

Practice: 468 - Lined Waterway or Outlet

Scenario: #1 - Turf Reinforced Matting

Scenario Description:

Install 300' long by 15' wide by 1.5' deep with 2:1 side slopes trapezoidal or parabolic shaped waterway lined with Turf Reinforced Matting (TRM). 1/2 the channel is excavated. Excess excavation is spoiled in the immediate area. TRM is installed over 100% of the width of the waterway to prevent scour and aid in waterway establishment. Cost include excavation, spoiling of excess material, and furnishing and installing TRM. Lined waterway width is measured from top of bank to top of bank. $(9'+3.35'+3.35') \times 300' = 4710$ Square Feet

Before Situation:

Excessive sedimentation and soil erosion as a result of ephemeral or classic gully erosion. Velocities are generally too high or saturated soil conditions make it difficult to establish a grassed waterway.

After Situation:

TRM lined waterway is 300' long by 15' wide by 1.5' deep with 2:1 side slopes. The practice is installed using a hydraulic excavator. TRM is installed by laborers. Associated practices are Subsurface Drain (606), Underground Outlet (620), Structure for Water Control (587), and Critical Area Seeding (342).

Scenario Feature Measure: Square Foot of Waterway

Scenario Unit: Square Foot

Scenario Typical Size: 4,710

Scenario Cost: \$3,930.10

Scenario Cost/Unit: \$0.83

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic yard	\$2.06	90	\$185.40
Labor						
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.74	2	\$73.48
Materials						
Turf reinforcement mat	1212	Synthetic turf reinforcement mat with staple anchoring. Includes materials, equipment and labor.	Square Yard	\$6.50	525	\$3,412.50
Mobilization						
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.72	1	\$258.72

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Scenario: #2 - Rock Lined, 12 inches

Scenario Description:

Install 300' long by 15' wide by 1.5' deep with 2:1 side slopes trapezoidal or parabolic shaped waterway lined with 12" thick riprap (D100 = 9", Velocity ~ 8 ft/sec). 1/2 the channel is excavated, before excavation for riprap. Excess excavation is spoiled in the immediate area. Riprap is installed over 100% of the width of the waterway to prevent scour. Cost include excavation, spoiling of excess material, geotextile underlayment and installing 9" Rock Riprap. Lined waterway width is measured from top of bank to top of bank. $(9'+3.35'+3.35') \times 300' = 4710$ Square Feet

Before Situation:

Excessive sedimentation and soil erosion as a result of ephemeral or classic gully erosion. Velocities are generally too high or saturated soil conditions make it difficult to establish a grassed waterway.

After Situation:

Rock lined waterway is 300' long by 15' wide by 1.5' deep with 2:1 sideslopes. Waterway is excavated and rock is placed using a hydraulic excavator. Geotextile underlayment is installed by laborers. Associated practices are Subsurface Drain (606), Underground Outlet (620), Structure for Water Control (587), and Critical Area Seeding (342).

Scenario Feature Measure: Square Foot of Waterway

Scenario Unit: Square Foot

Scenario Typical Size: 4,710

Scenario Cost: \$12,869.93

Scenario Cost/Unit: \$2.73

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic yard	\$2.06	295	\$607.70
Labor						
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.74	2	\$73.48
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.99	2	\$37.98
Materials						
Rock Riprap, Placed with geotextile	44	Rock Riprap, placed with geotextile, includes materials, equipment and labor to transport and place	Cubic yard	\$58.01	205	\$11,892.05
Mobilization						
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.72	1	\$258.72

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Scenario: #3 - Rock Lined, 24 inches

Scenario Description:

Install 300' long by 15' wide by 1.5' deep with 2:1 side slopes trapezoidal or parabolic shaped waterway lined with 24" thick riprap (D100 = 18", Velocity ~ 11 ft/sec). 1/2 the channel is excavated, before excavation for riprap. Excess excavation is spoiled in the immediate area. Riprap is installed over 100% of the width of the waterway to prevent scour. Cost include excavation, spoiling of excess material, geotextile underlayment and installing 18" Rock Riprap. Lined waterway width is measured from top of bank to top of bank. $(9'+3.35'+3.35') \times 300' = 4710$ Square Feet

Before Situation:

Excessive sedimentation and soil erosion as a result of ephemeral or classic gully erosion. Velocities are generally too high or saturated soil conditions make it difficult to establish a grassed waterway.

After Situation:

Rock lined waterway is 300' long by 15' wide by 1.5' deep with 2:1 sideslopes. Waterway is excavated and rock is placed using a hydraulic excavator. Geotextile underlayment is installed by laborers. Associated practices are Subsurface Drain (606), Underground Outlet (620), Structure for Water Control (587), and Critical Area Seeding (342).

Scenario Feature Measure: Square Foot of Waterway

Scenario Unit: Square Foot

Scenario Typical Size: 4,710

Scenario Cost: \$28,488.13

Scenario Cost/Unit: \$6.05

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic yard	\$2.06	555	\$1,143.30
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.99	2	\$37.98
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.74	2	\$73.48
Materials						
Rock Riprap, Placed with geotextile	44	Rock Riprap, placed with geotextile, includes materials, equipment and labor to transport and place	Cubic yard	\$58.01	465	\$26,974.65
Mobilization						
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.72	1	\$258.72

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Scenario: #4 - Concrete

Scenario Description:

Install 300' long by 15' wide by 1.5' deep with 2:1 sides slopes trapezoidal or parabolic shaped waterway lined with concrete. 1/2 the channel is excavated, before excavation for concrete and subgrade material. Excess excavation is spoiled in the immediate area. Concrete is installed over 100% of the width of the waterway to prevent scour. Cost include excavation, spoiling of excess material, 6" of clean sand or gravel subgrade, and 5" reinforced concrete slab. Lined waterway width is measured from top of bank to top of bank. $(9'+3.35'+3.35') \times 300' = 4710$ Square Feet

Before Situation:

Excessive sedimentation and soil erosion as a result of ephemeral or classic gully erosion. Velocities are generally too high or saturated soil conditions make it difficult to establish a grassed waterway. Usually installed in locations where rock or other lining materials are not readily available.

After Situation:

Concrete lined waterway is 300' long by 15' wide by 1.5' deep with 2:1 side slopes. Waterway is excavated using a hydraulic excavator. Concrete slab is placed on 6" of clean sand or #57 stone. Concrete is placed, graded and screeded by laborers. Associated practices are Subsurface Drain (606), Underground Outlet (620), Structure for Water Control (587), and Critical Area Seeding (342).

Scenario Feature Measure: Square Foot of Waterway

Scenario Unit: Square Foot

Scenario Typical Size: 4,710

Scenario Cost: \$17,082.98

Scenario Cost/Unit: \$3.63

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic yard	\$2.06	280	\$576.80
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	\$170.90	80	\$13,672.00
Labor						
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.99	2	\$37.98
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.74	2	\$73.48
Materials						
Aggregate, Gravel, Graded	46	Gravel, includes materials, equipment and labor to transport and place. Includes washed and unwashed gravel.	Cubic yard	\$22.40	110	\$2,464.00
Mobilization						
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.72	1	\$258.72

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Scenario: #5 - Articulated Concrete Block

Scenario Description:

Install 300' long by 15' wide (at top) by 1.5' deep with 2:1 sides slopes trapezoidal or parabolic shaped waterway lined with articulated concrete block (ACB). 1/2 the channel is excavated, before excavation for ACB and subgrade material. Excess excavation is spoiled in the immediate area. Articulated concrete block is installed over 100% of the width of the waterway to prevent scour. Cost include excavation, spoiling of excess material, 3" of clean sand or gravel subgrade, and 6" height articulated concrete block. Lined waterway width is measured from top of bank to top of bank. $(9'+3.35'+3.35') \times 300' = 4710$ Square Feet

Before Situation:

Excessive sedimentation and soil erosion as a result of ephemeral or classic gully erosion. Velocities are generally too high or saturated soil conditions make it difficult to establish a grassed waterway. Usually installed in locations where rock or other lining materials are not readily available.

After Situation:

Articulated Concrete Block lined waterway is 300' long by 15' wide by 1.5' deep with 2:1 sideslopes. Waterway is excavated using a hydraulic excavator. Articulated concrete block is placed on 3" of clean sand or gravel subgrade and installed with a hydraulic excavator, loader and laborers. Associated practices are Subsurface Drain (606), Underground Outlet (620), Structure for Water Control (587), and Critical Area Seeding (342).

Scenario Feature Measure: Square Foot of Waterway

Scenario Unit: Square Foot

Scenario Typical Size: 4,710

Scenario Cost: \$32,622.63

Scenario Cost/Unit: \$6.93

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Hydraulic Excavator, .5 CY	930	Track mounted hydraulic excavator with bucket capacity range of 0.3 to 0.8 CY. Equipment and power unit costs. Labor not included.	Hour	\$56.19	22.5	\$1,264.28
Excavation, Common Earth, side cast, small equipment	48	Bulk excavation and side casting of common earth with hydraulic excavator with less than 1 CY capacity. Includes equipment and labor.	Cubic yard	\$2.06	200	\$412.00
Track Loader, 95HP	935	Equipment and power unit costs. Labor not included.	Hour	\$88.86	22.5	\$1,999.35
Labor						
Skilled Labor	230	Labor requiring a high level skill set: Includes carpenters, welders, electricians, conservation professionals involved with data collection, monitoring, and or record keeping, etc.	Hour	\$28.44	25.5	\$725.22
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$22.65	51	\$1,155.15
General Labor	231	Labor performed using basic tools such as power tool, shovels, and other tools that do not require extensive training. Ex. pipe layer, herder, concrete placement, materials spreader, flagger, etc.	Hour	\$18.99	51	\$968.49
Materials						
Aggregate, Sand, Graded, Washed	45	Sand, typical ASTM C33 gradation, includes materials, equipment and labor to transport and place	Cubic yard	\$22.10	45	\$994.50
Articulated block	1906	Articulated precast concrete blocks with a typical thickness of 4.5 inches. Includes materials only.	Square Foot	\$5.22	4710	\$24,586.20
Mobilization						
Mobilization, medium equipment	1139	Equipment with 70-150 HP or typical weights between 14,000 and 30,000 pounds.	Each	\$258.72	2	\$517.44

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Scenario: #6 - Splash Pad

Scenario Description:

Install a 10'x10', 1' thick rock riprap pad at outlet into streams. Excess excavation is spoiled in the immediate area. Costs include 12" and smaller rock riprap installed. It does not include the cost of the required vegetation. This practice is often installed in conjunction with terraces, diversions, sediment control basins, waterways or similar practices.

Before Situation:

Excessive sedimentation and soil erosion as a result of concentrated water flow. Velocities are generally too high or saturated soil conditions make it difficult to maintain a stable outlet.

After Situation:

Runoff water is released through a stable outlet into streams or water courses without erosion or sedimentation. Associated practices are Critical Area Planting (342), Grassed Waterway (412), Terrace (600), Diversion (342), Water and Sediment Control Basin (638), and Subsurface Drainage (606)

Scenario Feature Measure: Area of Splash Pad

Scenario Unit: Square Foot

Scenario Typical Size: 100

Scenario Cost: \$557.29

Scenario Cost/Unit: \$5.57

Cost Details (by category):

Component Name	ID	Component Description	Unit	Price (\$/unit)	Quantity	Cost
Equipment/Installation						
Skidsteer, 80 HP	933	Skidsteer loader with horsepower range of 60 to 90. Equipment and power unit costs. Labor not included.	Hour	\$43.30	2	\$86.60
Labor						
Supervisor or Manager	234	Labor involving supervision or management activities. Includes crew supervisors, foremen and farm/ranch managers time required for adopting new technology, etc.	Hour	\$36.74	1	\$36.74
Equipment Operators, Light	232	Includes: Skid Steer Loaders, Hydraulic Excavators <50 HP, Trenchers <12", Ag Equipment <150 HP, Pickup Trucks, Forklifts, Mulchers	Hour	\$22.65	2	\$45.30
Materials						
Rock Riprap, Placed with geotextile	44	Rock Riprap, placed with geotextile, includes materials, equipment and labor to transport and place	Cubic yard	\$58.01	3.7	\$214.64
Mobilization						
Mobilization, small equipment	1138	Equipment <70 HP but can't be transported by a pick-up truck or with typical weights between 3,500 to 14,000 pounds.	Each	\$174.01	1	\$174.01