

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
Loyalhanna Creek, Upper Latrobe	2010	500 gpm, net alkaline, Fe 40 mg/L	unknown, system on line July 2010	3 aerobic settling ponds and constructed wetland	Design, permitting, project management	Inspections; iron removal every 10 years	Loyalhanna Watershed Association
Teerco, Seep B	2010	net acid, Fe 80 mg/L	pH 7, Fe <1 mg/L and Mn < 3 mg/L	ALD, aerobic settling ponds, constructed wetlands	Assistance with design, permitting, and CO	Inspections; iron removal every 10-15 years	Langan Engineering
Wingfield Pines	2009	1,500 gpm, net alkaline , Fe 15 mg/L	pH 8, Fe <1 mg/L	5 aerobic settling ponds and constructed wetland	Design, permitting, construction oversight, O&M Plan	Inspections; iron removal every 10 years	Allegheny Land Trust
Duquesne Slag	2009	net acid, Fe 15 mg/L; Mn 3 mg/L	net alkaline, Fe and Mn < 1 mg/L	ALD, settling pond, 2 constructed wetlands	conceptual design and oversight	Inspections; iron removal every 10 years	LaFarge North America through R.A.R. Engineering
Filson 7	2008	80 gpm, net acid 180 mg/L, Fe 105 mg/L	net alkaline, Fe 20 mg/L	3 ALDs and 2 settlings ponds that discharge into large existing wetland	Design, permitting, construction oversight, O&M Plan	Inspections; iron removal every 10 years	Mill Creek Coalition
Bilger Run	2008	20 gpm, net acid 50 mg/L, Fe 10 mg/L	net alkaline, Fe <1 mg/L	ALD and existing settling pond	Design, permitting, construction oversight, O&M	Inspections, pond elevation modifications	Anderson Run Watershed Association

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
					Plan		
Glenraffan Creek	2008	84 gpm, net alkaline, pH 7.2, Fe 8 mg/L	pH 7-8, Fe < 1 mg/L	aerobic settling pond	evaluate discharge, conceptual treatment design, permit review	Inspections, pond cleanout every 15-20 years	Pennoni Associates
Teerco, Seep A	2007	pH 5-6, Fe 2-10 mg/L	pH 7-8, Fe and Mn < 1 mg/L	ALD and constructed wetland	Design, permitting, construction oversight	Inspections	Langan Engineering
Wilson Run, Westmoreland County	2007	150-1200 gpm, net alkaline, Fe 30 mg/L	pH 7, Fe 1-5 mg/L Fe	cleaned out and redesigned settling pond	Design, permitting, construction oversight, O&M Plan	Inspections, iron removal (every 15-20 years)	Sewickley Creek Watershed Association
LC20D / Little Coon Run, Clarion Co.*	2007	55 gpm, net acid 200 mg/L, Fe 110 mg/L	Fe<5 mg/L, pH 5-6	ALD, pond, wetland	Design, permitting, construction oversight, O&M Plan	Inspections, iron removal (every 15-20 years)	Farmington Township (Clarion County)
Lowber / Sewickley Creek, Westmoreland Co.*	2007	1,800 gpm, net alkaline, pH 6.2, Fe 74 mg/L	Fe<1 mg/L, pH 7-8	Iron Oxide production ponds (6) and aerobic wetland	Design, permitting, construction oversight, O&M Plan	Inspections, iron removal (every 5 - 10 years per pond)	Sewickley Creek Watershed Association

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
Middle Branch Redesign, Twomile Run, Clinton County	2007	50 gpm, net acid 400-700 mg/L, pH 3, Al 50-90 mg/L, Fe 10-20 mg/L	net alkaline, Fe and Al < 2 mg/L	deep mine collection system, four vertical flows ponds, settling pond, wetland	Improved minewater collection; redesigned system; construction oversight	inspections, flow and water level adjustments	Trout Unlimited
Lewis System, Sullivan County	2006	75 gpm, net acid 75 mg/L, pH 4, Al 10 mg/L	pH 6-7, net alkaline, Al and Fe < 1 mg/L	vertical flow pond	Design	Inspections	Moshannon District Mining Office
Audenreid / Catawissa Creek, Schuylkill Co.	2005	8,500 gpm, net acid 70 mg/L, Al 8 mg/L, Fe < 1 mg/L	Al < 3 mg/L total, < 1 mg/L dissolved	Three large self-flushing limestone tanks, 2 ponds	Developed conceptual design; reviewed plans and specs	Inspections, sludge removal	Schuylkill Co. Conservation District
Robbins Hollow Complex / Kettle Creek, Clinton Co.*	2005	< 5 - 200 gpm, acidity 200-500; Al 40-80; Fe 1-60; Mn 10-15	variety of discharges; summed flow is pH 6-7 with Fe and Al < 1 mg/L	4 minisystems including an ALD, two OLDs, 4 VFPs, and ponds	Design, permitting, construction oversight, O&M Plan	Inspections, flushing	Trout Unlimited
Mitchell Self-Flusher / Babb Creek, Tioga Co.*	2005	40 gpm, acid 440 mg/L, Fe 10 mg/L, Al 30 mg/L	initially, pH 5-6 Fe and Al < 3 mg/L; declined to 50% effective after 6 months	Self-flushing limestone bed, settling pond	Design, permitting, construction oversight, O&M Plan	Inspections	Babb Creek Watershed Association

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
K&J Coal, Pond 23 Site (bond forfeiture COA)	2005	75 gpm, pH 5, Al 2 mg/L, Mn 5 mg/L, Fe < 1 mg/L	net alkaline 40 mg/L, Al < 1 mg/L; Mn < 1 mg/L; Fe < 1 mg/L	VFPs (2), flush system, settling pond	Major Bond Forfeiture COA; managed technical components of passive treatment system design, construction oversight, and O&M Plan	Inspections, flushing of VFPs	Nova Chemical
K&J Coal, Pond 4 Site (bond forfeiture COA)	2005	200 gpm, pH 4.5, Al 10 mg/L, Mn 40 mg/L, Fe < 1 mg/L	net alkaline 90 mg/L, Al < 1 mg/L; Mn < 1 mg/L; Fe < 1 mg/L	VFPs (2), flush system, settling pond and oxic LS bed			
K&J Coal, Pond P Site (bond forfeiture COA)	2005	150 gpm, pH 3.5, Al 15 mg/L, Mn 40 mg/L, Fe < 1 mg/L	net alkaline 40 mg/L, Al < 1 mg/L; Mn < 5 mg/L; Fe < 1 mg/L	VFPs (3), flush system, settling pond, wetland			
K&J Coal, Gaber-Brown Site (bond forfeiture COA)	2004	200 gpm, pH 3.5, Al 25 mg/L, Mn 40 mg/L, Fe < 1 mg/L	net alkaline 50 mg/L, Al < 1 mg/L; Mn < 1 mg/L; Fe < 1 mg/L	VFPs (2), flush system, settling pond, oxic LS bed, wetland			
LERMD20 / Elk Run, Jefferson Co.*	2003/04	125 gpm, net acid 230 mg/L, Fe 15 mg/L, Al 12 mg/L	net alkalinity 100 mg/L, Fe < 1. Al < 1	Downflow compost bed, upflow LS bed with flushing, pond, wetland	Design, permitting, construction oversight, O&M Plan	Inspections, flushing	Young Township (Jefferson County)

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
Anna S Mine Complex / Babb Creek, Tioga Co.	2003	440 gpm, pH 3, Fe 10 mg/L, Al 10 mg/L	net alkaline, Fe < 1 mg/L, Al < 1 mg/L	VFPs (4), flush system, and polishing wetland	Conceptual design, construction oversight and project management	Regular flushing	Babb Creek Watershed Association
Hunters Drift / Babb Creek, Tioga Co.	2003	330 gpm, pH 3, Fe 50 mg/L, Al 25 mg/L	net alkaline, Fe < 1 mg/L, Al < 1 mg/L	VFPs (4), flush system, and polishing wetland	Conceptual design, construction oversight and project management	Regular flushing	Babb Creek Watershed Association
Soberdash, Eastern Discharge (bond forfeiture COA)	2003	1 - 200 gpm; pH 3-4, Fe 10-50 mg/L, Al 1-10 mg/L	per PADEP, net alkaline with low metals under design conditions	oxic limestone channel, oxic limestone bed	Conceptual design and plan review (with RAR Engineering)	should be minimal but actual O&M unknown	Cambria District Mining Office
Soberdash, MD1 and MD2 (bond forfeiture COA)	2003	5-50 gpm, net acid, pH 5, 12-35 mg/L	per PADEP, net alkaline	ALD, pond, wetland	Conceptual design and plan review (with RAR Engineering)	should be minimal but actual O&M unknown	Cambria District Mining Office
Scrubgrass / Scrubgrass Creek, Allegheny Co.	2003	175 gpm, net alkaline, pH 6.0, 70 mg/L Fe	net alkaline, pH 6.5, Fe 30-40 mg/L	Two settling ponds with Maelstrom Oxidizer	System redesign and project management	Routine O&M handled by IOR	Scott Conservancy

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
Ace Drilling, Site 26 (bond forfeiture COA)	2002	20-100 gpm, net acid, pH 5, Fe 130 mg/L, Al 1-2 mg/L	net alkaline, Fe < 2 mg/L	ALD, reconfigured settling pond constructed wetland	Conceptual design and plan review (with Minetech, Inc.)	routine flushing by watershed association	Cambria District Mining Office
Ace Drilling, Site 26A (bond forfeiture COA)	2002	1-10 gpm, pH 3-4, Fe 130 mg/L, Al 9 mg/L	net alkaline, Fe and Al < 2 mg/L	VFP, reconfigured settling pond, oxic LS bed	Conceptual design and plan review (with Minetech, Inc.)	routine flushing by watershed association	Cambria District Mining Office
JRU 88 and 89 / Johnson Run, Elk Co.*	2002	100 gpm, Fe 5 - 15 mg/L, Al 10 mg/L, net acid 100 - 150 mg/L	net alkalinity 60 mg/L, Fe < 1 mg/L, Al < 1 mg/L	Self-flushing LS, VFP, settling Pond, and aerobic wetland	Complete design and project management	Regular flushing	North Central RPDC
Conifer East, Beaver Run, Jefferson Co.	2001	10-50 gpm	net acid, pH 4, Fe 1-10 mg/L, Al 1-8 mg/L	alkaline-amended wetland followed by oxic limestone bed	Complete design and project management	no routine O&M; some repairs due to flood and muskrat damage	Knox District Mining Office
Little Hefren / Toms Run, Cook Forest State Park, Clarion Co.*	2001	15 gpm, net acid, pH 5.8, Fe mg/L Fe	net alkaline, Fe 1-5 mg/L	ALD, settling pond and aerobic wetland	Complete design and project management	Periodic channel cleanout	DEP 319 Program

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
Keystone Power Plant, Armstrong Co.	2000	5-40 gpm, net acid, pH 3.5, Fe 40 mg/L, Al 6 mg/L	alkaline water with <2 mg/L Fe and Al	VFP and constructed wetland	Conceptual design and construction consultation	reported to be minimal by client	GAI Consultants
Conifer West, Beaver Run, Jefferson Co.	1998	0-200 gpm, net acid, pH 4.4, Fe 30 mg/L, Al 2 mg/L	net alkaline with Fe and Al <1 for 4 years; variable effluent since 2003	ALD, settling ponds, and aerobic wetland	Complete design and project management	periodic ALD flushing which has not occurred	Knox District Mining Office
C&K Pit 601 / Mill Creek, Jefferson Co.	1997	80 gpm, net acid, pH 5.7, Fe 80 mg/L	net alkaline, Fe < 7 mg/L	ALD, reconfigured constructed wetland	Design of ALD and reconfigured system	To our knowledge, none	C&K Coal (bankrupt)
SR-101A / Slippery Rock Creek, Butler Co.	1996	30 gpm, net acid, pH 5.5, Fe 90 mg/L	net alkaline, Fe 9 mg/L	ALD, settling pond and aerobic wetland	Conceptual design, project management	Negligible, periodic channel cleanouts	Knox District Mining Office
Delta Maust, Somerset Co. (bond forfeiture COA)	1996	25-50 gpm, net acid, pH 3, Fe 23-34, Al 6-7	reported by PADEP to be net alkaline, Fe and Al < 2 mg/L	two VFPs followed by aerobic wetland	System design (with CDS, Inc.)	reported to be negligible by PADEP	Cambria District Mining Office

## Hedin Environmental's Passive Treatment Systems

System / Location	Year	Average Influent Quantity/Quality	Effluent Quality	Design	HE Role	O&M	Client
SR 114D, Slippery Rock Creek, Butler Co. (bond forfeiture COA)	1995	125 gpm, net acid, pH 5.8, Fe 40 mg/L	net alkaline with Fe 1-10;	ALD, settling pond and aerobic wetland	Conceptual design, construction oversight, project management	Periodic channel cleanout; one spillway renovation	Knox District Mining Office
SR-114B, Slippery Rock Creek, Butler Co. (bond forfeiture COA)	1995	40 gpm, net acid, pH 6.0, Fe 20 mg/L	net alkaline, Fe < 10	ALD and settling pond	Conceptual design, construction oversight, project management	None	Knox District Mining Office
Area 1 Passive System, Sequatchie Valley Coal, Dunlap TN	1995	200 gpm; net acid, pH 5.8, Fe 120 mg/L, Mn 40 mg/L	net alkaline discharge with Fe < 1	ALD, settling ponds, aerobic wetland	Conceptual design and construction consultation	None during first two years;	Sequatchie Valley Coal