Gravel Wetland

The gravel wetland is a recent innovation in Low Impact Development (LID) designs that treat stormwater. Like other infiltration/filtration systems, it has a tremendous capacity to reduce peak flow and stormwater volume in general. It also has limited use as a replacement for septic systems.

This gravel wetland is designed as a series of horizontal, flow-through treatment cells, preceded by a sedimentation forebay. The device is designed to retain and filter the entire water quality volume (WQV)—10 percent in the forebay and 45 percent in each treatment cell.

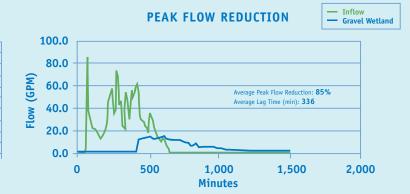
For small, frequent storms, each treatment cell filters 100 percent of its WQV. Additionally, the wetland can detain a channel protection volume (CPV) of 4,600 cubic feet, and release it over 24 to 48 hours. WQV is filtered and drains offsite. Any storm volume exceeding WQV overflows into the adjacent swale. Since standing water of significant depth is not expected (except during heavy rains), swale side slopes are graded at 3:1 or flatter for maintenance.

Maintenance involves the periodic mowing and replacement of vegetation, as needed.



The fully vegetated gravel wetland [left top & bottom] exhibits excellent pollutant removal, provides subsurface anaerobic treatment, attenuates peak flow, and reduces flow volume. [Right] The gravel wetland's forebay and retention cells just after installation.

WATER QUALITY PERFORMANCE 100 90 80 70 70 70 40 30 30 30 10 75 TSS TPH-D NO₃-N Zn



Category Type Stormwater Wetland

BMP TypeLow Impact Development Design

Design SourceNot Available

Basic DimensionsFilter Beds: 15 ft L X 32 ft W Forebay Top Width: 37 ft L X 56 ft W

Total Area: 5,450 sf

SpecificationsCatchment Area: 1 acre Peak Flow: 1 cfs Treatment Volume: 3.264 cf

Treatment FunctionPhysical, Chemical, Biological

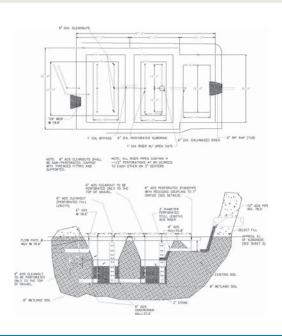
Cost Per Acre \$22,327

Maintenance Data Maintenance Sensitivity: Low Inspections: Low Sediment Removal: High

Water Quality Treatment Process

This treatment removes pollutants, provides subsurface anaerobic treatment, attenuates peak flow, and reduces flow volume through evapotranspiration and infiltration. Biological treatment of water quality occurs through plant uptake and soil microorganism activity. Physical and chemical treatment happens in the soil through filtering and adsorption with organic matter and mineral complexes.

During lighter rains, each cell filters 100 percent of its water quality volume. The cells allow stormwater to pass horizontally through the microberich, gravel substrate and drain into a sump basin. The wetland is designed to continuously saturate at a depth that begins four inches beneath the treatment's surface. This promotes water quality treatment and vegetation growth. To generate this condition, the system outlet pipe has an invert 4 inches below the wetland surface.



Summary Table

This chart offers an overview of the water quality treatment and runoff volume reduction of the 12 stormwater treatments analyzed in this report. It includes percent pollutant removal efficiencies expressed as median values; percent average peak flow reduction; and the average lag time for each treatment. (Lag time is the difference in minutes between the influent and effluent volume center of mass.) Blue bars present data from the UNH Stormwater Center; white bars show comparative data on the same, or similar treatments, from alternate sources. "N/T" signifies "no treatment," indicating that the stormwater treatment did not remove the pollutant(s) in question.

Treatment Unit Description	Reference	TSS (%)	NO ₃ -N (%)	Zn (%)	TPH-D (%)	Average Peak Flow Reduction (%)	Average Lag Time (Min.)
ADS Water Quality Unit	UNH	66	N/T	74	47	N/T	N/T
	www.ads-pipe.com	80	N/T	N/T			
ADS Infiltration Unit	UNH	99	N/T	99	99	83	364
Surface Sand Filter	UNH	49	6	81	94	60	220
	EPA: Sand Filters	70	N/T	45			
Sand Filter	Clayton & Schueler, 1996	85	N/T	71			
	Bell, W., et al, 1995	61–70	N/T	> 82			
Retention Pond	UNH	81	64	92	61	85	554
	EPA: Wet Detention Ponds	50-90	N/T	40-50			
	Winer, 2000	80 ± 27	43 ± 38				
Bioretention System	UNH	97	44	99	99	85	615
	EPA: Bioretention	90	N/T	N/T			
	Davis, et al, 1998	81	38				
	Winogradoff, 2001	N/T	N/T	87–99			
Aqua-Swirl and Aqua-Filter	UNH	66	10	61	42	N/T	N/T
	EPA website	84	N/T	N/T			
VortSentry	UNH	29	37	42	53	N/T	N/T
	Technical Bulletin 1	80	N/T	N/T			
V2B1 Structural System	UNH	38	-43	35	40	N/T	N/T
	www.env21.com	80					
Continuous Deflec- tive Separation Unit	UNH	41	N/T	26	26	N/T	N/T
	various	52-84					
Gravel Wetland	UNH	99	99	99	99	85	336
	Clayton & Schueler, 1996	80-93	75–87	55-90			
Stone (Riprap) Swale	UNH	52	-74	66	33	N/T	N/T
Vegetated Swale	EPA: Vegetated Swales	81	38	71			
	Clayton & Scheuler, 1996	30-90	0-80	N/T			