Practice: 747 - Subsurface Drain Bioreactor

Scenario # 1 Bioreactor with Liner and Cover

Scenario Description: **Actual Scenario # 1** **New York**

This bioreactor has geotextile fabric (or polyethylene - PE) between the wood chips and the surrounding soil plus the following components: woodchip filled pit, a soil cover, two water control structures (to allow management of the flow rate and and free water elevation within the bioreactor), and piping to convey water to and from the bioreactor. Woodchips serve as the carbon source necessary to the denitrification process. Associated practices: Subsurface Drain (606), Structure for Water Control (587), Drainage Water Management (554). Resource concern: Water Quality Degradation - Excess nutrients in surface and ground waters.Management and maintenance of the bioreactor (including chip replenishment), as well as monitoring and reporting to demonstrate the performance of the practice are not included in this scenario.

Before Practice Situation:

Before the installation, the subsurface drainage system is contributing nitrates and phosphorus to a surface water source (ditch or stream), high nutrient levels are a resource concern to the receiving water, and it is feasible to install a bioreactor to reduce the nitrate and phosphorus load from drainage outflows.

After Practice Situation:

All components of the bioreactor are installed and functional. Phosphorus and nitrates are removed from bioreactor outflow. The approximate bioreactor excavated pit volume is 280 cubic yards (e.g. 5 feet deep, 15 feet wide and 100 feet long). Woodchips occupy the lower ~3.5 feet of the pit (200 cu. yd.) and a soil blanket over the woodchips is mounded 1.0 ft. above the surrounding ground surface to shed water and account for settling. A geotextile fabric (or PE material) surrounds the chips to prevent migration of soil into the pit. Two inline water control structures are in place and connected to the two 6" diameter HDPE dual-wall manifold pipes by 10" diameter dual wall pipe.Flow rates are dependent upon the availability of drainage water from the 10" drainage mainline. The soil excavated from the pit is spoiled onto the nearby field.

Scenario Feature Measure:

Volume of Carbon Source

Scenario Typical Size:	200	Cubic Yard	Tot Unit Cost	$70.59

Cost Category	Component Name	Quantity	Unit	Unit Cost	Cost
Materials	Pipe, HDPE, CPT, Double Wall, Soil	40	Foot	$5.49	$219.60
Materials	Pipe, HDPE, CPT, Double Wall, Soil	30	Foot	$2.40	$72.00
Materials	Water Level Control Structure,	1	Each	$1,869.47	$1,869.47
Materials	Water Control Structure, Stoplog,	1	Each	$302.18	$302.18
Materials	Water Control Structure, Stoplog,	60	Height x Diameter	$11.67	$700.20
Equip./Install.	Geotextile, woven	780	Square Yard	$2.48	$1,934.40
Equip./Install.	Excavation, Common Earth, side	280	Cubic yard	$2.48	$694.40
Equip./Install.	Earthfill, Dumped and Spread	280	Cubic yard	$3.77	$1,055.60
Equip./Install.	Skidsteer, 80 HP	4	Hour	$47.33	$189.32
Equip./Install.	Aggregate, Wood Chips	200	Cubic yard	$23.95	$4,790.00
Equip./Install.	Trenching, Earth, 24" x 60"	50	Foot	$4.03	$201.50
Labor	General Labor	24	Hour	$23.16	$555.84
Labor	Equipment Operators, Light	6	Hour	$24.05	$144.30
Mobilization	Mobilization, medium equipment	3	Each	$282.78	$848.34

747 1 Bioreactor with Liner and Cover

Mobilization	Mobilization, large equipment	1	Each	$539.90	$539.90
				Total Cost:	$14,117.05

Payment types:

PayType	Unit Payment	PayType	Unit Payment
EQIP	$52.94	EQIP-HU	$63.53
WHIP	$0.00	WHIP-HU	$0.00

747 1 Bioreactor with Liner and Cover

Practice: 747 - Subsurface Drain Bioreactor

Scenario # 2 Bioreactor, No Liner or Cover

Scenario Description: **Actual Scenario # 2** **New York**

This bioreactor has no geotextile or PE liner on the walls or bottom and no soil cap over the wood chips. The components include woodchip filled pit, two water control structures (to allow management of the flow rate and and free water elevation within the bioreactor), and piping to convey water to and from the bioreactor. Woodchips serve as the carbon source necessary to the denitrification process. Associated practices: Subsurface Drain (606), Structure for Water Control (587), Drainage Water Management (554). Resource concern: Water Quality Degradation - Excess nutrients in surface and ground waters.Management and maintenance of the bioreactor (including chip replenishment), as well as monitoring and reporting to demonstrate the performance of the practice are not included in this scenario.

Before Practice Situation:

Before the installation, a subsurface drainage system is contributing nitrates and phosphorus to a surface water source (ditch or stream), high nutrient levels are a resource concern to the receiving water, and it is feasible to install a bioreactor to reduce the nitrate and phosphorus load from drainage outflows.

After Practice Situation:

All components of the bioreactor are installed and functional. Phosphorus and nitrates are removed from bioreactor outflow. The approximate bioreactor excavated pit volume is 200 cubic yards (e.g. 5 feet deep, 15 feet wide and 72 feet long). Woodchips occupy a 5 foot depth (200 cu. yd.) and the ground surface is graded away from the pit prevent inflow of surface water. Two inline water control structures are in place and connected to the two 6" diameter HDPE dual-wall manifold pipes by 10" diameter dual wall pipe.Flow rates are dependent upon the availability of drainage water from the 10" drainage mainline. The soil excavated from the pit is spoiled onto the nearby field.

Scenario Feature Measure:

Volume of Carbon Source

Scenario Typical Size:	200	Cubic Yard	Tot Unit Cost	$57.49

Cost Category	Component Name	Quantity	Unit	Unit Cost	Cost
Materials	Pipe, HDPE, CPT, Double Wall, Soil	40	Foot	$5.49	$219.60
Materials	Pipe, HDPE, CPT, Double Wall, Soil	30	Foot	$2.40	$72.00
Materials	Water Level Control Structure,	1	Each	$1,869.47	$1,869.47
Materials	Water Control Structure, Stoplog,	1	Each	$302.18	$302.18
Materials	Water Control Structure, Stoplog,	60	Height x Diameter	$11.67	$700.20
Equip./Install.	Excavation, Common Earth, side	200	Cubic yard	$2.48	$496.00
Equip./Install.	Earthfill, Dumped and Spread	200	Cubic yard	$3.77	$754.00
Equip./Install.	Skidsteer, 80 HP	4	Hour	$47.33	$189.32
Equip./Install.	Aggregate, Wood Chips	200	Cubic yard	$23.95	$4,790.00
Equip./Install.	Trenching, Earth, 24" x 60"	50	Foot	$4.03	$201.50
Labor	General Labor	16	Hour	$23.16	$370.56
Labor	Equipment Operators, Light	6	Hour	$24.05	$144.30
Mobilization	Mobilization, medium equipment	3	Each	$282.78	$848.34
Mobilization	Mobilization, large equipment	1	Each	$539.90	$539.90

Total Cost: $11,497.37

Payment types:

PayType	Unit Payment	PayType	Unit Payment
EQIP	$43.12	EQIP-HU	$51.74
WHIP	$0.00	WHIP-HU	$0.00

747 2 Bioreactor, No Liner or Cover