GLOSSARY

abandoned mine drainage (AMD) *p. 25*
Drainage flowing from or caused by surface mining, deep mining or coal refuse piles that is typically highly acidic with elevated levels of dissolved metals.

Abraham Darby *p. 7* An English Quaker familiar with both the brewing industry and the iron industry. He determined that coke was suitable for producing iron.

aeration *p.38* The introduction of air into water by stiring or mixing.

aerobic *p. 50* A term refering to processes or organisms that occur or are active in the presence of oxygen.

alkalinity *p. 37* The measurement of the ability of water's capacity to neutralize acids.

anaerobic *p.56* A term refering to processes or organisms that occur or are active in the abscence of oxygen.

anoxic limestone draine (ALD) *p. 52*
An anoxic limestone drain (ALD) is a buried bed of limestone constructed to intercept subsurface mine water flows. ALD's are used to prevent contact with atmospheric oxygen and retain carbon dioxide, which in turn, generates more alkalinity. Sediment ponds are constructed after an ALD to accumulate the iron oxide precipitates.

black lung disease *p.17* A condtion of the lungs that is caused by the inhalation and deposition of coal dust within the lungs resulting in violent and uncontrollable coughing.

blast furnace *p. 4* A tower like furnace which uses a blast of air forced into the furnace from below to produce the intense heat needed to separate metals from the impurities in the ore.

boom *p. 22* A long beam which can be swung laterally and vertically above its pivot. At the far end cables and a digging bucket can be mounted.

breaker *p. 14* A machine which combines coal crushing and screening. Normally consists of a rotating drum in which coal is broken by gravity impact against the walls of the drum.

breaker boy *p.14* A young boy who worked in the breaker where he separated slate and rock from the coal.

buffer *p.37* The ability to resist changes in pH when an acid or base is added. For example, alkalinity buffers the stream against acid mine drainage. However, if the drainage uses up the alkalinity, the stream loses it's buffering capacity.

carbon monoxide *p.17* (CO); A colorless, odorless, highly poisonous gas produced by the incomplete burning of any carbonaceous material.

charcoal *p.4* The residue, primarily carbon, from the partial combustion of wood or other organic matter.

coal *p.2* Coal is a combustible rock of organic origin composed mainly of carbon (50-98%), hydrogen (3-13%) and oxygen, with lesser amounts of nitrogen, sulphur and other elements. Some water is always present, as are grains of inorganic matter that form an incombustible residue known as ash.

coal auger *p.11* (1) A primitive tool resembling a brace and bit used to drill a hole in the coal in which explosives would be placed. (2) A special type of continuous miner that consists of a large diameter screw drill which cuts, transports, and loads the coal onto vehicles or conveyors.

coke *p. 6* A hard, dry carbon substance produced by heating coal to a very high temperature in the absence of air. Coke is used in the manufacture of iron and steel.

collectors *p. 43* Aquactic organisms who feed on the bite-sized suspended particles that are left over by the shredders and scrapers.

continuous miner *p. 12* A piece of mining equipment which produces a continuous flow of ore from the working face.

contour mining *p. 22* A technique of open cut mining in which coal beds are mined in relatively level benches along a hillside.

cutting machine *p. 11* A machine, usually used in coal, that will cut a 10- to 15-cm slot. The slot allows room for expansion of the broken coal after blasting.

detritis *p. 42* Freshly dead or partially decomposed organic material.

diffusion *p. 38* (1) The intermingling or mixing of the molecules of two or more substances. (2) The process by which both ionic and molecular species dissolved in water move from areas of higher concentration to areas of lower concentration.

dissolved oxygen *p. 38* The amount of oxygen gas (O2) dissolved in a given volume of water at a particular temperature and pressure. Usually expressed in concentrations in parts per million (ppm) or milligrams per liter (mg/L).

diversion well *p.57* A vertical tank filled with limestone aggregate that generates alkalinity by turbulently mixing and abrading the limestone into fine particles.

dragline *p.22* An excavating machine that uses a bucket operated and suspended by lines or cables, one of which lowers the bucket from the boom; the other, from which the name of the machine is derived, allows the bucket to swing out from the machine or to be dragged toward the machine to remove overburden above a coal seam.

drift mine *p.10* A mine that opens into a horizontal or practically level seam of coal. This type of mine is generally the easiest to open as the mine opening enters into the coal outcrop.

emphysema *p.17* An abnormal swelling of lung tissue which causes difficulty in breathing.

ferric iron *p.54* An oxidized form of iron (Fe+3). The precipitate is yellow to red in color.

final face *p.33* The exposed area of a coal bed.

highwall *p. 22,33* The unexcavated face of exposed overburden and coal in a surface mine.

James Watt *p.15* (1736 -1819) An instrument maker who improved upon Thomas Newcome's atmospheric steam engine and went on to invent the first true steam engine.

limestone *p.34* A sedimentary rock consisting chiefly of calcium carbonate primarily in the form of the mineral calcite and with or without magnesium carbonate. It can be formed through either organic or inorganic process. Limestone effervesces freely with any common acid.

longwall mining machine *p.13*
One of three major underground coal mining methods currently in use. Employs a steel plow, or rotation drum, which is pulled mechanically back and forth across a face of coal that is usually several hundred feet long. The loosened coal falls onto a conveyor for removal from the mine.

macroinvertebrates *p.42* Organisms with no backbone but are large enough to see with the unaided eye.

methane *p.17 (CH_4);* The most simple of the hydrocarbons formed naturally from the decay of vegetative matter, similar to that which formed coal. It is the principal component of natural gas.

milligrams per liter *(mg/L) p.38* A unit measure of the concentration of a component substance measured by the amount of milligrams of that substance that exists in one liter of a particular liquid which is typically water.

nephelometric turbidity units (NTU's) *p.39* A unit measure of turbidity in which the intensity of light scattered by the sample under defined conditions is compared to the light scattered by a standard reference suspension under the same conditions.

nipper *p.14* A young boy whose job it was to open the mining doors whenever a mule-drawn mine car passed through. Also called a trapper or door boy.

open limestone channels (OLC) *p.51*
A limestone-lined ditch that increases oxidation and generates alkalinity through limestone dissolution.

ore *p.4* The naturally occurring material from which a mineral or minerals of economic value can be extracted.

overburden *p.21* Layers of soil and rock covering a coal bed. Overburden is removed prior to surface mining and replaced after the coal is removed.

oxidation *p. 50* A natural chemical reaction that occurs in the process of oxygen.

pan line *p.13* A conveyor system which transports the coal to coal cars or a belt conveyor to be transported out of the mine.

parts per million (ppm) *p. 38* The unit measure of the concentration of a component substance. For example a 1 ppm concentration of iron is 1 part iron to 999,999 parts of other material. It also is equal to mg/L.

Passive Treatment *p. 46* The use of naturally occuring chemical and biological reactions to effectively and economically remove contaminants from mine drainage.

pH *p.37* The negative log10 of the hydrogen-ion activity in solution which is a measure of the acidity or basicity of a solution. The pH scale is from 0-14. A low pH is acidic where as a high pH is basic and 7 being neutral.

photosynthesis *p.38* A complex process by which plants use carbon dioxide, water, and sunlight to produce oxygen, carbohydrates, and other nutrient molecules.

pit *p.34* The area exposed to extract coal by removing the overburden.

precipitate *p.47, 51* A substance which separates from a solution as a solid by the action of chemical reagents, temperature, pH, etc.

pyrite *p. 25* A hard, heavy, shiny, yellow mineral, FeS_2 or iron disulfide, generally in cubic crystals. Also called iron pyrites, fool's gold, sulfur balls. Iron pyrite is the most common sulfide found in coal mines.

reclamation *p. 21* Restoring the land to approximate pre-mining conditions or to other viable land use.

refuse piles *p.28* Mounds of generally poor quality coal-like materials located where coal was prepared for market.

reverberatory furnace *p. 4* A furnace with a shallow hearth, usually non-regenerative, having a roof that deflects the the flame and heat downwards toward the hearth or the surface of the charge so that the material to be smelted would not need to be mixed with the fuel which would result in impurities.

riffle areas *p.38* A shoal, reef, or rocky obstruction in a stream, producing a ripple or a stretch of shallow, rapid, or choppy water.

rock dust *p.18* Finely ground limestone applied to the walls, ceiling, and floor of a mine to suppress potential fires.

roof bolt *p. 10* A long steel bolt driven into the roof of underground excavations to support the roof, preventing and limiting the extent of roof falls. The unit consists of the bolt (up to 4 feet long), steel plate, expansion shell, and nut. The use of roof bolts eliminates the need for timbering by fastening together, or "laminating," several weaker layers of roof strata to build a "beam."

room and pillar method *p. 12*
A method of mining flat-lying ore deposits in which the mined-out area, or rooms, are separated by pillars of approximately the same size.

scrapers *p. 42* Aquatic organisms that have mouth parts specifically adapted for removing algae from rocks and vegetation.

shredders *p. 42* Aquatic organisms that tear apart decaying plant material with powerful mouth parts.

smelting *p. 4* A process in which molten metal or molten slag is produced by separating the pure metal from extraneous or impure substances with the use of heat.

spent mushroom compost *p.48, 55*
Compost used by the mushroom industry consisting of hay, straw, horse and chicken manure, and gypsum that has been exhausted of the proper nutrients to grow mushrooms.

spoiled *p.21* The act of removing overburden from its original location to gain access to the ore or mineral in surface mining.

stripping shovel *p.22* A machine which is mounted on crawler tracks similar to a bulldozer and has an especially long boom with a bucket that shovels the overburden instead of dragging and scooping allowing it to reach further and pile higher.

subsidence *p.13, 32* The gradual sinking, or sometimes abrupt collapse, of the rock and soil layers into an underground mine. Structures and surface features above the subsidence area can be affected.

sulfuric acid *p. 26* A highly corrosive liquid (H_2SO_4) which is formed upon weathering of pyrite.

surface mining *p. 21* A mine in which the coal lies near the surface and can be extracted by removing the covering layers of rock and soil.

Thomas Newcome *p. 15* (1663- 1729)
A craftsman who built the first atmospheric steam engine which provided a continuous source of power to drive a pump.

vertical flow system *p. 54* Vertical flow systems (VFS) consist of a treatment cell (pond) filled with limestone and sometimes topped with a layer of organic matter. Water travels vertically through the decaying matter and limestone removing oxygen and generating alkalinity, respectively.

wetland *p. 46* Land that is permanently or periodically inundated with water sufficient to establish hydrophytic vegetation and anaerobic soil conditions.

working face *p.13* Any place in a mine where material is extracted during a mining cycle.

yellow boy *p. 41* An orange/red residue and staining which is iron in its solid form.

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Additional Resources

The Pennsylvania Iron Industry - http://explorepahistory.com/story.php?storyId=29

Overview of the History of the Iron Industry - http://www.history.com/topics/iron-and-steel-industry

Mining Anthracite - http://explorepahistory.com/story.php?storyId=11

Mining Bituminous - http://explorepahistory.com/story.php?storyId=30

Coal Mining in Pittsburgh and Western PA (a list of good links) - http://pittsburgh.about.com/cs/coal/

McIntyre, Pennsylvania, The Everyday Life of a Coal Mining Company Town: 1910-1947
photos, documents, memories of town residents - http://www.mcintyrepa.com/frontpage.htm

American Coal Foundation - http://www.teachcoal.org/

PBS (mountaintop removal mining) http://www.pbs.org/independentlens/razingappalachia/mtop.html

National Mining Association (info and stats about energy and coal) - http://www.nma.org/

Macroinvertebrate Key and Field Guide Links - http://www.watersheded.dcnr.state.pa.us/what/macroslinks.html

Virtual Museum of Coal Mining In Western Pennsylvania - http://patheoldminer.rootsweb.ancestry.com

Western Pennsylvania Coalfields - http://www.coalcampusa.com/westpa/index.html

Indiana University of Pennsylvania Coal Culture Projects - http://www.iup.edu/archives/coal/default.aspx

Passive Treatment Overview (variety of links to AMD, watersheds, laws and policies) -
http://www.amrclearinghouse.org/Sub/AMDtreatment/PassiveTreatment.htm

Eastern Pennsylvania Coalition For Abandoned Mine Reclamation - http://www.epcamr.org/

Western Pennsylvania Coalition For Abandoned Mine Reclamation - http://www.wpcamr.org/

Pennsylvania Abandoned Mine Reclamation Annual Conference – http://www.treatminewater.com/

American Society of Mining and Reclamation - http://www.asmr.us/

National Association of Abandoned Mine Land Programs - http://naamlp.net/

U.S. Office of Surface Mining Reclamation and Enforcement - http://www.osmre.gov/

Handbook of Technologies for Avoidance and Remediation of Acid Mine Drainage
http://www.techtransfer.osmre.gov/NTTMainSite/Library/hbmanual/hbtechavoid/front.pdf

International Mine Water Association - http://www.imwa.info/

Datashed (provides info and water quality data for specific mine drainage treatment projects http://www.datashed.org/

Lesson Plans

Edible Coal Mining - http://explorepahistory.com/viewLesson.php?id=91

American Coal Foundation (variety of lesson plans) - http://www.teachcoal.org/lessonplans/index.html

Working Where the Sun Never Shines - http://explorepahistory.com/viewLesson.php?id=92

US Department of Energy NETL Lesson Plans - http://www.netl.doe.gov/education/teachers.html#LESSONPLANS

Lesson Planet (search engine for teachers with a huge library of coal related lesson plans) - http://www.lessonplanet.com/search?keywords=coal&media=lesson

Winnie Palmer Nature Reserve - http://www.wpnr.org/

Kentucky Coal Education - http://www.coaleducation.org/lessons/primary.htm

Schuylkill Intermediate Unit 29 Mining Resources - http://www.iu29.org/Resources/CoalRegion.asp

Franz Kline art project - http://www.crayola.com/lesson-plans/detail/mine-the-work-of-franz-kline-lesson-plan/

Danger at the Breaker - http://www.lessonplanspage.com/LASSDangerAtTheBreaker-ComprehensionSkills-CoalMining24.htm

Hot Chalk Lesson Plans Page (search engine for lesson plans) - http://www.lessonplanspage.com/

Coal Mining and Coal Towns in Western Pennsylvania - http://www.lib.iup.edu/depts/speccol/Coal%20Culture/lessonplans/towns.pdf

42 Explore Mining - http://42explore.com/mining.htm

Historical Society of Pennsylvania - http://www.hsp.org/default.aspx

The Slippery Rock Watershed Coalition would like to extend its sincere appreciation to the following companies, agencies, and individuals that made this publication possible and have always represented the true meaning of a successful partnership.

Private Industry

Amerikohl Mining Inc., John Stilley, President
Quality Aggregates Inc., Joseph Aloe, President
Allegheny Mineral Corp., Darrel Lewis, Vice President
Biomost, Inc., Timothy Danehy, Secretary-Treasurer

Non-Profit

The William & Frances Aloe Charitable Foundation
Stream Restoration Inc., Margaret Dunn, President
Urban Wetland Institute, Dr. Fred Brenner, President
Foundation for Pennsylvania Watersheds

Government

PA Dept. of Conservation & Natural Resources,
Michael DiBerardinis, Sec.
PA Dept. of Environmental Protection,
Kathleen McGinty, Sec.

Individuals

Joan Clippinger, PA DCNR
Sarah Hopkins, PA DCNR
Robert Dolence
Robert Beran, Beran Environmental Services, Inc.
Jeff Jarrett, PA Dep
Robert & Margaret Hensley
Bob Zick
Jeff Ankrom, Quality Aggregates
Janice Belgraden
Charles Cooper, CDS Assoc., Inc.
Mike Leon