized (1,000 gpm and 25 psi) waste transfer system. Resource Concerns: 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; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use.

**After Situation:** Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 20

**Total Scenario Cost:** \$10,546.03

**Scenario Cost/Unit:** \$527.30

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	8	\$399.02
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	\$219.05	2	\$438.09
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	56	\$1,085.60

**Labor**

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	\$27.99	8	\$223.88
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	\$22.04	56	\$1,234.42
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	\$28.79	8	\$230.35
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	\$39.85	56	\$2,231.49

**Materials**

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 shipping only.	Each	\$1,968.95	1	\$1,968.95
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 only.	Horsepower	\$125.33	20	\$2,506.57

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	1	\$227.64
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**Practice:** 533 - Pumping Plant

**Scenario:** #7 - Electric-Powered Pump >30 hp <=75

**Scenario Description:** This is a close-coupled, 3-phase, 50 Hp electric-powered centrifugal pump mounted on a platform for pressurizing a large-sized 1,000 gpm and 50 psi sprinkler or very large microirrigation (2,000 gpm and 30 psi) system or a very large-sized surface irrigation system (3,000 gpm) or a large-sized (2,000 gpm and 25 psi) waste transfer system. Resource Concerns: 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; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use.

**After Situation:** A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency

**Scenario Feature Measure:** <Unknown>

**Scenario Unit:** Horsepower

**Scenario Typical Size:** 50

**Total Scenario Cost:** \$16,856.24

**Scenario Cost/Unit:** \$337.12

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	16	\$798.04
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	\$219.05	2	\$438.09
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	56	\$1,085.60

**Labor**

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	\$27.99	24	\$671.65
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	\$22.04	16	\$352.69
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	\$28.79	56	\$1,612.47
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	\$39.85	56	\$2,231.49

**Materials**

Pump, > 30 HP, pump and motor, fixed cost portion	1013	Fixed cost portion of a pump greater than 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 shipping only.	Each	\$4,657.54	1	\$4,657.54
Pump, >30 HP, Pump and motor, variable cost portion	1014	Variable cost portion of a pump greater than 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 only.	Horsepower	\$95.62	50	\$4,781.02

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	1	\$227.64
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**Practice:** 533 - Pumping Plant

**Scenario:** #8 - Electric-Powered Pump >75hp

**Scenario Description:** This is a close-coupled, 3-phase, 100 Hp electric-powered centrifugal pump mounted on a platform for pressurizing a medium-sized (500 gpm and 50 psi) sprinkler or large microirrigation (1,000 gpm and 30 psi) system or a large-sized surface irrigation system (1,500 gpm) or a medium-sized (1,000 gpm and 25 psi) waste transfer system. Resource Concerns: 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; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation: An existing irrigation system employs an inefficient, improperly sized pump that prevents efficient water application resulting in water loss and high energy use.

**After Situation:** Irrigation: A properly designed and efficient pumping plant is installed, reducing energy use and improving irrigation efficiency.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 100

**Total Scenario Cost:** \$20,955.29

**Scenario Cost/Unit:** \$209.55

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	8	\$399.02
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	\$219.05	4	\$876.19
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	56	\$1,085.60

**Labor**

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	\$27.99	12	\$335.82
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	\$22.04	56	\$1,234.42
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	\$28.79	12	\$345.53
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	\$39.85	56	\$2,231.49

**Materials**

Pump, > 30 HP, pump and motor, fixed cost portion	1013	Fixed cost portion of a pump greater than 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 shipping only.	Each	\$4,657.54	1	\$4,657.54
Pump, >30 HP, Pump and motor, variable cost portion	1014	Variable cost portion of a pump greater than 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 only.	Horsepower	\$95.62	100	\$9,562.04

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	1	\$227.64
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**Practice:** 533 - Pumping Plant

**Scenario:** #9 - Variable Frequency Drive

**Scenario Description:** This is an installation of electrical and electronic components designed to vary the frequency of the voltage to an electric motor and thus the ability to vary the speed of the motor. This directly affects pressure and flowrate. This also could give the operator the flexibility to operate several systems separately or at the same time. Resource concerns: Insufficient water - Inefficient use of irrigation water; Inefficient energy use - Equipment and facilities and Farming/ranching practices and field operations. Associated Practices: 374 - Farmstead Energy Improvement; 430 - Irrigation Pipeline; 441 - Irrigation System, Microirrigation; 449 - Irrigation Water Management; 516 - Livestock Pipeline; and 614 - Watering Facility.

**Before Situation:** Standard electrical connection from electrical utility to pump motor. No capability to match pump output pressure and/or flowrate to field(s) need(s). Result is over/under pressure(s) and/or flow rate(s), possible hydraulic anomalies, energy loss, and or inefficient water application in the irrigation system.

**After Situation:** VFD Modifications are implemented at the pump site to allow for varying the speed of a 40 Hp electric motor to match the pressure and flow requirements for a center pivot irrigation system.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 50

**Total Scenario Cost:** \$11,663.39

**Scenario Cost/Unit:** \$233.27

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Materials**

Variable Speed Drive, 50 HP	1288	Variable speed drive for 50 Horsepower electric motor. Does not include motor. Materials only.	Horsepower	\$233.27	50	\$11,663.39
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**Practice:** 533 - Pumping Plant

**Scenario:** #10 - Internal Combustion-Powered Pump less than or equal to 50 HP with L-pipe

**Scenario Description:** The typical scenario supports installation of a pump in an existing irrigation system or installation of a new pump on cropland with a 30 BHP pump. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. 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. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; 436 - Irrigation Reservoir; and 447 - Irrigation System, Tailwater Recovery; and 614 - Watering Facility.

**Before Situation:** Irrigation: 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: 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. or 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 30

**Total Scenario Cost:** \$28,891.15

**Scenario Cost/Unit:** \$963.04

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-place 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	\$219.05	0.25	\$54.76
Dozer, 140 HP	927	Track mounted Dozer with horsepower range of 125 to 160. Equipment and power unit costs. Labor not included.	Hour	\$110.36	8	\$882.90
Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$101.21	8	\$809.71
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	8	\$145.30
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	2	\$38.77

**Labor**

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	\$27.99	16	\$447.76
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	\$22.04	4	\$88.17
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	\$28.79	4	\$115.18
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	\$39.85	4	\$159.39

**Materials**

Pipe, Steel, 24", Std Wt, USED	1360	Materials: - USED - 24" - Steel Std Wt	Foot	\$49.98	40	\$1,999.28
Pipe, Steel, 30", Std Wt, USED	1361	Materials: - USED - 30" - Steel Std Wt	Foot	\$78.57	14	\$1,099.96

Pump, < 50 HP, Pump & ICE power unit	1027	Materials, labor, controls: < 50 HP Pump & ICE power unit	Horsepower	\$615.46	30	\$18,463.89
Swing Check Valve, metal, 12"	2082	12" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$4,130.78	1	\$4,130.78

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #11 - Internal Combustion-Powered Pump greater than 50 to 70 HP, with L-pipe

**Scenario Description:** The typical scenario supports installation of a pump in an existing irrigation system or installation of a new pump on cropland with a 60 BHP pump. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. 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. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; 436 - Irrigation Reservoir; and 447 - Irrigation System, Tailwater Recovery; and 614 - Watering Facility.

**Before Situation:** Irrigation: 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: 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 60

**Total Scenario Cost:** \$42,530.95

**Scenario Cost/Unit:** \$708.85

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	8	\$399.02
Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-place 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	\$219.05	1	\$219.05
Dozer, 140 HP	927	Track mounted Dozer with horsepower range of 125 to 160. Equipment and power unit costs. Labor not included.	Hour	\$110.36	4	\$441.45
Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$101.21	8	\$809.71
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	8	\$145.30

**Labor**

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	\$27.99	16	\$447.76
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	\$22.04	32	\$705.38
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	\$28.79	16	\$460.71
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	\$39.85	16	\$637.57

**Materials**

Pipe, Steel, 24", Std Wt, USED	1360	Materials: - USED - 24" - Steel Std Wt	Foot	\$49.98	40	\$1,999.28
Pipe, Steel, 30", Std Wt,	1361	Materials: - USED - 30" - Steel Std Wt	Foot	\$78.57	14	\$1,099.96

USED						
Pump, > 50 to 70 HP, Pump & ICE power unit	1028	Materials, labor, controls: > 50 to 70 HP Pump & ICE power unit	Horsepower	\$485.25	60	\$29,114.81
Swing Check Valve, metal, 14"	2083	14" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$5,595.67	1	\$5,595.67

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #12 - Internal Combustion-Powered Pump greater than 70 HP, with L-pipe

**Scenario Description:** The typical scenario supports replacement of a pump in an existing irrigation system or installation of a new pump on cropland that is 80 BHP pump or larger. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. Scenario could also be used for a pump for silage leachate, barnyard runoff, and milk house waste (as part of a waste transfer system) at farm headquarters. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.

**Before Situation:** Irrigation: 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: 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 80

**Total Scenario Cost:** \$47,201.36

**Scenario Cost/Unit:** \$590.02

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Concrete, CIP, slab on grade, reinforced	37	Steel reinforced concrete formed and cast-in-place 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	\$219.05	2	\$438.09
Dozer, 80 HP	929	Track mounted Dozer with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$58.85	8	\$470.77
Hydraulic Excavator, 1 CY	931	Track mounted hydraulic excavator with bucket capacity range of 0.8 to 1.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$101.21	8	\$809.71
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	8	\$145.30
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	6	\$116.31

**Labor**

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	\$27.99	8	\$223.88
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	\$22.04	48	\$1,058.07
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	\$28.79	8	\$230.35
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	\$39.85	24	\$956.35

**Materials**

Pipe, Steel, 18", Std Wt, USED	1358	Materials: - USED - 18" - Steel Std Wt	Foot	\$36.62	20	\$732.45
Pipe, Steel, 30", Std Wt, USED	1361	Materials: - USED - 30" - Steel Std Wt	Foot	\$78.57	40	\$3,142.73

Pipe, Steel, 36", Std Wt, USED	1362	Materials: - USED - 36" - Steel Std Wt	Foot	\$100.31	14	\$1,404.41
Pump, > 70 HP, Pump & ICE power unit	1029	Materials, labor, controls: > 70 HP Pump & ICE power unit	Horsepower	\$374.50	80	\$29,959.63
Swing Check Valve, metal, 16"	2084	16" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$7,058.01	1	\$7,058.01

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #13 - Internal Combustion-Powered Well Pump 50 HP and less, no L-pipe

**Scenario Description:** The typical scenario supports installation of a pump in an existing irrigation system or installation of a new pump on cropland with a 30 BHP pump. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. 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. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; 436 - Irrigation Reservoir; and 447 - Irrigation System, Tailwater Recovery; and 614 - Watering Facility.

**Before Situation:** Irrigation: 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: 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. or 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 30

**Total Scenario Cost:** \$21,411.97

**Scenario Cost/Unit:** \$713.73

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	8	\$399.02
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	\$219.05	1	\$219.05
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	4	\$77.54

**Labor**

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	\$27.99	8	\$223.88
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	\$22.04	32	\$705.38
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	\$28.79	8	\$230.35
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	\$39.85	16	\$637.57

**Materials**

Pump, < 50 HP, Pump &ICE power unit	1027	Materials, labor, controls: < 50 HP Pump &ICE power unit	Horsepower	\$615.46	30	\$18,463.89
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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	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #14 - Internal Combustion-Powered Well Pump Greater than 50 to 70 HP, no L-pipe

**Scenario Description:** The typical scenario supports installation of a well pump in an existing irrigation system or installation of a new well pump on cropland with a 60 BHP pump. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. 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. The well will be drilled using 642 Water Well. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; 436 - Irrigation Reservoir; and 447 - Irrigation System, Tailwater Recovery; and 614 - Watering Facility.

**Before Situation:** Irrigation: 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: 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 60

**Total Scenario Cost:** \$32,062.89

**Scenario Cost/Unit:** \$534.38

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	8	\$399.02
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	\$219.05	1	\$219.05
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	4	\$77.54

**Labor**

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	\$27.99	8	\$223.88
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	\$22.04	32	\$705.38
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	\$28.79	8	\$230.35
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	\$39.85	16	\$637.57

**Materials**

Pump, > 50 to 70 HP, Pump & ICE power unit	1028	Materials, labor, controls: > 50 to 70 HP Pump & ICE power unit	Horsepower	\$485.25	60	\$29,114.81
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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	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #15 - Internal Combustion-Powered Well Pump Greater than 70 HP, no L-pipe

**Scenario Description:** The typical scenario supports replacement of a pump in an existing irrigation system or installation of a new pump on cropland that is 80 BHP pump or larger. Size of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. Scenario could also be used for a pump for silage leachate, barnyard runoff, and milk house waste (as part of a waste transfer system) at farm headquarters. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; and 614 - Watering Facility.

**Before Situation:** Irrigation: 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: 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 100

**Total Scenario Cost:** \$41,326.91

**Scenario Cost/Unit:** \$413.27

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$49.88	8	\$399.02
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	\$219.05	2	\$438.09
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	6	\$116.31

**Labor**

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	\$27.99	8	\$223.88
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	\$22.04	48	\$1,058.07
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	\$28.79	8	\$230.35
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	\$39.85	24	\$956.35

**Materials**

Pump, > 70 HP, Pump &ICE power unit	1029	Materials, labor, controls: > 70 HP Pump &ICE power unit	Horsepower	\$374.50	100	\$37,449.54
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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	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #16 - Tractor Power Take Off (PTO) Pump

**Scenario Description:** This scenario involves a PTO driven pump to either transfer water for an irrigation system from a Pond - 378 (includes backflow prevention as appropriate) to cropland or; to transfer semi-solid/ liquid manure (as part of a waste transfer system) at the farm headquarters from a Waste Storage Facility - 313, to an irrigation system or waste treatment facility. In both cases, a PTO driven pump is selected because the landowner has equipment available to supply power to the pump. Electricity is not readily available and/or a stationary engine is not a practical alternative. Resource Concerns: Water Quality degradation - Excess nutrients in surface and ground waters; Insufficient water - Inefficient use of irrigation water. Associated Practices include: 430 - Irrigation Pipeline; 442 - Irrigation System, Sprinkler; 449 - Irrigation Water Management; 590 - Nutrient Management; 378 - Pond; 313 - Waste Storage Facility; and 634 - Waste Transfer.

**Before Situation:** Irrigation Setting: An existing surface irrigation system employs an inefficient, improperly sized pump that leads to inefficient water delivery resulting in high energy costs; Waste Transfer Setting: various types of semi-solid or liquid waste at the headquarters are uncollected causing surface and ground water issues. A transfer method for waste is needed. 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: A properly designed PTO-driven pump is installed, to transfer water to an Irrigation Pipeline (430) or Irrigation Canal or Lateral (320). Waste Transfer Setting: Wastes that have been collected through a waste transfer system are now efficiently transferred from a Waste Storage Facility (313) to an appropriate treatment facility or to an irrigation system. The pump typically will move 2,000 gallons per minute and is portable so that it can be used at several locations.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 60

**Total Scenario Cost:** \$11,338.90

**Scenario Cost/Unit:** \$188.98

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$219.05	2	\$438.09
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	16	\$310.17

**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	\$22.04	16	\$352.69
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	\$39.85	16	\$637.57

**Materials**

Pump, Ag Water PTO, 1,000 GPM	1923	Materials, labor, controls: Ag Water PTO Pump 1,000 GPM - 8"	Each	\$9,600.37	1	\$9,600.37
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**Practice:** 533 - Pumping Plant

**Scenario:** #17 - Windmill-Powered Pump

**Scenario Description:** A windmill is installed in order to supply a reliable water source for livestock and/or wildlife. The windmill includes the tower, concrete footings, wheel blade unit, sucker rod, down pipe, gear box, pump, plumbing, and well head protection concrete pad. The typical scenario will be a windmill system with a 10 ft diameter mill and 27-foot tower which is pumping from a 150-foot well. As a result of installing this windmill, resource concerns of inadequate stock water, plant establishment, growth, productivity, health, and vigor, and water quantity can be addressed. Resource Concerns: Insufficient stockwater.

**Before Situation:** In a rangeland or pasture setting, a reliable source of water for livestock is not available, or the spacing between water sources is such that grazing distribution and plant health are adversely impacted.

**After Situation:** A windmill, with a wheel ranging from 6' to 16' in diameter, will be installed over a well that is located to provide a reliable source of livestock water at the rate of at least 2 gpm, to facilitate proper grazing distribution and improved plant health. To increase reliability, water is pumped into a storage tank to provide a given number of days of supply. Installation includes the footings, wellhead protection concrete pad, tower, gear box, sail, sucker rod, down hole accessories, and a short outlet pipe to a storage tank.

**Scenario Feature Measure:** Diameter of Mill Wheel

**Scenario Unit:** Foot

**Scenario Typical Size:** 10

**Total Scenario Cost:** \$10,208.09

**Scenario Cost/Unit:** \$1,020.81

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**Equipment Installation**

Aerial lift, telescoping bucket	1893	Aerial lift, bucket truck or cherry picker, typical 40' boom. Equipment only.	Hour	\$37.54	8	\$300.32
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	\$219.05	2	\$438.09
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	4	\$77.54

**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	\$22.04	32	\$705.38
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	\$39.85	16	\$637.57

**Materials**

Windmill, 10', fan diameter	1036	Includes materials costs for windmill head and 27' tower	Each	\$7,593.90	1	\$7,593.90
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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	\$227.64	2	\$455.29
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**Practice:** 533 - Pumping Plant

**Scenario:** #18 - Photovoltaic-Powered Pump

**Scenario Description:** The typical scenario assumes installation of a submersible solar-powered pump in a well or a live stream. The installation includes the pump, wiring, drop pipe, solar panels, mounts, inverter, and all appurtenances. Note: It is generally not advisable to use a storage battery for a number of reasons. A storage tank is generally the most efficient method to store energy. Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Irrigation - energy consumption will be reduced and the increased pressure and flow rates will improve irrigation efficiency. Resource Concerns: Insufficient stockwater. Associated Practices include: 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:** Livestock: Inadequate supply or location of water for a prescribed grazing system. Eroded stream banks and degraded water quality due to livestock access to stream. Cattle are not well-distributed because of remote water location. Irrigation: Pressure and flow rate is insufficient for uniform irrigation.

**After Situation:** The typical scenario assumes installation of a 746-watt photovoltaic (PV) panel, capable of operating a 1 Hp solar-powered submersible pump in a well or other water source (Notes: 1) A PV panel is rated under standard and ideal conditions which will most likely not be replicated in the field; 2) 1 Hp is defined as 746 watts; 3) It is reasonable to expect a 1/4 Hp solar-powered submersible pump to deliver about 1.5 gpm and develop a pressure at the pump outlet of about 60 psi.). The installation includes the pump, wiring, pipeline in the well, solar panels, frame mounts, inverter, and all appurtenances. Water will be pumped to an existing storage tank at a higher elevation from which it will be used to pressurize the Livestock Pipeline (516) or Irrigation Pipeline (430). Grazing - Livestock exclusion from surface water will result in improved surface water quality and reduced erosion. Grazing has potential to be well distributed. Irrigation: Improved pressure and flow rate will improve irrigation efficiency.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 1

**Total Scenario Cost:** \$9,331.56

**Scenario Cost/Unit:** \$9,331.56

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$22.04	16	\$352.69
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	\$39.85	16	\$637.57

**Equipment Installation**

Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	16	\$310.17
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**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	\$549.88	1	\$549.88
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	\$413.86	1	\$413.86
Solar Panels, fixed cost portion	1031	Fixed cost portion of the Solar Panels. This portion is a base cost for all Solar Panels and is not dependant on KiloWatt. The total cost of any Solar Panels will include this fixed cost plus a variable cost portion. The completed Solar Panels will include all materials (electrical, controllers, service drops and etc). This cost will include material, labor and equipment.	Each	\$460.51	1	\$460.51
Solar Panels, variable cost portion	1135	Variable cost portion of the Solar Panels. This portion IS dependent on the total Kilowatt for the Solar Panels. The total cost of any Solar Panels will include this variable cost plus the fixed cost portion. The completed Solar Panels will include all materials (electrical, controllers, and service drop, etc). This cost will include material, labor and equipment.	Kilowatt	\$8,258.60	0.8	\$6,606.88

**Practice:** 533 - Pumping Plant

**Scenario:** #19 - Pump Conversion to Low Pressure

**Scenario Description:** This scenario involves converting an existing pump which is set up to operate any high pressure system to a pump set up to operate a low pressure system, when the existing high pressure system is being converted to low pressure system. Resource Concerns: Excess/Insufficient Water - Inefficient Use of Irrigation Water & Water Quality Degradation; Energy Conservation Associated Practices: 449 - Irrigation Water Management, 442 - Irrigation System, Sprinkler

**Before Situation:** An existing irrigation pump is operating a high pressure center pivot system and needs to be converted to a low pressure pump to efficiently operate a center pivot system converted to low pressure.

**After Situation:** The existing high pressure pump is pulled and stages are removed in order to reduce the pressure which the pump will produce, this will cause a more energy efficient system and a system which is more efficiently distributing water.

**Scenario Feature Measure:** conversion of pump

**Scenario Unit:** Each

**Scenario Typical Size:** 1

**Total Scenario Cost:** \$6,010.89

**Scenario Cost/Unit:** \$6,010.89

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$22.04	6	\$132.26
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	\$39.85	2	\$79.70

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	2	\$455.29
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**Equipment Installation**

Crane, truck mounted, hydraulic, 12 ton	1734	12 ton capacity truck mounted hydraulic crane. Equipment cost only.	Hour	\$81.44	6	\$488.63
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**Materials**

Pump, Bowl replacement, 30 to 100 HP	1984	Includes all material and shop labor to replace/service the entire set of bowls for a vertical turbine pump, install new bowls as necessary, and all appurtenances and materials to connect to the existing well column. Typical of 100 to 300 feet of column depth, 400 to 800 gpm discharge at 30 to 50 psi. Does not include labor and equipment to remove and install the assembled pump from the well.	Horsepower	\$97.10	50	\$4,855.02
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**Practice:** 533 - Pumping Plant

**Scenario:** #20 - Basic Pump Automation

**Scenario Description:** Typical: a diesel or electrical pump is set up with basic capabilities to shut off the pump based upon time, water levels, or other sensor or device to prevent excess run-time and unnecessary pumping. Resource Concerns: Excess/Insufficient Water - Inefficient Use of Irrigation Water & Water Quality Degradation  
 Associated Practices: 449 - Irrigation Water Management

**Before Situation:** Pumps are manually stopped. Oil, fuel, and water level in reservoir/tailwater pit are manually read. Requires a person to physically be on site to manipulate the pump and to take readings. Excess irrigation water is allowed to run off the crops and farmland when situations occur where farm labor is unable to operate the pump when irrigation is needed or needs have been met.

**After Situation:** Pump has an automatic pump stop based upon a timer, water level sensor or other device. This prevents the landowner from being physically at the site when sufficient water is available or not for irrigation. Crops are supplied the required water needs and excess is not allowed to leave the farm, thus preventing damage to the pumping system, increased labor of the overall farm operation and increasing efficiency, preventing sediment loss, reducing turbidity, over saturation of the plants, water quality turbidity or excess water use in critical ground water areas.

**Scenario Feature Measure:** automation of a pump cut-off

**Scenario Unit:** Each

**Scenario Typical Size:** 1

**Total Scenario Cost:** \$375.47

**Scenario Cost/Unit:** \$375.47

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$22.04	8	\$176.35
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**Equipment Installation**

Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	2	\$38.77
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**Materials**

Switches and Controls, programmable controller	1193	Programmable logic controller (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$160.35	1	\$160.35
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**Practice:** 533 - Pumping Plant

**Scenario:** #21 - Intermediate Pump Automation

**Scenario Description:** Typical: a diesel or electrical pump is set up with a intermediate automation component that controls the pump via remote access in order to prevent excess run-time and unnecessary pumping. Resource Concerns: Excess/Insufficient Water - Inefficient Use of Irrigation Water & Water Quality Degradation Associated Practices: 449 - Irrigation Water Management

**Before Situation:** Pumps are manually stopped. Oil, fuel, and water level in reservoir/tailwater pit are manually read. Requires a person to physically be on site to manipulate the pump and to take readings. Excess irrigation water is allowed to run off the crops and farmland when situations occur where farm labor is unable to operate the pump when irrigation is needed or needs have been met.

**After Situation:** By use of a smartphone or tablet, the pump can be remotely started or stopped. Alerts can be sent to operator of interruptions in the system or can be preset to shut off at specified time. This prevents the landowner from being physically at the site when sufficient water is available or not for irrigation. Crops are supplied the required water needs and excess is not allowed to leave the farm, thus preventing damage to the pumping system, increased labor of the overall farm operation and increasing efficiency, preventing sediment loss, reducing turbidity, over saturation of the plants, water quality turbidity or excess water use in critical ground water areas.

**Scenario Feature Measure:** automation of a pump start and stop

**Scenario Unit:** Each

**Scenario Typical Size:** 1

**Total Scenario Cost:** \$3,022.88

**Scenario Cost/Unit:** \$3,022.88

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$22.04	4	\$88.17
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$107.62	4	\$430.47

**Materials**

Engine/Fuel Tank Sensor	2487	Transducer and sensors to monitor the oil pressure, oil and water temperatures, fuel flow meter with digital pulse output and fuel levels in a tank. Includes the conduit and cabling.	Each	\$49.41	1	\$49.41
Safety Camera on Automated Pump	2474	Waterproof outdoor wireless IP Network security camera with housing. Includes materials only.	Each	\$468.51	1	\$468.51
Switches and Controls, programmable controller	1193	Programmable logic controller (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$160.35	1	\$160.35
Switches and Controls, radio system	1195	Output radio, field transmitter, and receiver commonly used to control pumps and irrigation systems	Each	\$767.55	1	\$767.55
Switches and Controls, temp sensors	1192	Temperature and soil moisture sensors installed as part of an electronic monitoring (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$627.96	1	\$627.96
Switches and Controls, Wi-Fi system and software	1194	Software with built-in cellular or Wi-Fi communication commonly used to control pumps and irrigation systems	Each	\$430.47	1	\$430.47

**Practice:** 533 - Pumping Plant

**Scenario:** #22 - Advanced Pump Automation

**Scenario Description:** Typical Scenario: a diesel pump is set up with automation including telemetry capabilities to operate the pump while recording important data such as the fuel levels, the temperature, oil levels, water levels in the reservoir or tailwater pit or both, and rainfall at the site. This data is collected and obtainable by the producers from any location. An electric power unit may use a different set of sensors (e.g. grid versus fuel tank, VFD) in the specific application, but the basic purpose, intent, and goals remain the same. Resource Concerns: Excess/Insufficient Water - Inefficient Use of Irrigation Water & Water Quality Degradation Associated Practices: 449 - Irrigation Water Management

**Before Situation:** Pumps are manually started. Oil, fuel, and water level in reservoir/tailwater pit are manually read. Requires a person to physically be on site to manipulate the pump and to take readings. Excess irrigation water is allowed to run off the crops and farmland when situations occur where farm labor is unable to operate the pump when irrigation is needed or needs have been met.

**After Situation:** Pump has an automatic pump start/stop remotely controlled from any location based on the information relayed from water availability or unavailability. This prevents the landowner from being physically at the site when sufficient water is available or not for irrigation. Crops are supplied the required water needs and excess is not allowed to leave the farm, thus preventing damage to the pumping system, increased labor of the overall farm operation and increasing efficiency, preventing sediment loss, reducing turbidity, over saturation of the plants, water quality turbidity or excess water use in critical ground water areas.

**Scenario Feature Measure:** automation of a pump

**Scenario Unit:** Each

**Scenario Typical Size:** 1

**Total Scenario Cost:** \$9,484.85

**Scenario Cost/Unit:** \$9,484.85

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$22.04	4	\$88.17
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	\$28.79	4	\$115.18
Specialist Labor	235	Labor requiring a specialized skill set: Includes Agronomists, Foresters, Biologists, etc. to provide additional technical information during the planning and implementation of the practice. Does not include NRCS or TSP services.	Hour	\$107.62	4	\$430.47

**Equipment Installation**

Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	4	\$77.54
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**Materials**

Data Logger with Telemetry System	1454	Data Logger W/Graphic Output for water management and telemetry - data communication device with power supply in a weather proof enclosure. Equipment only.	Each	\$1,679.44	1	\$1,679.44
Engine/Fuel Tank Sensor	2487	Transducer and sensors to monitor the oil pressure, oil and water temperatures, fuel flow meter with digital pulse output and fuel levels in a tank. Includes the conduit and cabling.	Each	\$49.41	1	\$49.41
Safety Camera on Automated Pump	2474	Waterproof outdoor wireless IP Network security camera with housing. Includes materials only.	Each	\$468.51	1	\$468.51
Solar Panels, fixed cost portion	1031	Fixed cost portion of the Solar Panels. This portion is a base cost for all Solar Panels and is not dependant on KiloWatt. The total cost of any Solar Panels will include this fixed cost plus a variable cost portion. The completed Solar Panels will include all materials (electrical, controllers, service drops and etc). This cost will include material, labor and equipment.	Each	\$460.51	1	\$460.51
Solar Panels, variable cost portion	1135	Variable cost portion of the Solar Panels. This portion IS dependent on the total Kilowatt for the Solar Panels. The total cost of any Solar	Kilowatt	\$8,258.60	0.5	\$4,129.30

		Panels will include this variable cost plus the fixed cost portion. The completed Solar Panels will include all materials (electrical, controllers, and service drop, etc). This cost will include material, labor and equipment.				
Switches and Controls, programmable controller	1193	Programmable logic controller (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$160.35	1	\$160.35
Switches and Controls, radio system	1195	Output radio, field transmitter, and receiver commonly used to control pumps and irrigation systems	Each	\$767.55	1	\$767.55
Switches and Controls, temp sensors	1192	Temperature and soil moisture sensors installed as part of an electronic monitoring (with or without wireless telecommunications) commonly used to control pumps and irrigation systems	Each	\$627.96	1	\$627.96
Switches and Controls, Wi-Fi system and software	1194	Software with built-in cellular or Wi-Fi communication commonly used to control pumps and irrigation systems	Each	\$430.47	1	\$430.47

**Practice:** 533 - Pumping Plant

**Scenario:** #23 - Pump without power unit, with L-pipe

**Scenario Description:** The typical scenario supports installation of a pump and support typically used with pumping from a tailwater recovery channel or reservoir on cropland with a 35 BHP pump without a power unit (3000gpm x 30 ft)/(3960\*.65) = 35 BHP. Size (BHP) of pump is determined by required GPM and pressure derived from a design for specific irrigation system on cropland. Typical scenario is 3000 gpm with 30 ft of head (lift, line friction, pressure, etc). Also may apply to a pump for wastewater. Cooperator has existing motor, will rent motor, or buy used motor. Resource Concerns: 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; 313 - Waste Storage Facility; 634 - Waste Transfer; 436 - Irrigation Reservoir; and 447 - Irrigation System, Tailwater Recovery; and 614 - Watering Facility.

**Before Situation:** Irrigation: Implementation of a tailwater recovery system or on-farm storage system requires a transfer pump w/o a power plant. 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: 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 and allowing proper utilization of captured water. or 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.

**Scenario Feature Measure:** Pump Power Requirement

**Scenario Unit:** Brake Horse Power

**Scenario Typical Size:** 35

**Total Scenario Cost:** \$15,092.93

**Scenario Cost/Unit:** \$431.23

**Cost Details**

Component Name	Id	Description	Unit	Cost	Qty	Total
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**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	\$219.05	0.25	\$54.76
Hydraulic Excavator, 2 CY	932	Track mounted hydraulic excavator with bucket capacity range of 1.5 to 2.5 CY. Equipment and power unit costs. Labor not included.	Hour	\$146.34	8	\$1,170.68
Portable Welder	1407	Portable field welder. Equipment only. Labor not included.	Hour	\$18.16	8	\$145.30
Truck, Pickup	939	Equipment and power unit costs. Labor not included.	Hour	\$19.39	2	\$38.77

**Labor**

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	\$27.99	16	\$447.76
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	\$22.04	4	\$88.17
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	\$39.85	4	\$159.39

**Mobilization**

Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$227.64	2	\$455.29
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**Materials**

Pipe, Steel, 24", Std Wt, USED	1360	Materials: - USED - 24" - Steel Std Wt	Foot	\$49.98	40	\$1,999.28
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Pipe, Steel, 30", Std Wt, USED	1361	Materials: - USED - 30" - Steel Std Wt	Foot	\$78.57	14	\$1,099.96
Pump, 40-80 hp axial flow/mixed flow	2215	Propeller pump to handle 10,000 - 20,000gpm axial flow/ mixed flow; 12" - 24" discharge, head (<20' to 25'), propeller type pump. Materials and shipping only.	Gallon per Minute	\$1.77	3000	\$5,302.78
Swing Check Valve, metal, 12"	2082	12" swing check valve for back flow prevention, ductile iron metal body with flange mount and lever shaft. Materials only.	Each	\$4,130.78	1	\$4,130.78