The Pennsylvania Infrastructure Investment Authority

Non-Point Source Pollution Control Funding Program

Program Design Manual

June 2016

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DEFINITIONS

Abandoned Mine Drainage (AMD): Mine drainage from locations where there is no existing entity with continuing responsibility for the discharge.

Animal equivalent unit (AEU): One thousand pounds live weight of livestock or poultry animals, regardless of the actual number of individual animals comprising the unit.

Best management practices (BMP): Practice, or combination of practices, which is an effective and practicable (given technological, economic and institutional considerations) method to protect surface and groundwater from non-point source impacts.

Brownfields: A project designed to remediate water quality problems caused by the presence of hazardous substances, pollutants, or contaminants to promote expansion, redevelopment or reuse of real property.

Exceptional Value Water (EV): This highest level of protection requires that "water quality … be maintained and protected." To be compatible with the federal regulation, Pennsylvania's EV waters classification includes "Outstanding National Resource Waters." In addition, outstanding state, regional, and local waters are also protected at this level. Thus, the Pennsylvania anti-degradation regulation provides multiple routes for these waters to qualify for EV protection. At this highest level, no lowering of water quality is allowed. A water qualifies for EV if it is an HQ water which meets one or more of the following attributes: (1) it flows in a national wildlife refuge or a state game propagation and protection area; (2) it flows in a designated state park natural area, state forest natural area, national natural landmark, federal or state wild river, federal wilderness area, or national recreation area; (3) it is an outstanding national, state, regional, or local resource water as defined in regulation; (4) it is a surface water of exceptional recreational significance as defined in regulation; (5) the water achieves a biological test score of 92 percent or greater using the modified Rapid Bio-assessment Protocol; or (6) the water is designated a wilderness trout stream by Pennsylvania Fish and Boat Commission following public notice and comment. An additional pathway is available for waters that possess "*exceptional ecological significance*." Water quality better than the criteria set forth in Department of Environmental Protection (Department) regulations is not needed to qualify as EV waters for surface waters of exceptional ecological significance. These waters include, but are not limited to, EV wetlands and thermal springs.

High Quality Water (HQ): Department regulations specifying how a waterbody may qualify as HQ waters provide that such qualification may occur by demonstration of suitable chemical or biological conditions. Under the chemical test, a surface water is HQ if long-term water quality (at least one year of data) for 12 chemical parameters is better than levels necessary to support

propagation of fish, shellfish, and wildlife and recreation in or on the water. Under the biological test, a water is HQ if it meets either of the following: (a) in comparison to a reference stream, the water shows a macroinvertebrate community score of 83 percent or greater using a protocol based on EPA's Rapid Bio-assessment Protocol, or (b) the water is a Class A wild trout stream designated by the Pennsylvania Fish and Boat Commission following public notice and comment.

Nonpoint Source (NPS): A pollution source which is not a point source discharge. For the purpose of this program, stormwater projects that are required by MS4 permits are considered Nonpoint Source.

Manure Acre: A pasture acre having the equivalent of 145 Animal Equivalent Units (AEUs) of manure applied. The number of manure acres treated by an Animal Waste Management system is defined as the AEUs that the system services divided by 145. For example, a dairy operation with 218 AEU's of livestock would be credited with 218/145 = 1.5 manure acres effectively treated

Municipal Separate Stormwater System (MS4): A conveyance or system of conveyances owned by a state, city, town, village, or other public entity that discharges to waters of the Commonwealth that is designed or used to collect or convey stormwater (including storm drains, pipes, ditches, etc.); not a combined sewer; and not part of a Publicly Owned Treatment Works (sewage treatment plant).

Operation and Maintenance (O&M): Actions taken after construction is complete and project is fully operational that ensure that facilities constructed will continue to function as intended.

Point Source (PS): Any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, Confined Animal Feedlot Operation (CAFO), landfill leachate collection system, or vessel or other floating craft, from which pollutants are or may be discharged. Projects related to achieving and/or retaining compliance with an MS4 permit are point source projects.

Urban Runoff: Stormwater from areas defined as developed in a County Comprehensive Plan prepared in accordance with the Pennsylvania Municipalities Planning Code (Act 247 of 1968) and the amendments made by Act 67 and 68 of 2000.

Stormwater: Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt

PROGRAM OVERVIEW

The expansion of nonpoint source pollution (NPS) funding in the Pennsylvania Infrastructure Investment Authority (Pennvest) program is a significant change to the Clean Water State Revolving Loan Fund (CWSRF), which has primarily served "traditional" wastewater system needs in Pennsylvania. The US Environmental Protection Agency (EPA) reports that 36 states currently use the CWSRF for NPS, one of which is Pennsylvania. The Commonwealth is credited for already having a NPS program due to the successful program for on-lot septic system repair, the funding of a few Brownfields projects and three abandoned mine drainage projects. In addition, as a result of the American Recovery and Reinvestment Act (ARRA) requirements for "green" infrastructure projects; a large number of NPS stormwater, hydromodification and agricultural projects were funded in 2009. The proposed program as now proposed is based on the lessons learned in selecting and implementing these projects.

The following is a description of the program that Pennvest intends to implement in the short term. These preliminary guidelines will be used to solicit projects over the next couple Pennvest Board meetings, while program staff completes an extensive outreach effort to solicit input from organizations representing potential applicants, recipients who have received funding and others to insure the program will be successful as designed. Staff has identified a number of issues that need further discussion before final guidelines can be developed. It will also be necessary to revise the statute that created Pennvest and the regulations promulgated by the Pennvest Board to put all the components of the program into place. An extensive public participation process will be implemented as part of the necessary procedures to revise these regulations.

Program Goals and Performance Measures

The primary goals of the NPS Program are to: (1) improve water quality or protect existing exceptional value or high quality waters, (2) promote water conservation and energy efficiency and (3) promote economic development. The program has been designed to maximize the performance of key environmental performance measures including:

1. Pounds of nitrogen, phosphorus and sediment reduced to either surface or ground water.
2. Dollars disbursed to projects that conserve water, promote energy efficiency, are environmentally innovative or implement non-structural alternatives to storm water management.
3. Gallons of potable water use reduced annually through water conservation
4. Annual amount of kilowatt hours reduced or produced through energy efficient practices.

5. Gallons per year of urban runoff reduced by the installation of “green infrastructure” alternatives.

Sources of Pollution to be Addressed

Nonpoint source (NPS) pollution is typically the result of rainfall becoming contaminated with pollutants as it runs off the land surface into streams or infiltrates through the soils into groundwater. The types of NPS pollution are highly varied, and are discussed in detail in “Pennsylvania’s Nonpoint Source Management Program Update” (October 11, 2008, Document Number 394-2000-002).

After careful review of this document, only projects that address the three highest causes for water quality impairment from NPS will be eligible for funding. They include agriculture, stormwater and abandoned mine drainage. For the purposes of this program, stormwater projects were further defined as those projects that address water quality problems caused by “urban runoff”. In addition, this program will also implement Brownfield remediation projects. The program will fund projects which construct Agricultural Best Management Practices, Urban Stormwater Pollution Control, Acid Mine Drainage Control, and Brownfield Water Pollution Reduction, as follows:

Agricultural Best Management Practices. Eligible agricultural work is limited to recognized US Department of Agriculture, Natural Resource Conservation Service (NRCS) best management practices (BMPs). A list is available through the link below, in alphabetical order by practice name, with the practice code in parentheses. The list contains links to the practice standard (available in either Portable Document Format (PDF) or MS-Word), a conservation practice information sheet and the Conservation Practice Physical Effects (CPPE) worksheet for most practices, and to job sheets for a limited number of conservation practices. The last column contains national templates for Statements of Work associated with each conservation practice. These national templates are provided in MS-Word and are for modification and adaptation by the State Offices. These Statements of Work outline deliverables for all conservation practices in the National Handbook of Conservation Practices (NHCP), as well as for comprehensive nutrient management plan development, conservation planning, and cultural resources compliance activities.
http://efotg.nrcs.usda.gov/toc.aspx?CatID=12487

Urban Runoff Control. Eligible practices, as described in the Department’s Stormwater Best Management Practice Manual, include BMPs that transport, store, infiltrate or treat stormwater from existing developed areas. Projects will be recognized as serving developed areas either by reference to County Comprehensive Plans or through descriptions provided by applicants. The Manual is available at:
http://www.elibrary.dep.state.pa.us/dsweb/View/Collection-8305

Abandoned Mine Drainage Control (AMD). Any project designed to reduce AMD volume or concentration, or treat AMD discharges is eligible, provided there is no entity with the continuing responsibility under applicable law to accomplish the work. Included are Surface Mining Control and Reclamation Act of 1977 (SMCRA) pre-1977 Abandoned Mine Land projects as well as those 1977 and later projects which remain incomplete despite bond forfeiture. A list of eligible practices is included in Appendix 1.

Brownfield Water Pollution Reduction. Eligible projects include those projects on contaminated commercial/industrial sites whose purpose is to protect water or groundwater quality from contaminants on the site. A list of eligible practices is included in Appendix 2.

PROJECT ELEMENTS

The following is a listing and description of the project elements to be included in an application for funding. Applications are submitted to PENNVEST through the website at http://www.pennvest.state.pa.us.

Project Description

Key components of a project description include:

1. Project Location – At a minimum, the county and the 8-digit Hydrologic Unit Code (HUC) watershed identifier is needed (See http://water.usgs.gov/wsc/reg/02.html for this code) If at all possible, applicants are requested to also provide the latitude and longitude of the project.
2. Problem Statement – This is a short description of the problem that the project will fix. For example, an agricultural BMP for manure storage might be solving the following problem: "Cow manure is presently being spread on farmland at times of the year when rainfall causes some of it to run off into streams, and a cow pasture includes full access to a creek."
3. Description of Work to be Done – This is a description of the practices or structures to be implemented to address the problem described in the problem statement. For example, a project description for the cow manure problem described above could be: "The project will construct a 15,000 gallon cement manure storage structure (NRCS Practice Code 634), barnyard runoff control measures (NRCS Practice Code 561) and 0.5 miles of streambank fencing (NRCS Practice Code 382) with 2 stream crossings (NRCS Practice Code 578). In addition, a nutrient management plan (NRCS Practice Code 590) for the farm will be written by a nutrient management specialist hired by the County Conservation District."

4. Area Map – An electronic version of the map using a USGS quad sheet (1:24000 scale) or equivalent is required. More detailed maps are acceptable, if it would help describe the project.

Identification of "Green Components"

EPA's criteria are complex, and subject to change, but in general they recognize projects (or parts of projects) as "green" if they result in water or energy conservation, efficient use of energy, hydro-modification or stormwater control through non-structural measures or other innovative practices to control nonpoint source pollution. Examples of the types of projects that meet these criteria include the use of wetlands for stormwater control, rain barrels and rain gardens, riparian buffers, or selected NRCS best management practices for agricultural runoff control. The final EPA criteria for "green infrastructure" can be found on the Department website at the following link:

http://www.portal.state.pa.us/portal/server.pt/community/municipal_finance/10564/municipal_finance_programs/554058

Content of Design and Specifications

In order for a project to be considered for funding, the applicant must provide adequate technical data that allows the Department project manager to make a determination on the viability of the project. For this reason, the project is expected to be fully designed, with all the necessary planning completed. This means that the problem to be solved must be fully understood, alternatives evaluated, and site access must be obtained or under negotiation. Surveying and all design calculations must be completed, including consideration for site hydrology and hydraulic conditions. Plan view and profile view drawings must be done, along with the identification of type and quantity of construction materials, and methods of installation. The project need not be fully ready for advertisement for bid (bid forms and administrative aspects of procurement need not be completed).

The NPS program is a permanent feature of the PennVest program. Projects which do not yet meet the above standard for readiness to proceed should plan to apply for funding in the future. PennVest typically solicits applications four times per year.

All projects are required to be endorsed by an expert. The qualifications of that expert vary with the nature of the project. In general, abandoned mine drainage, urban runoff, brownfields projects and streambank restoration projects require the support of a PA licensed Professional Engineer. Agricultural projects require endorsement through the local Natural Resource Conservation Service or County Conservation District.

At this time applications for Design & Build projects are not being accepted for NPS projects. The Department is currently exploring the use of the

Design & Build concept for incorporation into the NPS program. To ensure compliance with funding program requirements, the Department is proposing a committee that shall consist of state and local government personnel, consultants and contractors to discuss, develop and implement a Design & Build concept for use in the NPS program.

Implementation Plan

Applicants need to describe the actions necessary to get the project under construction, when they will be done, and what will be required in order to maintain the facility through its design life. Permits that are required for the work and their approval date(s) need to be listed. A schedule for construction start, construction completion, and operation must be defined. The plan should include a description of the construction inspection(s) that will be done to ensure a quality outcome; including the name and credentials of the inspector(s), if known, and the hours they will be on-site. The process the applicant intends to use to complete construction must be identified. (In most cases the process will involve advertisement, bid opening, contract award and a notice to proceed). Also a description of the long-term operation and maintenance plan for the project must be included. For example, for a project that proposes to plant trees for stormwater control; is there a plan to water the trees, especially while they are getting established; is there sufficient community support to believe they will not be damaged by vandals; who is responsible for trimming and other maintenance as the trees grow.

Budget

The project budget will be captured through the Pennvest Website. Costs need to broken down between pre-design, design and construction categories. The “soft” costs are then divided into further detail to include administration costs, legal fees, accounting charges, interest during construction, engineering fees, permit, land acquisition, construction and contingency funds. Construction costs would also need to be broken into further detail to describe the major items for construction.

Cost Effectiveness Review

Background

The purpose of cost effectiveness analyses (CEA’s) is to identify the most economical approach to accomplish a desired outcome. CEA’s done for traditional wastewater projects employ a sophisticated evaluation of both capital and operations/maintenance costs. Those evaluations require identification of all of the needs at the facility over a 20-year planning period, and an identification of the most cost-effective way to satisfy those needs. Annual O&M costs for each alternative are converted into a present worth. Present worth is added to the

capital cost of each alternative to establish a total present worth. Total present worth provides a rational basis to compare alternatives that have a different mix of capital and O&M expense. The mix of options which provides the lowest total present worth costs is the cost-effective alternative, as required by PennVest for funding.

NPS Cost-Effectiveness Analysis

CEA's done for NPS projects rely on a more subjective analysis. If, for example, the objective of the project is to keep cows out of a stream, the application should show that the most economical option to solve the problem was selected. The scenario at each farm will dictate what the options are. Specific design considerations are also relevant to the analysis. NRCS has standard designs for agricultural BMP's which describe those design considerations. NRCS practices can be assumed to represent appropriate methods as long as the use described in the in the project matches the intended use of the NRCS design. The same principles apply to urban runoff, AMD and brownfields projects to the extent that standard design approaches are provided by the applicant and are shown to be relevant.

Compliance With Land Use Planning Requirements

All NPS projects must demonstrate compliance with Act 67 and 68. These two acts amended the Municipalities Planning Code to:

- Clarify the authority of counties and municipalities to create "Locally Designated Growth Areas" as part of their comprehensive land-use plans;
- Encourage and enhance "Transferable Development Rights" as a tool to preserve open space and farmland, and to drive growth to areas where it is wanted. This voluntary program would empower property owners to realize the full value of their land by selling development rights to another owner;
- Direct state agencies to consider local land-use plans or ordinances when reviewing applications for funding or permitting of infrastructure or facilities to avoid conflicts with local land use decisions;
- Give local governments greater ability to withstand legal challenges while effectively planning for growth in their communities; and
- Facilitate consistent planning at the local, county and regional levels while retaining local control.

County planning agencies and local governments have 30 days to review submittals of Pennvest projects and provide comments. If the planning agency does not provide comments within that period, applicants have the option to provide a copy of their letter requesting the review, and indicate that no response has been received.

PROJECT REVIEW AND SELECTION

Planning Consultation Meeting

All projects should have a Planning Consultation meeting. The intention of a planning consultation meeting is to save applicant and program staff time. They are ideally done when the applicant has just begun the application process, or is just contemplating the application. The attendees are usually the key person who represents the applicant, their technical expert, the Pennvest Project Specialist, and the Department project manager. The purpose of the meeting is to make sure everyone understands the project work, the applicant understands the program objectives and requirements, and a clear identification of next steps is completed. Issues and problems can be resolved quickly, such as the identification, need and final approval of permits.

Ranking Criteria

Department program staff scores projects using the rating factors below. PENNVEST adds points from the factors listed below to develop a final list of recommended projects for PENNVEST Board consideration. The PENNVEST Board reviews the applications and approves the list of projects to be funded.

Department Priority Rating Factors-Summary

Priority among eligible projects is established according to the total accumulation of 100 points for the following factors. The maximum points for each factor are noted.

(1)	Water Quality	– 30 points
(2)	Compliance	– 10 points
(3)	Planning	– 30 points
(4)	Benefit-To-Cost	– 30 points
(5)	Safety	– 5 points

(a) Water Quality – factors considered in allocating points include whether or not the project is designed to (1) address a source of impairment as identified on the 305(b) or 303(d) lists; (2) protect EV or HQ streams; (3) achieve some level of water quality improvement or protection.

(b) Compliance – a project designed to proactively address a compliance issue is given priority over a project designed to achieve compliance with a consent order and agreement or notice of violation.

(c) Planning – factors include consideration of the applicant's ability to manage the project as reflected in past experience and the definition of the project goals and objectives and the proposed project's consistency with other watershed, water quality or TMDL implementation plans.

(d) Benefit-To-Cost – this factor is a judgment call made by the regional office staff person ranking the project and is based on a comparison of relative benefits of different practices and their costs. Tables on various practices and costs and their relative impact are provided as examples in the guidance document.
(e) Safety – points are awarded based on whether or not the project addresses a critical or ongoing safety or health hazard.

PENNVEST Additional Rating Factors

To develop a final score for each project, PENNVEST adds the following points to the Department environmental project scores. The total that can be added to each project is 70 points.

(a) Economic Development – The Department of Community and Economic Development (DCED) provides this ranking based on whether or not there is a direct link to job creation or preservation and private investment.
(b) Distressed Community – DCED evaluates communities across the Commonwealth for financial well-being. Communities on the Distressed Communities list are identified in order to have access for consideration for assistance from various state agencies in order to get the communities back to normal status.
(c) Infill – PENNVEST adds 10 points to those projects that serve a city, borough or township of the first class. Redevelopment of existing population centers is a priority.
(d) Brownfield – PENNVEST adds 15 points to those projects that serve a designated Brownfield site as identified by the Department.
(e) Community Action Team (CAT) Projects – DCED adds 10 points to those projects that are in a CAT community. The CAT community system is an effort to focus financial and technical resources to specific communities identified by the CAT Team. Members of the CAT Team include DCED, the Department, the Pennsylvania Department of Transportation, the Public Utility Commission and other local and state agencies.
(f) Comprehensive Planning – DCED adds 5 points to those projects that are within communities with a comprehensive plan, where the community plan is consistent with the adopted county comprehensive plan.

Review/Approval of Permits

Applicants will be asked to list the permits that are required for the work and their approval date(s). If permits remain unapproved an explanation will be needed. The purpose of the requirement is to ensure that the project is ready to proceed. If it is not, the applicant will be advised to complete the work and apply in the next round.

Some projects will not require any permits. For example, the installation of cattle fencing would not normally require permits. Even in the case of apparently simple projects the applicant should discuss the project with their technical expert, the Department project manager and the local government. The environmental review process may also surface the need for permits that were overlooked up to that point in time.

APPENDICES

Appendix 1 -- List of Eligible AMD Practices

1. Treatment Methods – Passive

    a. Oxidation/Precipitation Basins or Ponds (OPB)
    b. Settling Ponds
    c. Anoxic Limestone Drains (ALD)
    d. Oxic Limestone Drains (OLD)
    e. Oxic Limestone Channels (OLC)
    f. Vertical Flow Ponds (VFP) or Successive Alkalinity Producing Systems (SAPS)
        1. Limestone Only Ponds (RAPS)
        2. Upflow Units
        3. Self Flushing Units
            a. Siphons
            b. Automatic Valves
                i. Solar
                ii. Conventional Power – Electrical
    g. Anaerobic Wetlands
    h. Aerobic Wetlands
    i. Manganese Oxidizing Beds (Pyrolusite Beds)
    j. Porous Barriers
    k. Bioreactors
        i. Sulfate Reducing Systems
        ii. Bacterially catalyzed Low pH Iron Oxidation

2. Treatment Methods – Semi-Active

    a. Lime Sand Dosing
    b. Aquafix Wheels (Pebble Quicklime or Sodium Hydroxide)
    c. Swedish Bucket Dosers
    d. Diversion Wells

3. Treatment Methods – Active

    a. Hydrated Lime Treatment Plant
    b. Quicklime Treatment Plant
        i. With Slaker
        ii. Without Slaker
    c. Sodium Hydroxide Treatment Plant
    d. Soda Ash Treatment Plant
    e. Treatment Facility using other Chemicals
        i. Ammonia
        ii. Liquid to Liquid Extraction

f. Other Active Treatment Technologies
    i. Aerators and Oxidizers
    ii. Activated Iron Solids (AIS) Process

4. Abatement Methods

a. Re-Mining
b. In-Situ Abatement
    i. Sulfate Reduction Processes
    ii. Bulk Void Filling (Reduce Permeability and Porosity)
    iii. Alkaline Addition (to mine environment)
    iv. Other In-Situ Treatment Processes
c. Ex-Situ Abatement
    i. Refuse Pile Reprocessing
    ii. Removal and Special Handling of Acid Forming Materials (AFM)
    iii. Alkaline Addition (to Backfills)
    iv. Consolidating, Relocating, or Mixing Mine Pools and Discharges
    v. Capping or Covering

The above list was developed by the Department Bureau of Abandoned Mine Reclamation and is used in federal Office of Surface Mining training courses. Many of these technologies are described further in the following published documents:

- *A Citizen's Handbook to Address Contaminated Coal Mine Drainage*, Region 3, 3WP12, Philadelphia, PA, EPA-903-K-97-003, September, 1997

- *Overview of Passive Systems for Treating Acid Mine Drainage*, West Virginia University Extension Service, Jeff Skousen, West Virginia University

Appendix 2 -- List of Eligible Brownfields Practices

It is recommended that applicants use the Department Stormwater BMP Manual (363-0300-002, December 2006) as a reference source to review and understand how to properly develop their Brownfields site. Most water engineers practicing in Pennsylvania have read it and use it regularly and it's not too technical for someone with limited stormwater knowledge or those used to working in just the subsurface. Section 9 – Stormwater Calculations and Methodology has checklists for each BMP the applicant or reviewer could use.

Non-structural
The first 3 BMPs listed below are particularly important for Brownfield sites because natural features allow optimal draining to occur and help prevent pollutants from entering waterways or aquifers at higher concentrations. All these BMPs help improve water quality and reduce the stormwater volume and peak rates that enter waterways.

Protect Sensitive and Special Value Resources
BMP 5.4.1 Protect Sensitive and Special Value Features
BMP 5.4.2 Protect/Conserve/Enhance Riparian Areas
BMP 5.4.3 Protect/Utilize Natural Glow Pathways in Overall Stormwater Planning and Design

Cluster and Concentrate
BMP 5.5.1 Cluster Uses at Each Site; Build on the Smallest Area Possible
BMP 5.5.2 Concentrate Uses Areawide through Smart Growth Practices

Minimize Disturbance and Minimize Maintenance
BMP 5.6.1 Minimize Total Disturbed Area – Grading
BMP 5.6.2 Minimize Soil Compaction in Disturbed Areas – soil compaction is the #1 way developers try to meet site-specific "remediation" standards. By putting a 2-foot soil cap over the entire site, it is believed to prevent contaminant migration. From a stormwater standpoint, it would be good to try to minimize compacting soil and paving the entire site and encourage infiltration in areas along the site boundary where the water is migrating towards. It really does depend on the site-specific conditions, though.
BMP 5.6.3 Re-Vegetate and Re-Forest Disturbed Areas, Using Native Species

Reduce Impervious Cover
BMP 5.7.1 Reduce Street Imperviousness
BMP 5.7.2 Reduce Parking Imperviousness

Disconnect/Distribute/Decentralize
BMP 5.8.1 Rooftop Disconnection – Depending on site-specific conditions, disconnecting the rooftop leaders and connecting them to a reuse system would probably be more beneficial on a Brownfields site than allowing it to infiltrate

vegetated areas connected to the soil horizon below. There may be large uncontaminated areas that the rooftop runoff could be directed to.
BMP 5.8.2 Disconnection from Storm Sewers - Depending on site-specific conditions, disconnecting the storm sewers and connecting them to a reuse system would probably be more beneficial on a Brownfields site than allowing it to infiltrate vegetated areas connected to the soil horizon below. There may be large uncontaminated areas that the rooftop runoff could be directed to.

Source Control
BMP 5.9.1 Streetsweeping – This BMP would be beneficial for the large impervious areas that are often constructed on Brownfield sites. Removing trash and soil particulates that may be bound to hazardous compounds would help prevent contamination from entering the waterway or aquifer.

Structural
Infiltration on brownfield sites seems to bring together dichotomous management of stormwater and contamination. Developers will often cap the whole site, but fail to mention that they rely on the natural hydrogeologic processes to dilute, disperse, and advect contamination. The infiltration BMPs are listed below, but are contingent on site-specific conditions.

Volume/Peak Rate Reduction by Infiltration
BMP 6.4.1 Pervious Pavement with Infiltration Bed – using porous pavement as part of the cap in uncontaminated areas would be beneficial for Brownfield sites.
BMP 6.4.2 Infiltration Basin
BMP 6.4.3 Subsurface Infiltration Bed
BMP 6.4.4 Infiltration Trench
BMP 6.4.5 Rain Garden / Bioretention
BMP 6.4.6 Dry Well / Seepage Pit
BMP 6.4.7 Constructed Filter – this would work in parking lot areas often constructed on Brownfield sites
BMP 6.4.8 Vegetated Swales
BMP 6.4.9 Vegetated Filter Strip – this would work in parking lot areas often constructed on Brownfield sites
BMP 6.4.10 Infiltration Berm and Retentive Grading – this is a beneficial BMP to use along the downgradient site boundary where puddling and stormwater volume is high

The following BMPs are ideal for Brownfields sites that have limited infiltration potential and encourages mimicking of the natural hydrologic regime by restoring part of the evapotranspiration process and/or reusing the water on-site rather than increasing the amount that enters the waterway or aquifer:
Volume/Peak Rate Reduction
BMP 6.5.1 Vegetated Roof
BMP 6.5.2 Rooftop Runoff – Capture & Reuse

The following BMPs could be designed so that infiltration is limited on the Brownfield site, but the stormwater volume is still retained:

Runoff Quality/Peak Rate
BMP 6.6.1 Constructed Wetland
BMP 6.6.2 Wet Pond / Retention Basin
BMP 6.6.3 Dry Extended Detention Basin
BMP 6.6.4 Water Quality Filter

Restoration BMPs are ideal to use on Brownfield sites:
BMP 6.7.1 Riparian Buffer Restoration
BMP 6.7.2 Landscape Restoration – since Brownfield sites will undergo landscape restoration anyway, consideration of stormwater in the design will allow some of the volume to be captured and evapotranspired by the landscaping vegetation.
BMP 6.7.3 Soil Amendment and Restoration – this one could be used in conjunction with a Soil Vapor Extraction (SVE) system or Dual-Phase Vapor Extraction (DVPE) system, making it an ideal stormwater Brownfield BMP.
BMP 6.7.4 Floodplain Restoration – many of PA's floodplain are filled with fine-grained legacy sediments, disconnecting it from the aquifer. By restoring the floodplain to natural hydrologic conditions, a great deal of sediment and silt will be removed and could be reused for grading fill on the Brownfield site. If the soil contains high levels of nitrogen or phosphorus, it may need a clean fill cap or could be transported and sold as nutrient-rich soil to nearby farmers.

Other BMPs that could be used on Brownfield sites:
BMP 6.20 Level Spreader – this might have some usefulness on a Brownfield site where there is a large parking lot and the upgradient portion of the site has a higher slope.
BMP 6.21 – Special Detention Areas – Parking Lot, Rooftop – retaining the water on a roof or in the parking lot could be feasible for Brownfield sites that have limited infiltration potential.