west virginia department of environmental protection

# Groundwater Programs and Activities

## Biennial Report to the West Virginia 2010 Legislature

Joe Manchin III, Governor
West Virginia

Randy C. Huffman, Secretary
West Virginia Department of Environmental Protection

Scott G. Mandirola, Acting Director
Division of Water and Waste Management

William F. Timmermeyer II
Groundwater/UIC/Stormwater Programs Manager
Division of Water and Waste Management

## Editor's Notes

This biennial report was compiled and edited by the Division of Water Resources' Groundwater Program staff, using information submitted by agencies with groundwater regulatory authority. Copies of this report can be obtained on-line at www.wvdep.org or from:

Division of Water and Waste Management
Groundwater Program
601 57th St., S.E.
Charleston, WV 25304
(304) 926-0495
FAX (304) 926-0496
TDD (304) 926-0489

Rules promulgated by West Virginia State Agencies mentioned in this report can be obtained from:

Secretary of State
Administrative Law Division
Building 1, Capitol Complex
1900 Kanawha Boulevard East
Charleston, WV 25305
(304) 558-6000

Copies of documents and educational information mentioned in this report can be obtained from the individual programs with groundwater regulatory responsibilities. For more program activity information, please contact the respective regulatory agency. A list of these agencies is included in Appendix A.

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# GROUNDWATER BIENNIAL REPORT TO THE 2010 LEGISLATURE

## I. EXECUTIVE SUMMARY

The Groundwater Protection Act, West Virginia Code Chapter 22, Article 12, Section 6.a.3, requires the West Virginia Department of Environmental Protection (WVDEP) to submit a biennial report to the Legislature on the status of the state's groundwater and groundwater management program, including detailed reports from each agency that holds groundwater regulatory responsibility. This is the ninth Groundwater Biennial Report to the Legislature since the passage of the Act in 1991 and covers the period from July 1, 2007 through June 30, 2009.

The WVDEP Division of Water and Waste Management (DWWM) Groundwater Program is responsible for compiling and editing the information contained in this report. The WVDEP, the West Virginia Department of Agriculture (WVDOA), and the West Virginia Department of Health and Human Resources (WVDHHR) all have groundwater regulatory responsibility and have contributed to this report. The boards and standing committees that share the responsibility for developing and implementing rules, policies, and procedures for the Ground Water Protection Act are: the Environmental Quality Board, the Groundwater Coordinating Committee, the Ground Water Protection Act Committee, the Groundwater Monitoring Well Drillers Advisory Board, the Well Head Protection Committee, and the Non-Point Source Coordinating Committee.

The purpose of this report is to provide a concise, yet thorough, overview of the programs charged with the responsibility of protecting and ensuring the continued viability of groundwater resources in West Virginia, and to convey the challenges faced and the goals accomplished as the agencies, programs, and committees work together to protect and restore West Virginia's water resources.

One difficulty in achieving the goals of the Act has been the lack of specific hydrogeologic information about the state's groundwater, such as regional and local potentiometric surfaces (water levels), groundwater quality, groundwater flow studies, and access to statewide dedicated groundwater monitoring data. As more regulated development occurs, especially pertaining to stormwater discharge, it is hoped that the WVDEP will compile a database of constituents found in stormwater that can be utilized to protect groundwater resources. As more stormwater discharge sites come under regulation, a clearer picture begins to emerge of potential contaminants found in stormwater. A centralized database linked to the geographic information system (GIS) coverages that can be accessible to the various agencies and the public will greatly facilitate resolving this problem.

Also needed is continuing outreach to the citizens of West Virginia on issues such as nonpoint source pollution, the protection of individual groundwater and drinking water sources, and the creation of toll-free help lines to enhance statewide consistency and a unified approach to the implementation of groundwater rules. Much of this need is addressed by five-year cooperative studies performed jointly between the Division of Water and Waste Management (DWWM) and the United States Geological Survey (USGS). The current DWWM/USGS study is presented in Section D of this report.

The Ambient Groundwater Quality Monitoring Network was established by DWWM in cooperation with the USGS in 1992 and is an ongoing project. This Network provides valuable data critical to the management of West Virginia's groundwater resources. The major objective of the study is the assessment of the ambient groundwater quality of major systems (geologic units) within the State, and the characterization of the individual systems. Characterization of the quality of water from the major systems will help to (1) determine which water quality constituents are problematic, (2) determine which systems have potential water quality problems, (3) assess the severity of water quality problems in respective systems, and (4) prioritize these concerns. Only by documenting the present ambient groundwater quality of the major systems can regulatory agencies assess where water quality degradation has occurred and where potential degradation is a result of natural processes or human activity.

Spatial variability in water quality is determined for specific geologic units based on the annual sampling of approximately 30 wells. This sampling will continue over a period of approximately five years and will provide a database of more than 175 wells. Wells will be sampled in specific drainage basins in given years, rotating annually to new basins, thus providing sampling of groundwater in all watersheds of the state over the five year period. The watershed samples will correspond to those from which DWWM will be collecting stream water samples as part of its Watershed Initiative and will provide a linked dataset of groundwater and surface water data that can be used to assess water quality conditions throughout the state.

Upon completion of the five-year sampling program, some wells may be resampled as necessary, then comprehensive statistical analyses of all groundwater quality data will be conducted. DWWM will prepare an interpretative report summarizing ambient groundwater quality in West Virginia, which will include an assessment of future data needs. All associated groundwater quality data for each sampled well and summaries of groundwater quality for each respective watershed will be published in the USGS Water Resources Data for West Virginia Annual Report and the results reported to the DWWM. These results will be incorporated into reports submitted by the DWWM.

The 30 sampling sites in the Group D watershed that were sampled in the ambient groundwater quality study are listed in the data tables in Appendix B of this report. These tables provide a detailed analysis of geochemical parameters, ionic concentrations, pesticides and concentrations of metals, radon, nutrients, organic carbon and volatile organic compounds.

While many challenges remain, much has been done to provide protection and continued viability of the groundwater resources of the state of West Virginia. The WVDEP, WVDOA, and WVDHHR continue to work closely to fulfill the mission of the Department of Environmental Protection, "To promote a healthy environment".

## II. Groundwater Protection and Watershed Management

Under the guidance of the United States Environmental Protection Agency (EPA) and the signing of the West Virginia Watershed Management Framework Document (signed in 1997), a new approach to management of the state's groundwater has begun. Total watershed management strives to bring a holistic approach to protecting the waters of the state. The signing of this document by those agencies that chose to participate as partners indicates their understanding that, by collective agreement and cooperation, stakeholders can better achieve the goals of individual water quality programs. The WVDEP has chosen to participate as a partner and stakeholder in watershed management in West Virginia.

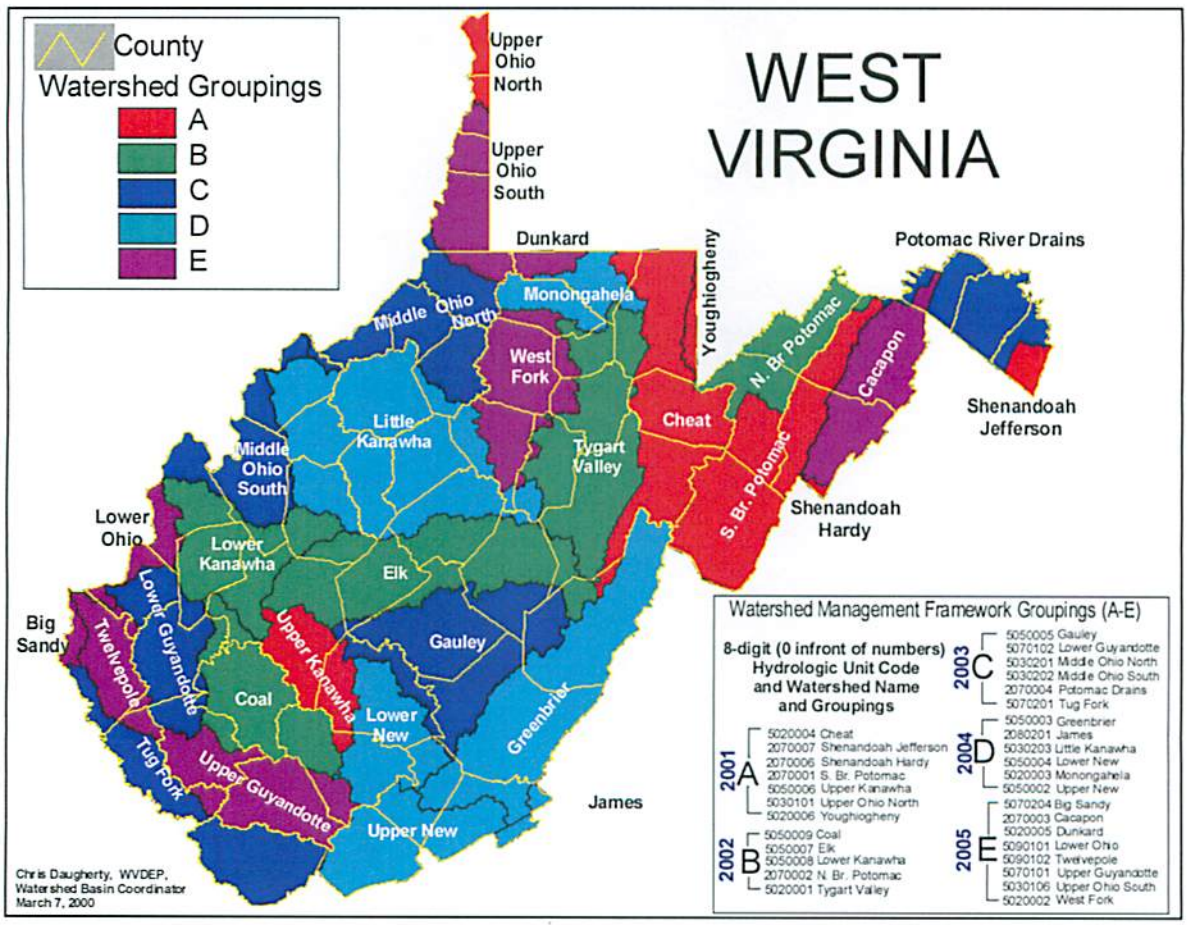
Agencies having groundwater regulatory authority and responsibility provide repositories for ground and surface water data collected about those facilities under their authority. As stated in this report's Executive Summary, compilation of the available groundwater data into a collective database continues as a work in progress, providing a picture of the State's groundwater protection activities and the contributions of the associated programs.

Eventually, all groundwater data that is generated by these activities and facilities will be housed in a central data repository overseen by senior scientists from each agency under the guidance of the WVDEP's Groundwater Coordinating Committee and Information Technology Office. We anticipate that population of the central database will be implemented using a watershed approach. Each watershed is comprised of smaller divisions called sub-watersheds from which data will be gathered and entered systematically until the larger picture emerges.

## Map of Watershed Groups for 2007-2009

A list of the major rivers sampled in each watershed group appears in the table below.

| WEST VIRGINIA WATERSHED SAMPLING 2008 |
|---|
| ***Group D - 2008*** |
| Little Kanawha River |
| Monongahela |
| Greenbrier |
| James River |
| Lower New River |
| Upper New River |



# III. BOARDS AND COMMITTEES

The following boards and committees are responsible for developing and implementing policies, procedures and rules to ensure proper application of the Groundwater Protection Act (GWPA).

**Environmental Quality Board**

**Appellate Activities**

The Board is authorized by *W.Va. Code* § 22-11-21 to hear appeals of agency decisions concerning groundwater protection. The following are administrative appeals which were filed with or addressed by the Board during the last biennial reporting period and include issues arising under provisions of the Groundwater Protection Act:

**Huntington Alloys Corporation**
Appeal No. 04-15-EQB
Filed: May 14, 2004
*Final Order: November 13, 2008*

**St. Mary's Refining Company, Inc.**
Appeal No. 06-25-EQB
Filed: October 6, 2006
Agreed Order: March 26, 2009

**Pennzoil-Quaker State Company**
Appeal No. 06-27-EQB
Filed: October 10, 2006
Agreed Order: March 26, 2009

**Andrew and Karen Zetts**
Appeal No. 08-02-EQB
Filed: January 7, 2008
Pending

**West Virginia Alcohol Beverage Control Administration**
Appeal No. 09-04-EQB
Filed: May 1, 2009
Agreed Order: June 3, 2009

**Review of Civil Administrative Penalties**

*W. Va. Code* § 22-12-10 establishes procedures for review of the assessment of civil administrative penalties. This section provides for an informal hearing to review the penalty, and gives the Board appellate authority for review of the final decision. The Board has not received any appeals filed pursuant to this provision.

# IV. DEPARTMENT OF AGRICULTURE
## A. Overview of Groundwater Protection Activities

### 1. Groundwater Protection Goals and Principles

Environmental Stewardship is a fundamental principle of the agricultural community. The protection of groundwater resources through prudent development and use and the control of contributing environmental factors are the goals of the Department of Agriculture. The maintenance and protection of current and future groundwater quality through enforcement of State and Federal regulations, cooperative outreach and education programs, and support and investigation of Best Available Technologies are continuing objectives in the promotion and expansion of agriculture in the State. The Commissioner shall utilize any and all existing regulatory authority available and shall petition additional regulatory authority, if needed, to ensure the protection of the groundwater resource.

The Commissioner may develop chemical-specific regulations or generic mandatory Best Management Practices (BMPs) pertaining to any and all aspects of pesticide use. The Commissioner finds that the existing categorization and distribution of soils within the state, combined with the accepted properties of pesticides known or suspected to be highly mobile in the soil profile, do not warrant the promulgation of additional area-specific or regional regulations beyond those required by the products registration program. Although empowered by both Federal and State statute, the Commissioner finds that the existing use restrictions have protected the existing quality of this resource. The WVDA has maintained a cooperative and evolving pesticide management process under the Federal Groundwater Protection Initiative. There have been no significant changes in pesticide use in the State during the current report period. Retirement, loss of profit margins, and urban encroachment have resulted in some reduction in size and intensity of certain agricultural facilities.

Contamination sources not regulated by Federal statute, but deemed detrimental to the current or future quality of groundwater, will be addressed through educational outreach and, when possible, through cooperative implementation of BMPs. In response to the need for comprehensive strategies for the protection of groundwater and surface water quality, the Department has initiated and supported state-of-the-art technologies. Research and demonstration projects in the areas of biogeneration of alternate fuels and genetic identification of bacterial contamination are ongoing.

Priorities in groundwater protection are established by the identification of areas where suspected or detected chemicals are used. Intensive agricultural production is restricted to readily identifiable areas of the state, further facilitating the establishment of priorities. The Department of Agriculture's Pesticide Regulatory Programs operates within the parameters delineated in the West Virginia Groundwater Protection Act and is the lead State agency for enforcement of the Federal Fungicide, Insecticide, and Rodenticide Act (FIFRA). Operation of the Department as the State lead agency for FIFRA is closely monitored by regional and national offices of the Environmental Protection Agency. This close supervision has ensured that the

Department has maintained and exercised the mandates of Federal Pesticide Statutes and related environmental health directives. State regulations have, in fact, anticipated and preceded Federal regulations (section II).

The registration of pesticides and the regulation of commercial pesticide application businesses, commercial applicators, and private applicators is approved under the WVDEP's Groundwater Certification Program. The certification of pesticide applicators parallels the licensing strategy used in other agencies. The initial certification process of pesticide applicators requires that an applicant demonstrate an understanding of the State Groundwater Protection Act and the specific groundwater protection regulations promulgated by the Department, i.e. Title 61 SCR 6B, 12A, 12H, 12I and 22A. Approximately 3,000 applicators are certified.

In order to maintain certification, private applicators must attend five hours of pre-approved update training over a three-year period, and commercial applicators must attend ten hours. Updates on groundwater protection programs and revisions of pesticide use relative to groundwater protection were included in the update training programs.

The Department has been in full compliance with the Federal pesticides in groundwater management initiative as administered by the EPA's Office of Pesticide Programs.

**2. Pesticide Groundwater Fee Collection; Recycling and Disposal Activities**

Every product qualifying as a pesticide as defined under the West Virginia Pesticide Control Act must be registered with WVDA prior to release in commercial channels. Under the West Virginia Groundwater Protection Act each of these products is assessed an annual fee of fifteen dollars by WVDEP. Approximately 10,000 products were registered during each of the past two years. A portion of the fee is transferred to WVDA to support groundwater protection programs.

The WVDA has continued the pesticide container collection and recycling program. This program diverts pesticide containers from permitted landfills and illegal disposal and reduces the potential for pesticide contamination of ground water resources. Containers are ultimately reprocessed and used in the production of shipping pallets, fence posts and other structural components.

Improper disposal of large quantities of pesticides is a threat to the State's groundwater. Proper disposal is usually cost prohibitive, which leads to alternate, environmentally unsound methods of disposal. The WVDA has identified and disposed of 14,000 pounds of waste and obsolete pesticides. The diversion of this material from the regular waste stream is a significant reduction of the threat to ground water reserves in the State.

### 3. Groundwater Rules

The WVDA is monitoring fertilizer through legislative and procedural rules. These rules include:

| | |
|---|---|
| 61 CSR 6B | Primary and Secondary Containment of Fertilizer |
| 61 CSR 6C | General Groundwater Protection Rules for Fertilizer and Manures |
| 61 CSR 22B | Best Management Practices for Fertilizers and Manures |

**61 CSR 6B.** The Primary and Secondary Containment of Fertilizer rule establishes standards for the purpose of protecting the groundwater resources of the State of West Virginia.

Facilities regulated by this rule must submit a design plan and specifications for construction to the Commissioner for approval. This applies to both liquid and dry fertilizers. The operator of a storage facility shall prepare a written Discharge Response Plan for the storage facility for each type of bulk fertilizer stored that includes procedures used in controlling and recovering, or otherwise responding, to a discharge.

**61 CSR 6C.** The General Groundwater Protection Rules for Fertilizer and Manures establishes practices to prevent or minimize the entry of nutrients from fertilizers and manures into groundwater while maintaining and improving the soil and plant resources of this State. The Department encourages the education of all users of fertilizers and manures so they will have the knowledge and technical means to respond independently and voluntarily in addressing environmental concerns. The WVDA also encourages the development of training and educational programs for those who make recommendations for application rates for fertilizers and manures and for those who apply fertilizers and manures.

Agricultural BMPs and comprehensive environmental management plans are promoted through the United States Department of Agriculture's Natural Resource Conservation Service (NRCS). The NRCS has no regulatory authority in the administration or enforcement of State or Federal pesticide regulation. The NRCS has effectively used Federal cost-share programs to promote and establish low chemical input production practices and chemical handling facilities.

The environmental impact of agricultural fertilizers and soil amendments are not determined by the WVDA. The department does maintain a quality assurance and label compliance monitoring program for commercial fertilizers. Bulk fertilizer dealers are required to register with the WVDA, and are subject to inspections as outlined in the regulation. These duties are delegated to the WVDA's Field Services Section of the Regulatory and Environmental Affairs Division.

The establishment of priorities is partially independent of sub-regional hydrogeologic parameters. The preliminary data on groundwater contamination by pesticides indicates that

areas of gross vulnerability, such as karst geology, in conjunction with established and repetitive production of row crops, are equally vulnerable. Assessment of vulnerability at a sub-regional scale is beyond the resources and jurisdiction of the WVDA. The department will consult with appropriate Federal and State agencies to establish protection and monitoring priorities to ensure the continued protection of public health.

**61 CSR 22B.** BMPs for Fertilizers and Manures is a procedural rule to prevent or minimize the entry of nutrients from fertilizers and manures into groundwater while maintaining and improving the soil and plant resources of the State. Best Management Practices for Fertilizers and Manures calls for fertilizers to be stored inside a sound structure or device having a cover or roof top, side walls, and a base sufficient to prevent contact with precipitation and surface water. Manure is to be stored in a facility that meets or exceeds the standards of the Soil Conservation Service Field Office Technical Guide.

On July 1, 1993, Non-Bulk Pesticide Rules for Permanent Operational Areas (Title 61 Series 12 I) became effective. This regulation, which contains a four-year implementation period, became enforceable July 1, 1997. The activities of the WVDA during the report period, which pertain to the enforcement of this regulation, have focused on review and approval of facility design and construction. The regulation addresses agricultural production, golf course maintenance, right-of-way applications, ornamental and turf production, and some general pest control operations. As part of the routine inspections of operations, evaluation and documentation of secondary containment, when applicable, is included in the inspection report. To date, there have been no enforcement actions resulting from the regulation.

The WVDA has worked closely with the regulated community in the maintenance of existing demonstrational containment and the construction of permanent facilities. All bulk pesticide dealers and commercial agricultural application businesses are in compliance with the secondary containment regulation. A majority of the tree fruit industry is in compliance by means of permanent loading areas or modification to operational procedures as specified by 61 CSR 12I and CSR 22A.

The Department has consulted with the U.S. Department of Agriculture and NRCS in the design and construction of secondary containment facilities funded through cost-share monies. The structures were approved under provisions of the Groundwater Certification Program.

Since groundwater contamination due to chemical accumulations at pesticide handling and application equipment maintenance areas has not been identified in West Virginia, the promulgation of 61 CSR 22A was seen as a preventive measure. Federal label amendments and increased restrictions on the use of prime groundwater contaminants have, in effect, duplicated this regulation. The WVDA anticipated Federal restrictions and obtained significant lead time in the implementation and acceptance of the restrictions.

Related regulations, which have been described in previous reports, include:

| | |
|---|---|
| 61 CSR 22 | Generic State Management Plan for Pesticides and Fertilizers in Groundwater |
| 61 CSR 12G | General Groundwater Protection Rules for Pesticides |
| 61 CSR 22A | Best Management Practices Act - Temporary Operational Areas for Non-Bulk Pesticide Mixing and Loading Locations |
| 61 CSR 12H | Bulk Pesticide Operational Rules |
| 61 CSR 12I | Non-Bulk Pesticide Rules for Permanent Operational Areas |

The increasing use of new products, commercial applicators and restrictions on product labels, as well as the low frequency and level of detection of pesticides in groundwater do not necessitate promulgation of additional regulations at this time. The WVDA has maintained its role in the Wellhead Protection Program and Source Water Advisory Committee. Program specialist and compliance officers are working closely with the regulated community to improve compliance with existing regulations by means of practice and cost-effective methods.

**4. Groundwater Projects**

The WVDA continues to monitor and improve surface water quality in West Virginia. Environmental staff collects approximately 2,640 water quality samples per year on 11 streams in West Virginia's eastern panhandle. These samples are analyzed for parameters such as pH, Temperature, Conductivity, Dissolved Oxygen, Nitrate, Nitrite, Ammonia, Orthophosphate, Total Phosphorous, Turbidity, and Total Suspended Solids.

The WVDA is also nearing the end of a two-year study on Atrazine in surface waters. This study began in April 2008 and will be completed in March 2010. The purposes of this study is to determine if atrazine can be found in select West Virginia streams via runoff and/or groundwater transport, and if so, determine concentrations of atrazine in these streams. Streams and Sites to be monitored include:

**South Branch**

SB08 (South Branch @ Upper Tract)
SB12 (South Branch @ Welton Park)
SB14 (South Branch @ Buzzard Ford Bridge)
SB20 (South Branch @ Romney Bridge)
SB26 (South Branch @ Mouth of the South Branch)

**Lost River**

LR07 (Lost River @ Lost River)
LR08 (Lost River @ McCauley)

**Patterson Creek**

PC06 (Patterson Creek @ Burlington)

PC10 (Patterson Creek @ Low Water Bridge)

**South Fork**

SF19 (South Fork @ Moorefield)

Samples are collected April through June at a frequency of two times per month and July through March at a frequency of one time per month. Results from the study will be presented in summer 2010.

Most poultry producers have Nutrient Management Plans that specify cropping recommendations for all acreage to which commercial fertilizer, litter or manure is applied. Results of soil tests, coupled with specific crop yields or soil utilization, are used to develop recommendations concerning amounts of fertilizers to be applied to each field. Several government agencies make recommendations and participate with landowners on developing NMP.

To further assist poultry growers, additional meetings and workshops are routinely conducted by representatives of the WVDA and the West Virginia University Cooperative Extension Service (WVUCES). To facilitate nutrient management plan implementation, Moorefield's Nutrient Management Laboratory of the WVDA routinely analyzes more than 200 litter/manure samples per year.

In an effort to incorporate nutrient management into all existing poultry operations, the staff of the West Virginia Conservation Agency and USDA Natural Resources Conservation Service provides technical assistance to local integrators in developing nutrient management plans. There are currently more than 100 certified Nutrient Management Planners in the State of West Virginia.

# IV. DEPARTMENT OF AGRICULTURE
## B. Regulatory and Environmental Affairs Division
## Pesticide Regulatory Programs

As defined by the EPA, a pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. Though often misunderstood to refer only to insecticides, the term pesticide also applies to herbicides for the control of weeds, fungicides for fungus and plant pathogens and other organisms such as rodents and termites which damage food fiber or present threats to human health. The regulation of pesticides recognizes the toxic nature of pesticides and uses a risk benefit analogy in the review and registration process of each. Often referred to as the "risk benefit balance" an example is the use of pesticides to control rats and mice (rodenticides). With rodenticides being toxic to mammals, do the benefits of the decreased risk of food contamination and threats to human health outweigh the risk of proper use?

The release of a known toxin into the environment for the control of a greater threat is a unique situation in environmental regulations. Therefore, it is deemed necessary to regulate and control pesticides by their registration, use and application. The regulation of all pesticides is through the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) and is administered at the Federal level by the EPA's Office of Pesticide Programs. Every three years, the Office of Pesticides Programs (OPP) and the Office of Enforcement and Compliance Assurance (OCEA) release a guidance document which establishes the priorities and minimum requirements for the enforcement of FIFRA at the State level. Failure of a State agency to meet the minimum requirements or "core activities" listed in the guidance document may result in forfeiture of the state lead agencies primacy in the enforcement of FIFRA.

State laws generally mirror FIFRA and are contained in that state's code of laws and regulations. In most states, the Department of Agriculture is the state lead agency for enforcement. A contractual cooperative grant agreement based on core and supplemental activities to achieve measurable standards as specified by the guidance document establishes the priorities and demonstration of progress towards the established goals.

The label on a pesticide product is a legally enforceable document and addresses, either directly or indirectly, the majority of the enforcement activities that are encumbered by the State in the enforcement of FIFRA and state laws. It is essential to recognize that under FIFRA, "use" is a comprehensive term. All activities from sale, including the eligibility of an individual to purchase products, through the ultimate disposal of the container or surplus product is addressed under FIFRA and consequently the OECA guidance document the State agrees to enforce.

EPA's protection of ground water from pesticides can be traced back to the early 1980's. The evaluation as to the extent of pesticides detections in ground water and the development of management and enforcement strategies to minimizing pesticide impacts in the environment has been a dynamic process. Initial OPP/OECA guidance was for the development of a Generic State Management Plans (GSMP), which would outline the overall strategy and identifying

regulatory actions that had been or could be promulgated. After submission and concurrence on a GSMP by EPA region III in Philadelphia, WVDA was to develop Pesticide Specific Management Plans (PSMP) for pesticides that would be later identified by the OPP.

The Generic plan that WVDA had submitted several years ago has been placed in a reference status as an updated and more comprehensive management strategy or system, is being implemented. The new strategy first appeared in the current OPP/OECA guidance document as the "FIFRA Water Quality Grant Guidance". The strategy is commonly identified by the regulatory community by the acronym for its' on line data recording system POINTS (Pesticides of Interest Tracking System) or Pesticide Water Quality Program. The POINTS strategy is unique in several aspects:

- ❖ All water resources, surface, groundwater and watersheds are to be considered in the evaluation and protection strategies.

- ❖ Pesticides that are the cause of water quality impairments under the Clean Water Act are to be prioritized.

- ❖ All pesticide uses, agricultural urban and industrial are to be considered.

- ❖ An initial list of pesticides to be addressed has been compiled through surveys of all State FIFRA Issues Research and Evaluation Group (SFIREG).

- ❖ A three-tiered approach has been adopted under the guidance.

Existing regulations and ongoing groundwater protection programs are fully recognized and accredited.

The POINTS/Pesticide Water Quality Program are not in conflict with existing Departmental regulation addressing groundwater protection. A brief review and update of these regulations, which were promulgated within the guidelines of the SMP, will be addressed later in the report.

The goal of WVDAs Pesticide Water Quality Program is to ensure that pesticides do not adversely affect the nation's water resources. Reducing the concentration of pesticides in urban and agricultural watersheds are strategic targets under the OPP/OECA 2006-2011 guidance objective "**Protect the Environment from Pesticide Risk.**" WVDAs goal is to protect the environment by continued enforcement of State and Federal regulations to ensure pesticides continue to be safe and available when used in accordance with the label.

The inclusion of surface and ground water in a single management strategy reflects the comprehensive aspect of all environmental quality issues. It facilitates inter-agency and inter-program data sharing and the evaluation of synergistic effects. Water shed based environmental

strategies and outreach is widely used and has proven to be very effective in the agricultural sector.

During this reporting period there were no monitoring or sampling programs for pesticides in ground or surface waters of the State. The compilation of data from surface water sampling done by WVDA in 2007 in the South Branch of the Potomac watershed was completed in 2008. The study confirmed seasonal and temporal detections of agricultural herbicides at levels well below maximum acceptable limits as adopted by either the Clean Water Act (CWA) or Safe Drinking Water Act (SDWA) and essentially mirrored historical data gathered from across the county over the past 10 years under the SMP program guidelines.

A specific target in the current FIFRA guidance is the elimination of three pesticides diazinon, chlorpyrifos and malathion from urban watersheds. All three pesticides are insecticides whose use in the agricultural sector has been severely diminished, but remain as possible threats from urban use. By 2011 two insecticides, azinphos methyl and chlorpyrifos are to be eliminated from agricultural watersheds. According to The United States Geological Services "National Water Quality Assessment" program, circular 1291 does not identify impaired watersheds or surface waters in West Virginia. Likewise, WVDA is unaware of any impaired water shed, surface water or ground water reserve that exceeds standards. Although the situation provides performance measurement criteria that is easily obtainable additional field work and monitoring will be required to maintain the States impairment free status.

The initial list of pesticides that resulted from the SFIREG concurrence totals 57 products including commonly recognized and used pesticides such as glyphosate (Roundup) and relatively obscure compounds such as copper based products used in marine paints and for the suppression of aquatic vegetation (see Figure 8). The 57 pesticides are indentified as "pesticides of interest". The first step in the three-tiered strategy is to evaluate each of the listed pesticides of interest and evaluate or identify those pesticides that may have the potential to threaten water quality. The criteria for the evaluation are left open to each state. But at least one of six categories has to be chosen. The categories are as follows: no activity; cause of impairment under 303d CWA; not evaluated; under review; not a pesticide of concern; or pesticide of concern.

Some states have taken an historic approach in evaluation by selecting products that are known to have impacted water, as would be the case with a 303d listing. Physical characteristics such as the products solubility in water and its persistence in the environment may also be used. Products that are no longer in use may not even be evaluated. The percentage of overall use of a specific pesticide is also a valid evaluation tool. A product representing 75 percent of the total pesticide use in a particular watershed poses a greater threat than the remaining 25 percent. The same reasoning can be applied to cancelled pesticides or pesticides undergoing cancellation or use reduction. While the criteria appear to be ambiguous, the two tiers that follow this initial characterization, "active management" and "Demonstrated Progress," generate the accountability and measurement parameters.

The guidance intentionally allows this process to occur over time so that individual States can focus resources on immediate concerns. A decision "to take no activity" or "not to evaluate" is a representation of prioritization or a recognition that the product is already under review at a Federal level. A pesticides evaluation is also dynamic, as additional data is generated by EPAs re-registration eligibility decision (RED) process the product may drop out of use or become severely restricted resulting in a lower threat.

None of the 57 pesticides of interest have been identified as causing impairment under the 303d section of the Clean Water Act. Two herbicides, bentazon and bromacil, have been evaluated and listed as "no activity." No activity is a method of putting an evaluation aside or on hold due to infrequency of use in the State or recognition that the pesticides is being reevaluated, it does not mean that the pesticides cannot be reevaluated if required. The Insecticides carbofuran which is in the final phases of cancellation and carbaryl have also been evaluated as requiring no activity. Carbaryl, commonly known as Sevin will likely stay in the market it is in a class of compounds currently undergoing the RED process.

Eleven pesticides have been classified as "not evaluated." Of the eleven, two are insecticides (imidacloprid and lamda-cyhalothrin) and nine are herbicides (2,4-D, imazapyr, pendimethalin, metolachlor, picloram, prometon, tebuthiuron, triclopyr, and triflralin). While similar to the hold status of "no activity," "not evaluated" was chosen for pesticides with known uses but no record of impact. The largest use of these herbicides are for utility right of way maintenance but have yet to be connected with significant impacts on water resources. Product labels and supporting State regulations restrict both ground and aerial applications in areas of surface water or vulnerable ground water recharge.

Seven pesticides have been evaluated as "under review." This categorization is the result of known impacts on water resources, extensive use or other environmental concerns. The herbicide atrazine is the target of the groundwater quality/pesticide initiative and remains as the primary compound detected in surface and groundwater. Another herbicide clopyralid has agricultural, industrial and residential uses. Glyphosate is proving to be the most commonly used home owner herbicide. The phonoxy class of herbicides has been identified as a probable endocrine disrupting compound and remains in wide use. Dicamba is a herbicide that is frequently the subject of complaint in many pesticide investigations. The insecticides chlorpyrifos and diazinon are being reviewed due to wide spread historical use and the continued use by home owners under the existing stocks provision of cancelled pesticides as specified in FIFRA.

The 35 remaining pesticides are currently designated as "not being a pesticide of concern." (See appendix 1 State List of Pesticides of Water Quality Concern.) As the initial list of pesticides that are under review progress into the next tiers of the program, the "not pesticides of concern" will be reevaluated. It is important to remember that the current guidance has allowed for the process to occur over time and recognizes that as use patterns and additional data become available pesticides may have to be reclassified. The WVDA's actions to date are in full compliance with the progress delineated in the current guidance have EPA Region 3 concurrence.

As data is collected for the "pesticides under review" they may be categorized as a Pesticide of Concern (POC) and subject to the remaining implementation tiers "active management" or "demonstrated progress." Several reference points are recognized as legitimate criteria for the transfer of a "pesticides under review" to a POC:

- Maximum Contaminant Levels (CWA) as adopted under the Safe drinking Water Act may be used, but this is seen as a reactive response rather than a proactive response and successful strategies are driven by preventive action using a percentage of this value commonly referred to as Preventative Action Levels (PAL).

- Drinking water health advisories came into use in the early phases of the groundwater protection program and essentially parallel PAL criteria.

- Surface or ground water quality standards adopted under the CWA. The WVDA has no authority to set water quality standard but would confer with the WVDEP and West Virginia Department of Health and human Resources (WVDHHR) if these standards are to be used .

Aquatic life benchmarks have been developed by the EPA/OPP and appear to be the most promising and uniform criteria that will be used. These benchmarks are well below levels that would pose any health hazard to humans and are reasonably expected to have little effect on aquatic organisms. The bench marks are internal reference points for WVDAs pesticide water quality management program. A listing of the benchmarks can be found at http://www.epa.gov/oppefed1/ecorisk_ders/aquatic_life_benchmark.htm.

The second tier of the strategy is **management** of a pesticide of concern. Management is defined as activities carried out to prevent or reduce the occurrence of a pesticide in water such that it will not exceed an accepted water quality standard as adopted under the Clean Water Act or Safe Drinking Water Act or other standards as promulgated by the West Virginia Department of Environmental Protection.

The WVDA relies heavily on public outreach and user education to alter behavior and elicit positive behavioral changes. The applicator certification process, which is required under the OPP/OECA guidance, has continuously addressed changes in product use and regulatory updates. All commercial applicators using general or restricted use pesticides and all private applicators using restricted use pesticides must maintain certification by attending recertification training sessions.

Routine agricultural use inspections target existing water quality-related label restrictions and State regulations. The most frequent violation noticed is the lack of adherence to specified set-backs from surface water and field drainage sites. Under the existing enforcement process first time violators are notified by letter. Additional violations can result in monetary fines or license revocation.

WVDA is has working very closely with the WV Conservation Agency in the promotion of and adoption of voluntary BMPs shown to reduce impacts by pesticides and fertilizers. Examples include riparian buffer zones, filter strips and no till cultivation.

While monitoring is not a required activity, WVDA will continue its nutrient management strategy monitoring program which has proven to be adaptable to identifying pesticides in surface waters. It is also anticipated that the program can be extended into groundwater surveillance through the use of private wells. WVDA has been in communication with the WVDEP to address the possibility to add the pesticides under review into the analyte list currently used in the ambient ground water data base program.

The third tier, and the most challenging, is the demonstrated measurement of progress. While monitoring is not required under the strategy, it is the most representative method of showing a decrease in a particular pesticides occurrence in water. The WVDA has historically referenced studies from allied agencies such as the United States Geological Service and has made inquires as to proposed programs that may augment or continue monitoring work being done by WVDA. A recent review of the studies done by the USGS in the Potomac watershed utilizing passive sampling identified very low levels of home owner pesticides that had never been anticipated as having the potential to reach water sources. This information was also used in WVDAs decision to raise some home owner and turf management related chemicals to a higher status of concern in the initial prioritization of pesticides of interest.

The requirement of demonstration or measurability of progress is a result of the increasing concern of government to verify the efficacy of resources and expenditures to federal programs. WVDA is confident that the uniformity of the development of all its environmental programs, the continued interagency cooperation and the reliance on successfully demonstrated management practices will facilitate the accountability tier of the program.

As previously mentioned, the guidance does not negate State regulations promulgated concurrently with the States Groundwater Protection Act. A summary of pertinent regulations, which have been addressed are as follows:

| | |
|---|---|
| 61 CSR 22 | Generic State Management Plan for Pesticides and Fertilizers in Groundwater |
| 61 CSR 12G | General Groundwater Protection Rules for Pesticides |
| 61 CSR 22A | Best Management Practices Act – Temporary Operational Areas for Non-Bulk Pesticide Mixing and Loading Locations |
| 61 CSR 12H | Bulk Pesticide Operational Rules |
| 61 CSR 12I | Non-Bulk Pesticide Rules for Permanent Operational Areas |

A significant accomplishment of WVDA was the accreditation or concurrence by EPA that the secondary containment requirement for bulk pesticides as stated in 61 CSR 12H Bulk Pesticide Operational Rules have environmental equivalency to the Federal Secondary Containment regulation recently released. If environmental equivalency had not been approved then WVDA would have been required to amend the current rule or strike the existing regulation and pursue the legislative process for adoption of the federal regulation.

**Figure 1: Example of secondary containment at a bulk pesticide facility.**

The current guidance recognizes both the pesticide container recycling program and the waste pesticide collection and disposal projects as being acceptable ground water protection activities but no longer considers them as core achievements that must be met.

**Figure 2: Properly inspected and rinsed pesticide containers is secure storage prior**

The WVDA maintains that the continuation of these programs is a legitimate protection of ground water in that it reduces the number of containers or waste pesticides that would be disposed of illegally. The WVDA maintains pesticide collection container facilities (Figure 2) in Greenbrier, Kanawha, Lewis, Hardy, Berkeley, Jefferson and Ohio counties. Approximately 15,000 two-and-a-half-gallon containers have been collected over the past two years. The containers are shred and remanufactured into shipping pallets, drainage tile, composite lumber or other low contact non food containing plastic items. Recent work done by a private company in Oregon had demonstrated a profitable process through which agricultural plastics of all types can be reconstituted into a market grade of crude oil.

In June of 2009, WVDA collected and dispose of fifteen thousand one hundred and sixteen pounds (approximately 7 ½ tons) of waste and surplus pesticides from five sites across the State (Figure 3). In past collections, the pesticides have been in commercial quantities resulting from the abandonment of farming, cancellation of a product or the closure of a commercial green house or nursery.


**Figure 3: Waste pesticide from commercial orchard.**

In this most recent collection, a large amount of home owner lawn care product was recovered. The product had been purchased at an extremely low price from a building supply store that was closing. The product was purchased by a nursery retailer in hopes of being able to sell it to his customers. There were no violations of FIFRA or State regulations but it was an unusual discovery (fig4).

The "Best Management Practices Act – Temporary Operational Areas for Non-Bulk Pesticide Mixing and Loading Locations" was passed to address pesticide mixing in the field where a permanent secondary containment may not be practical and conditions were such that the operations would not fall under Non-Bulk Pesticide Rules for Permanent Operational Areas. Several temporary containment structures composed of heavy vinyl or plastic liners with high density foam forming the structures side walls are available. These products may be affordable in industry but are cost prohibitive for the majority of the agricultural sector. During an RCS field day in June of 2009 a half scale demonstration model of a temporary containment (Figure5) which also meets the minimum requirement under Non-Bulk Pesticide Rules for Permanent Operational Areas was introduced. The structure is easily assembled using readily available building supply store materials and the liners can range from light weight tarps to swimming pool liners. The original prototypes which were constructed and used in the late 1990's utilized pressure treated wood and surplus plastic land fill liner. Several of these prototypes provided up to five years of service.

**Figure 5 : Temporary pesticide mix and load containment.**


**Figure 4: Surplus homeowner lawn care pesticides purchased during a retailer closeout.**

The adoption of the regulations for secondary containment at areas falling under the permanent operations areas for non bulk pesticides is progressing with several new facilities in place. While a full size structure similar to that shown in figure 5 would meet the minimum requirements it would not prove to be very durable. Many agriculture producers and golf courses have recognized the economic and environmental importance of containing pesticides (Figure 6).

**Figure 6 : Low cost containment facility built to utilize a gravity feed water supply from an adjacent pond.**

**State List of Pesticides of Water Quality Concern**
**Source: State Survey for Water Resource Monitoring Programs and Analytical Parameters**
Conducted by the SFIREG WQ/PD Working Committee Includes chemicals of concern for both ground and surface water

2,4-D
Acetochlor (+ ESA, OXA
Alachlor (+ ESA)
Aldicarb (+ degradates)
Atrazine (+ DEA, DIA, DACT, Hydroxy)
Azinphos-methyl
Bentazon
Bromacil
Carbaryl
(Cancellation being prepared)
Chlorothalonil
Chlorpyrifos (+ TCP)
Clopyralid
Copper Pesticides
Dacthal (+ degradates)
(Cancellation being Prepared)
DBCP
Diazinon
Dicamba
Dimethenamid
Diuron
Endosulfan
Esfenvalerate
Ethoprop
Glyphosate (+ AMPA)
Hexazinone (+ Metabolite B)
Imazamethabenz
Imazapyr
Imidacloprid
Isoxaflutole
Lambda-cyhalothrin
Lindane (Voluntarily cancelled, use of existing stocks permitted until October 1, 2009)
Malathion
Mesotrione
Metalaxyl
Metsulfuron Methyl
Metolachlor (+ ESA, OXA, S-Metolachlor)
Metribuzin ( + DA, DADK, DK)Carbofuran
MSMA + other arsenical herbicides
Napropamide
Norflurazone ( + degradates)
Pendimethalin
Phenoxy herbicide group
Phosmet
Picloram
Prometon
Prometryn
Propazine
Propiconazole
Simazine ( + DACT, DIA)
Sulfometuron (et. al.)
Tebuthiuron
Terbacil
Thiamethoxam
Tralkoxydim
Triallate
Triclopyr
Trifluralin

# IV. DEPARTMENT OF AGRICULTURE
## C. West Virginia Conservation Agency

The WVCA focuses resource conservation efforts on the maintenance and/or improvement of water quality relative to natural resource utilization with a primary focus on agriculture and construction activities. The main concern is for surface water quality but activities impacting groundwater resources directly and indirectly are addressed through conservation programs that implement Best Management Practices (BMPs), provide technical support, and involve educational outreach to the citizens throughout the state.

The WVCA is proud of its "Conservation Partnerships" with state, federal, and local agencies as well as the private sector, businesses, and many organizations. Utilizing a cooperative approach provides benefits such as funding sources for projects, technical expertise and enables citizen input assisting our agency to pinpoint and target specific problems in specific areas. Utilizing our "Conservation Partnerships" continues to be a very effective approach to addressing West Virginia's concerns and providing the resources vital in the solutions and/or prevention of water quality degradation issues.

Our state has a diversity of terrain and geology that challenges natural resource conservationists with a multitude of issues that must be confronted by methods that are both effective and sensitive to the specific location and individuals affected.

The West Virginia Conservation Agency (WVCA) undertook the following activities which either directly or indirectly protect West Virginia's groundwater resources:

**Agricultural Activities**

Cost share programs have been a significant contributor to encourage landowners to develop conservation practices on their property. The WV Lime Incentive Program provides assistance for landowners to apply lime to their land which decreases the acidy of the soil and increases the plant nutrient uptake. The WV Multiflora Rose Program assists landowners by paying half the cost to treat infestations of an invasive species. By doing so, they increase the overall grassland on their farm which is more efficient in infiltration of stormwater and nutrient uptake. This program also mandates education for farmers on proper pesticide application. Additionally, federal 319 Clean Water Act funds and Farm Bill Programs have also been used to assist landowners.

WVCA Conservation Specialists (CS) working with NRCS and farmers assisted with riparian buffers through CREP on nine farms protecting 58,916 linear feet of stream bank, 1208 acres of karst with estimated sediment load reduction of 31,012.5 tons/year. Thirty-three agricultural conservation plans were written on 5261 acres and 30 nutrient management plans for 2,998 acres were reviewed or written. Over 3,000 tons of lime was applied to over 5,000 acres through the WV Lime Incentive Program, 130 acres treated for multiflora rose infiltration

through the WV Multiflora Rose Control Program, and 52 acres of riparian buffers were developed.

Through these plans approximately 708,411 pounds of nitrogen and 707,486 pounds of phosphorus were properly managed and applied to agriculture lands, reducing the potential for leaching of these nutrients into groundwater resources.

WVCA NPS staff serves as a technical resource role on the West Virginia Concentrated Animal Feeding Operations Committee that worked to develop rules to reduce or eliminate the NPS pollution to surface and ground water due to animal agriculture operations.

WVCA NPS staff serves on the WV Nutrient Management Committee that oversees planner certification and develops resource management practices concerning chemical fertilizer, livestock manure and poultry litter utilization.

The WVCA and the Eastern Panhandle Conservation District have developed a pilot program called the Agriculture Enhancement Program. The purpose of the program is to increase farm productivity by conserving soil and making wise use of agricultural resources and improving water quality by offering technical and cost-share assistance as an incentive to implement BMPs. The practices that the program offer are:

- ❖ Poultry litter – 669.84 acres are enrolled
- ❖ Lime for cropland – 490.23 acres are enrolled
- ❖ Cover crops – 554.23 acres are enrolled
- ❖ Pasture reseeding – 452.50 acres are enrolled
- ❖ Frost seeding – 39 acres have been completed
- ❖ Stream protection – 2 farms are enrolled for cattle exclusion

**Educational Activities Specific to Groundwater**

The WVCA held 35 nonpoint source educational programs attended by 3,744 students, 202 members of the general public and 921 producers, agency personnel and watershed association members. Eight agricultural field days were held with 1,270 attendees. Other outreach activities included sediment and erosion control training for 60 people, leading the WVSOS monitoring on 31 stations, and instructing a watershed management class at the WV Conservation Camp for 120 students.

- ❖ **Presented:** Watershed Hydrology and Impacting Groundwater
  - **To Whom:** West Virginia State Conservation Camp attendees
  - **Number of attendees:** 200 youth

- ❖ **Presented**: Nonpoint Source / 319 Program
  - **To Whom:** Davis Stuart School in Greenbrier County
  - **Number of attendees:** 10 attendees

- ❖ **Presented:** _"Stream Exploration"_

- **To Whom**: Hardy County Older 4-H Camp
- **Number of attendees:** 6 youth participated

❖ **Presented**: Enviroscape
- **To Whom:** Sandhill Elementary School
- **Number of attendees:** 64 students K-6$^{th}$ grade

❖ **Presented**: Soil Training
- **To Whom:** Cameron High School Envirothon Team
- **Number of attendees:** 5 students

❖ **Presented**: Soil Training
- **To Whom:** John Marshall High School Envirothon Team
- **Number of attendees:** 6 students

❖ **Presented**: Water Quality
- **To Whom:** Morgan County Girl Scout Troop
- **Number of attendees:** 14 attendees

❖ **Presented**: Water Quality
- **To Whom:** Region 3 FFA Chapters
- **Number of attendees:** 16 students

❖ **Presented**: Tree Seedlings
- **To Whom:** Third graders from Berkeley, Morgan & Jefferson Co.
- **Number of attendees:** 3000 attendees

❖ **Presented**: Pesticide Spray Equipment
- **To Whom:** GVCD Farmers
- **Number of attendees:** 80 GVCD Farmers

❖ **Presented**: Agricultural BMPs
- **To Whom:** GVCD Farmers
- **Number of attendees:** 65 GVCD Farmers

❖ **Presented**: Erosion and Sediment Control
- **To Whom:** GVCD Contractors
- **Number of attendees:** 25 GVCD Contractors

❖ **Presented**: Envirothon Workshop on Aquatics & Water Quality
- **To Whom:** Eastern Panhandle CD
- **Number of attendees:** 14 students / 4 teachers

- **Presented**: Envirothon Workshop on Aquatics & Water Quality
  - **To Whom:** Mineral County Vocational School
  - **Number of attendees:** 10 students / 2 teachers

- **Presented**: Envirothon Workshop on Aquatics & Water Quality
  - **To Whom:** West Fork CD
  - **Number of attendees:** 45 students / 5 teachers

- **Presented**: Envirothon Workshop on Aquatics & Water Quality
  - **To Whom:** Hampshire County Home School Students
  - **Number of attendees:** 7 students / 1 teacher

- **Presented**: Envirothon Workshop on Aquatics & Water Quality
  - **To Whom:** Cameron FFA / Doddridge County FFA
  - **Number of attendees**: 9 students / 2 teachers

- **Presented**: Envirothon Workshop on Aquatics & Water Quality
  - **To Whom:** Braxton County FFA
  - **Number of attendees:** 6 students / 1 teacher

- **Presented**: Buckhannon River WSA Program
  - **To Whom:** Buckhannon River WSA
  - **Number of attendees:** 23 attendees

- **Presented**: Bioengineering & Nutrient Management
  - **To Whom:** Field Day at TVCD
  - **Number of attendees:** 45 attendees

- **Presented**: Nonpoint Source Pollution
  - **To Whom:** Envirothon Teams at Cedar Lakes Training
  - **Number of attendees:** 30 attendees

- **Presented**: "The Benefits of Riparian Areas"
  - **To Whom:** Earth Day Celebration Attendees at Big Ugly Community Center
  - **Number of attendees:** 20 attendees

- **Presented**: "Turbidity and Water Quality"
  - **To Whom:** Earth Day Celebration Attendees at Huntington Community Center
  - **Number of attendees:** 50+ attendees

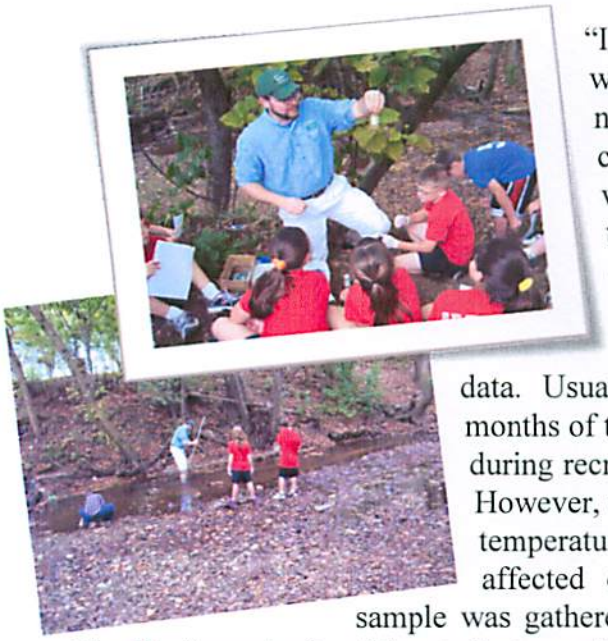
- **Presented**: "Watershed Associations"

- **To Whom:** WV Conservation Education Council
- **Number of attendees:** 15 attendees

❖ **Presented**: District & Regional Land Judging X 3
- **To Whom:** FFA Students
- **Number of attendees:** 205 students / +395 attendees

❖ **Organized:** Stream Clean Up
- **To Whom:** Baker Ruritans
- **Result:** Netted several hundred pounds of trash from a 3 mile stretch on Baker's Run

## Stream Monitoring And Students



"I hate having cold, wet feet" I think to myself as the water laps up and over the tops of my waterproof hikers, numbing my feet beyond feeling. Oh well, it's for a good cause, I tell myself. I slowly climb back up the bank with a capped plastic container and make my way back to the school. The water sample will be used in the classroom of a local teacher interested in not only teaching her students about water quality but also giving them "hands on" experience with gathering data. Usually water sampling takes place during the warmer months of the year when officials are concerned with water contact during recreational sports like swimming, fishing and boating etc. However, this class of 5$^{th}$ graders was interested in seeing how the temperature of the stream changed throughout the year and if it affected other parameters within the stream. Therefore, the sample was gathered in mid-December, a week before Christmas break. Usually the majority of the students are lined up along the banks of the stream while a select few help grab water samples. However, this day was just too windy and cold for the students to be outside, therefore the stream had to be taken to them.

The scenario of students monitoring streams is exhilarating to me. In my humble opinion, there is no better classroom setting than a stream. Monitoring streams gives educators the opportunity to present an immeasurable variety of educational experiences to their students. Math and science skills are honed when students are asked to calculate flow rates, average temperature readings and measure a variety of parameters including: pH, dissolved oxygen and turbidity to name just a few. Students then make inferences or predictions after the data is analyzed and summarize their findings by writing reports. Many times the reports lead to in class discussions about what the data suggests and what can be done within the watershed to mitigate the impacts on the stream. This type of activity promotes problem solving and critical thinking skills. During the process they start to formulate the concept of how interrelated the landscape is. In laymen's

terms they see "the big picture". I can't claim or quote any statistical data that suggests an increase in test scores or a bump in the number of students suddenly interested in science. The bottom line is that the students get excited about the processes involved with gathering and discussing data. I can't imagine anything other than a positive influence on the skills involved with similar-style projects. Additionally, these projects go beyond benefiting the academic endeavors of teachers and their students by promoting a sense of community involvement for young people. It allows them to see that they are part of a larger whole and that the decisions they make can and often do affect others.

Teachers who are interested in taking on such a project may shy away from the process as it can require a large investment of time and or money; two things that aren't exactly abundant for most of us. However, teachers who are interested and have access to a local stream may be interested to know that there are a variety of opportunities available to them. Conservation districts, watershed associations, and a number of state agencies support a variety of similar activities. Teachers can start their search with a phone call to their local conservation district office or by visiting the website www.wvca.us .

**The West Virginia Conservation Agency's Watershed Resource Center:**

- An EnviroScape presentation was given to over sixty 5th grade students. The EnviroScape Watershed/Nonpoint Source model demonstrates how different land uses affect water quality. The EnviroScape allows the students to visually understand how they contribute to water quality problems and how they can be part of the solution. The students were also provided reusable grocery bags with informational brochures on nonpoint pollution solutions, Dig It Book Marks, Soil Posters, and "What is a Watershed" fact sheets.

- Published and distributed the Waternet Newsletter to approximately 250 Watershed Associations and agencies statewide four times a year. The Waternet newsletter is an informative publication designed to keep Watershed Groups up to date on BMPs, upcoming workshops and conferences offered statewide, and showcase the efforts of volunteers working for water quality.

- Displayed sediment & erosion information at the 2009 EXPO. A workshop on New and Innovative BMPs for Sediment & Erosion Control was also hosted. The workshop was a success with over 75 attendees receiving 1.5 CEU. 1000 tree seedlings, protective tubes, reusable grocery bags, and "Water Conservation Ideas" books were distributed along with Conservation District contact information for available programs.

- Composting display at Earth Day at the Clay Center. Distributed 100 composting in a bag, backyard composting fact sheets, "What it Takes to Make an Inch of Soil" posters, Dig It Book Marks.

- ❖ Rain Barrels, Chains, and Gardens display at the Kanawha Valley Sustainability Fair. Distributed 500 Water Conservation Ideas books, reusable grocery bags, rain barrel brochures, rain chain brochures, and 50 Conservation District contact sheets.

- ❖ Composting activity at Cedar Lakes Conservation Day for 5th grade students – 45 attendees +. Students enjoyed hands on activity building their own worm composting farm while learning about the benefits of using compost. Reusable grocery bags were distributed to the students with information on backyard composting, composting in a bag, and Dig It book marks.

- ❖ Distributed 100 Water Conservation Ideas books and Lawn & Garden fact sheets to WVU Extension Service for distribution at Earth Day.

- ❖ Distributed 15 packets with WV Conservation Ideas books, rain barrel fact sheets, rain barrel brochures, and nonpoint source books for educators at the 2009 Environmental, Health, & Safety Day at the Sugar Grove Naval Base in Pendleton County.

- ❖ Distributed 20 each of the Water Conservation Ideas, rain gardens, rain barrels, and nonpoint source pollution publications at a Conservation Field Day in the EPCD.

- ❖ Distributed large packet of water quality programs and information to resident of Pennsylvania upon request.

- ❖ Distributed 500 "What it Takes to Make an Inch of Soil" posters to watershed associations and conservation districts upon their request.

**Sediment / Construction and Development**

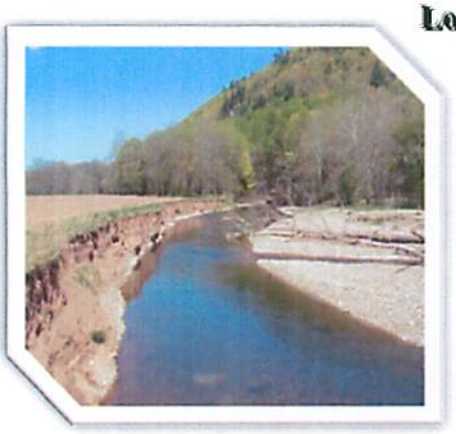
In construction assistance, the WVCA reviewed 14 sediment and erosion control plans for construction sites less than one acre with an estimated 26.07 tons of soil saved. The WVCA provided technical stormwater management assistance to 30 construction projects providing recommendations for BMPs to alleviate problem areas. These plans are reviewed to check the erosion controls and best management practices on construction sites to prevent sedimentation of the state's waters. Eighteen watershed associations throughout the state were provided technical and educational outreach support.

Various sediment catchment systems and erosion prevention systems are utilized on less than 1 acre construction sites. These systems are planned so that water from these sites is contained as long as possible and released slowly into natural waterways or allowed to infiltrate into the ground.

All of these practices prevent excess sedimentation and nutrient loading in our waterways, both ground and surface. Reduction of these pollutants reduces the overall need for filtration and potential contamination of pathogens in both public and private water supplies.

WVCA takes the lead on the Lost River 319 Incremental Project working with landowners to protect groundwater and streams through the reduction of sediment and nutrients utilizing the installation of buffers, natural stream restoration techniques, and establishment of vegetation on streambanks.

## Lost River 319 Stream Project Funkhouser Site



Mr. Rodney Funkhouser, a landowner, in the Lost River Valley located in eastern Hardy County had been experiencing tremendous erosion along a corn field. In the fall of 2008, the stream bank erosion was addressed using natural stream restoration structures.

Mr. Funkhouser approached USDA-NRCS for assistance. At that time NRCS was able to provide technical assistance, but not financial assistance. The local NRCS District Conservationist referred Mr. Funkhouser to the Moorefield West Virginia Conservation Agency Field Office. At that time the Conservation Specialist was working with West Virginia Department of Environmental Protection, Cacapon Institute, and local landowners to develop a watershed based plan. The working group made it a goal to address the severe stream bank erosion in the 319 Project Proposal. The Lost River 319 Project Proposal received approval from EPA and funding was allotted for the Funkhouser site.

The WVCA Watershed Division began surveying the site and determined the length of the stream bank to be addressed was 2100 feet. The concern of the landowner was the erosion occurring after large rainfall events. When the water would rise, up to a foot of stream bank would be eroded away.

In the summer of 2008 the design was completed and construction was scheduled to begin in October. The contractor, Jennings Excavating, worked with WVCA Watershed Division inspectors for four weeks. The design consisted of constructing a flood-plain bench, designating a stream channel (the river had several braded areas), constructing six structures, and sloping the stream bank.

This project has been a collaboration for partnering agencies. WVCA provided the design and finical assistance. The Potomac Valley Conservation District sponsored the project as well as handled the finances. Mr. Funkhouser is currently working with USDA-NRCS and USDA-FSA to place the crop land into CREP. This will provide Mr. Funkhouser with financial assistance for purchasing trees to establish in the buffer area, and

ensure the buffer area is maintained. WV Department of Environmental Protection and Cacapon Institute have been key players in the development of the watershed based plan and project proposal.

**Protection of Public and private water supplies**

Water supplies are protected from agriculture by developing buffers along streams and exclusion fences around sink holes. Livestock watering systems away from waterways prevent loafing, which can lead to nutrient loading in critical areas. Grazing systems for livestock are also developed to promote adequate vegetation that increases nutrient uptake of the plants and infiltration rates of stormwater. Streambank stabilization practices are also used to prevent massive erosion and sedimentation in waterways.

**Source Water Assessment/Wellhead Protection Program**

The WV Department of Health and Human Resources Bureau of Public Health, Office of Environmental Services formed this committee to address the component of the Safe Drinking Water Act which is integrated into the WV Watershed Management Framework. The goal is to work with partners to prevent degradation of source waters, both surface and groundwater, used for public drinking supplies.

The implementation of source water protection plans should be a component of Watershed Based Plans where applicable and coordinating planning with the WVDHHR will bring another facet to plans that will further serve the public good.

This program was dropped in 2008 due to funding problems but has been refunded in 2009 through the USDA Farm Service Agency and we are providing assistance with field staff, conservation district and watershed association contacts to Lewis Baker, the source water program coordinator. He is asking for assistance to implement a state wide program with rural water suppliers to identify risk and develop emergency alternative sources. We will continue to work with the program to help assess situations in regard to potential nonpoint source impairments when services are requested.

**Preside Dress Nitrogen Program**

Soil sampled to determine application rates of additional nitrogen to achieve yield goals for corn farmers.

- 966 acres sampled, recommended Nitrogen application rates reduced by 50,650 pounds (25.325 tons)

**Land Application of Biosolids**

- ❖ Provided technical advice to 2 waste water treatment plants on site evaluation and acceptable soil types.

- ❖ Provided technical advice and agronomic plans to one farmer using biosolids and to 2 other prospective users.

**WVCA Conservation Specialist functions as the Sleepy Creek Incremental Project Manager.**

- ❖ Completed 5 septic pumping.

- ❖ Current signups: Septic Pumping 49 applicants out of 600.

- ❖ Completed 25 applications for the Chesapeake Bay Septic Pumping Program.

- ❖ Received 11 applications for septic upgrades.

- ❖ Attended the Morgan County Plant Fair to work the Sleepy Creek Watershed Application booth. The SC Project Team signed up 7 people for septic pumping and 2 for possible failing septic and has 2 interested parties for urban tree planting.

- ❖ Received 4 signed contracts, bids awarded and checks for $300 for septic upgrades.

- ❖ Completed 2 septic upgrade systems / 23 acquires out of 25 – received 1 contract and bids awarded.

- ❖ Provided educational information for approved septic pumping.

- ❖ Assisted Sleepy Creek with a Natural Stream Restoration and tree planting.

**The WVCA Conservation Specialists provide technical and educational support to Watershed Associations and Basin Coordinators throughout the state as requested.**

- ❖ Assisting Little Grave Creek WSA with the implementation of their watershed based plan (restoration plan), as well as assisting them with the development of a second stream restoration plan.
- ❖ Assisting Maxwell Acres Home Owners Association with forming a watershed association.

- ❖ Assisted the Pocahontas County Water Resource Task Force in developing a water resources study.

- ❖ Presented the Draft Second Creek Watershed Based Plan to Friends of the Second Creek.

- Continue working with the Friends of the Cheat in developing an Invasive Species Management area within the watershed and with the control and vegetation of areas where control has been accomplished.

- Provided soils data to the Friends of the Cheat WSA in regard to the site where they are building an outdoor classroom facility.

- Continue to provide assistance to the USDA NRCS with projects in the Deckers Creek Watershed, including the Richard Mine project and 2 other AMD projects to be installed this year.

- Working with the Cow Creek WSA doing measurements and a preliminary evaluation of 4 sites for Bioengineering Projects to stabilize severely eroded streambanks.

- Provided support to the Campbells Creek WSA for their school based water monitoring project at Fair Haven Elementary in Charleston.

- Work with the Pocahontas County Water Resources Task Force in developing goals for water resources study for the County.

- Assisted Friends of the Lower Greenbrier River WSA's public meeting for Watershed Based Plan for Muddy Creek with approximately 60 attendees.

- Assisted Warm Springs Watershed Association with developing a new watershed map by using the ERIS database and applying for stream partners grant monies.

- Assisted Jefferson County Watershed Coalition with developing and planning of a 1 day workshop for local citizens where over 550 different trees / shrubs were planted along the stream.

# V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION

## A. Office of Oil and Gas

The Office of Oil and Gas (OOG) regulates West Virginia's oil and natural gas industry. Protection of groundwater is of utmost importance and is achieved through the permitting, inspection and enforcement of the exploration, production, plugging and injection activities of the industry. More than 57,000 active wells are regulated by the OOG. Regulations aimed at protecting groundwater have been in existence since 1929. Additional regulations have been added in subsequent years to further aid in the protection of groundwater. The OOG believes that groundwater protection is maximized by conforming to these existing regulations and practices. The following is a summary of selected regulatory functions and activities the OOG conducts in protecting groundwater.

### Fresh Water Casing and Drilling Practices-35CSR4-11.3 and 11.7

Operators must set fresh water casing at least 30 feet below the deepest fresh water horizon and cement circulated to surface prior to drilling into any oil, gas or salt water bearing strata. The operator shall use practices and procedures necessary to minimize damage or disturbance to strata including, groundwater until casing has been set.

#### Plugging Methodology-35CSR4-13 and 22-6-24

During plugging and abandonment operations of a well, the operator is required to separate oil, gas and water bearing strata with 100 foot cement plugs to completely seal the hole and prevent communication with other zones, including groundwater.

#### Water Supply Testing-35-CSR4-19

Operators are required to notify landowners within 1,000 feet of a proposed drill site for a well. At the request of the landowner, the operator shall sample and analyze water from wells or springs within the designated 1,000 feet. If no requests are made, then the operator shall choose an existing well or spring from within the 1,000 feet to sample and analyze. Results are to be submitted to the landowner as well as the OOG. Results are kept on file for groundwater quality purposes should a problem ever arise.

#### Underground Injection Control Program-35CSR4-7

The OOG administers the Class II and III injection wells under the Underground Injection Control (UIC) Program. Class II wells include brine disposal and secondary

recovery gas and water injection wells. Class III wells include solution mining wells. The active inventory consists of approximately 73 brine disposal wells, 717 secondary recovery wells and 16 solution mining wells. Primary focus of this program is the protection of groundwater from injection operations. Operators are required to submit reports monthly of daily activity for each injection well. Underground Injection Control permits are issued for five-year periods and must be renewed for injection to continue. During the permitting process, operators are required to sample and analyze water wells, springs and surface water bodies within a ¼ mile radius of the injection well or facility. Solution mining permits require that groundwater be sampled, analyzed and charted on a quarterly basis. Mechanical Integrity Tests (MITS) are required to be conducted by the operator at least once every five years to ensure that injected fluid is not migrating into any Underground Source of Drinking Water (USDW). The OOG is required to conduct field compliance reviews of all injection wells.

**Abandoned Well-35CSR6**

Abandoned wells are the most problematic area related to groundwater, especially for wells drilled 75 to 100 years ago, when technology and concern for groundwater protection were not as advanced as today. These wells, which are throughout the state, now pose potential and actual threats to groundwater quality, as aquifers penetrated by these wells are typically not cased to protect them from contaminants within the borehole of the well. Some of the contaminants that may affect groundwater quality include such things as hydrocarbons, chlorides and metals. The OOG works with both industry and the federal government to locate, prioritize and plug or produce abandoned wells. The OOG has a priority ranking of abandoned wells, and those that pose a significant and/or immediate threat to human health or the environment are scheduled for evaluation first.

**Annual Inspection-35CSR4-11.6**

Operators are required to visually inspect all wells that are not plugged and have been drilled for more than five years. Any significant leakage or well integrity failure is reported to the OOG and measures are taken to remedy the problem. Operators are required to submit certification to the OOG that the inspections have been conducted.

**General Water Pollution Control Permit**

Operators applying for a permit involving the use of a pit for holding wastes generated during well work must also register the site and indicate the method for treating and disposing of the pit contents. Most pit contents are land applied after proper treatment and aeration. The primary function of the general permit is the prevention of pollution to the waters of the state relating to the handling and disposing of these wastes.

**Spill Prevention and SPCC Plans 35CSR1**

To prevent discharged oil from reaching waters of the state, all operators are to have adequate containment or diversionary structures in place at each well or facility. Operators are also required to have a Spill Prevention Control Countermeasure (SPCC) Plan for these facilities. This requirement was devised as a result of the passage of the Clean Water Act to protect waters of the state from discharged oil.

**Groundwater Data Collection**

Groundwater data is primarily collected from three activities regulated by the OOG. Operators proposing a new drilling location must provide notice to every dwelling within 1,000 feet of the location, and offer to sample and analyze their well water and/or spring. This data then represents the groundwater quality standard for the area of proposed drilling. Parameters include, but are not limited to pH, iron, chlorides, total dissolved solids and detergents. Results are currently being submitted on paper and kept on file with its corresponding permit.

Operators applying for an UIC Permit are required to sample and analyze all water wells, springs and surface water bodies within ¼ mile radius of the proposed facility. Parameters are the same as those mentioned above. Results are submitted on paper and kept in the corresponding UIC file.

The OOG investigates numerous water well contamination cases yearly. Sampling and analytical work have become routine tasks during such investigations. Parameters vary from case to case, but usually, at a minimum, include those which have already been mentioned. Again, the analyses are submitted on paper and kept in the corresponding investigation file.

A computer tracking system has been established for the chloride content of streams receiving discharges of produced water associated with stripper oil wells. National Pollutant Discharge Elimination (NPDES) permits require the chloride content and stream flow be checked and submitted monthly. Under this permit, the operator of these permitted facilities must also sample and analyze the effluent every month for pH, iron, chlorides, total dissolved solids and oil and grease. The monthly analytical data is currently submitted on a paper Discharge Monitoring Report. However, electronic filing will be encouraged in the near future. The point at which the effluent enters the stream has been identified by GPS for all active facilities.

To date, the OOG has collected GPS data on more than 3,000 wells. This data is first corrected for various external degredation effects, the largest of which is intentionally imposed by the U.S. Department of Defense. After correction, this data is placed on the GIS server to allow for incorporation with other GPS data. Over time, we will be able to develop a more complete and accurate (2-5 meters) location database.

Presently, in our GPS work, we are focusing on the "abandoned" well population, as many of these wells are not mapped and often tend to be sources of groundwater contamination.

The GIS provides us the capability of relating our well location information with such basic information as topography, roads and streams. A vast amount of other, more area-specific, characteristics are also accessible on this system. This data can be pulled together into a map to be used in the field for environmental investigations and presentations.

At times, the citizens of West Virginia encounter contamination of their water wells, possibly due to oil and gas wells or their operations or other surface or underground activities. An alliance should be formed between the offices within the WVDEP and other state and county agencies such as Dept. of Health, Public Service Commission and County Public Service Districts to pool talents and resources for providing relief to the families whose drinking water has been adversely affected. While the offices within the WVDEP and outside agencies may not have the funding to provide the total solution to a particular situation, some funding from other agencies, as well as a review of possible alternatives may result in helping the family. Currently, there is no such alliance, but the need for one is certainly obvious and the benefits will more effectively help the citizens of West Virginia.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## B. Division of Water and Waste Management

### 1. Solid Waste Permitting Unit (SWPU)

The SWPU regulates solid waste facilities under the Solid Waste Management Rule, 33 CSR 1. This includes the review of applications for various permitting activities for new and existing facilities such as permit issuance, renewal or closure. The SWPU reviews applications to accept special waste or alter groundwater monitoring systems and also reviews statistical groundwater monitoring reports, conducts construction quality assurance and quality control inspections and compliance assistance to waste generators.

| Description | Permitted Facilities |
|---|---|
| Active Municipal Solid Waste Landfills (Class A & B) | 19 |
| Closed Municipal Solid Waste Landfills (Class A & B) | 33 |
| Construction/Demolition Waste Facilities (Class D and D-1) | 17 |
| Yard Waste Composting Facilities | 23 |
| Transfer Stations | 20 |
| Waste Tire Facilities | 3 |
| Recycling Facilities (Class E) | 3 |
| Sewage Sludge Processing Facilities | 0 |
| Mixed Waste Processing Facilities | 0 |

Permitted landfills must sample groundwater-monitoring wells twice each year and perform statistical tests to determine whether groundwater has been contaminated. The statistical reports are reviewed by the SWPU and the Office of Environmental Enforcement takes any necessary enforcement action.

In an effort to protect groundwater, the Solid Waste Management Rule requires an impermeable liner system for solid waste municipal solid waste landfills. This multiple layer liner system that includes a leak detection zone which will alert the facility should there be a failure in the liner. If contamination has been detected by routine detection monitoring, the landfill may be required to begin corrective action to clean up the groundwater. There are currently two facilities (one operating and one closed) that are in assessment monitoring due to detection of potential contamination.

Although some releases have been detected, the statistical groundwater-monitoring program is in need of improvement. The Division of Water and Waste Management has prepared a guide to groundwater sampling, but no State training or certification of groundwater samplers exists. As improved statistical methods are introduced, contamination caused by poor

sampling techniques will become more apparent. Currently, the SWPU does not have regulatory authority to address the problem of inadequate sampling. To remedy this problem, 33 CSR 1 would need to be modified to require adherence to the American Society for Testing Materials (ASTM) Standard D 6312-98, "Standard Guide for Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Program."

Groundwater monitoring wells must sometimes be replaced because they have caved in, gone dry, or are located where the disposal area is expanding. The SWPU reviews well replacement plans to ensure that the new wells are properly placed to detect potential groundwater contamination as soon as possible.

Groundwater monitoring reports are submitted to the SWPU on paper. The Environmental Quality Information System (EQuIS), which is being developed by DEP, will accept groundwater-monitoring data electronically and provide an interface to statistical and mapping software that will allow the SWPU to check statistical calculations.

The proper management of waste reduces the likelihood of groundwater contamination by reducing the amount and controlling the types of contaminants in leachate. This is achieved by special waste requests that are reviewed by the SWPU and either approved or denied for disposal.

The SWPU is responsible for ensuring that facilities are properly designed by reviewing plans and granting permit modifications for expansion. During construction at these facilities, the SWPU conducts quality assurance/quality control (QA/QC) inspections to assure that facilities are built according to specifications and accepted industry practices.

Oil and other chemicals, primarily from vehicles, and leachate can contaminate stormwater flowing from solid waste facilities. Plans for structures and procedures for managing stormwater are a part of the detailed plans reviewed by the SWPU. Proper design, construction, and management prevent contaminated stormwater from infiltrating into the groundwater.

Through the Landfill Closure Assistance Program (LCAP), the WVDEP is currently monitoring the 30 closed solid waste landfills in West Virginia. Under this program, the emphasis is on the capping of these facilities to minimize groundwater impact. Active solid waste landfill facilities have an on-going program to identify and address any groundwater releases. The LCAP Program utilizes consultants who follow the procedures outlined in 33 CSR 1 to sample, analyze, and identify groundwater and any associated problems. The SWPU has assisted LCAP by providing geological assistance on program priorities.

# V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION

## B. Division of Water and Waste Management

### 2. Hazardous Waste Section

The Hazardous Waste Permitting Unit (Permits) was established by Chapter 22, Article 18 of the West Virginia Code and the rules promulgated there under. Legislative Rule, Title 33, Series 20, known as the Hazardous Waste Management Rule (HWMR), are the regulations promulgated to regulate the storage, treatment, and disposal of hazardous wastes generated and managed in West Virginia. The HWMR has incorporated by reference the Code of Federal Regulations (CFR) promulgated under the Resource Conservation and Recovery Act (RCRA) amendments of 1984. All provisions of 40 CFR 264 Subpart F and 40 CFR 265 Subpart F, which pertain to groundwater protection and any releases from a Solid Waste Management Unit (SWMU), have been incorporated by reference in their entirety.

Permits and the State of West Virginia coordinate this regulatory effort with EPA. In general, as a summary of the relationship between the two agencies, West Virginia has authorization to assume the lead role in the groundwater protection and monitoring at the permitted units in West Virginia while EPA has the lead for implementing corrective action activities.

#### a. Groundwater Protection Goal and Priorities

The goal of Permits is to identify all permitted sites with groundwater contamination or potential for groundwater contamination due to a release, remediate the site and return the site to its original condition.

The priority objectives are to:

- ❖ Identify all sites with contaminated groundwater or potential for groundwater contamination.

- ❖ Define the contaminants, source and extent of contamination.

#### b. Mechanisms to Regulate and Protect Groundwater at Permitted Units

The groundwater monitoring regulations in 40 CFR Part 264/265, Subpart F, is one part of an overall strategy to reduce the likelihood of environmental contamination resulting from hazardous waste treatment, storage, and disposal. This strategy includes restrictions on disposal of untreated hazardous waste, unit-specific standards for land-based hazardous waste management units, and monitoring groundwater below these units. The land disposal restrictions

program requires the treatment of hazardous wastes before disposal to reduce the mobility or toxicity of hazardous constituents. The unit-specific standards for land-based hazardous waste management seek to prevent the release of hazardous waste to the environment.

Groundwater monitoring is the final link in this strategy to prevent environmental contamination. Owners and operators of all land-based units must institute a groundwater monitoring program that is able to detect and characterize any releases of hazardous waste or hazardous constituents to the groundwater underlying the facility. Should the other elements of the strategy fail, groundwater monitoring will detect the release so it can be remedied.

The regulations in Subpart F of Part 264/265 are general requirements, establishing performance-based standards that state what a successful groundwater-monitoring program must accomplish; they do not dictate specific technical standards. Each facility's groundwater monitoring program is unique because no two Treatment, Storage, or Disposal Facilities (TSDF) are the same. Individual groundwater monitoring programs are based on site-specific conditions, including the underlying geology and hydrology, as well as the properties of the waste managed on site.

Regulatory authority is available to require the owner and operator of a TSDF to remediate releases of hazardous waste or hazardous constituents to the environment. All permitted facilities must comply with Part 264, Subpart F, for releases from SWMU's. There are three stages to the Part 264, Subpart F, groundwater monitoring and follow-up activities:

- ❖ Detection monitoring - to detect if a release has occurred
- ❖ Compliance monitoring - to determine whether regulatory standards have been exceeded once a release has occurred
- ❖ Corrective action - to remediate a release to the groundwater

Section 264.97 sets out the basic requirements that apply to all groundwater monitoring programs under Part 264, Subpart F. The specific requirements that apply to each of the three phases of groundwater monitoring are found in 264.98, 264.99, and 264.100.

The general requirements for groundwater monitoring programs at permitted facilities are found in 264.97. These general requirements apply to all three phases of groundwater monitoring: detection monitoring, compliance monitoring and corrective action. A groundwater monitoring program established pursuant to Part 264, Subpart F, must have a sufficient number of monitoring wells, installed at appropriate locations and depths, to yield water samples that:

- ❖ Represent the background conditions of the site.
- ❖ Represent the quality of groundwater passing the point of compliance.
- ❖ Detect any contamination of the uppermost aquifer at the point of compliance.

The goal of a detection monitoring program is to detect and characterize any release of hazardous constituents from a regulated unit into the uppermost aquifer. The detection monitoring system must be installed at the point of compliance and adhere to the task requirements applicable to all groundwater monitoring systems. The owner and operator must monitor for certain indicator parameters and any other specific waste constituents or reaction products that would provide a reliable indication of the presence of hazardous constituents in groundwater at the point of compliance.

Once it is established that a release has occurred, the owner and operator must institute a compliance monitoring program. The goal of the compliance monitoring program is to ensure that the amount of hazardous constituents released into the uppermost aquifer does not exceed acceptable levels. Once those levels are exceeded, the owner and operator must initiate corrective action. The compliance monitoring program establishes routine monitoring, at least semiannually.

The goal of the Subpart F corrective action program is to bring regulated units back into compliance with the required standards at the point of compliance. The Subpart F corrective action program seeks to accomplish this goal by requiring that the owner and operator either remove the hazardous constituents or treat them in place. Examples of corrective measures include excavation, stabilization, solidification, and source control. The owner and operator must also conduct corrective action to remove or treat in place any hazardous constituents that exceed the required standards between the point of compliance and the downgradient property boundary, and beyond the facility boundary where necessary to protect human health and the environment.

**c. Mechanisms for Corrective Action**

The Hazardous and Solid Waste Act of 1984 (HSWA) requires corrective action for all releases of hazardous waste or constituents from any SWMU at a facility seeking a permit, regardless of when the waste was placed in the unit. An SWMU is any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste. This definition includes any area at a facility where solid wastes have been routinely and systematically released. This authority is applied to any facility seeking a permit, including operating permits, post-closure permits, or permits-by-rule after November 8, 1984.

Under HSWA, Congress also gave EPA the authority to issue orders requiring cleanups at interim status facilities. For interim status TSDFs that were already in operation when the applicable RCRA standards were established, and that are operating under the standards in 40 CFR Part 265 until they receive a permit under 3008(h), as added by HSWA, EPA can issue an administrative order or file a civil action whenever it determines, on the basis of any information that there is or has been a release of hazardous waste into the environment. This applies to facilities that are currently operating under interim status, that formerly operated under interim status, or that should have obtained interim status. It also applies to any release of hazardous waste or constituents from the facility. In addition to requiring cleanup, EPA has the authority under 3008(h) to revoke or suspend interim status. Finally, as with 3004(v), EPA may use 3008(h) to require corrective action beyond the facility boundary and to require proof of financial assurance for cleanup.

One of the keys to understanding the RCRA corrective action program is knowing when a facility becomes subject to the corrective action. A facility can enter the corrective action program in a variety of ways. There are primarily four ways a facility becomes subject to corrective action. Facilities can enter the corrective action program under statutory authorities, by enforcement orders, by volunteering to perform cleanups or after detecting statistically significant increases of contamination according to the groundwater monitoring requirements in 40CFR264, Subpart F.

In the past, EPA has used the corrective action process to evaluate and document the nature and extent of contamination, identify the physical and geographic characteristics of the facility, and identify, develop, and implement appropriate corrective measures. The conditions at contaminated sites vary significantly, making it difficult to adhere to one rigid process. Consequently, the corrective action process is designed to be flexible.

The original corrective action process of investigation and remedy selection and implementation comprises several activities. These activities are not always undertaken as a linear progression towards final facility cleanup, but can be implemented flexibly to most effectively meet site-specific corrective action needs. These activities are:

- RCRA Facility Assessment (RFA) - identifies potential or actual releases from SWMU's
- Interim/Stabilization Measures - implements measures to achieve high-priority, short-term remediation needs
- RCRA Facility Investigation (RFI) - compiles information to fully characterize the release
- Corrective Measures Study (CMS) - identifies appropriate measures to address the release

Once the implementing agency has selected a remedy, the facility enters the corrective measures implementation (CMI) phase of corrective action. During the CMI, the owner and operator of the facility implement the chosen remedy. This phase includes design, construction, maintenance, and monitoring of the chosen remedy, all of which are performed by the facility owner and operator with agency oversight, a remedy may be implemented through a phased approach. Phases could consist of any logically connected set of actions performed sequentially over time or concurrently at different parts of a site.

**d. Facilities with On-going Corrective Action**

The following chart lists the West Virginia facilities that are currently performing corrective actions. It lists the facility, if the facility has human health (HH) and groundwater (GW) under control, and where each facility stands with its cleanup status.

This chart is on the internet at:

http://www.epa.gov/reg3wcmd/ca/wv.htm

Additional information can be seen about site history and project detail if you go to the web site and click on the facility name.

Facility fact sheets and the Environmental Indicator forms are Adobe Acrobat PDF files. For additional facility information, go to the following links:

- Click on the facility name to view the facility fact sheet
- Click on the "YES" to view the facility's completed Environmental Indicator form
- Click on the location name to view a map of the area

| Facility Name | EPA ID# | Location | Environmental Indicators | | Cleanup Status |
|---|---|---|---|---|---|
| | | | HE | GW | |
| AEP Kanawha River Plant | WVD980554588 | Glasgow | YES | YES | Corrective Action Underway |
| Airco Welding | WVD980554760 | Chester | YES | YES | Complete With Controls |
| Alcan Rolled Products LLC | WVD009233297 | Ravenswood | YES | YES | Corrective Action Underway |
| Alliance Tubular Products Co. | WVD060692126 | Jane Lew | TBA | TBA | To Be Assessed |

| Facility Name | EPA ID# | Location | Environmental Indicators | | Cleanup Status |
|---|---|---|---|---|---|
| | | | HE | GW | |
| American Environmental Services | WVD981107600 | Morgantown | TBA | TBA | To Be Assessed |
| Appalachian Timber Service | WVD063461958 | Sutton | YES | YES | Remedy Selected |
| Arcelormittal Weirton Inc. (Mittal Steel USA, Weirton) | WVD000068908 | Weirton | YES | YES | Corrective Action Underway |
| ATK Tactical Propulsion & Controls | WV0170023691 | Rocket Center | TBA | TBA | To Be Assessed |
| Ball Aerosol & Speciality Container Inc. | WVD041517830 | Weirton | TBA | TBA | To Be Assessed |
| Bayer Cropscience LP (Rhone Polenc,Aventis) | WVD005005509 | Institute | YES | YES | Corrective Action Underway |
| Bayer Material Science LLC (Miles) | WVD056866312 | New Martinsville | YES | YES | Corrective Action Underway |
| Beazer East-Colliers | WVD980707178 | Colliers | YES | YES | Complete With Controls |
| Browning Ferris Ind. | WVD063468342 | Charleston | TBA | TBA | To Be Assessed |
| Chemical Leaman Tank Lines | WVR000001719 | Institute | TBA | TBA | To Be Assessed |
| Chemtura Corp - North Plant | WVD980552384 | Morgantown | YES | IN | Corrective Action Underway |
| Chemtura Corp - South Plant | WVD061776977 | Morgantown | YES | YES | Corrective Action Underway |
| Cytec | WVD004341491 | Willow Island | YES | IN | Corrective Action Underway |
| Dupont - Belle | WVD005012851 | Belle | YES | YES | Corrective Action Underway |

| Facility Name | EPA ID# | Location | Environmental Indicators | | Cleanup Status |
|---|---|---|---|---|---|
| | | | HE | GW | |
| Dupont Martinsburg - Potomac River Works | WVD041952714 | Martinsburg | YES | YES | Corrective Action Underway |
| Dupont - Washington | WVD045875291 | Washington | YES | YES | Corrective Action Underway |
| Flint Group (XSYS Print, BASF Corp.) | WVD000068601 | Huntington | YES | YES | Corrective Action Underway |
| FMC - So. Charleston | WVD005005079 | South Charleston | YES | YES | Complete Without Controls |
| GM's Spo Bulk Center #37 (Area #6) | WVD044145209 | Martinsburg | YES | YES | Complete Without Controls |
| Great Lakes Chemicals Corp (FMC) | WVD005005087 | Nitro | YES | YES | Corrective Action Underway |
| Huntington Alloys Corporation | WVD076826015 | Huntington | TBA | TBA | To Be Assessed |
| Koppers - Green Spring (CSXT) | WVD003080959 | Green Spring | YES | YES | Corrective Action Underway |
| Koppers-Follans (Beazer East) | WVD004336749 | Follansbee | YES | YES | Corrective Action Underway |
| Miller Springs Remediation Management | WVD005010277 | Belle | YES | YES | Corrective Action Underway |
| MPM Silicones L.L.C. (GE Silicones, Crompton Witco Corp., CK Witco) | WVD004325353 | Friendly | YES | YES | Complete with Controls |
| P P G Industries | WVD004336343 | New Martinsville | YES | YES | Corrective Action Underway |
| Sabic US Innovative Plastics LLC (General Electric Co.) | WVD088911854 | Washington | YES | YES | Complete With Controls |

| Facility Name | EPA ID# | Location | Environmental Indicators | | Cleanup Status |
|---|---|---|---|---|---|
| | | | HE | GW | |
| Safety-Kleen Systems, Inc. | WVD981034101 | Wheeling | TBA | TBA | To Be Assessed |
| Severstal Wheeling Inc. | WVD004319539 | Follansbee | YES | IN | Corrective Action Underway |
| Shell Lubricants (Penzoil-Quaker State) | WVD057634776 | Newell | YES | YES | Corrective Action Underway |
| SMR Technologies (BF Goodrich) | WVD980555395 | Fenwick | YES | YES | Complete Without Controls |
| Solutia Nitro Site | WVD039990965 | Nitro | YES | IN | Corrective Action Underway |
| St. Mary's Refining (Quaker State) | WVD004337135 | St. Mary's | YES | YES | Corrective Action Underway |
| Thiokol Speciality Chemical Div | WVD074968413 | Newell | TBA | TBA | To Be Assessed |
| TRC Spent Cathode Storage Pile | WVD988766127 | Ravenswood | YES | YES | Corrective Action Underway |
| Union Carbide Corporation | WVD005005483 | South Charleston | YES | YES | Corrective Action Underway |
| Union Carbide Corporation - PTO | WVD000739722 | Nitro | YES | YES | Corrective Action Underway |
| Union Carbide Corporation - Technical Center | WVD060682291 | South Charleston | YES | YES | Corrective Action Underway |

**DEFINITIONS:**

HE = Current Human Exposures Under Control Environmental Indicator (CA725)

GW = Migration of Contaminated Groundwater Under Control Environmental Indicator (CA750)

YES = YES, The Environmental Indicator has been met

IN = More information is needed

Cleanup Started - Initiation of a facility-wide investigation and cleanup

Cleanup Initiated = Initiation of a facility-wide investigation and cleanup.

Remedy Selected = The regulator has selected final cleanup objectives to address contamination and exposures.

Construction Complete = All components of the final remedy are in place and operating as designed.

Complete without Controls = Final cleanup objectives are met for all media, and no further activity or controls are necessary.

Complete with Controls = Final cleanup objectives are met but but on-going operation, maintenance and/or monitoring of controls are necessary to ensure protection of human health and the environment.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## B. Division of Water and Waste Management

### 2. Underground Storage Tank (UST) Unit

The Underground Storage Tank (UST) Unit of the Division of Water and Waste Management's Environmental Enforcement section is responsible for the implementation of the provisions of the Underground Storage Tank Act (USTA), Chapter 22 Article 17, of the West Virginia Code.

The UST Unit regulates tanks that are included in the federal UST law and maintains a database with a total of 24,927 registered USTs, 19,342 of which have been permanently closed. The remaining 5,585 consist of 4,106 active and 1,479 temporarily out of service USTs.

The UST inspectors perform UST installation, closure and compliance monitoring inspections. The UST Unit also administers the UST worker certification program to certify those who install, repair, retrofit, upgrade, tightness test or permanently close UST systems, and install, repair or test UST cathodic protection systems.

**Goals**

The UST Unit's goal is to protect human health and the environment by requiring UST systems to have release detection, corrosion protection, overfill protection, and spill prevention. The federal Energy Bill that became effective on August 8, 2005, increases the requirements for USTs to include secondary containment, delivery prohibition to noncompliant USTs and mandatory operator training.

The Energy Bill also required states to perform on-site inspections at every facility by August 8, 2007, that had not undergone a compliance monitoring activity since December 22, 1998. This goal has been met. It then requires that all facilities be inspected once every three (3) years.

**Staffing**

There are currently seven inspectors in regional offices throughout the state, one inspector specialist, one data entry technician, one inspection coordinator through the federal Senior Environmental Employee Program and a program manager.

**Public Outreach**

The UST Unit meets regularly with a working group consisting of representatives from the community of UST owners and contractors to discuss UST related issues. Representatives from the UST Unit also meet with multi-site owners to discuss specific issues related to their sites. The UST inspectors provide one-on-one training to the UST owners/operators during their compliance monitoring inspections.

An Operation & Maintenence Manual for West Virginia UST owners and operators has been developed and is distributed to the regulated community. In the past, the UST Unit has conducted seminars to inform the regulated community of the UST regulations. The unit also has mailed instructional manuals, pamphlets and fliers on UST regulations and the effects that a release can have on the environment and the public.

Two videos, *LUST in a Small Town* and *Tank Time*, were mailed to all of the public libraries in West Virginia several years ago. The UST webpage within WVDEP's website provides additional information on UST regulations, including contractor information, closure and installation requirements and UST forms. The UST Unit will be providing UST owners with information on meeting the new requirements for operator training. All UST owners will be required to have provided training for three levels of UST operators by August 8, 2012. The UST Unit also is working to provide training opportunities for UST certified workers.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## B. Division of Water and Waste Management

### 3. Division of Land Restoration - Office of Environmental Remediation

The Office of Environmental Remediation (OER) was created in 1997 to consolidate the agency's remediation programs. The organizational structure allows the office to focus its energy and technical talent on the remediation sciences and procedures used to restore contaminated sites. The office is primarily organized along a project management function, which oversees site activities; and a technical support function, which provides specialized technical support.

**OER operates five sections:**

1. **Voluntary Remediation/Brownfield** – This section encourages voluntary remediation activities and Brownfield revitalization. The Voluntary Remediation and Redevelopment Act (VRRA) was one of the first voluntary cleanup or Brownfield laws in the nation. The VRRA section is characterized by uniform, predictable processes with flexible cleanup standards based on future land uses that are protective of human health and the environment.

2. **Leaking Underground Storage Tanks (LUST)** - This section provides oversight of the cleanup from leaking underground storage tanks, including release from the tanks, their piping, spills or overfills. This section also administers the federal and state leaking underground storage tank response funds. These funds enable state cleanups, where the responsible party is unwilling or does not have the financial means to respond to the leak. The agency received authorization from EPA in 1997 to assume the regulatory lead for the leaking underground storage tank program in West Virginia.

3. **Superfund** - This section coordinates with EPA and as applicable, the U.S. Department of Defense, at Superfund cleanups. Recent Federal efforts have also focused on recognizing and supporting the successful state Brownfield and voluntary cleanup programs.

4. **Rehabilitation Environmental Action Plan (REAP)** - This was a strategic initiative signed into law by Governor Joe Manchin in 2005. The Governor's bill combined elements of the Department of Environmental Protection and the Division of Natural Resources into a more effective and streamlined system for the direction of environmental remediation programs. The program provides oversight of litter removal, statewide recycling and open dump cleanups.

5. **Landfill Closure Assistance Program (LCAP)** - The program provides landfill closure assistance to owners/permittees of landfills that were required to cease operations pursuant to certain statutory closure deadlines for non-composite lined facilities. The

program designs and constructs all closure-related activities necessary to provide sufficient leachate management, sediment and erosion control, gas management, groundwater monitoring and a final cover cap on non-composite lined landfills.

**OER accomplishments in Fiscal Years 2008 and 2009**

- The REAP Program eliminated 2,178 dumps from WV's landscape. This led to the proper disposal of over 16,500 tons of litter/waste. REAP was also responsible for the proper disposal of over 765,000 waste tires. Many of these tires were pulled from the 478 miles of rivers and streams that REAP cleaned during this time.

- REAP The Pollution Prevention Open Dump Program (PPOD) reclaimed 1,761 acres of land through the eradication of 2,111 dumps. PPOD also removed more than 3,000 appliances from the landscape and recycled more than 1,000 tons of scrap metal.

- REAP The Make It Shine Program coordinated the efforts of more than 5,800 volunteers. These volunteers worked to remove 350 tons of litter and debris. The volunteers removed litter from 668 acres of park, 286 miles of streams, and 99 miles of trails.

- REAP Adopt-A- Highway Program had more than 49,000 volunteers in more than 1,900 active groups. They worked to remove over 3,000 tons of litter from over 7,800 miles of roadway.

- The REAP Litter Control Grant Program, which provides grants to cities, counties, and municipalities for litter control and cleanup programs, funded 38 projects totaling $108,943.

- The REAP West Virginia Recycling Assistance Grant Program, which provides grants for recycling to public and private entities, awarded 62 grants totaling $2,441,071.

- REAP developed the Covered Electronic Device Grant Program, which offers grants to counties and municipalities wishing to implement electronic device recycling programs or e-cycling events. Issuance of the first grants will begin in FY 2010.

- The REAP West Virginia Public Employees Office Paper Collection Program collected more than 1,200 tons of paper from state offices.

- REAP developed and implemented standard operating procedures for litter control in the state of West Virginia. The SOP recommended 16 programs to clean up litter in their counties. For fiscal year 2008 and 2009, all 55 counties implemented the necessary programs.

- The Voluntary Remediation and Redevelopment Act program accepted 44 new applications for properties to participate in the program, and issued Certificates of Completion for 13 voluntary remediation sites which opened more than 77 acres of land, ready for reuse, with cumulative totals of 82 Certificates of Completion and 1,023 acres.

- OER completed brownfield targeted site investigation work at Elite Glass in Cameron, the Wood Choppers Village in Webster Springs, Quality Glass in Morgantown, the Barboursville Brickyard, the former Nitro sanitation landfill in collaboration with FMC and the city of Nitro, and at the JG Bradley Campground in Clay. OER completed a petroleum brownfields assessment at the former Todds Exxon station in Salem.

- 3) OER provided oversight of the investigation and cleanup of 93 new leaking underground storage tank sites and completed investigations and closed the active files on 203 leaking underground storage tank sites. OER also removed seven abandoned underground storage tanks from three different sites.

- OER continued working with EPA Region 3 and ExxonMobil Corp. on the Sharon Steel/Fairmont Coke Project XL Superfund cleanup, while ExxonMobil Corp. and the city of Fairmont continued to work collaboratively on redevelopment plans to return the site to productive use.

- OER continued working with EPA Region 3 on the Superfund actions at the Big John's Salvage site near Fairmont. at Morgantown Ordnance Works, the Fike-Artel Chemical site in Nitro, Allegheny Ballistics Laboratory in Mineral County, the Vienna well field in Wood County, the Pantasote site in Pt. Pleasant, the Ravenswood PCE site, and at the Olin-Hanlin Chemical site near New Martinsville, and worked collaboratively with EPA Region 3 and the U.S. Army Corps of Engineers at West Virginia Ordnance Works at Pt. Pleasant.

- OER continued working collaboratively with EPA Region 3 on 30 RCRA Corrective Action sites, with upcoming work on eight additional sites on the 2020 list.

- OER initiated site assessment activities at nine priority hazardous substance sites and continued site assessment activities at 10 other sites.

- ❖ OER completed closure construction activities at Don's Disposal and Jackson County landfills under the Landfill Closure Assistance, and closure work was initiated at the Pine Creek Omar landfill in Logan County.

- ❖ OER received and processed 1,749 notifications of excavations from MISS Utility of West Virginia, to provide protections from uncontrolled exposures at properties with established environmental covenants under the Voluntary Remediation and Superfund programs.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## B. Division Of Water and Waste Management

### 4. Groundwater Program

#### a. Introduction: SUMMARY OF GROUNDWATER QUALITY IN WEST VIRGINIA

**Prepared by the Division of Water and Waste Management - Groundwater Program in conjunction with the U.S. Geological Survey**

### 1. Background

Water quality data from locations in the Group D Watersheds were collected during the reporting period July 1, 2007 – June 31, 2009 from the ambient groundwater quality network. The report also summarizes groundwater quality data stored in the USGS National Water Information System (NWIS) water quality database for West Virginia.

Water quality data for the 30 sites in the West Virginia ambient groundwater quality network and for wells in the U.S. Geological Survey National Water Information System (NWIS) database for West Virginia were analyzed statistically to identify any water quality trends and relations and to compare data from the two data sets. Site selection was concentrated in areas of high priority or special interest to the West Virginia Department of Environmental Protection - Division of Water and Waste Management - Groundwater Program.

### 2. Parameters

Data for selected properties and constituents were grouped by geologic unit, topographic setting, geologic age, well depth and season. The constituents include field and laboratory parameters such as specific conductance, pH, oxidation-reduction potential, turbidity, dissolved oxygen and other gases, bacterial counts of fecal coliform, total coliform, E. coli, organic carbon, hardness, acidity, ionic concentration of calcium, magnesium, sodium, potassium, bicarbonate, alkalinity, chloride, fluoride, bromide, sulfate, dissolved solids, nutrients such as nitrogen including nitrate plus nitrite, and phosphorus, concentration of metals such as aluminum, antimony, arsenic, barium, beryllium, cadmium, iron, lead, manganese, zinc, radon, a variety of hydrocarbons, volatile organic compounds, 53 semi-volatile organic compounds, and 52 pesticides.

Data from the ambient network did not show any significant seasonal variations in groundwater quality.

## 3. The Geochemistry of West Virginia's Water

Groundwater quality is affected by human activities and can be degraded as a result of industrial waste disposal, coal mining, oil and gas drilling, agricultural activities, domestic or municipal waste disposal, transportation, and rural development. Waters sampled at the 30 locations show that background levels of pesticides, hydrocarbons, volatile organic compounds, and other chemicals that were tested occur at concentrations far below action levels set by groundwater quality standards.

## 4. Abundance of Groundwater

Although there seems to be adequate supplies of groundwater for public and private use, industry must usually rely on other sources of water. Groundwater quantity is highly variable throughout the State. Yields range considerably, even from location to location within the same water-bearing formation. Water-bearing formations in areas of fractured limestone in the southeastern and eastern part of the State and wells drilled in alluvium along the Ohio River tend to have the greatest yields. Water-bearing formations produce from a few gallons per minute (gpm) to more than 2,300 gpm in some sand and gravel aquifers along the Ohio River. Average yields throughout the State are around 260 gpm.

## 5. Concerns

Two major concerns are the high concentrations of radon in certain watersheds and the presence of pharmaceuticals and endocrine disrupting chemicals in groundwater. Radon is a naturally occurring element found in many soils and rock types. The EPA has proposed a maximum contaminant level for radon at 300 pCi/L.

Data collected by the USGS for the Ambient Groundwater Quality study show concentrations of radon above the 300 pCi/L were found at approximately half of the sites sampled. These high concentrations of radon were found in diverse geological settings and well depths.

The discovery of the presence of pharmaceuticals and endocrine disrupting chemicals in groundwater has raised concerns regarding their effects on human health and the continued viability of antibiotic medications. Endocrine disrupting chemicals are found in a wide variety of products; their presence appears to be ubiquitous in the environment. Bioassays of fish in the Potomac River found intersex characteristics in the fish sampled. One such mutation is the presence of eggs in the testes of male fish. Another concern is the presence of certain antibiotics in ground and surface waters. At this time, more study needs to be done in this area to determine the appropriate course of action needed to address this concern.

Although not a threat to public health, high concentrations of iron and manganese may render groundwater unsuitable for domestic use due to aesthetic reasons in some locations. These concentrations of dissolved iron and dissolved manganese are naturally occurring and are found sporadically throughout the State. Approximately one third of wells sampled contained concentrations of iron above secondary standards for drinking water.

Bacterial contamination continues to be a concern in many areas, especially in the eastern panhandle and other areas where large poultry farms, feedlots, and the practice of maintaining manure ponds may be found. However, the most likely source of bacterial contamination is failing or inadequately sited septic systems. Some improvement in reducing bacterial contamination has been noted.

This study also noted an increase in volatile organic compounds (VOCs). There are two reasons for this: a lower detection limit, and increasing atmospheric contamination. Specifically, an increase was seen in four volatile organic carbon compounds, di-isopropyl ether, methyl pentyl ether, styrene, and methyl tertiary butyl ether (MTBE). The first three of these compounds can be products of chlorinated hydrocarbon breakdown. MTBE is a gasoline additive. This is most likely from gasoline residues, and is attributed to local land use or atmospheric contamination. As recent sampling studies are now detecting the presence of these compounds in groundwater for the first time, it is prudent that their presence be monitored closely.

Fifty three semi-volatile organic carbon compounds were sampled for at five sites. No semi-volatile organic carbon compounds were detected at any site in 2008.Fifty-two pesticide compounds were sampled for at five sites. No pesticides were detected at any site in 2008.

### b. Groundwater Quality Standard Variances - Title 47 Series 57

Title 47 Series 57 established procedures for facilities to petition the Secretary for a variance from groundwater protection standards for an individual source or for a class of sources. If the Secretary agrees that a variance is appropriate, the rulemaking procedures will be initiated in accordance with Chapter 29 Article 3 of the W. Va. Code. The Secretary may deny a variance; however, only the legislature may grant a variance.

Variances may be granted by the legislature to allow groundwater quality standards to be exceeded for a single source or class of sources, which by their nature cannot be conducted in compliance with the requirements of W. Va. Code 22-12-5. The benefits of granting the variance must outweigh the benefit of complying with existing groundwater quality standards and demonstrate that there is no technologically feasible alternative available. The request must also show that granting the variance is more in the public interest than adherence to existing groundwater quality standards.

During this reporting period, there have been no new requests for any Groundwater Quality Standard Variances. The five year variances granted to American Electric Power and Allegheny Energy have now expired and are currently under review.

### c. Groundwater Protection Regulations - Title 47 Series 58

Groundwater Protection Plans (GPP) for 50 facilities in West Virginia have been received by the Groundwater Program. Memoranda identifying their deficiencies or approving the GPP were prepared and sent to the Permits Section where these deficiencies will be addressed during the permitting process. These facilities are listed in the table at the end of this section.

Underground Storage Tank (UST) facilities that distribute only gasoline or diesel fuel are adequately regulated by the Underground Storage Tank Section of the Division of Waste Management. Therefore, some facilities have received a waiver from the requirement to develop and maintain GPP's. In lieu of a site specific GPP, the facility must complete and submit a registration form certifying that they do not have service bays, do not provide mechanical service, do not have above ground storage tanks, and do not have outside bulk storage of materials with the potential to harm groundwater.

Guidance documents have been developed to aid in the preparation and implementation of Groundwater Protection Plans (GPP). These are the Groundwater Protection Plan Guidance and the Groundwater Protection Plan for Small Businesses. Both documents are in the process of being updated for the coming year. Other technical assistance documents are the Salt Storage Guidelines, the Above Ground Storage Tank Guidance (revision 2010), the Site Evaluation for Land Application of Industrial Sludge Guidance Document, the Groundwater Sampling QA/QC/SOP (revised 2009), and the Guidance Document for the Use of Monitored Natural Attenuation at Contaminated Sites. Short descriptions of these documents are presented on the following page.

**Groundwater Protection Plan Guidance Document**

This document summarizes and explains the elements required in a GPP for an industrial facility.

**Salt Storage Guidelines**

This is a guidance document to enable consistency in the environmental regulation of salt storage facilities which includes sections on salt pile configuration, storage pad construction, covering salt during storage periods, runoff handling, best management practices, groundwater monitoring and permitting.

**Above Ground Storage Tank Guidance**

This guidance outlines the groundwater protection requirements for Above Ground Storage Tanks (AST's). It also includes sections on AST construction, operation, safety, closure procedures, and post fuel storage use.

| Site Number | Project Name | Location | Date Received | Date Approved |
|---|---|---|---|---|
| 1 | Opequon Overlook | Baker Heights | | 9/27/05 |
| 2 | Tabler Station Manor, Section 4 | Tablers Station | | 8/28/05 |
| 3 | Pebble Ridge Phase 3 | N Central Berkeley Co. | | 7/20/05 |
| 4 | Willowby Estates | SE of Inwood | | 7/8/05 |
| 5 | Blackbird Village Townhomes | Lewisburg | | 10/11/05 |
| 6 | Yorkshire Glen Phase 1-Section2 | Martinsburg | | 8/26/05 |
| 7 | Townes of Ridgeway | Ridgeway | | 8/28/05 |
| 8 | Four Oaks | Martinsburg | | 02/06 |
| 9 | Elizabeth Station,Section F | Bunker Hill | | 8/31/05 |

| Site Number | Project Name | Location | Date Received | Date Approved |
|---|---|---|---|---|
| 10 | The Gallery Subdivision | Martinsburg | | 10/7/05 |
| 11 | Otterbein UM Church | Martinsburg | | 10/3/05 |
| 12 | Village Makers | Baker Heights (E of Martinsburg) | | |
| 13 | Stonebrook Village–Phase 2 | Hedgesville | | 02/06 |
| 14 | Sader Point | Inwood | | 01/06 |
| 15 | Potomack Mews Neighborhood | N. Berkeley Co. | | 01/06 |
| 16 | Honeywood South | N. Berkeley Co. | | 12/05 |
| 17 | Brookside Subdivision | Nollville, W of Martinsburg | | 10/13/05 |
| 18 | Universal Forest Products | Ranson | | 12/05 |
| 19 | Flowing Springs North Basin | Ranson | | 01/06 |
| 20 | Shallow Creek Acres | Shanghai – Third Hill Mtn. | | |
| 21 | Rock Spring Church | Leetown, Jefferson Co. | | |
| 22 | Flowing Springs Subd. Sect. 1 | Jefferson Co. | | 01/06 |
| 23 | International Mill Service | Weirton | | 12/05 |
| 24 | Tackley Mill Neighborhood | Jefferson Co. | | 01/06 |
| 25 | Moorefield Crossing | Moorefield | | 01/06 |
| 26 | Lorraine's Hair Salon | Berkeley Springs | | 01/06 |

| Site Number | Project Name | Location | Date Received | Date Approved |
|---|---|---|---|---|
| 27 | Townes at Oakhurst | Berkeley Co. | | 01/06 |
| 28 | Spring Hill, Section 6 | Berkeley Co. | | 01/06 |
| 29 | Dodd General Contractors Corp. | Clarksburg | | 01/06 |
| 30 | Pick-Up City Auto & Truck Recycler | Fairmont | | 01/06 |
| 31 | Tungste-Met | Fairmont | | 01/06 |
| 32 | Bowden Fish Hatchery | Bowden | | 01/06 |
| 33 | Republic Paperboard | Berkeley Co. | | 01/06 |
| 34 | Reeds Creek Hatchery | | | 01/06 |
| 35 | Willow Ridge | Berkeley Co. | | 01/06 |
| 36 | Laurita Excavating | Fairmont | | 01/06 |
| 37 | Leslie Equip. Co. | | | 02/06 |
| 38 | WJ Clark, Inc. | | | 02/06 |
| 39 | A&R Transport, Inc. | | | 02/06 |
| 40 | Sheetz Car Wash | Martinsburg | | 02/06 |
| 41 | AMI Class D | Clarksburg | | 02/06 |
| 42 | Rooster's Hydraulic Service | | | 02/06 |
| 43 | TDT, Inc. | | | 04/06 |
| 44 | Comet Compressor Station | | | 04/06 |
| 45 | Spencer Veneer | Spencer | | 04/06 |
| 46 | Independence Coal Cp. | Revolution Mine | | 04/06 |

| Site Number | Project Name | Location | Date Received | Date Approved |
|---|---|---|---|---|
| 47 | Mills Farm Section VI | Berkeley Co. | | 04/06 |
| 48 | DuPont Class D | Belle | | 04/06 |
| 49 | Durbin Outfitters | Durbin | | 06/06 |
| 50 | Pratt WTP | Pratt | | 06/06 |
| 51 | Petroleum Products | | | 07/06 |
| 52 | Lake Lumber and Fence Co. | Hacker Valley | | 07/06 |
| 53 | Rural Garbage and Refuse | | | 08/06 |
| 54 | Brenntag Mid-South, Inc. | Clarksburg | | 08/06 |
| 55 | Creo Manufacturing | Inwood | | 08/06 |
| 56 | Gauley Robertson | | | 08/06 |
| 57 | D&D Enterprises | | | 09/06 |
| 58 | City of Clarksburg Class D | Clarksburg | | 09/06 |
| 59 | Rhodes Trailers & Trucks | | | 10/06 |
| 60 | Tecumseh Redevelop. | | | 10/06 |
| 61 | Technology Park | | | 10/06 |
| 62 | Coffman's Metals | | | 10/06 |
| 63 | Appalachian Forest Products | | | 11/06 |
| 64 | DeBarr Trucking | | | 11/06 |
| 65 | US Mulch | | | 11/06 |

| Site Number | Project Name | Location | Date Received | Date Approved |
|---|---|---|---|---|
| 66 | Ben's Auto Salvage | | | 11/06 |
| 67 | Kessler Excavating Class D | | | 11/06 |
| 68 | Newsome & Son Class D | | | 12/06 |
| 69 | Quad Graphics | Martinsburg | | 12/06 |
| 70 | Savin Lumber | Buckhannon | | 12/06 |
| 71 | Interstate Machinery | | | 12/06 |
| 72 | Hurricane Gas Processing | | | 12/06 |
| 73 | Grant County Mulch | | | 12/06 |
| 74 | Longview Power | | | 12/06 |
| 75 | Miller's Pallets | | | 01/07 |
| 76 | Boxley Trucking | | | 02/07 |
| 77 | River Valley Campground | Parkersburg | | 02/07 |
| 78 | Mt. Storm Ready Mix | Mt. Storm | | 02/07 |
| 79 | JP Geary Class D | | | 02/07 |
| 80 | CeramX Products, Inc. | Bolt | | 03/07 |
| 81 | Sharp's Garage | Spencer | | 03/07 |
| 82 | Oak Ridge Trenching & Excavating | | | 03/07 |
| 83 | Kingsford Corp. | Beryl | | 03/07 |
| 84 | Davis Creek Nazarene Church Class D | Kanawha Co. | | 03/07 |
| 85 | Joe Blosser Construction Class D | | | 03/07 |

| Site Number | Project Name | Location | Date Received | Date Approved |
|---|---|---|---|---|
| 86 | T and S Auto Recycling | | | 03/07 |
| 87 | Jefferds Corp. | St. Albans | | 03/07 |
| 88 | Arrow Concrete | | | 03/07 |
| 89 | PW Eagle/Uponor | Clarksburg | | 06/07 |
| 90 | R and B Recycling | Fairview, Mon. Co. | | 06/07 |
| 91 | Jim C. Hamer Co. | | | 06/07 |
| 92 | Plastic Coatings Corp. | | | 06/07 |
| 93 | Charleston W. Travel Center | Hurricane | | 06/07 |
| 94 | Valley Proteins | | | 06/07 |
| 95 | FedEx Freight East | | | 06/07 |
| 96 | J.F. Allen Co. | Elkins | | 06/07 |
| 97 | ALCON, Inc. | | | 06/07 |
| 98 | Clearon Corp. | South Charleston | | 06/07 |
| 99 | Key Energy Services | Dunbar | | 06/07 |
| 100 | Fern Ridge | | | 06/07 |
| 101 | Spring Heights Education Center | | | 06/07 |
| 102 | Garretson's Machine and Fabrication, Inc. | | | 06/07 |
| 103 | Augusta Lumber, LLC | | | 06/07 |
| 104 | New Parks Division of Zinsser Co., Inc. | Parkersburg | | 06/07 |
| 105 | Rish Equipment | St. Albans | | 06/07 |
| 106 | Charles Pointe Road A-4 Project | Morgantown | | 06/07 |

**Site Evaluation for Land Application of Industrial Sludge**

This is a manual designed to enable choosing sites which are capable of receiving land applied industrial sludge. Chapters include soil evaluation, geology and hydrogeology, hydrology, climate, vegetation, application method and rate, and land ownership.

**Groundwater Sampling QA/QC/SOP**

This is a guidance document intended to standardize groundwater sampling practices in West Virginia. It includes chapters on equipment, field data collection, well purging, filtering, preservation, and techniques for groundwater sampling.

**Vulnerable Groundwater Use Areas**

Two areas of the state have been identified as areas which are "areas of karst, wetlands, faults, subsidence, delineated wellhead protection areas or other areas determined by the director to be vulnerable based on geologic or hydrogeologic information,". These areas are the Berkeley – Jefferson area in Berkeley and Jefferson counties, and the Deer Creek Valley area around Green Bank and Boyer in Pocahontas County.

**Groundwater Protection Plan for Small Businesses**

This document is a "fill in the blank" style GPP for small businesses which are unfamiliar with environmental regulation. It helps them maintain compliance with and understand groundwater protection measures as required by 47CSR58.

**Groundwater Protection Plans approved July 1, 2007 to June 30, 2009.**

| FACILITY | DATE APPROVED |
|---|---|
| Morgantown Excavators Inc. Class D LF | 7/23/07 |
| Sistersville County Club, Inc. | 7/23/07 |
| Bengamon Corporation, Class D LF | 8/6/07 |
| Hazard's Excavating & Trucking Co. | 8/7/07 |
| City of Salem Class D LF | 8/30/07 |
| Valley View Golf Association, Inc. | 9/5/07 |
| Peer's Sanitation, Class D LF | 9/10/07 |
| High Wall Park Class D LF | 10/25/07 |
| Rockhouse Springs Grow Out Facility | 2008 |
| Judy Fencecraft Wood Treatment Facility | 2008 |
| Mike Ferrell Ford Lincoln Mercury | 2008 |
| Philips Lighting Company | 2008 |
| Gary Solomon Osage Class D LF | 2008 |
| R & J Roofing and Repair Class D LF | 2008 |
| Swanson Plating Company | 2008 |
| Morgantown Energy Associates | 2008 |
| Danny Sullivan Excavating Class D LF | 2008 |
| Whisper Mountain Campground | 2008 |
| Century Aluminum | 2008 |
| Phillips Machine Service | 2008 |
| Arrow Concrete Company | 2008 |
| Vecellio & Grogan | 2008 |
| Dominion Transmission & Dominion Hope | 8/26/08 |
| Echo Inc. | 8/26/08 |
| Snowshoe Mountain | 9/25/08 |
| Mountain State Carbon | 10/24/08 |
| Clark Truck Parts | 11/06/08 |
| Solo Crane Inc. | 12/4/08 |
| Cabot Corp. | 1/8/09 |
| David Hill Concrete, Inc. | 1/8/09 |
| SFK Pulp Recycling U.S. Inc. | 1/8/09 |
| Alliance Consulting Inc. | 1/15/09 |
| Bluefield Yard – Norfolk Southern | 2/24/09 |
| High Wall Park LF | 3/5/09 |
| Laurita Excavating Inc. | 3/5/09 |
| White Sulphur Springs National Fish Hatchery | 3/5/09 |

| FACILITY | DATE APPROVED |
|---|---|
| City of Clarksburg | 4/1/09 |
| Whitten Construction | 4/15/09 |
| Bio-Tech Environmental Services, Inc. | 4/23/09 |
| Hess Roofing Company, Inc. | 4/23/09 |
| Town of Millcreek WTP | 4/23/09 |
| Chemtura Corporation | 4/28/09 |
| AMI | 4/30/09 |
| Cunningham Excavating, Inc. | 4/30/09 |
| Peer's Sanitation | 4/30/09 |
| PPG Industries-Natrium Facility | 4/30/09 |
| Randolph County | 5/28/09 |
| Joe Blosser LF | 6/16/09 |
| AOP Clearwater | 6/22/09 |
| Reclaim Co. | 6/24/09 |

**d. Monitoring Well Driller Certification/Recertification Program**

The Monitoring Well Driller Program instructs and certifies monitoring well drillers in the design, construction, alteration and abandonment of monitoring wells and boreholes. This program, as authorized by 47 CSR 59 *Monitoring Well Regulations*, was established to ensure industry, well owners and the regulatory community that all monitoring wells installed or abandoned meet a minimum set of standards.

Although the WVDEP is responsible for the certification of monitoring well drillers, the Bureau for Public Health's Office of Environmental Health Services (OEHS) conducts the training and testing for certification of these drillers. OEHS has a long established water well driller certification program and is ideally suited for providing these services to WVDEP, eliminating the need for increased staffing.

As of June 30, 2009, the Monitoring Well Driller Program has certified 480 monitoring well drillers. There are currently 228 active monitoring well drillers, 35 of which were certified during this reporting period.

The monitoring well driller certification information is available on the Internet. The web site address is http://www.wvdhhr.org/bph/monwell/. This site provides information on testing requirements and testing dates, and an application for the testing and training. The recertification of the monitoring well drillers is handled directly by the Monitoring Well Driller Program. Recertification requires a fee and the completion of an address verification form.

To track the driller certification and recertification process the WVDEP's Information Technology Office developed a monitoring well driller module to the Environmental Resource

Information System (ERIS). ERIS is a flexible client/server system of Windows programs, which allows WVDEP offices to track and manage a wide variety of environmental information.

At this time the environmental information that can be tracked includes permitting activities, complaints, violations, inspections and the licensing of technical capabilities, e.g. the monitoring well driller modular. The driller database contains a listing of drillers who are currently certified and those whose certification has expired. As of June 30, 2009, there are 228 active drillers and 159 drillers that have been placed on inactive status. This database is capable of generating invoices for the recertification fees, related certification and recertification correspondences, certification cards, and address verification forms. Reports can be generated from this database containing all drillers' addresses, initial certification date, certification expiration date, driller registration numbers and fee invoicing information.

**e. Monitoring Well Installation and Abandonment**

Concerns from the drilling industry, the desire to protect well owners, and an overwhelming need by groundwater regulatory agencies for quality control of data from monitoring wells led to the enactment of 47 CSR 60, *Monitoring Well Design Standards,* in May, 1996. This rule established the minimum acceptable documentation and standards for the design, installation, construction and abandonment of monitoring wells and the abandonment of boreholes. This rule does not eliminate nor supersede the more stringent aspects of well design criteria as established by federal programs such as RCRA or CERCLA but only stipulates that, at a minimum, monitoring wells must be constructed and abandoned in accordance with 47 CSR 60.

As is the case with any rule, there are unforeseen circumstances that require alternatives and exceptions when compliance with the rule is not feasible or unnecessary. The alternatives and/or exceptions are handled through written variance requests on an individual basis.

The rule has resulted in the need for electronic files to capture the well installation and abandonment and high-risk borehole abandonment information. The electronic submission of the *Monitoring Well Construction Documentation Forms* and *Abandonment Documentation for Monitoring Well/Borehole Forms* became available as of 2003. The format for the electronic submission consists of drop-down menus for choices of materials and procedures and areas for written comments. The information is now being stored in EQuIS along with water quality and site information.

During this reporting period the following documentation forms were received and reviewed:

| Forms Received and Reviewed Between July 1, 2007 and June 30, 2009 | Totals |
|---|---|
| Monitoring Well Construction Forms | 685 |
| Monitoring Well Abandonment Forms | 815 |
| High Risk Borehole Abandonment Forms | 2 |

The forms were reviewed for completeness and correct information. The major deficiencies noted were incomplete or incorrect latitudes and longitudes, incomplete physical site information, incorrect or missing installation materials and procedures. The electronic submission of the forms has eliminated several of these problem areas.

**f. Complaints and Calls**

The Division of Water and Waste Management's Monitoring Well Drillers Program responded to approximately 728 calls/requests for information concerning monitoring well drillers' certifications and recertifications, monitoring well design standards, documentation, variances, and enforcement. This does not include minor telephone call requests for basic information.

**g. Public Outreach**

Training and assistance is provided to county health department sanitarians and staff members on the use of their Global Positioning System (GPS) for the location of septic tanks.

The Global Positioning System (GPS) information, septic tank system permit number, septic tank seal number, owner's mailing address and written directions to the site where the septic tank is located, is maintained in ERIS, our environmental database. For those septic tank registrations with GPS data in ERIS there is now a link to West Virginia Geographic Information System (WVGIS) that generates a map showing the location of the septic tank selected.

County health departments issued a total of 8,033 septic tank permits from July 1, 2005 through June 30, 2007. The following table details the number by county that have been issued septic tank registrations.

| Septic Tank Registration from July 1, 2005 to June 30, 2007 | |
|---|---|
| County | # of Registrations |
| Barbour | 114 |
| Berkeley | 781 |
| Boone | 19 |
| Braxton | 124 |
| Brooke | 64 |
| Cabell | 350 |
| Calhoun | 68 |

| Septic Tank Registration from July 1, 2005 to June 30, 2007 | |
|---|---|
| **County** | **# of Registrations** |
| Clay | 75 |
| Doddridge | 7 |
| Fayette | 28 |
| Gilmer | 18 |
| Grant | 175 |
| Greenbrier | 196 |
| Hampshire | 508 |
| Hancock | 24 |
| Hardy | 371 |
| Harrison | 6 |
| Jackson | 127 |
| Jefferson | 19 |
| Kanawha | 40 |
| Lewis | 109 |
| Lincoln | 110 |
| Logan | 1 |
| Marion | 141 |
| Marshall | 21 |
| Mason | 25 |
| McDowell | 140 |
| Mercer | 178 |
| Mineral | 242 |
| Mingo | 3 |
| Monongalia | 310 |
| Monroe | 106 |
| Morgan | 733 |
| Nicholas | 250 |
| Ohio | 2 |
| Pendleton | 170 |
| Pleasants | 50 |
| Pocahontas | 159 |
| Preston | 327 |
| Putnam | 89 |
| Raleigh | 321 |
| Randolph | 130 |
| Ritchie | 85 |
| Roane | 124 |
| Summers | 112 |
| Taylor | 82 |
| Tucker | 90 |
| Tyler | 53 |

| Septic Tank Registration from July 1, 2005 to June 30, 2007 | |
|---|---|
| **County** | **# of Registrations** |
| Upshur | 200 |
| Wayne | 100 |
| Webster | 95 |
| Wetzel | 55 |
| Wirt | 71 |
| Wood | 231 |
| Wyoming | 4 |
| **Totals** | **8033** |

**h. Underground Injection Control (UIC) Program**

The federal Safe Drinking Water Act of 1974 established the UIC program to ensure that fluids injected underground will not endanger drinking water sources. Applying the UIC regulations (47 CSR 13) promulgated under the authority of Chapter 22, Article 11 of the State Code, the Division of Water and Waste Management's UIC program mainly regulates the subsurface placement of effluents into or above underground sources of drinking water by permitting the site, construction, operation, and abandonment of Class 5 shallow injection wells.

The Class 5 category includes 32 types of injection wells ranging from high-tech aquifer remediation wells to low-tech septic systems. UIC permits for Class 5 wells fall into four broad categories:

- Industrial/Commercial

  This includes groundwater remediation re-injection wells, where contaminated groundwater is pumped out, treated to meet groundwater quality standards, then re-injected. It also includes various industrial/commercial facilities that dispose of certain types of wastewater into subsurface distribution systems, including facilities that inject sanitary waste from restrooms co-mingled with other wastewater constituents into a septic tank and leachfield system.

- Stormwater

  Disposal of stormwater into a well or directed into a naturally occurring sinkhole may be permitted if it can be reasonably demonstrated that no underground sources of drinking water will be adversely impacted.

- UIC septic permits

  These class 5 wells typically dispose of solely sanitary waste into a septic tank and leachfield system (solely sanitary waste not co-mingled with any other fluid). Permits for facilities at fifty nine locations have been issued during this reporting period.

- UIC Mining
  These class 5 wells typically dispose of fluids associated with mining into underground mine pools.

## 1. Groundwater/UIC Program – Mining and Quarrying

### Environmental Goals of the Groundwater Protection and Underground Injection Control Programs for Mines and Quarries

Because, as stated in Chapter 22 Article 12, *Groundwater Protection Act*, "Over fifty percent of West Virginia's overall population, and over ninety percent of the state's rural population, depend on groundwater for drinking water" (§22.12.2.a.2), and because mineral mining, both coal and non-coal, is ubiquitous in West Virginia, protecting the quality and quantity of the groundwater from adverse impacts due to these activities is imperative both to the environment and to human health and safety. These programs' goals are identical and twofold: to ensure the future chemical and biological quality of the groundwater of the state, and to prevent adverse changes in the quantity of the groundwater, *e.g.*, the dewatering of existing aquifers or the excessive flooding of underground mine voids.

**Protecting Water Supplies and the Environment:**

Groundwater protection at mine sites was begun 13 years ago in West Virginia with the passage of Legislative Rule Title 38 CSR 2F, *Groundwater Protection Regulations for Coal Mining Operations*, and the policies and practices established by WVDEP's DWWM and DMR to enforce it. The resulting changes in the management of surface activities and substances at mine sites have protected many public and private water sources, both present and potential, from damage due to mining, and have mitigated many of the impacts that occurred prior to or despite those changes.

The Underground Injection Control (UIC) Program, as established under Legislative Rule Title 47 CSR 13, *Underground Injection Control*, applies to mining primarily through the permitting of Class 5 Type X13 injection wells, typically for the disposal of coal preparation plant slurry or acid mine drainage treatment sludge into abandoned underground mine voids. The UIC 5X13 permitting process is designed to ensure that the injectate meets Federal Safe Drinking Water Standards at the point of injection and that the additional volume of fluid will not endanger human safety or the environment.

**SCR-15 and UIC:**

In 2006, the West Virginia Legislature authorized SCR-15, a comprehensive two-phase study on the potential effects of underground injection of coal slurry on the environment (Phase 1) and human health (Phase 2). A team whose members include personnel from West Virginia Department of Environmental Protection's DMR (Division of Mining and Reclamation) and Division of Water and Waste Management (DWWM), the West Virginia Department of Health

and Human Resources-Bureau of Public Health, and Office of Surface Mining Reclamation and Enforcement conducted the first phase of this study.

An analysis of the chemical composition of coal slurry, including an inventory of organic and inorganic constituents, was conducted at six locations across the State. With input from the environmental and industry groups, six sites were selected from the 13 active coal slurry injection sites in the state. The study sites included are: Southern Minerals, Panther LLC, Marfork Coal Company, Power Mountain, Loadout LLC, and Coresco, LLC.

A detailed hydrogeologic evaluation of the migration of coal slurry and its constituents from injection wells into the ground and surface waters was conducted at four of the six sites. The assessment sites include the coal preparation facilities where the underground injection of coal slurry took place. The sites are Southern Minerals, Panther LLC, Loadout LLC and Power Mountain. All four assessment sites are located in the southern coal fields and have mines which are considered below or mostly below-drainage (mines workings are located below surface drainage features). Water samples collected from surrounding surface and ground water were analyzed for over 170 organic and inorganic chemical constituents. All the sites sampled reflect a "snapshot" of the site-specific hydrologic conditions that surround the slurry injection sites.

The completed WVDEP Phase I SCR-15 study can be found at the WVDEP website at http://www.wvdep.org/item.cfm?ssid=9&ss1id=989. The findings of this study have been officially presented to the Senate Committees on "Government and Finance" and "Water Resources".

As part of the implementation on the recommendations of the SCR-15 study the management of mining related UIC permits is being taken over by the Division of Mining and Reclamation and will no longer reside in the WVDEP Groundwater program. This includes all mining-related UIC permitting activity and all tracking and enforcement of UIC-related violations. Two full-time mining UIC employees have been hired by DMR and are presently being trained. More details on the WVDEP plans to improve mining related UIC issues can be found in the "Recommendations" section of SCR-15 at http://www.wvdep.org/item.cfm?ssid=9&ss1id=989.

The second part of SCR-15 is being conducted by the West Virginia Division of Health and Human Resources, which has a contract with West Virginia University. SCR-15 Phase II will concentrate on the human health aspects of the underground injection of coal slurry. This study is still in progress and can be tracked at it official website maintained by WVU at http://www.coalslurry.net/.

**Use of the ERIS Database:**

Every UIC – Mining application will continue to be tracked in the ERIS Database. As information is received it will be added into the database by members of the Division of Mining and Reclamation.

**Statistics:**

Permitted Coal Slurry Injection Sites 13
Permitted AMD Sludge Injection Sites 34

A full summary of all known historic underground injection of Coal Slurry can be found in SCR-15 Phase I.

**2. UIC Industrial/Commercial permitting, including stormwater disposal permits**

The permitting of UIC wells provides for minimum standards and technical requirements for the proper siting, construction, operation, monitoring, and abandonment of injection wells. These types of wells include aquifer remediation wells, injection wells permitted for the disposal of co-mingled sanitary and process waste waters at commercial/industrial facilities, geothermal injection wells, and stormwater disposal wells.

When UIC permit applications are received and reviewed, they are accepted, accepted with modifications, or denied. Upon acceptance, an individual permit is issued in draft form and placed in public notice for a 30-day comment period. If no significant comments are received, a final permit is issued 30 days after the end of the comment period. Public hearings are held if necessary. Permits for facilities at 49 locations have been issued during this reporting period.

Significant improvements to UIC Industrial/Commercial permits continue to be made through close scrutiny of each application in regard to injection well design and maintenance, potential toxicity of proposed injectates, fate and transport of the injectate, site hydrogeology, and careful attention to monitoring the sites discharge reports on an on going basis. All such sites are currently the responsibility of one hydrogeologist. As the number of Industrial/Commercial permits continues to increase, support for this portion of the UIC Program must also increase to keep pace with growing development and the need for oversight to ensure responsible methods of fluid injection into the subsurface.

Forty-nine Industrial/Commercial permits have been issued during this reporting period. There were a total of 367 injection points permitted for these permits. Nineteen Industrial/Commercial permits for injection of subsurface releasing compounds at groundwater remediation sites have been issued during this reporting period specifically for bioremediation of contaminated sites. There were a total number of 297 injection points permitted for these bioremediation permits.

Fourteen of the 49 Industrial/Commercial permits issued during this reporting period were for the underground disposal of stormwater. Two were issued as permit modifications. There were a total number of 18 injection points permitted at 12 sites.

In addition, one geothermal injection permit with three injection points was renewed during this reporting period. Five Industrial/Commercial permits for the disposal of co-mingled sanitary and process waste waters at commercial/industrial facilities were issued. There were a total number of seven injection points permitted for these commercial/industrial permits.

Without abundant resources of clean groundwater, there will be no economic growth, no industrial base, and no preservation of the quality of life that is the foundation of our culture. Limiting and controlling underground injection ensures that groundwater and underground sources of drinking water will remain viable for future use. Once ground water becomes contaminated, it is very difficult or even impossible to remove the pollution. The cost of groundwater remediation can be enormous, with no certain outcome of how effective the final results will be. Since the water moves so slowly, the pollutant is able to stay very concentrated in higher levels in certain areas instead of dispersing over the entire area as surface water does. The pollutants could remain in an area, making the water unusable for a period of many years or decades. After a period of time, the contamination in the ground water will spread to the surface water as well through its natural outlets.

| UIC Industrial / Commercial permits issued July 1, 2007 – June 30, 2009 | | | | |
|---|---|---|---|---|
| **Watershed** | **stormwater** | **aquifer remediation** | **industrial / commercial** | **geothermal** |
| **Group A Watersheds** | | | | |
| Upper Ohio River North | | 1 | 1 | |
| Cheat River | | | | |
| Youghiogheny River | | | | |
| S. Branch Potomac River | | | 2 | |
| Shenandoah River | 1 | 3 | | |
| Upper Kanawha River | | 3 | | |
| **Group B Watersheds** | | | | |
| N. Branch Potomac River | | | | |
| Tygart Valley River | | | | |
| Lower Kanawha River | | 1 | | |
| Elk River | | 1 | | 1 |
| Coal River | | | | |
| **Group C Watersheds** | | | | |
| Middle Ohio River North | | 3 | | |
| Potomac River Drains | 3 | 3 | 1 | |
| Middle Ohio River South | | | 1 | |
| Lower Guyandotte River | | 1 | 1 | |
| Gauley River | | 1 | 1 | |
| Tug Fork River | | 1 | | |
| **Group D Watersheds** | | | | |
| Monongahela River | | 2 | 1 | |
| Little Kanawha River | | | | |
| Greenbrier River | 8 | | | |
| James River | | | | |
| Lower New River | | | | |
| Upper New River | 1 | 1 | | |
| **Group E Watersheds** | | | | |
| Upper Ohio River South | | 4 | 1 | |
| Dunkard Creek | | | | |
| Cacapon River | | | 1 | |
| West Fork River | | 4 | | |
| Lower Ohio River | | | | |
| Big Sandy River | | | | |
| Twelvepole Creek | | | | |
| Upper Guyandotte River | | | | |

In addition to issuing UIC permits for pump-and-treat methods of groundwater remediation, an increasing number of permits for the injection of subsurface releasing compounds (SRC) are issued for the bioremediation of contaminated groundwater.

The most common application of SRC is in remediation of hydrocarbon contaminated waters where oxygen releasing compounds, sometimes mixed with a microbial agent, is injected into the shallow subsurface. The addition of oxygen is often necessary to enhance the natural chemical and biological processes that break down hydrocarbons and certain other compounds *in situ*. In many situations, there is no need for the addition of other microbial agents, as the native bacteria in the soil are sufficient for bioremediation purposes as long as there is sufficient oxygen to fuel this process. In other situations, active bioremediation is enhanced by the addition of sulfate, magnesium and ferric compounds. Other sites are treated with injections of food grade molasses, emulsified soy oil or other nutrients may be used.

In addition to remediating hydrocarbons, other subsurface releasing compounds may be used to remediate chlorinated hydrocarbons, other metals, and chlorinated biphenyls using hydrogen releasing compounds.

Oxygen releasing compounds are being pumped into several injection points at a facility in Institute in an effort to clean up carbon tetrachloride, chloroform, and fluorocarbons.

### 3. Inspections

The UIC inspections are conducted at business facilities, residential multiple dwellings (i.e. trailer parks and apartment complexes), schools that are not served by public sewage disposal plants and campgrounds. Single-family dwellings with no co-mingled waste streams (sanitary waste only) are exempt from UIC regulation. Some inspections are conducted as multimedia inspections with other programs or agencies. Priority is given to inspections conducted in selected watershed areas, which rotate on a 5-year basis.

The regional Environmental Enforcement inspector and local sanitarians are contacted to gather useful information regarding areas that are not served by a public sewage disposal system and may contain facilities that require a UIC permit. The regional Environmental Enforcement inspector and local sanitarians are given the opportunity to coordinate inspections in the area if they wish to accompany the UIC inspector. Inspections are focused on wellhead protection areas.

In addition to the routine inspection of permitted facilities, facilities that are found to require a UIC permit are inventoried and a determination is made regarding the proper injection well classification. In addition to Class 5 wells discovered during routine inspections, information on suspected injection wells may come from the Class 5 inventory database, complaints, request for permits, and referrals from other agencies.

During the inspections, a UIC inspection form is completed on site. The owner/operator is verbally informed of the status of his well and informed of what actions are to be taken to come into compliance with UIC regulations. The UIC Program has conducted 639 UIC inspections during this reporting period, and an additional 102 inspections of UIC stormwater sites.

If the facility has a Class 5 well that is not permitted, the owner/operator is given the option to apply and obtain a UIC permit for the well or submit a plan for the UIC Program's approval to close the well. All injection wells must be properly abandoned according to UIC regulations. If there are other environmental concerns the owner/operator is given the information necessary to come into compliance with WVDEP regulations. During this reporting period, 209 verbal enforcements were given to owners/operators of facilities, and 19 enforcement letters were written. Verbal enforcements have been successful in resolving all issues that have arisen. No written Notices of Violations had to be written during this reporting period.

Groundwater Protection Plans (GPPs) and Best Management Practices (BMPs) are reviewed with the facility owner/operator. Working with facility owners in the implementation of these practices not only helps protect the environment, but also assists the owner/operator of the facility in reducing the amount of waste generated.

### 4. Enforcement

The enforcement of UIC regulations is primarily dependent on UIC staff with some assistance from DEP enforcement personnel. Although the major enforcement steps are outlined in 47 CSR 13, "Underground Injection Control", DWWM will often informally deal with problems on an individual basis to achieve a quick solution based on characteristics unique to the situation with a success rate of nearly 100%. When an informal enforcement has failed or is not likely to succeed, a Notice of Violation or an Administrative Order is issued instructing the violator to take appropriate action within a specified amount of time. If a satisfactory resolution has not been achieved within a reasonable time frame, civil and criminal actions may be filed.

### 5. UIC Outreach

The UIC program personnel provide technical assistance to State agencies, business and industrial personnel, and concerned citizens throughout the state. UIC program personnel are working with and educating county sanitarians on the types of injection wells that require oversight by the UIC program. An agreement has been reached with local Health Departments to forward any and all potential UIC concerns to the UIC Program. This will enable the UIC Program to determine if a UIC permit is required at a particular site and will lessen the potential for the dissemination of misinformation to the prospective permittee. This communication between the UIC Program and county sanitarians will benefit the regulatory community and citizens alike.

## i. Groundwater Program Remediation Activities

Since 1991, the remediation section of the Groundwater Program has worked on 255 sites, approximately 66 of which were active during this reporting period.

These sites vary between equipment yards, above-ground tank releases, petroleum bulk terminals and refineries, railyards, and manufacturing plants. Some of the sites are active facilities, but many are physically abandoned (as opposed to legally abandoned) and are nothing more than empty lots or fields. Most of the contamination is some type of hydrocarbon, usually diesel fuel or fuel oil; however, other sites have benzene, chloride, or chlorinated solvent problems.

The Groundwater Program is the lead state agency at most of these locations, while we give advice to other WVDEP programs at others. In general, the Groundwater Program handles those sites with groundwater and soil contamination that do not fit easily under some other regulatory authority.

The following is a list of the sites that the Groundwater Program has worked on during this reporting period, from July 1, 2007, to June 30, 2009:

**A.E., (ALERIS) INC. OF BUCKHANNON** (Upshur County): This is a facility where a hydraulic line leaked under a large building. The company repaired the line and then discovered that free product was appearing in an adjacent surface stream. They removed the product and the contaminated soils, and have been sampling the surface stream to ensure that the problem has been remediated. The facility was ultimately referred to Industrial Permits, so that the company would only have to report to one WVDEP group.

**AEP KAMMER SWITCH YARD** (Marshall County): This facility had an oil spill from a large transformer. The company contained the spill and removed the contaminated soils; however, no completion report was submitted.

**AEP POINT PLEASANTS SERVICE STATION** (Harrison County): This was a facility where a leaking hydraulic lift contaminated the subsurface. The company removed as much contaminated soil as possible (without compromising the foundation walls of their building), with the proper soil sampling, and the groundwater monitoring was initiated to ensure that the problem had been successfully remediated. No significant contamination was found, and a No Further Action Letter was provided by the Groundwater Program on February 26, 2008.

**AVERY DENNISON FACILITY** (Lewis County): This was a site with both solvent and hydrocarbon soil and groundwater contamination. The Groundwater Program asked for soil removal, an investigation in the solvent area, and groundwater monitoring; however, the company elected to move the facility to the Voluntary Remediation Program.

**BERKELEY SPRINGS AREA** (Morgan County): This was a site where it was feared the construction of a housing development could contaminate a large karst spring. The Groundwater Program provided geological advice to the 401 Certification Program.

**BROOKFIELD DEVELOPMENT** (Berkeley County): This was a housing development whose construction could possibly cause groundwater degradation. The Aremediation section@ of the Groundwater Program provided geological advice to other personnel within the Program.

**CSX FAIRMONT RAILYARD** (Marion County): This is a railyard with free product, soil and groundwater hydrocarbon contamination. The free product and contaminated soils have been removed, with the proper soil sampling, and groundwater monitoring is currently underway to determine if these strategies have been successful.

**CSX GRAFTON RAILYARD LOCOMOTIVE SHOP** (Taylor County): This is an area within this railyard with soil and groundwater hydrocarbon contamination. The contaminated soils that could be excavated without disrupting the railyard's operations were removed, and oxygenating compounds have been added to the remainder. Groundwater monitoring is underway to determine the effectiveness of this remediation.

**CSX GRAFTON RAILYARD LOCOMOTIVE SHOP** (Taylor County): This is a part of this railyard that contains soil and groundwater solvent contamination. The contamination is relatively deep, and reducing compounds have been added to these soils. Groundwater monitoring is underway to determine the effectiveness of this remediation.

**CSX HANDLEY RAILYARD** (Kanawha County): This is a part of an old railyard with groundwater and soil hydocarbon contamination that was producing a sheen on both the Kanawha River and the nearby Upper Creek. CSX installed a large-diameter well to recover the free product (eliminating the sheen), and used soil removal, vapor recovery, and oxygenating compounds to remediate the contaminated soils. The effectiveness of these strategies is currently being assessed with groundwater monitoring.

**CSX HANDLEY RAILYARD** (Kanawha County): This is a part of an old railyard with solvent groundwater contamination. The contamination is relatively deep, and CSX has used air sparging and reducing compounds to remediate this problem. The effectiveness of these strategies is currently being assessed with groundwater monitoring.

**CSX KEYSER RAILYARD** (Mineral County): This is a site with soil and groundwater solvent contamination. CSX has completed several stepped-out investigations, and has used a reducing compound to reduce the contamination. They are currently using monitored natural attenuation to monitor the effectiveness of their remedial strategies.

**CSX MARYLAND JUNCTION RAILYARD** (Mineral County): This railyard had both soil and groundwater hydrocarbon contamination, as well as free product. CSX removed

most of the contaminated soil, with the proper sampling, and is using an oxygenating compound to remediate the remainder. Groundwater monitoring continues to determine the effectiveness of the work.

**CSX PEACH CREEK RAILYARD** (Logan County): This is a yard with both soil and groundwater hydrocarbon contamination, as well as a persistent free product problem. CSX has excavated some of the soils and used oxygen-releasing compounds to address the remainder of the contamination. Free product collection continues, and CSX is continuing to investigate the site to locate other contamination sources.

**CSX ROWLESBURG RAILYARD** (Preston County): This railyard had both soil and groundwater hydrocarbon contamination. CSX removed most of the contaminated soil, with the proper sampling, and used an oxygenating compound to remediate the remainder. Groundwater monitoring continues to determine the effectiveness of the remediation.

**CUMMINGS FAIRMONT SERVICE CENTER** (Marion County): This site had groundwater hydrocarbon contamination, where the Groundwater Program recommended quarterly groundwater monitoring. There is no record of the company complying, and the site is now inactive.

**DOH GLEN DALE EQUIPMENT YARD** (Marshall County): This site had heavy-end hydrocarbon contaminated soils. The DOH has repeatedly excavated more and more of these soils, but has been unsuccessfully in completely eliminating the problem. Groundwater monitoring is now being used to determine if the soil removal has been effective.

**DOH GREENWOOD EQUIPMENT YARD** (Doddridge County): This site has continued hydrocarbon and chloride soil and groundwater contamination. The Division of Highways has been monitoring the groundwater and the surface water in a nearby creek; however, no effective remediation has been performed to date.

**DOH NEW MARTINSVILLE EQUIPMENT YARD** (Wetzel County): This site has chloride soil and groundwater contamination, and the Division of Highways has begun monitoring the groundwater to determine how severe and extensive the contamination is.

**DOH OAK HILL EQUIPMENT YARD (SALT CONTAMINATION)** (Fayette County): This site has both soil and groundwater chloride contamination. The Division of Highways has excavated much of the soil contamination, but groundwater problems remains. Groundwater monitoring continues to determine if the soil removal will ultimately be effective.

**DOH SISTERSVILLE EQUIPMENT YARD** (Tyler County): This site has chloride soil and groundwater contamination. The Division of Highways has begun monitoring the groundwater to determine how severe and extensive this contamination is.

JARRETT BRANCH LANDFILL (Fayette County): This is a landfill where leachate appears to be seeping by a slurry wall. The Groundwater Program provided dye-tracing advice to Industrial Permits.

JOHNS POOL SERVICE (Berkeley County): This is an old bulk terminal where there are mixed reports as to whether there is subsurface contamination. The Groundwater Program researched the question and spoke to several local residents, and determined that the problem was actually originating for an adjacent property (which was already under the authority of the LUST Program).

LANEVILLE WATER WELL (Randolph County): This is a water well that could possibly be contaminated by nearby oil-and-gas activities, where the Groundwater Program provided geological advice to the Health Department.

LEMAC MINE SERVICES (Monongalia County): This was a site where the Groundwater Program provided advice to Environmental Enforcement, and where additional information is required before an overall strategy can be formulated.

LIN ELECTRIC (Mercer County): This is a karst area with PCB and solvent contamination, and where the Groundwater Program has provided geological advice to Environmental Enforcement.

LONGVIEW POWER PROJECT (Monongalia County): This was a site where hydrocarbon soil contamination was encountered during construction work. The Groundwater Program required the removal of these soils, with the proper soil sampling, and a No Further Action Letter was issued on February 11, 2009.

MARATHON KENOVA OHIO RIVER SEEPS (Wayne County): This is a location where several old, abandoned pipes were leaking hydrocarbon in the Ohio River. The company removed these pipes, and did an offshore and onshore investigation to determine the source area for the problem. To date, free product, as well as soil and groundwater hydrocarbon contamination has been found, but the source area has yet to be located. Groundwater monitoring and free product recovery has been started, and additional subsurface investigations are required.

MARATHON KROUT CREEK TECHSOL SPILL (Wayne County): This is a location were a full tank car spilled techsol (coal tar light oil) into a drainage ditch, storm sewer, and surface creek. The company has removed a large quantity of contaminated soils, and is currently monitoring the groundwater (with approximately 50 groundwater monitoring wells) to show that the contamination is lessening. The Groundwater Program has asked for groundwater remediation, but no effective strategy has been approved to date.

MARLINTON ELECTRIC BULK TERMINAL BARTOW (Pocahontas County): This is an old bulk terminal with both soil and groundwater contamination. The company was

monitoring the groundwater and formulating a remediation strategy; however, this has halted because of a lack of money.

**MARLINTON ELECTRIC BULK TERMINAL MARLINTON** (Pocahtonas County): This is an old bulk terminal with free product and soil and groundwater contamination. The company was monitoring the groundwater, recovering the product (using a vacuum system), and formulating a remediation strategy; however, this has halted because of a lack of money.

**MARMET LOCKS** (Kanawha County): This was a location where the U.S. Army Corps of Engineers encountered hydrocarbon-contaminated soils while constructing a new set of river locks. The Groundwater Program allowed the Corps to stockpile the contaminated soils near the locks, and requested a report (which was not delivered) when this work was completed.

**MATTHEW BROTHERS BULK PLANT** (Harrison County): This was an old bulk plant with extensive soil contamination. The company has excavated this soil, stockpiled it, and is currently turning it to provide oxygen.

**MEADOW OIL FUEL OIL SPILL** (Raleigh County): This was located where a fuel-oil truck wrecked and product was lost. Environmental Enforcement recovered as much product as possible, and excavated a large amount of contaminated soil. They then asked the Groundwater Program for advice, and we suggested groundwater monitoring. This found no significant contamination, and our Program issued a No Further Action Letter on April 1, 2009.

**MORRISON HOME** (Jefferson County): This was a site with hydrocarbon soil contamination. Environmental Enforcement had required that some of these soils be excavated; however, the proximity of the home=s foundation prevented the removal of all the soils. The Groundwater Program then asked for additional remedial work, but this was never implemented.

**NS BLUEFIELD RAILYARD (FUEL TRANSLOADING AREA)** (Mercer County): This is an area with free product, and soil and groundwater hydrocarbon contamination. Norfolk Southern has refurbished their infrastructure and removed the contaminated soils. Free product recovery and groundwater monitoring continue.

**NS BLUEFIELD RAILYARD (LOCOMOTIVE REFUELING AREA)** (Mercer County): This is an area with free product, and soil and groundwater hydrocarbon contamination. Norfolk Southern has refurbished their infrastructure and excavated the contaminated soils. Free product recovery and groundwater monitoring continue.

**NS DICKINSON RAILYARD** (Kanawha County): This is railyard with free product, and soil and groundwater hydrocarbon contamination. Norfolk Southern is recovering the product, with continued groundwater monitoring.

**NS MULLENS RAILYARD** (Wyoming County): This is a railyard with free product, soil and groundwater contamination, and hydrocarbon seeps into the Guyandotte River. Norfolk Southern has contained the seeps and recovered a large of amount of product. They have also used groundwater extraction in attempt to reduce the groundwater contamination. Groundwater monitoring continues.

**NS WILLIAMSON RAILYARD** (Wyoming County): This is an area with free product, and soil and groundwater contamination. In addition, there were also hydrocarbon releases into the nearby Tug Fork. Norfolk Southern has refurbished their infrastructure and removed some contaminated soils. Free product recovery and groundwater monitoring continue, and the hydrocarbon releases have been halted.

**PANTRY STORE #2 (BENZENE)** (Harrison County): This is a site with continued benzene groundwater contamination, where the company has proposed to begin using an oxygen-releasing compound. Groundwater monitoring continues.

**PANTRY STORE #2 (TPH-DRO)** (Harrison County): This is a site where there was a second overfill of an aboveground diesel tank. The company excavated the contaminated soils, and requested a No Further Action Letter. The Groundwater Program has declined to issue this letter because several of the on-site groundwater monitoring wells still contain TPH-DRO contamination. Groundwater monitoring continues.

**PAYNES FORD STATION SUBDIVISION** (Jefferson County): This is a housing development whose construction has the potential to contaminate the groundwater. The Aremediation section@ of the Groundwater Program provided geological advice to other personnel within the Groundwater Program.

**PRIMA STORE #5720** (Wood County): This site had an overfill of a kerosene aboveground tank. The contaminated soils were excavated, with the proper sampling, and the groundwater sampled. The Groundwater Program provided a No Further Action Letter on February 25, 2008.

**REYNOLDS BULK TERMINAL LEWISBURG** (Greenbrier County): This was a site with hydrocarbon-contaminated soils. The owner removed some of these soils and started to replace his infrastructure. The Groundwater Program was unhappy with the limited amount of work and the slow pace that the work was proceeding, and wrote a Consent Order against the facility. The owner has not completed any of our requested work, and this site has become inactive.

**ROACH BULK TERMINAL MARTINSBURG** (Berkeley County): This was a site with hydrocarbon-contaminated soils, resulting from the overfill of an aboveground tank (the remediation of which was handled by Environmental Enforcement). The owner removed some of these soils and started to remove his infrastructure. The Groundwater Program was unhappy with the limited amount of work and the slow pace that the work was

proceeding, and wrote a Consent Order against the facility. The owner has not completed any of our requested work, and Environmental Enforcement is considering implementing enforcement action.

**ROGERS BULK TERMINAL HINTON** (Summers County): This was a site with hydrocarbon-contaminated soils resulting from an overfill of an aboveground tank. The owner removed as much of the soils as possible, and used a vapor-extraction system to address the remainder of the contamination. This, unfortunately, did not address the overall problem, and additional remediation is required. Groundwater monitoring continues at this site.

**SHEPARDS COVE DEVELOPMENT** (Berkeley County): This is a housing development whose construction had the potential to contaminate the groundwater. The Aremediation section@ of the Groundwater Program provided geological advice to other personnel within the Groundwater Program.

**SILVERS CAVE** (Berkeley County): This is a housing and airport development whose construction had the potential to contaminate the groundwater. The Aremediation section@ of the Groundwater Program provided geological advice to other personnel within the Groundwater Program.

**STONEY GLEN SUBDIVISION** (Greenbrier County): This is a housing development whose construction had the potential to contaminate the groundwater. The Groundwater Program provided geological advice to the UIC Program and to Environmental Enforcement.

**UNOCAL (CHEVRON) CABIN CREEK EAST REFINERY** (Kanawha County): This is a site with soil and groundwater hydrocarbon contamination, as well as some free product, where the company has employed an extensive phytoremediation strategy. Groundwater monitoring continues.

**UNOCAL (CHEVRON)-SPEEDWAY SITE** (Kanawha County): This is a site with soil and groundwater hydrocarbon contamination that has originated from two different operations by two different companies. Chevron has installed a vapor-extraction system on their portion of the site and are continuing to monitor the groundwater. The Speedway part of the site, which is under the authority of the LUST Program, is for the most part inactive.

**UNOCAL (CHEVRON) CABIN CREEK WEST BULK TERMINAL** (Kanawha County): This is a site with soil and groundwater hydrocarbon contamination, and where the company has employed an extensive phytoremediation strategy. Groundwater monitoring continues.

**VA HOSPITAL MARTINSBURG** (Berkeley County): This is a site with soil and groundwater hydrocarbon contamination and solvent groundwater contamination. The

hospital has excavated some of the hydrocarbon-contaminated soils and has applied an oxygen-releasing compound to this area. They met with personnel from the Groundwater Program and proposed a three-part strategy: vacuum extraction in the hydrocarbon area, the attempted location of the solvent source area, and continued groundwater monitoring for the entire site.

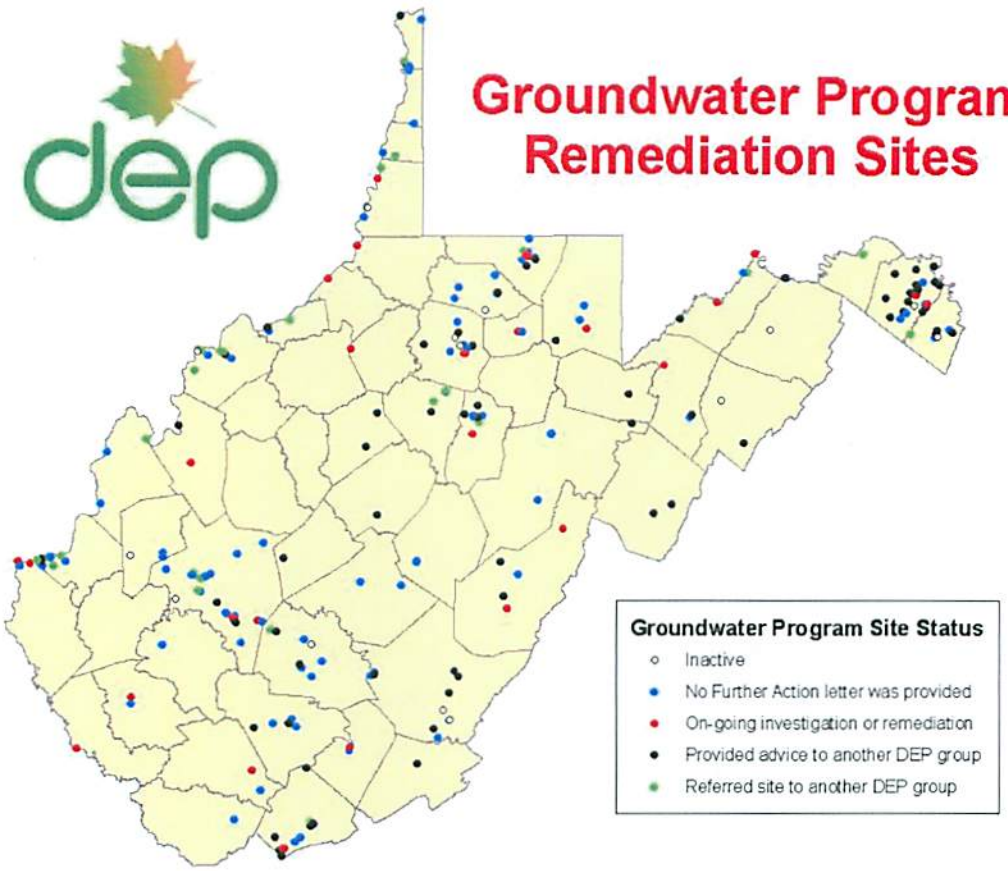
**VEPCO MOUNT STORM POWER PLANT** (Grant County): This is a site that had free product and groundwater hydrocarbon contamination. A sump was installed to collect the free product. Groundwater monitoring continues.

**WEIRTON STEELCTRACK 222 AREA** (Brooke County): This was a site with hydrocarbon soil contamination. These soils were removed, with the proper sampling, but the results were not conclusive. A groundwater monitoring program was initiated, and found no significant contamination. A No Further Action Letter was issued by the Groundwater Program on March 18, 2009.

**WILLOW ISLAND HYDROELECTRIC PLANT** (Hancock County): This was a proposed hydroelectric plant where the pre-construction borings encountered significant groundwater and soil contamination. The Groundwater Program offered advice to the company on how to proceed, and the soils are to be removed and stockpiled on an adjacent property (with that owner=s permission).

**WVU-PRT** (Monongalia County): This is a site with glycol contamination originating from the deicing system used by the Personal Rail Transportation system. This lost glycol cannot be collected, as it flows quickly into the surface stream and storm sewers. The University is working to move all the glycol lines to locations where they will not rust or be damaged by various work operations.

**ZINKAN ENTERPRISES** (Harrison County): This was a site with metals soil contamination, where the Groundwater Program provided advice to Environmental Enforcement.


Groundwater Program
Remediation Sites
Groundwater Program Site Status
Inactive
No Further Action letter was provided
On-going investigation or remediation
Provided advice to another DEP group
Referred site to another DEP group

# V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
## B. Division of Water and Waste Management

### 6. Education and Outreach

### Project WET (Water Education for Teachers) Program

### Introduction

The WVDEP works with educators to foster understanding and appreciation of groundwater and water quality through the Project WET (Water Education for Teachers) program. Project WET is an interdisciplinary program that provides K-12 teachers and other educators with hands-on classroom activities through training workshops. The activities incorporate important water-related lessons into all disciplines including the sciences, mathematics, fine arts, social studies, language arts, and music. Project WET activities are perfect for use in formal and non-formal settings.

#### *Project WET Workshops*

Engaging, motivating, interactive and activity-oriented describe Project WET workshops that are offered at no cost to the West Virginia education community. The workshops include demonstrations of a groundwater flow model and a watershed model. Project WET activities are relevant, hands-on, inquiry-based, and help students learn about water and its relevance to our lives.

More than 460 educators attended Project WET training workshops during the reporting period. A breakdown of project WET workshops is provided in Table 1.

#### *Education & Outreach*

Networking and helping other state and federal organizations with their education efforts is an essential part of the Project WET program. Organizations that provide the opportunity to present Project WET activities directly to students include the Natural Resources Conservation Service (NRCS), Jefferson County Board of Education, Fish and Wildlife Service, WV State Extension Service, WV Department of Natural Resources and ORSANCO.

A breakdown of education and outreach activities and the approximate number of people attending each event is provided in Table 2.

#### *West Virginia Environmental Education Association Conference*

The 2nd and 3rd Annual Environmental Education Association Conference took place during the reporting period. Project WET presented a *Healthy Water-Healthy People Workshop* in 2008 with the assistance of staff from the WVDEP Watershed Assessment Program. Twenty-three educators of students in grades 6-12 attended the two-day training. In addition, Project WET staff served on the conference committee that organized the event.

### *Watershed Model and Ground Water Flow Model Loan Program*

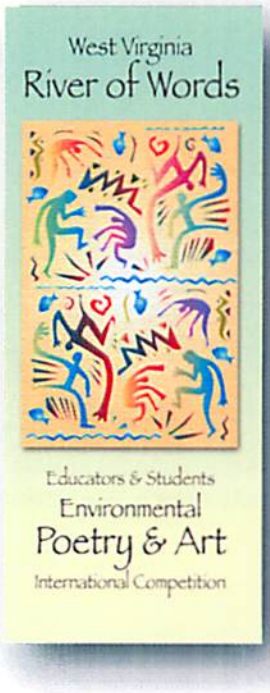
The groundwater flow model and the watershed model (the EnviroScape) are effective tools that facilitate the teaching of groundwater, watersheds and nonpoint source pollution. Both models were loaned out to schools and environmental organizations.

***Governor's Environmental Stewardship Awards – Environmental Education***

Ruthanne Cole, a biology teacher at Pikeview High School in Mercer County, received the 2007 Environmental Education Leadership Award. Ruthanne is known to her fellow teachers at Pikeview High School for her unique ability to create innovative science adventures that inspire students and fellow teachers alike to appreciate science and the environment. Her dedication to water education is evident in her drive to create and deliver inservice training opportunities for Mercer County teachers, which include environmental education programs such as Project WET.

*Williamstown. Janet Butler (lower left) of the U.S. Fish and Wildlife Service teaches educators how to identify wetland soils.*

Janet Butler received the 2008 Environmental Education Leadership Award for her work to advance the knowledge and stewardship of wetlands. Janet is a biologist and the manager of the Department of the Interior's Ohio River Islands National Wildlife Refuge Visitor Services. With Janet's assistance, the WVDEP expanded its wetlands education efforts along the Ohio River. By joining forces, the two organizations were able to offer day-long *training workshops that focused on the values* and functions of wetlands, and their unique importance to the Ohio River watershed. The workshops, offered through Project WET reached more than 100 teachers in Wood, Wetzel, Marshall, Brooke and Ohio counties.




***River of Words® – Poetry and Art Contest***

A brochure to promote the River of Words (ROW) program in the Guyandotte River Watershed and a ***River of Words Teacher's Guide*** that includes information specific to that drainage basin were completed during the reporting period.

ROW is an arts and environmental education program that teaches watershed education through the arts. The WVDEP has a partnership with ROW (www.riverofwords.org) through the Project WET (Water Education for Teachers) Program. In West Virginia, ROW is coordinated in cooperation with organizations interested in promoting watershed awareness in their communities.


***Water Jeopardy***

A water jeopardy game that includes five water-related categories with five questions for each category, was developed during the reporting period. The questions are geared for 5th and 6th grade students. The game proved to be very successful at indoor and outdoor educational events.

***Project WET Training in Montevideo, Uruguay***


*Project WET facilitators in Uruguay*

Rose Long, the Project WET West Virginia state coordinator, joined a small contingent of educators from the United States and Mexico to present a three-day water education workshop to 70 elementary school teachers in Montevideo. The April 2008, three-day training was a joint effort of UNESCO's International Hydrological Programme and the Project WET Foundation.

***Children's Water Festival***

The Department of Environmental Protection and the National Park Service have cooperated since 2000 to offer well-organized Children's Water Festival that deliver effective and meaningful water education to 4th and 5th grade students. Through a series of interactive learning stations students and teachers explore water topics ranging from groundwater, macro invertebrates, water quality, watershed, and pollution prevention. Students learn that each one of us has a role in protecting and conserving our precious water resources.

*Children's Water Festival at Marshall University Graduate College. Taryn Murray, conducts the activity, "Watershed Pollution Detectives."*

The festivals take place at the Marshall University Graduate College in South Charleston and at New River Gorge, National River in Grandview.

***Children's Water Festival, Logan, March 13, 2008***

Modeled after the successful Make-a-Splash with Project WET water festivals, the Logan event gathered 180 students and their teachers at the Southern West Virginia Community College. Presenters from the U.S. Geological Survey, the Department of Natural Resources, Bureau for Public Health, and the Department of Environmental Protection engaged students in grades 4th and 5th in hands-on activities and investigations. The sessions were structured in 25-minute segments with students moving from session to session for the duration of the event that lasted from 9 a.m. to noon.

Students learned about habitat issues as they acted like ducks migrating between North and South America; drilled in trays full of sand to find the source of a leaking underground storage tank; made their own edible aquifers; built a community on a model watershed; polluted a tank with dyes to see how nonpoint source pollution would affect a plastic fish named Freddy; and identified common insects that are indicators of water quality in a stream.

## Table 1. Project WET Teacher Training Workshops

| Workshop Location | July 2007 - June 2009 | No. of Participants | Participant Breakdown By Occupation |
|---|---|---|---|
| West Virginia University, Morgantown | July 5, 2007 | 13 | **Pre-service Teachers** |
| Williamstown, U.S. Fish and Wildlife Headquarters | August 17, 2007 | 6 | **Classroom Teachers** |
| Chapmanville (WEB of Life) | August 24, 2007 | 5 | **Non-formal educators& Classroom Teachers** |
| Lenore | September 15, 2007 | 3 | **Non-formal educators** |
| West Virginia University, Morgantown | October 2-3, 2007 | 54 | **Pre-service teachers** |
| Marshall University, Huntington | November 27 – 29, 2007 | 43 | **Pre-service teachers** |
| DEP Headquarters, Charleston | January 16, 2008 | 3 | **Non-formal educators** |
| Shepherd University, Shepherdstown | February 9, 2008 | 8 | **Pre-service** |
| Mullens Community Center, Mullens | February 22, 2008 | 10 | **5 Non-formal, 5 formal (middle)** |
| West Virginia University, Morgantown | March 12, 2008 | 20 | **Pre-service teachers** |
| Jackson's Mill | March 19–20, 2008 | 23 | **19 Non-formal educators,1 Middle school 2, High school , University 1** |
| Marshall University, Huntington | April 15-17, 2008 | 44 | **Pre-service teachers** |
| Glenville State College, Glenville | June 22, 2008 | 9 | **Non-formal educators** |
| Concord University, Athens | June 24, 2008 | 22 | **(In-service) 13 middle, 9 high** |

| Workshop Location | July 2007 - June 2009 | No. of Participants | Participant Breakdown By Occupation |
|---|---|---|---|
| Cacapon State Park, Berkeley Springs | June 26, 2008 | 5 | Non-formal educators |
| West Virginia University, Morgantown | July 15, 2008 | 10 | Pre-service teachers |
| WV State University, Institute | August 5, 2008 | 6 | 3 elem, 3 non-Formal |
| Marshall University, Huntington | October 16 & 21, 2008 | 42 | Pre-service teachers |
| West Virginia University, Morgantown | October 28–29–30, 2008 | 25 | Pre-service teachers |
| University of Charleston, Charleston | November 18, 2008 | 5 | Pre-service teachers |
| Big Ugly Community Center, Lincoln County | January 23, 2009 | 6 | Non-formal Educators |
| Terra Alta, Preston County | February 18, 2009 | 5 | 2 elementary , 2 middle school, 1 non-formal |
| Charleston, DEP headquarters | April 3, 2009 | 1 | Non-formal |
| WV Northern Community College | June 12, 2009 | 25 | 4 high school, 5 elementary, 3 middle, 1 university, 9 non-formal, 3 preservice. |
| Concord University | June 17, 2009 | 17 | 12 middle school, 5 high school. 1 university |
| RESA VII Clarksburg | June 25, 2009 | 10 | 10 elementary |

## Table 2. Education & Outreach Events

| Location | July 2007 - June 2009 | Event | Participants (Approximate Number) |
|---|---|---|---|
| DEP Headquarters, Charleston | February 13, 2007 | Presentation for WV Sustainable Communities Program | 10 adults |
| State Capitol, Charleston | February 21, 2007 | Display. DEP Public Relations Day at the WV Legislature | 150 – general public |
| Jackson's Mill | March 21, 2007 | Presentation. 1st Annual Conference of the WV Environmental Education Association | 25 educators |
| Elizabeth , Wirt County | May 4, 2007 | Wetlands Field Day | 55 – 6th grade students |
| North Bend State Park, Cairo | May 19, 2007 | Youth Environmental Day | Approx. 100 adults and students |
| Shepherdstown , Jefferson County | May 21- 22, 2007 | Jefferson County Science Olympiad | 68 – 6th grade students |
| Camp Virgil Tate, Sissonville | May 24, 2007 | Outdoor classroom | 40 students |
| Marshall University Graduate College, South Charleston | Sept. 21, 2007 | Water Festival – Make a Splash with Project WET | 280 students |
| New River Gorge National Park at Grandview | Sept. 29, 2007 | Water Festival (organized by the National Park Service) | 277 students |
| White Sulphur Springs | Sept. 30, 2007 | Fresh Water Festival, U.S. Fish and Wildlife Service | 200 approx. |
| Charleston, P.A. Denny Sternwheeler | October 22-23, 2007 | Organized by ORSANCO | 90 – 5th graders |
| State Capitol, Charleston | February 20, 2008 | Display. DEP Public Relations Day for the WV Legislature | 150 general public |
| State Capitol, Charleston | March 6, 2008 | Wildlife Diversity Day. Groundwater exhibit | 100 general public |
| Southern West Virginia Community College, Logan | March 7, 2008 | Make a Splash Water Festival | 180 students |
| Elizabeth, Wirt County | May 2, 2008 | Wetlands Field Day | 50 students in 5th & 6th grade |
| Shepherdstown, Jefferson County | May 22 - 23,2008 | Jefferson County Science Olympiad | 68 - 6th grade students |
| Staunton Elementary, Charleston | August 15, 2008 | Presentation (groundwater flow model) | 30 students |

| Location | July 2007 - June 2009 | Event | Participants (Approximate Number) |
|---|---|---|---|
| Cato Park, Charleston | August 21, 2008 | Presentation (groundwater flow model) | 25 students |
| Marshall University Graduate College, South Charleston | Sept. 26, 2008 | Water Festival – Make a Splash with Project WET | 300 students |
| Grandview, New River Gorge National River | October 3, 2008 | Children's Water Festival | 250 students |
| White Sulphur Springs | October 4, 2008 | Freshwater Folk Festival | 150 general public |
| Clay Center , Charleston | November 1, 2008 | Watershed Celebration Day | 100 general public |
| Clay Center, Charleston | February 21, 2009 | Discover Engineering | 400 girl scouts |
| State Capitol, Charleston | March 3, 2009 | DEP Public Relations Day for the WV Legislature | 100 general public |
| State Capitol, Charleston | March 26, 2009 | Wildlife Diversity Day Watershed exhibit | 200 general public |
| Clay Center, Charleston | April 25, 2009 | Earth Day | 100 young people |
| Elizabeth, Wirt County | May 1, 2009 | Wetlands Field Day | 60 5$^{th}$ grade students |
| North Bend State Park | May 16, 2009 | Youth Environmental Day | 80 young people |
| Habitat for Humanity, Charleston | May 30, 2009 | Sustainability Fair | 100 general public |
| Mercer County Tech Center, Princeton | June 22, 2009 | Women Technology Program | 30 high school students |

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
## B. Division of Water and Waste Management

### 7. West Virginia Nonpoint Source Program

The Nonpoint Source Program (NPSP) is funded by Clean Water Act Section 319 grants administered by the EPA. The Program supports the efforts of four West Virginia state agencies to reduce nonpoint source pollution from various land use activities; the Department of Environmental Protection, the Conservation Agency, Division of Health and Human Resources and the Division of Forestry. The Programs' goals are to:

- ❖ Provide technical assistance in the proper installation and maintenance of Best Management Practices (BMPs).
- ❖ Educate the public and land users on nonpoint source issues
- ❖ Support citizen-based watershed organizations
- ❖ Support enforcement of nonpoint source water quality laws
- ❖ Restore impaired watersheds.

**The goals of the Nonpoint Source Program**

**Management Plan 2000.** The mission of the NPSP is to both support efforts to prevent nonpoint source pollution and to restore watersheds impaired by such pollution. This requires a wide range of activities and so there are two types of CWA 319 funds used in the Program, base and incremental. The base funds are used for supporting education, outreach, technical support, volunteer monitoring, and support for the statewide watershed management stakeholder process. Activities supported by base grant funds include agricultural workshops, logging workshops, oil and gas workshops, volunteer monitoring training sessions, and general nonpoint source education. The NPSP staff supported by the base grant have become an integral part of the entire watershed management effort. West Virginia relies heavily on the base program to foster watershed groups and agencies to prepare them for, and support them through, the challenging process of developing and implementing watershed based plans. In addition the NPSP has used some of the base funding to support special projects in watersheds that are threatened, but not part of a TMDL.

In watersheds with a TMDL the NPSP's incremental funds are used on water quality restoration of impaired waters. Choosing priority watersheds to target these funds and other resources is the role of West Virginia's Watershed Management Framework (WMF). When the WMF chooses a priority watershed a project team is established including all interested parties. The Basin Coordinators of the NPSP facilitate or lead these teams. Current priority watersheds include Opequon Creek, Sleepy Creek, Mill

Creek of South Branch Potomac, Lost River, Deckers Creek, Cheat, Lamberts Run of West Fork, Buckhannon River, North Fork of Elkhorn Creek, Upper Guyandotte, North Fork Blackwater and Morris Creek of Upper Kanawha.

The NPSP and its component programs; Section 319 Nonpoint Source Program, WV Save Our Streams Program, Chesapeake Bay Program and Stream Partners Program, are funded primarily through federal funds from EPA with the exception of the Stream Partners Program, which is funded by the WV Legislature. The challenges of protecting or restoring state waters from nonpoint source pollution are many, but the lack of funding from state sources makes matching the federal grant funds difficult. The NPSP's activities are focused on protecting or restoring the surface waters of the state. None of the program's projects are focused on groundwater although indirect groundwater improvements are assumed. No monitoring of groundwater occurs in the program to determine any benefits. The national goals of the program set by EPA focus on TMDL implementation and removal of impaired streams from the 303(d) list. There is no documentation of the effects of these activities on public or private water supplies but restoring the designated use of "drinking water" is a part of TMDL implementation.

# V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
## B. Division of Water and Waste Management

### 8. National Pollutant Discharge Elimination System (NPDES) Permit Program

The NPDES Permit Program is continuing its efforts in implementing the requirements of the Groundwater Protection Act and the rules promulgated under it. For existing and new industrial facilities, submission of a Groundwater Protection Plan with a permit application is required. Upon receipt of the plan, it is forwarded to a Groundwater Program staff geologist for review and follow-up actions.

For groundwater related issues at industrial facilities, the staff members closely work with the groundwater section personnel to provide necessary technical assistance. For discharge of groundwater generated because of groundwater clean-up activities, the section issues the required permit modifications or permits.

The General WV/NPDES Water Pollution Control Permit for Discharges Associated with the Water Treatment Plant was reissued in June 2007. The General Permit for Ground Water Remediation has been extended to 08/2009 and plans are to have it reissued in 2009.

The General WV/NPDES Water Pollution Control Permit for Stormwater Associated with Construction Activities was reissued on November 5, 2007. The General WV/NPDES Water Pollution Control Permit for Stormwater Associated with Industrial Activities was reissued on April 1, 2009.

NPDES permits for industrial facilities also require submission of Best Management Practices (BMP) plans which promote improved housekeeping practices, improved diking for storage facilities, improved loading/unloading practices for chemicals etc. Thus, BMP plans help to protect groundwater at industrial sites. Similarly, in case of storm water discharges from industrial sites, Storm Water Pollution Prevention Plans (SWPPP) is required in NPDES permits and in the Storm Water General Permit. These plans also help indirectly to protect groundwater at industrial sites.

The statistical data for the Permit Section for the fiscal year of 2008 (July 1, 2008 - June 30, 2009) is as follows:

1. Number of individual WV/NPDES permits issued: 105
2. Number of General Permit Registrations issued: 1199
3. Number of modifications of individual WV/NPDES permits and General Permits Registrations issued: 141

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION
## B. Division of Water and Waste Management

### 9. Watershed Assessment Branch

The Watershed Assessment Branch was created in March 2002 from the joining of two existing programs, the Watershed Assessment Section (WAS) and the Total Maximum Daily Load (TMDL) Section. WAS has chosen a specific combination of physical, chemical and biological variables to help determine streams' health and what types of stressors may be operating on the benthic (aquatic bottom-dwelling) community.

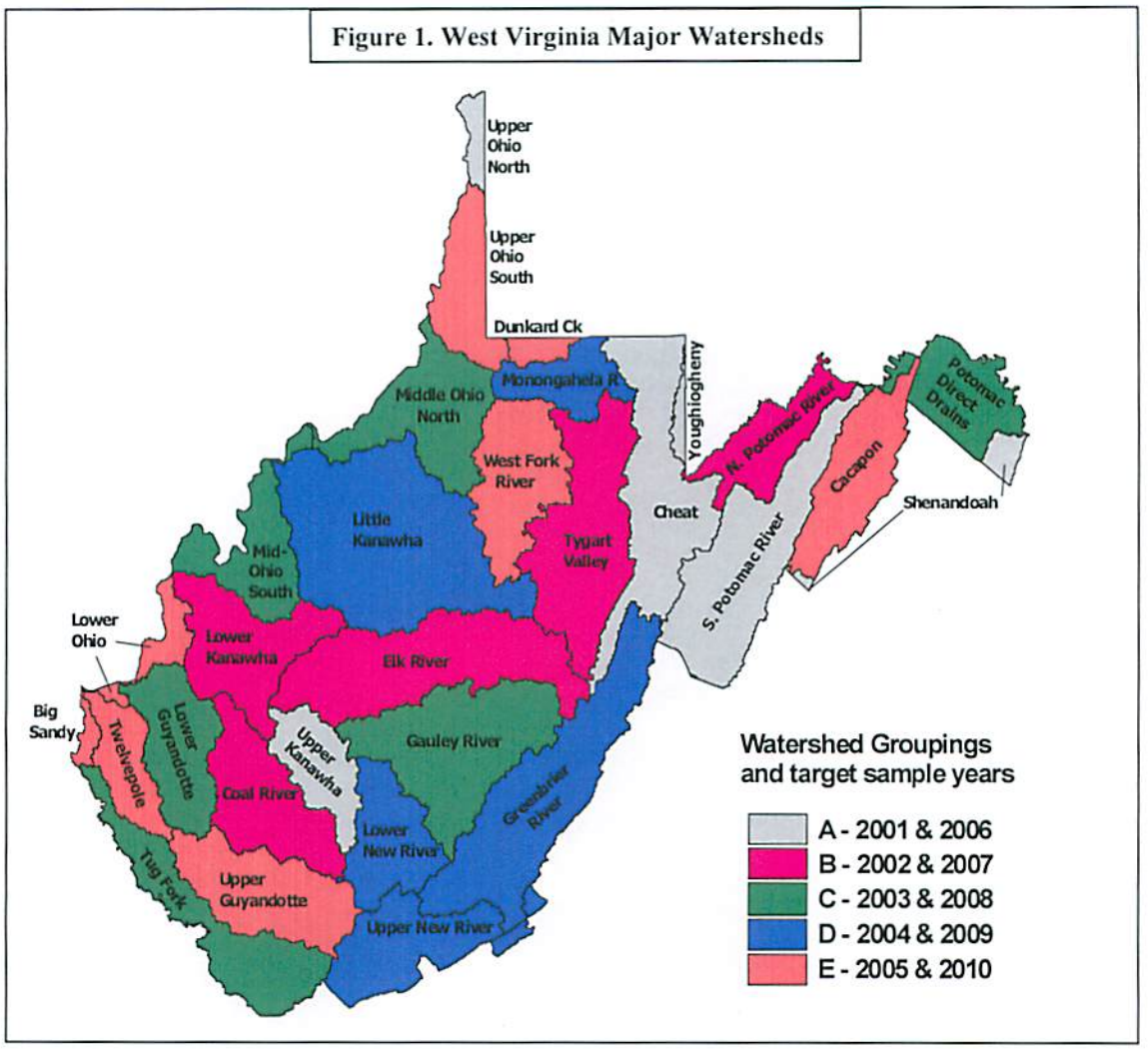
West Virginia utilizes a combination of stratified probabilistic monitoring design; targeted sampling; long-term or "ambient" site network (largest streams and rivers); deployable water quality meters to collect continuous data; and a thorough pre-TMDL development sampling design to meet the objectives of assessing the water quality of the state's waterbodies. In 2007, WVDEP added the 'LiTMuS' monitoring program, which entails annual sampling of wadeable streams throughout the state to better understand annual variation and track changes in different stream types.

Assessments are performed on a watershed basis. To better manage the state's water resources, West Virginia has been divided into 32 watersheds, or hydrologic regions. Each watershed is assessed every five years, according to the state's watershed management framework.

The Targeted and Pre-TMDL sampling programs are based on this five-year rotating basin schedule, whereas the Ambient, Probabilistic and LiTMuS programs collect data statewide annually. A map depicting the 32 watersheds and the hydrologic groupings is shown below in Figure 1.

From July 1, 2007 through June 30, 2009, WAS personnel collected 9,835 samples from 1,237 sites that are on 761distinct streams and rivers. These sites are shown in Figure 2.

The streamside and instream habitats, and the benthic macroinvertebrates (bottom-dwelling animals that do not have backbones) in addition to water quality analysis, are the center of the ecological assessment. Habitat evaluations are important to the assessment because they reflect the physical conditions that support the benthic community. The benthic community is crucial because it reflects environmental conditions over an extended period of time. Other parameters, like dissolved oxygen concentration, are important, but may reflect recent fluctuations in environmental conditions. A contaminant, which flowed through the reach a week ago, for example, would be reflected by the impaired benthos, but probably, would not be revealed in a water sample.

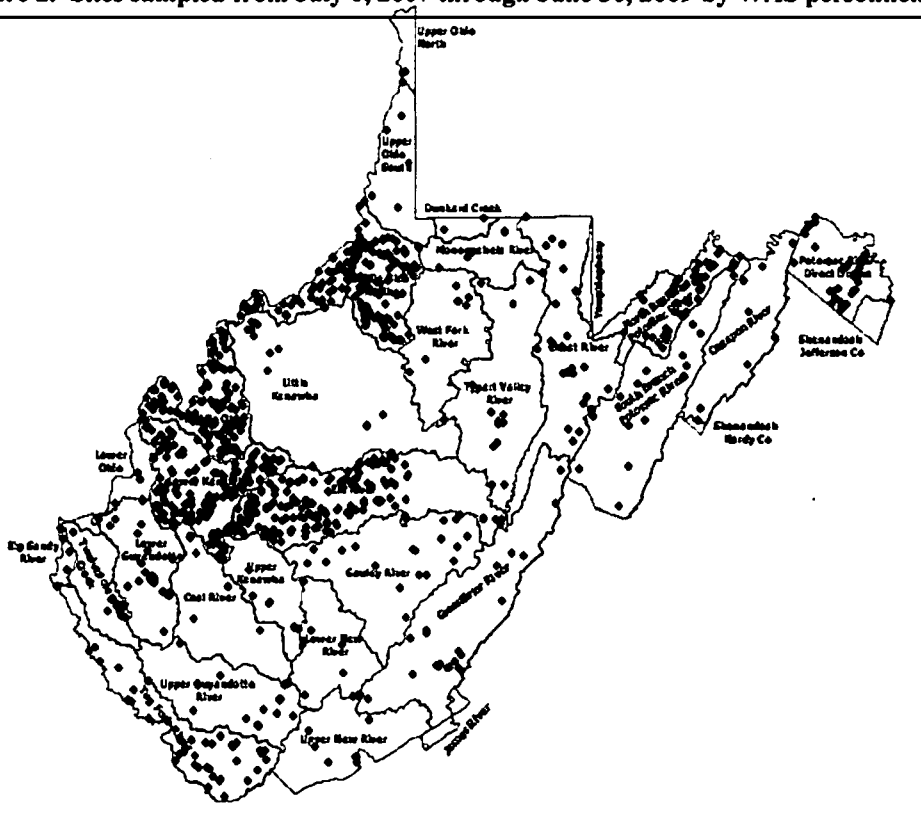



A number of sites are selected for duplicate sampling to provide for quality assurance/quality control checks on sampling techniques, sample handling procedures and sample analysis procedures. In addition, WAS holds a spring refresher training session before the sampling season each year to ensure all field staff are obtaining water quality and biological samples in a consistent manner at all sites.

WAS tries to identify the source, both regulated and non-regulated, and the severity of impacts on streams in watersheds throughout the state. For instance, fecal coliform bacteria from open pipe discharges, failing septic systems, failing sewer lines, inappropriate animal waste management techniques, and "collect and dump" sewage treatment activities is a major stressor on the groundwater and surface waters in West Virginia. By identifying streams with violations of the criteria for fecal coliform bacteria, WAS has identified sub-watersheds with groundwater that is likely impaired by fecal coliform bacteria. Since fecal coliform bacteria is usually filtered out by groundwater seeping through dirt, sand and rock, additional studies must be conducted to confirm the potential impairment of groundwater. However, in karst areas, where groundwater is not

subjected to as much filtering, the presence of fecal coliform bacteria in streams is a clear indicator that groundwater pollution has occurred "upstream".

**Figure 2. Sites sampled from July 1, 2007 through June 30, 2009 by WAS personnel.**



By identifying streams impacted by acid mine drainage, WAS has identified areas where the groundwater also is likely impaired. By helping identify these areas, WAS has made it possible to target remediation efforts lessening the negative effects on fish and benthic communities.

The WAS has developed and maintains the 303(d) list of impaired waters. These impaired waters have, in some cases, been linked to contaminated groundwater. This, perhaps, is the single greatest contribution to groundwater protection by WAS. For example, dioxin found in the Lower Kanawha River has been traced to groundwater seeping through abandoned hazardous waste dumps. The EPA completed a Total Maximum Daily Load (TMDL) for dioxin on this river segment in September 2000.

| West Virginia Watershed Assessment Schedule | | | | |
|---|---|---|---|---|
| Group A-2006 | Group B-2007 | Group C-2008 | Group D-2009 | Group E-2010 |
| Cheat River | Elk River | Tug Fork River | Greenbrier River | Cacapon River |
| Shenandoah River 1 & 2 | Coal River | Lower Guyandotte River | James River | Upper Guyandotte River |
| South Branch of Potomac River | Lower Kanawha River | Gauley River | Little Kanawha River | Twelvepole Creek |
| Upper Kanawha River | North Branch of Potomac River | Middle Ohio River North | Upper New River | Upper Ohio River South |
| Northern Upper Ohio River | Tygart Valley River | Middle Ohio River South | Lower New River | Lower Ohio |
| Youghiogheny River | | Potomac River Direct Drains | Monongahela River | Big Sandy River |
| | | | | West Fork River |
| | | | | Dunkard Creek |

TMDLs are required by the federal Clean Water Act. In simple terms, a total maximum daily load is a plan of action used to clean up streams that are not meeting water quality standards. The plan includes pollution source identification and strategy development for contaminant source reduction or elimination. Additionally, TMDLs are being conducted under the 1997 settlement of the lawsuit, *Ohio Valley Environmental Coalition, Inc., West Virginia Highlands Conservancy, et. al. v. Browner, et. al.*, which sought state and federal aid to improve and maintain West Virginia's water quality. The lawsuit resulted in a consent decree between the plaintiffs and EPA . The consent decree established a rigorous schedule for TMDL development, requiring the federal agency to develop over 500 TMDLs from West Virginia's 303(d) list of impaired streams by March 2006 (extended to September 30, 2009).

After settlement of the lawsuit in 1997 and the resulting consent decree, the EPA began developing TMDLs for West Virginia streams, with the DEP providing onsite logistical and technical support. However, beginning with the Upper Kanawha River in 2001, the DEP took the lead in developing TMDLs for state waters.

In future years it is likely that additional cases of stream contamination documented on the 303(d) list will be traced back through groundwater to their original sources. WAS will then be able to suggest remediation and restoration activities to improve groundwater and surface water quality in West Virginia.

Currently all targeted, probabilistic, and TMDL monitoring data, is managed in an ORACLE database (using previous Access 'front end') that was developed in-house. WAPBASE stores all water quality, habitat, watershed characteristics, macroinvertebrate data – both raw data and calculated metrics. At present most data is entered manually, however we are beginning to receive the laboratory derived water quality results electronically, and all WVDEP certified labs will be providing results electronically in the future. WAS currently also uses EPA's STORET database to store surface water quality information.

WAS uses WCMS, an application developed for ESRI/Arcview software to identify the location of sampling sites, geologic and land use patterns upstream from the sampling sites, and similar data. WAS also uses this program to print maps showing the geographic distribution of violations in a watershed.

WAS is cooperating with the rest of WVDEP in the development and implementation of a database (EQuIS) that will provide a clear picture of the water quality based on the physical and chemical characteristics and the biological life existing in all of West Virginia's waters, both groundwater and surface waters.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

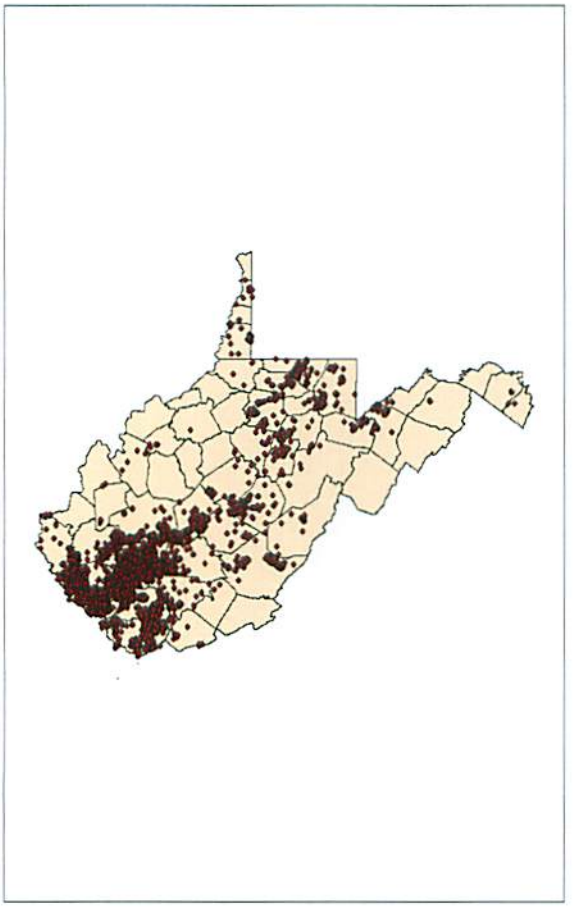
## C. Information Technology Office (ITO)

### Technical Applications and Geographic Information Systems (TAGIS) Application Development and Support (ADS)

EarthSoft's Environmental Quality Information System (EQuIS – which resides both on client Microsoft Windows desktops and also on Linux as Oracle tables provides an integrated suite of applications and a common database management system for all Divisions/Programs involved in collection, processing, management, analysis and visualization of water quality data related to WVDEP's environmental project work. Since initially purchased by the Agency, EQuIS has evolved into an Enterprise solution residing on an Oracle platform. Earthsoft's EQuIS is the world's most widely used environmental sample data management system.

Currently, all data collected and analyzed by WVDEP resides in a myriad of places and formats. By developing a central repository and a uniform format for the data collected, WVDEP's goal is to expedite the transfer of information and data between WVDEP personnel and WVDEP data providers. For the first time in the history of the agency, the opportunity exists for all of environmental programs to evaluate or cross reference each programs data for a given facility, project or geographic area. This will increase efficiency by allowing WVDEP data providers to fully understand this Agency's requirements, and to communicate these requirements to interested parties.

The size of the database is expected to grow exponentially as more users are brought online. To date, 603 facilities are registered in the database. The facilities have a total of 9,704 sampling locations a mixture of surface and groundwater locations. There has been 1,600,707 test results recorded in the EQuIS database. This will be one of the largest databases in the agency accessible to both WVDEP employees and the public. The map below shows locations of all sites having analytical results currently stored in EQuIS.



To date, the Division of Mining and Reclamation has the most data stored in EQuIS. Their Trendstation project is the single largest facility in EQuIS. Data has been collected at 231 locations monthly shown on the above map since October 2002 and currently has 302,184 test results. Other groups within the Department of Environmental Protection storing data in EQuIS are the Closed Landfill Program (LCAP) and the Voluntary Remediation Program (VolRem).

Frequently, effective management does not occur due to poor communication between parties involved or the disparity of tools they employ (or do not employ) to get their work accomplished. Along with being a central repository for data and information, EQuIS acts as an interface with many third party software packages. The EQuIS system uses ESRI's ArcGIS as a 'data broker' to serve data to several different analysis applications within a GIS environment. EQuIS for ArcGIS provides a flexible yet simple means of accessing, analyzing, and viewing geology and environmental chemistry geospatially. EarthSoft's EQuIS Chemistry and EQuIS Geology extensions make available many options for 2D, 2.5D and 3D visualization and modeling, as well as reporting and enhanced labeling options. The EQuIS tools allow management to make

effective and timely decisions without the complication of needing to prepare data for the modeling programs used.

A new feature of the current Enterprise version is the EQuIS Dashboard. The Dashboard allows users to load data via an internet interface. The Dashboard also allows users to subscribe to facilities they wish to keep up to date about. It will notify the user when new data is added and push predefined reports to the user when scheduled or triggered by user defined threshold values.

After the untimely death of the EQuIS gatekeeper in February 2009, Information Technology Office created a browser-based Adobe Flex geospatial application specifically engineered to provide insights into DMR's trend stations data. The URL is http://gisonline.wvdep.org/equis.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## D. State Water Pollution Control Revolving Fund (SRF)

The SRF program environmental goals are to reduce and/or eliminate water quality violations caused by sanitary wastewater and nonpoint sources in surface waters and groundwater. In FY2008 and FY2009 approximately $76 million dollars was expended from the SRF program to build and replace wastewater collection and treatment systems. In many of these projects, unsewered areas of West Virginia were provided with central sewer collection systems that eliminated direct wastewater discharges and failing or marginally functional onsite septic systems. The failing systems and direct discharges contribute to polluting the groundwater in the state. For example, Putnam Public Service District (PSD) provided sewer service to an area where the Putnam County Health Department had received numerous complaints of failing sewage systems and Crab Orchard – MacArthur PSD provided service to the Helen area where the malfunctioning septic systems have generally been attributed to three items by the Raleigh County Health Department; small lot sizes (resulting in soil absorption fields smaller than required by design standards), unsuitable soils, and soil absorption fields constructed on slopes greater than 20%.

Design standards for the SRF program are included in the Legislative Rules, Title 47-Series 31 and include restrictions on constructing sewer lines within 10 horizontal feet of a drinking water reservoir, 50 feet of any well or spring utilized for a public drinking water system, 50 feet of a private or individual homeowner's drinking water system, or within 10 feet of a homeowner's well. The enforcement of these regulations help protect public and private water supplies.

The DEP's Agriculture Water Quality Loan Program is also administered through the SRF program and expended $687,121 in FY2008 and $290,860 in FY2009. This program was established in 1997 and continues to provide loans to correct nonpoint source pollution. Most of the loans are made to the poultry industry in the eastern panhandle to assist in alleviating groundwater pollution from the poultry farms. The SRF will provide $750,000 as a set-aside for this program for FY2010.

A pilot program was started in 2000 called the Onsite Systems Loan Program. The purpose of this nonpoint source program is to eliminate existing health hazards and water quality problems due to direct sewage discharges from houses and malfunctioning septic tank systems. Many problems and barriers have prevented this program from being successful to date, but program revisions have been made to make it a more viable program. During the 2007 legislative session, the SRF statute was amended to allow other entities to act as an intermediary lender for this program. The WV Housing Development Fund will be the first entity to enter into an agreement with the SRF to provide low interest loans to homeowners to correct failing onsite sewage systems. The

SRF expended $95,606 in FY 2008 and $350,000 in FY2009 from this program and will provide $750,000 as a set-aside for this program for FY2010.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## E. Environmental Enforcement

The Environmental Enforcement (EE) office is primarily responsible for inspection and enforcement of the state and federal solid waste, hazardous waste, underground storage tank and water pollution control laws. EE's groundwater objective is to investigate all reports of contamination that fall within its jurisdiction and to refer all reports of contamination which are not under its jurisdiction to the appropriate authority.

The Compliance Monitoring Unit of the Environmental Enforcement Section of DEP has been assigned the responsibility to conduct Groundwater Sampling Inspections (GSI's) at various facilities throughout the State. Primarily, these facilities are active and inactive municipal and industrial landfill sites. The sites selected for sampling comes from requests from WVDEP's permitting staff, regional inspectors/supervisors and the discretion of the Compliance Monitoring unit.

At present, only one position has been funded to do groundwater sampling inspections (GSI's). Additional staffing is needed to adequately address all the groundwater sites within the State. WVDEP's present grant commitment is for six GSI's per year. With the low level of staffing in the Monitoring Unit, it will be hard to do any more than the commitment numbers with all the other job responsibilities assigned to this unit.

The Department of Environmental Protection's Quality Assurance/Quality Control Plan and Standard Operating Procedures for Groundwater Sampling Revision No. 1 (effective August 5, 2009) is used by the Monitoring Unit as a guide when conducting GSI's.

Generally, all landfill sites will have a minimum of four groundwater monitor wells. The number of wells per site will depend on the size of the landfill and could be as high as 20 or more. Data collected from these wells depend upon whether it is an industrial or a municipal landfill. All municipal landfills generally have the same parameters (Phase I) as outlined in 33CSR Appendix I.

Collection of groundwater samples is accomplished by compressed air operated bladder pumps as well as bailers. All organics are collected by teflon bailers. All samples are collected, preserved and analyzed in accordance with 49 CFR. Groundwater samples are analyzed by State certified laboratories.

The Pre-Closure Program continues the review of industrial facilities that are in the process of ceasing operations. The review process allows EE to ensure that all known contamination is remediated. All groundwater wells present at the sites are

sampled during this process. When any contaminated soil is identified at the facility, remediation is required under the Groundwater Protection Act.

Training that focuses on the complex interaction of groundwater, geology, and chemistry must be provided to EE staff. This training must include all staff, but prioritize newly hired inspectors. Classroom style training accompanied with ample practical (hands on) training exercises with a focus on sample collection and preservation would be most beneficial. This training program will result in environmental inspectors that are both effective and safety conscious in their field work.

EE recognizes the need for a centralized database system that is accessible to all inspectors and other agency staff. EE maintains hard copy files on groundwater complaints, investigations, Notice of Violations (NOV's), enforcement actions, spills, Well Head Protection Areas, reports on groundwater flow mapping, groundwater quality data, and monitoring well data for landfills and industrial sites. Due to storage limitations, this information cannot be maintained in accessible files for extended periods of time. Currently, the only utilization of the ERIS data base is for permit information.

Both the Hazardous Waste Management Act and the Underground Storage Tank (UST) act are, in part, groundwater protection acts. The Hazardous Waste Management Act requires long term groundwater monitoring at permitted disposal sites. EE Inspectors conduct Groundwater Monitoring Inspections every three years at every hazardous waste land disposal facility in the state. These Inspections involve evaluating the facility's sampling protocols and "splitting" samples with the company to conduct an independent analysis of the groundwater.

The UST act requires release detection, corrosion protection, overfill protection and spill prevention at UST sites to ensure protection of the groundwater. The Energy Policy Act of 2005 has increased the regulations applicable to USTs installed within 1,000 feet of existing community water systems or potable drinking water wells. The act requires states to perform on-site inspections at all UST facilities every three years. This is a significant increase in the required frequency of inspections. In addition, the act includes additional regulations related to secondary containment, delivery prohibition and employee training at UST sites.

Additionally, in fiscal year 2009, EE personnel investigated 384 spills and 1,760 complaints that had the potential to impact our groundwater.

# V. WEST VIRGINIA DEPARTMENT OF ENVIRONMENTAL PROTECTION

## F. Office of Abandoned Mine Lands

In reviewing surface mining legislation in the mid – 1970s, the United States Congress found that more than 1.5 million acres of land had been directly disturbed by coal mining and more than 11,500 miles of streams was polluted by sedimentation or acidity from surface or underground mines. In response to the problems associated with inadequate reclamation of coal mining sites, Congress enacted the Surface Mining Control and Reclamation Act of 1977 (SMCRA).

The two main purposes of SMCRA are (1) to establish a nationwide program to protect society and the environment from the adverse effects of surface mining operations while assuring that the coal supply essential to the Nation's energy requirement is provided and (2) to promote the reclamation of mined areas left without adequate reclamation before SMCRA was passed. Title V of SMCRA deals with active mining, Title IV deals specifically with the problems associated with inadequate reclamation of abandoned mine lands (AML).

In Title IV, Congress established the Abandoned Mine Reclamation Fund to be used for the reclamation and restoration of areas affected by past mining. The fund is derived from a reclamation fee collected from coal mining operators on each ton of coal mined since SMCRA was enacted.

West Virginia received primacy of the AML program February 21, 1981, and the WVDEP was designated by the governor to operate this program with funding provided from the AML Reclamation Fund. The Office of Abandoned Mine Lands and Reclamation (AML&R) was established within the WVDEP.

The mission statement of the Office of Abandoned Mine Lands and Reclamation is "To protect public health, safety, and property from past coal mining and enhance the environment through reclamation and restoration of land and water resources".

The program's vision statement states, " The Abandoned Mine Lands and Reclamation Program efficiently and effectively uses all available resources to achieve a long term benefit to public health, safety, property and general welfare while restoring the environment to pre – mining conditions."

**AML&R Organizational Structure**

AML&R is divided into groups: Administration & Financial, Realty, Planning, Design and In - House Design, Construction and Emergency. The state is divided into Northern and Southern Regional offices. The responsibilities of those groups are:

1. ***Administration & Financial*** - This group performs the accounting function for the office. The group tracks expenditures as they relate to administrative and construction functions responsible for management of grants, budgets and financial administration of AML&R. Furthermore, the group oversees the Stream Restoration section that is mandated to perform all program, pre-construction, post-construction and compliance, and water monitoring functions.

*2.* ***Realty*** - This group gains rights of entry from property owners so that exploration and construction can be conducted to address abandoned mine land problems. Also, the group's responsibility includes determining if before and after appraisals are necessary for the purposes of lien actions.

*3.* ***Planning*** - The Planning group identifies abandoned mine land problems. Each requires preparation of environmental assessments to be in compliance with the National Environmental Policy Act (NEPA), creation of a description of each project, and development of a preferred alternative for correcting the problem. The group also maintains the West Virginia Abandoned Mine Land Inventory.

*4.* ***Design & In - House Design*** - This group approves all consultant plans and specifications involving abandoned mine land projects. It also evaluates and selects a design consultant to perform all necessary preparation of plans and specifications for projects. This group also administers exploratory drilling, aerial mapping, surveying contracts, and prepares plan and specification on selected projects in – house.

*5.* ***Construction*** - The main task of the Construction group is contract administration and oversight of abandoned mine land construction projects. This includes site inspections during construction. The group conducts pre-bid and pre-construction conferences and performs final inspections.

*6.* ***Emergency*** - This group administers and conducts the Emergency Reclamation Program.

**AML Public Health and Safety Issues**

SMCRA defined eligible sites under Title IV as those sites which were mined for coal and left in an inadequate state of reclamation prior to August 4, 1977, and for which there is no continuing reclamation responsibility under state or federal law. The definition of eligibility was extended in 1992 to sites mined for coal after August 4, 1977. These sites were abandoned before the date the secretary of the U.S. Department of the Interior approved a regulatory program for the state in which the sites are located.

The expenditures of moneys from the fund on lands and water eligible shall reflect the following priorities stated in Section 403 (a) in the Surface Mining Control and Reclamation Act Amendments of 2006:

1. (A) The protection of public health, safety, and property from extreme dangers of adverse effects of coal mining practices;

(B) the restoration of land and water resources and the environment that -

(i) have been degraded by the adverse effects of coal mining practices; and

(ii) are adjacent to a site that has been or will be remediated under subparagraph (A)

2. (A) The protection of public health and safety from adverse effects of coal mining practices;

(B) the restoration of land and water resources and the environment that -

(i) have been degraded by the adverse effects of coal mining practices; and

(ii) are adjacent to a site that has been or will be remediated under subparagraph (A); and

3. The restoration of land and water resources and the environment previously degraded by adverse effects of coal mining practices including measures for the conservation and development of soil, water (excluding channelization), woodland, fish and wildlife, recreation resources, and agricultural productivity.

The SMCRA Amendments of 2006 stated that any state or tribe may extend funds allocated to such state and tribe in any year through the grants for the purpose of protecting, repairing, replacing, constructing, or enhancing facilities related to water supply, including water distribution facilities and treatment plans, to replace water supplies adversely affected by coal mining practices.

The U.S. Office of Surface Mining (OSM) maintains an inventory of abandoned mine problems known as the Abandoned Mine Lands Inventory System (AMLIS). OSM maintains the system to provide information to meet the objectives of Title IV specified in Section 403(a).

When a problem area is entered into AMLIS along with the estimated cost of repairing the area, not including design, inspection, and program administration costs the estimated cost is entered in the unfunded category. When a problem area on the inventory is funded, it is moved to the funded category. Later, when the actual construction is completed, the problem is again moved, this time to the completed category. In this manner, a complete history of the abandoned mine land problems are maintained in AMLIS. The total unfounded costs of all priorities in West Virginia as of June 1, 2007 are $1,388,729,805.

**AML&R Accomplishments**

AML&R has completed the Problem Areas and the associated Problem Types. The PA and the problem type accomplishments have been entered into AMLIS and moved from the funded to completed category.

**Summary of Accomplishments From 6/30/07 to 7/1/09**

| Problem Type | Total Accomplishment |
|---|---|
| Clogged Streams (Miles) | 1.1 |
| Dangerous Highwall (Feet) | 200 |
| Dangerous Impoundments (Count) | 83 |
| Dangerous Piles & Embankments (Acres) | 97 |
| Dangerous Slides ( Acres) | 9.8 |
| Hazardous Equipment & Facilities (Count) | 1 |
| Industrial/Residential Waste (Acres) | 0 |
| Portals (Count) | 24 |
| Polluted Water: Agriculture. & Industrial (Count). | 5.6 |
| Polluted Water: Human Consumption (Count) | 2862 |
| Subsidence (Acres) | 45.4 |
| Surface Burning (Acres) | 2. |
| Vertical Opening (Count) | 4 |

# VI. DEPARTMENT OF HEALTH AND HUMAN RESOURCES
## Office of Environmental Health Services

## A. Well Head Protection Program

## Section I - Ground Water Protection Goals

As of June 30, 2009, the Source Water Assessment and Protection (SWAP) / Wellhead Protection (WHP) program has completed assessments for 100 percent (delineation through public availability) of the community and non-community public water supply systems. It is our hope that this work accomplished in West Virginia and across the United States will be a valuable tool to a public water supply/community and will help in planning and building future capacity for economic growth.

Moving from the initial assessment phase to a protection phase will require a multifaceted approach that will require continued financial support within West Virginia. The SWAP/WHP programs target water systems for protection on a county or localized basis. The Office of Environmental Health Services (OEHS) relies on participation and involvement of federal, state, local agencies, industry, agriculture, environmental groups, public water supplies, and the public at many levels to protect the surface and ground waters of the State and the health of the people of West Virginia.

Results of the SWAP/WHP assessments conducted to date are used as a priority-setting approach for protection. Systems with higher susceptibility rankings are primarily targeted first, especially in higher population centers. Implementation of the SWAP/WHP builds on other environmental assessment and protection programs and requires integrated linkage and cooperation with many associated entities. Availability of initial assessments alone is not likely to drive local action to the protection phase. Follow-up assistance and a continuing source of funding for activities will likely be required for sustainability.

The overall goal of the SWAP/WHP programs is to gather and utilize meaningful information to assist source water protection efforts and the overall drinking water program in the state. There are approximately 1191 surface and ground water intakes serving the State's public water systems. Efforts to identify significant potential sources of contamination will focus on the greatest threats to drinking water and guide future source water protection efforts. The SWAP/WHP programs maximize the use of existing information, require integration with existing state and federal programs and use Geographic Information System (GIS) to map delineations and assessments and the emphasis on the local partnerships.

## Section II - Program Milestones and Future Priorities

During this reporting cycle, the SWAP/WHP programs continued to pursue the following:

I. **Building Partnerships-Inter-agency cooperation and other alliances:**

a. In 2008, at the West Virginia Cacapon State Park, a stakeholder meeting was held to review the status of the SWAP/WHP programs. Representatives from various state, federal, and local agencies/groups attended this meeting to provide insight concerning the programs.

b. Continuation of the SWAP/WHP Memorandum of Understanding (MOU) that has been signed by a number of state ground water regulatory agencies, establishes a coordinated effort by all agencies to protect ground water in delineated SWAP/WHP areas. The MOU enhances the SWAP/WHP programs ability to protect ground water utilized by public water systems.

c. Continue to participate and build voluntary protection efforts by prioritizing efforts, program resources, education and outreach efforts in developing and implementing voluntary protection measures not only to the local water systems but also to local governments, councils, planners, and other stakeholders.

d. Provide funding for the WVDEP Underground Injection Control (UIC) Class V program to locate UIC Class V wells in source water protection and sensitive hydrological areas within West Virginia. This work also includes an inventory of underground and above ground storage tanks in the SWAP/WHP area.

e. Continue participation and provide funding for the Potomac Drinking Water Source Protection Partnership. This partnership is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Potomac River basin.

f. Continue participation with the Ohio River Valley Water Sanitation Commission (ORSANCO) work group on source water protection. This work group is composed of water utilities and the various governmental agencies responsible for drinking water protection in the Ohio River basin.

g. Continuing a working relationship between the federal *Safe Drinking Water Act* and the *Clean Water Act* programs within the state to provide the most accurate and representative assessment of source waters, based on available data which the state believes best reflects the quality of the resources.

h. Continue to work with the West Virginia Rural Water Association (WVRWA), under an EPA grant through the National Rural Water Association, working with the local SWAP and WHP's areas within the state.

i. Continuing to use hydrogeologic information provided from the US Geological Survey to help define SWAP/WHP delineation areas.

## II. Public Outreach/Educational Activities:

a. Participation with the WVDEP on Project WET (Water Education for Teachers), a nonprofit water education program for educators and young people ages 5-18. In conjunction with this program, the SWAP program has developed a program to loan groundwater models to schools that complete the Project Wet training. The SWAP group uses a groundwater flow model within Project WET workshops and other educational outreach events to demonstrate groundwater and surface water and how both can be affected by precipitation, the pumping of wells, and human activities above or below the land surface. It is the intent to further use the cumulative effect within the public school platform so that more teachers and more students will have the tools and content to learn about water resources effectively.

b. For the past nine years, the SWAP program has participated in the annual WV Children's Water Festival. Approximately 250 Kanawha County students in fourth and fifth grade attend this festival that consists of structured learning stations where students actively engage in hands-on water activities and investigations.

c. The West Virginia Bureau for Public Health (WVBPH) website continues to provide information on the SWAP/WHP programs and guide municipalities, water suppliers, or other groups through developing a local SWAP program. A secure website that provides the wellhead and source water areas and potential contaminant sources has be developed for use by other utilities, state, emergency management, and federal agencies.

d. Information on the SWAP/WHP assessments is available through the West Virginia Bureau for Public Health (WVBPH) website and is included in the annual Consumer Confidence Report (CCR) prepared by each community water system and reviewed by the WVBPH staff.

e. Provide educational materials, posters and brochures concerning the SWAP/WHPP program.

## III. Other Actions for Protection of Sources of Drinking Water

a. Source Water Protection Grants Program, providing funding that will allow municipalities and water suppliers to enhance local protection programs. Specifically, grant money will be available to implement programs to protect existing groundwater sources of public drinking water.

b. Continue to evaluate new public water supply water wells or intakes to assure they are located in areas where contamination threats are minimal. Permits for new public water wells now require an initial survey for potential sources of contamination within 2,000 feet of proposed well location with site-specific information used when available.

c. The Alternative Monitoring Strategy Program (AMSP), which determines future monitoring frequency reductions, is dependent on having a SWAP/WHP program in place, which requires consistent revisions and updates.

d. Continue to participate in the development of regulations and design standards for water supply wells, private water wells and monitoring wells for the protection of groundwater contamination.

e. Continue to evaluate public water supply wells to determine whether or not ground water sources are under the direct influence of surface water (GWUDI).

f. Continue to support the efforts of the West Virginia DEP, Division of Water and Waste Management and the United States Geological Survey (USGS) with its ground water ambient water quality studies. This program has strived to benchmark raw water quality data for West Virginia aquifers. West Virginia is trying to identify the impacts of various land uses on water quality. This information will help West Virginia avoid future contamination events.

g. Continue to implement the revised regulations and design standards for private water wells, approved April 2, 2008, for the protection of groundwater. The following meetings and presentations at the Sanitarian Training In-Service on Water Wells were held to help implement the revised rules. Meetings were held at Beckley, Fairmont, Parkersburg, and Snowshoe, West Virginia. In addition, staff attended the Midwest Well Program Managers Meeting in Kansas City, Missouri, and the National Water Well Jubilee in Myrtle Beach, South Carolina.

## Section III - Ground Water Data Collection and Management:

The WHP/SWAP programs acquire a variety of data, including locations and characteristics of public water supply sources, point of entry, potential contaminant sources, and description of watersheds, hydro geologic settings, and aquifer parameters. These data continue to be collected through field data collection activities and contractor services, as well as programs within federal, state, and local agencies.

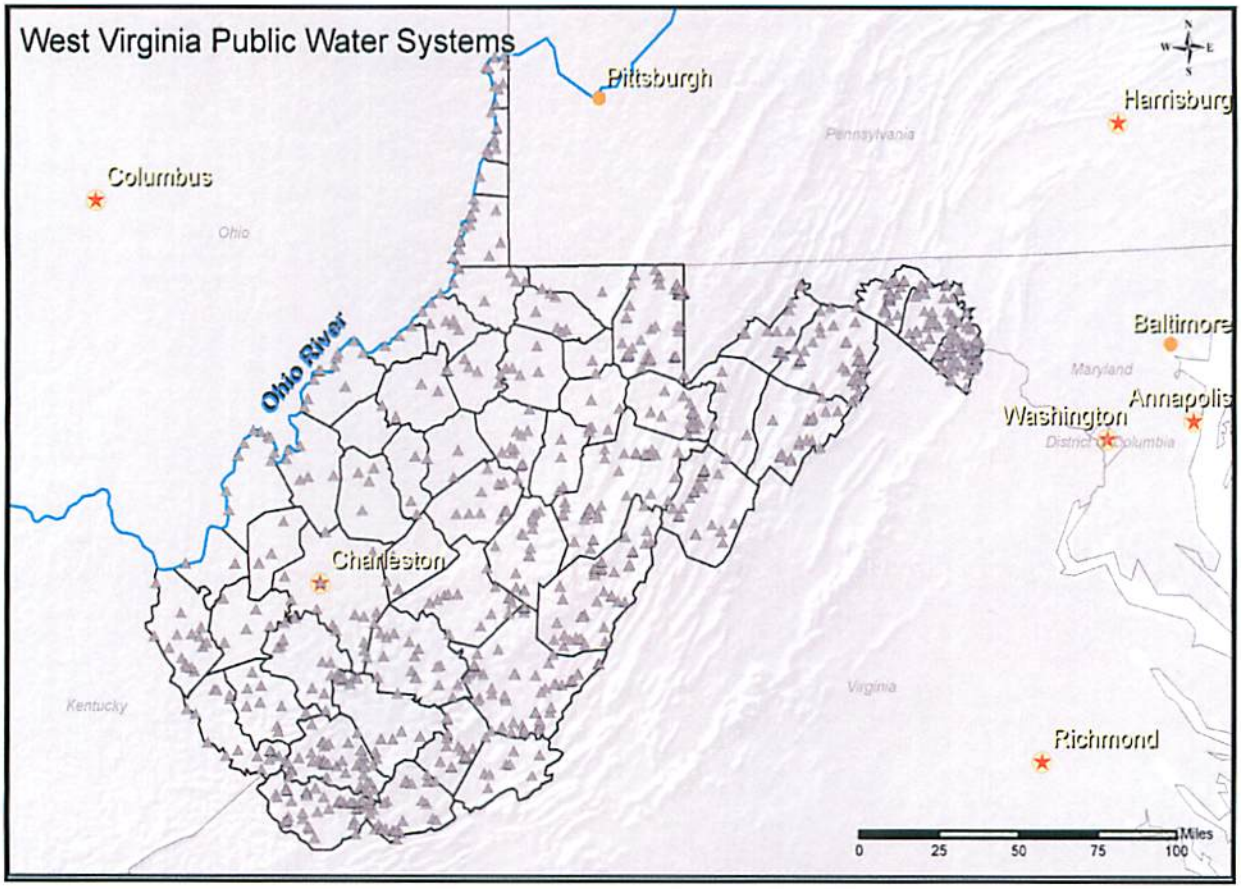
## Section IV - Future Program Needs

To date, West Virginia BPH has hired additional staff and spent a significant amount of time in developing the WHP/SWAP programs, creating a GIS for collection and storage of geologic/hydrologic data, the regulatory site data, delineations, and existing significant contaminant source inventories. Potential future Source Water Protection program needs are as follows:

I. Pollution prevention technical assistance to small businesses located within wellhead protection areas to balance Brownfield redevelopment with local water protection/restoration efforts.

II. Public education efforts such as ground water components for natural resource curriculum for grades K-12.

III. Continued groundwater quality monitoring to support activities mandated by the SDWA and the Clean Water Act.


West Virginia Public Water Systems
Pittsburgh
Harrisburg
Pennsylvania
Columbus
Ohio
Ohio River
Baltimore
Maryland
Annapolis
Washington
District of Columbia
Charleston
Kentucky
Virginia
Richmond
0
25
50
75
100
Miles

# VI. DEPARTMENT OF HEALTH AND HUMAN RESOURCES
## Office of Environmental Health Services

## B. Public Health Sanitation Division

Two Groundwater Protection Programs are operated by the Public Health Sanitation Division. These include the permitting and approval of individual water supplies and individual sewage systems. The goal of the individual water supply program is to ensure that individual water wells are properly constructed and located at the required distances from potential pollution sources. This program is carried out through local health departments and includes permitting, inspections, and water sampling. The Public Health Sanitation Division provides technical assistance to local health departments by assisting with complaint investigations and design of remedial systems for the correction of failures. New Water Well Regulations and Design Standards were enacted in April 2008 to better ensure groundwater protection.

### Individual Water Supply Program

Local health departments continue to collect water samples upon request to determine bacteriological and chemical conditions of individual and public water groundwater supplies. Complaints related to groundwater protection, which are not regulated by state or local health departments are referred to the appropriate agency for response.

### Individual Sewage Program

The individual on-site sewage program involves the plan review, site evaluation, inspection, and complaint investigation of on-site sewage systems in West Virginia. The goal of this program is threefold: 1) protect the groundwater, 2) ensure all new building sites utilizing on-site sewage disposal have a suitable on-site sewage disposal reserve area that will accommodate the initial system and have space for future repairs, and 3) correct failing systems to prevent a public health hazard. Local health departments are responsible for on-site systems up to 3,000 gallons per day (plan review, site evaluation, permitting, inspection, and approval). The Public Health Sanitation Division issues permits for surface discharge systems (under 600 gallons per day) that qualify for an N.P.D.E.S. permit, conducts training and certification of septic installers, develops and interprets rules and design standards, develops operating procedures and guidelines, investigates complaints, and reviews new technology. A new inspection program geared at the inspection of new Home Aeration Units (HAUs) with surface discharge has also been implemented. Public Health Sanitation Division staff work routinely with the WVDEP to monitor HAUs throughout the state.

The Individual Sewage Program will be faced with many new challenges in the coming years. The use of new treatment technologies, coupled with the fact that most of the good sewage sites are already occupied creates a tremendous taxation on the minds and creative abilities of the Health Department personnel employed to address these problems. A pilot project, in conjunction with the WV Sewage Advisory Board, has been established through a Product Verification Protocol to allow new technologies to apply applications in West Virginia.

# Appendix A
## Regulatory Agencies with Groundwater Responsibility and Authority

**Department of Agriculture**

1900 Kanawha Blvd., E.
Charleston, WV 25305
(304) 558-3708

**Department of Environmental Protection**

601 57th Street, SE
Charleston, WV 25304

Office of Oil and Gas
(304) 926-0450

Division of Land Restoration
(304) 926-0455

Division of Water and Waste Management
(304) 926-0495

Office of Information Technology
(304) 926- 0499, Ext. 1615

**Department of Health and Human Resources**

Capitol and Washington Sts.
1 Davis Square, Suite 200
Charleston, WV 25301

Office of Environmental Health Services
(304) 558-2981

Environmental Engineering Division
(304) 558-2981

Public Health Sanitation Division
(304) 558-2981

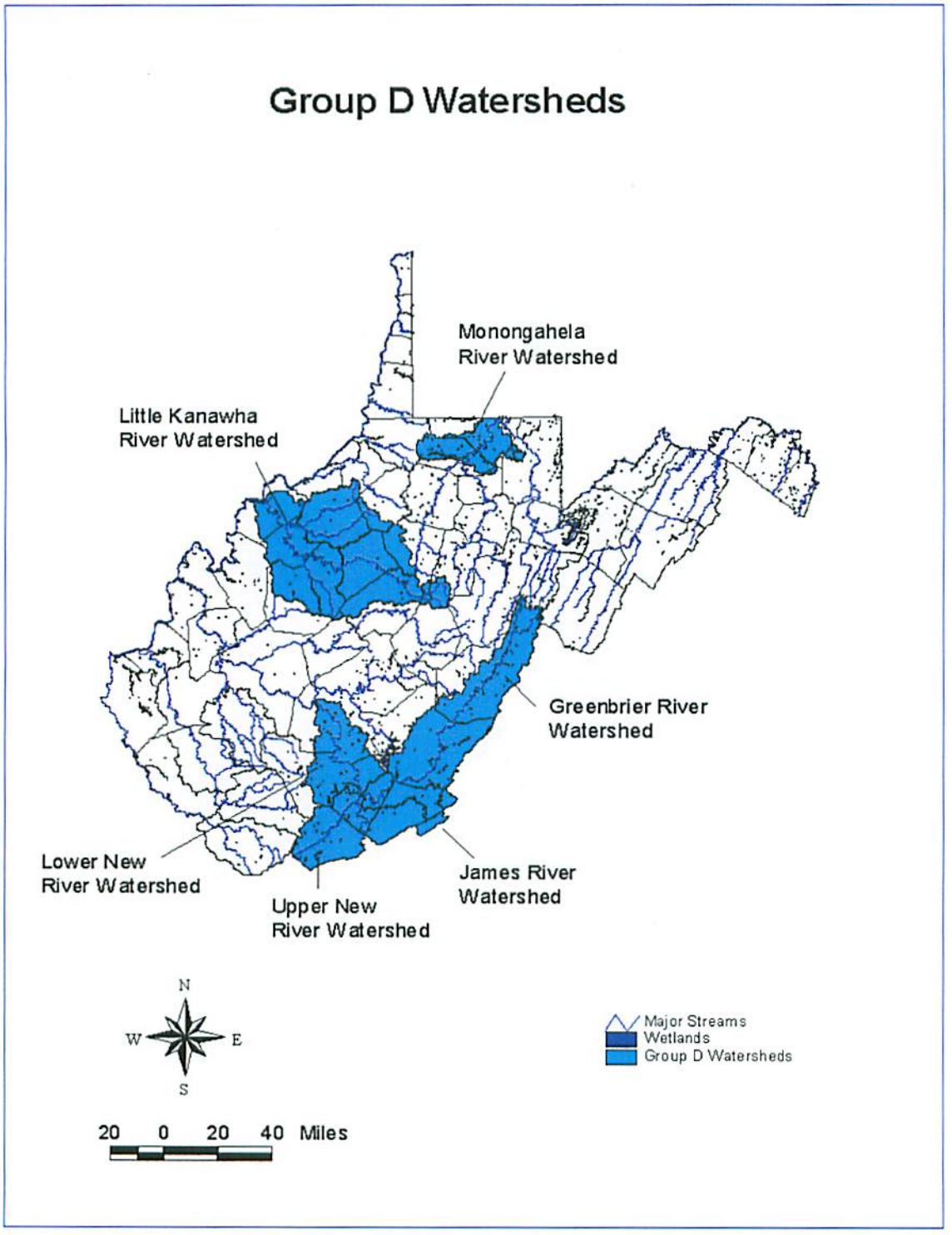
# Appendix B

## Division of Water and Waste Management - Groundwater Program, Department of Health and Human Resources - Office of Environmental Health Services, and the United States Geological Survey Study of Ambient Groundwater Quality in West Virginia

## Data Tables From 2008

**Note: Groundwater Quality Standards are noted where such standards have been established for a particular parameter. Groundwater Quality Standards are standards of quality and purity, established by the Environmental Quality Board in 46 CSR 12.**

Exceedences of groundwater quality standards are in **bold**


Group D Watersheds
Monongahela River Watershed
Little Kanawha River Watershed
Greenbrier River Watershed
Lower New River Watershed
Upper New River Watershed
James River Watershed
N
W
E
S
20 0 20 40 Miles
Major Streams
Wetlands
Group D Watersheds

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables**
**Key to the sampling sites 2008**

| Site | County | Watersheds (Group D) | Geologic Unit | Geologic Age | Depth of Sample (feet) | Elevation (feet above mean sea level) |
|---|---|---|---|---|---|---|
| 1 | Mercer | Upper New | Tuscarora Sandstone | Lower Silurian System | 217 | 3480 |
| 2 | Mercer | Upper New | Bluestone And Princeton Formations | Upper Mississippian | 38 | 2470 |
| 3 | Mercer | Upper New | Bluestone And Princeton Formations | Upper Mississippian | 44.4 | 2060 |
| 4 | Mercer | Upper New | Hinton Formation | Upper Mississippian | | 2745 |
| 5 | Mercer | Upper New | Mauch Chunk Formation | Upper Mississippian | | 1700 |
| 6 | Roane | Little Kanawha | Dunkard Group | Lower Permian | | 720 |
| 7 | Wirt | Little Kanawha | Dunkard Group | Lower Permian | 24.62 | 615 |
| 8 | Wirt | Little Kanawha | Quaternary System | Quaternary | 24.5 | 640 |
| 9 | Ritchie | Little Kanawha | Dunka rd Group | Lower Permian | | 860 |
| 10 | Pocahontas | Greenbrier | Marcellus Shale | Upper-Middle Devonian | 5.92 | 2790 |
| 11 | Pocahontas | Greenbrier | Marcellus Shale | Upper-Middle Devonian | 17.5 | 2550 |
| 12 | Pocahontas | Greenbrier | Brallier Formation | Upper Devonian | 0 | 2670 |
| 13 | Pocahontas | Greenbrier | Pocono Group | Lower Mississippian | | 2110 |
| 14 | Greenbrier | Greenbrier | Pocono Group | Lower Mississippian | | 2680 |
| 15 | Greenbrier | Greenbrier | Brallier Formation | Upper Devonian | | 2050 |
| 16 | Calhoun | Little Kanawha | Conemaugh Formation | Upper Pennsylvanian | 11.95 | 840 |
| 17 | Braxton | Little Kanawha | Conemaugh Formation | Upper Pennsylvanian | | 830 |
| 18 | Taylor | Monongahela | Conemaugh Formation | Upper Pennsylvanian | | 1520 |
| 19 | Marshall | Monongahela | Dunkard Group | Lower Permian | | 1040 |
| 20 | Marshall | Monongahela | Dunkard Group | Lower Permian | 12.25 | 1030 |

| Site | County | Watersheds (Group D) | Geologic Unit | Geologic Age | Depth of Sample (feet) | Elevation (feet above mean sea level) |
|---|---|---|---|---|---|---|
| 21 | Preston | Monongahela | Conemaugh Formation | Upper Pennsylvanian | | 1710 |
| 22 | Taylor | Monongahela | Conemaugh Formation | Upper Pennsylvanian | 20.65 | 1530 |
| 23 | Fayette | Lower New | New River Formation | Lower Pennsylvanian | | 1670 |
| 24 | Summers | Lower New | Hinton Formation | Upper Mississippian | 19.83 | 1290 |
| 25 | Summers | Lower New | Hinton Formation | Upper Mississippian | | 1360 |
| 26 | Fayette | Lower New | New River Formation | Lower Pennsylvanian | | 2270 |
| 27 | Greenbrier | Greenbrier | Pocono Group | Lower Mississippian | | 1720 |
| 28 | Summers | Greenbrier | Mauch Chunk Formation | Upper Mississippian | | 1430 |
| 29 | Greenbrier | Greenbrier | Chemung Formation | Upper Devonian | | 1940 |
| 30 | Greenbrier | Greenbrier | Greenbrier Limestone | Lower Mississippian | | 2090 |

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables**
**Key to the sampling sites 2008**

| Site | Water Temp. (Deg C) | Barometric Pressure (mm of Hg) | Turbidity (NTRU) | Specific Conductance (Us/Cm) @ 25C | Water pH (Whole Field, Standard Units) SDWR = 6.5-8.5 | Dissolved Oxygen, (mg/L) |
|---|---|---|---|---|---|---|
| 1 | 11.6 | 667 | <1.0 | 731 | 7.6 | 4.3 |
| 2 | 12.7 | 699 | 1.5 | 407 | 7.4 | 1.2 |
| 3 | 13.7 | 711 | 4.2 | 426 | 8.5 | 1.1 |
| 4 | 12 | 693 | <1.0 | 373 | 7.2 | 6.4 |
| 5 | 15 | 722 | <1.0 | 1140 | 7.4 | 1.1 |
| 6 | 14.1 | 747 | 2.2 | 718 | 9.4 | 1.2 |
| 7 | 15.5 | 746 | <1.0 | 565 | 8 | 1 |
| 8 | 15.5 | 748 | 2.2 | 518 | 7.7 | <1.0 |
| 9 | 13.7 | 740 | <1.0 | 906 | 8.7 | 1 |
| 10 | 11 | 684 | 6.4 | 169 | 6 | 7.9 |
| 11 | 11.4 | 702 | <1.0 | 181 | 7.8 | 1 |
| 12 | 11.7 | 697 | <1.0 | 135 | 7.4 | <1.0 |
| 13 | 12.2 | 710 | <1.0 | 167 | 7.4 | 1 |
| 14 | 11.6 | 693 | <1.0 | 213 | 8.3 | 1 |
| 15 | 13.9 | 712 | 1.5 | 520 | 7.1 | <1.0 |
| 16 | 14.6 | 745 | 4.6 | 609 | 9.1 | <1.0 |
| 17 | 14.4 | 744 | <1.0 | 410 | 8 | <1.0 |
| 18 | 17.2 | 723 | 18 | 141 | 6.4 | 6.7 |
| 19 | 14.4 | 732 | <1.0 | 619 | 8.4 | <1.0 |
| 20 | 12.7 | 732 | 520 | 218 | 6.8 | 3.1 |
| 21 | 12.9 | 715 | <1.0 | 484 | 9.3 | <1.0 |
| 22 | 12.8 | 726 | 14 | 115 | 6.6 | 1 |
| 23 | 12.9 | 720 | <1.0 | 488 | 6.7 | 1.1 |
| 24 | 19.3 | 736 | 3.2 | 611 | 6.7 | <1.0 |
| 25 | 21.5 | 732 | 68 | 816 | 6.8 | <1.0 |
| 26 | 13.6 | 712 | 2.1 | 82 | 8.2 | <1.0 |
| 27 | 14.2 | 718 | <1.0 | 385 | 6.9 | 2.7 |
| 28 | 15.8 | 725 | <1.0 | 1030 | 7.5 | <1.0 |
| 29 | 11.3 | 709 | <1.0 | 135 | 7.2 | <1.0 |
| 30 | 13.8 | 710 | <1.0 | 525 | 7.2 | 3.5 |

SWDR = Secondary Drinking Water Regulations

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Field Parameters, Bacteria, Acidity, and Ions 2008**

| Site | Total Coliform, (Colonies/ 100 ml) MCL = no more than 5%in samples | Fecal Coliform, (Colonies/ 100 ml) MCL = 0 | E. Coli (Colonies/ 100 ml) | Hardness Noncarb. (mg/L as $CaCO_3$) | Acidity (mg/L as $H^+$) | Acid Neutralizing Capacity (mg/L as $CaCO_3$) | Total Recoverable Calcium (mg/L as Ca) | Total Recoverable Magnesium, (mg/L as Mg) |
|---|---|---|---|---|---|---|---|---|
| 1 | <1 | <1 | <1 | 165 | 0.00003 | 69 | 53.3 | 24.5 |
| 2 | <1 | <1 | <1 | 12 | 0.00004 | 187 | 63.7 | 9.71 |
| 3 | <1 | <1 | <1 | | M | 196 | 11.7 | 2.82 |
| 4 | <1 | <1 | <1 | | 0.00006 | 190 | 41.8 | 18 |
| 5 | <1 | <1 | <1 | 255 | 0.00004 | 270 | 144 | 40 |
| 6 | <1 | <1 | <1 | | M | 360 | 0.75 | 0.126 |
| 7 | <1 | <1 | <1 | | 0.00001 | 230 | 16.8 | 2.66 |
| 8 | <1 | <1 | <1 | | 0.00002 | 265 | 55.9 | 9.56 |
| 9 | <1 | <1 | <1 | | M | 364 | 14 | 3.26 |
| 10 | <1 | <1 | <1 | 39 | 0.00101 | 31 | 13.9 | 8.56 |
| 11 | <1 | <1 | <1 | 20 | 0.00002 | 73 | 34.2 | 1.89 |
| 12 | **4** | <1 | <1 | 7 | 0.00004 | 49 | 11.6 | 6.59 |
| 13 | <1 | <1 | <1 | | 0.00004 | 74 | 18.6 | 4.33 |
| 14 | <1 | <1 | <1 | | 0.00001 | 116 | 34.4 | 5.12 |
| 15 | <1 | <1 | <1 | 20 | 0.00008 | 160 | 38.2 | 20.5 |
| 16 | <1 | <1 | <1 | | M | 281 | 0.7 | 0.113 |
| 17 | <1 | <1 | <1 | | 0.00001 | 187 | 38.8 | 5.01 |
| 18 | **37** | <1 | <1 | 17 | 0.0004 | 52 | 17.3 | 6.42 |
| 19 | <1 | <1 | <1 | | M | 272 | 23.6 | 2.91 |
| 20 | **28** | <1 | <1 | | 0.00016 | 69 | 20.1 | 3.79 |
| 21 | <1 | <1 | 3 | | M | 252 | 1.82 | 0.228 |
| 22 | **19** | <1 | <1 | | 0.00025 | | 6.98 | 2.86 |
| 23 | <1 | <1 | <1 | | 0.0002 | 223 | 29.2 | 10.3 |
| 24 | <1 | <1 | <1 | | 0.0002 | 252 | 44.9 | 18.2 |
| 25 | <1 | <1 | <1 | | 0.00016 | | 79.1 | 23.6 |
| 26 | <1 | <1 | <1 | | 0.00001 | 27 | 3.98 | 2.41 |
| 27 | <1 | <1 | <1 | 8 | 0.00013 | 203 | 62 | 13.7 |
| 28 | <1 | <1 | <1 | 160 | 0.00003 | 184 | 116 | 13 |
| 29 | **1** | <1 | <1 | | 0.00006 | 61 | 8.68 | 4.24 |
| 30 | <1 | <1 | <1 | 36 | 0.00006 | 258 | 76.5 | 24.9 |

MCL = Maximum Contaminant Level
M = measured, but not quantified

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables**
**Ions 2008**

| Site | Total Recoverable Sodium (mg/L as Na) | Total Recoverable Potassium, (mg/L as K) | Bicarbonate (mg/L as $HCO_3$) | Carbonate (mg/L as $CO_3$) | Alkalinity (mg/L as $CaCO_3$) | Dissolved Carbon Dioxide (mg/L as $CO_2$) | Dissolved Sulfate (mg/L as $SO^-_4$) |
|---|---|---|---|---|---|---|---|
| 1 | 39 | 3.01 | 79 | <1 | 65 | 3.4 | 27.5 |
| 2 | 11.5 | 0.57 | 223 | <1 | 183 | 14 | 21.7 |
| 3 | 81.4 | 0.46 | 216 | <1 | 177 | 1.2 | 5.11 |
| 4 | 10.4 | 1.14 | 226 | <1 | 185 | 23 | 18 |
| 5 | 50.2 | 1.23 | 301 | <1 | 247 | 21 | 311 |
| 6 | 162 | 0.64 | 405 | <1 | 332 | 0.2 | 5.39 |
| 7 | 105 | 1.04 | 265 | <1 | 217 | 4.4 | 14.4 |
| 8 | 44.7 | 1.47 | 317 | <1 | 260 | 10 | 22.5 |
| 9 | 178 | 1.25 | 404 | <1 | 331 | 1.4 | 9.16 |
| 10 | 3.1 | 0.55 | 26 | <1 | 21 | 60 | 43.3 |
| 11 | 0.8 | 0.66 | 85 | <1 | 70 | 2.2 | 19.6 |
| 12 | 5.2 | 0.32 | 50 | <1 | 41 | 3.8 | 20.1 |
| 13 | 8.2 | 1.81 | 84 | <1 | 69 | 5.7 | 11.6 |
| 14 | 5.2 | 1.24 | 137 | <1 | 113 | 1.1 | 4.3 |
| 15 | 35.3 | 1.34 | 178 | <1 | 146 | 25 | 53.3 |
| 16 | 137 | 0.79 | 310 | <1 | 254 | 0.4 | 7.41 |
| 17 | 40.8 | 1.24 | 209 | <1 | 171 | 3.6 | 0.23 |
| 18 | 0.4 | 1.19 | 55 | <1 | 45 | 40 | 19.6 |
| 19 | 121 | 1.4 | 299 | <1 | 245 | 2.1 | E.15 |
| 20 | 16 | 1.05 | 95 | <1 | 78 | 21 | 10.3 |
| 21 | 118 | 0.72 | 283 | <1 | 232 | 0.2 | 9.87 |
| 22 | 1.1 | 1.16 | 50 | <1 | 41 |  | 11.1 |
| 23 | 61.1 | 2.5 | 262 | <1 | 215 | 86 | 36.3 |
| 24 | 63.6 | 0.85 | 287 | <1 | 235 | 97 | 34.5 |
| 25 | 56.9 | 0.93 | 223 | <1 | 183 |  | 151 |
| 26 | 2.5 | 1.25 | 34 | <1 | 29 | 0.3 | 0.3 |
| 27 | 5.2 | 1.15 | 228 | <1 | 187 | 50 | 11.2 |
| 28 | 88.1 | 0.57 | 190 | <1 | 156 | 11 | 295 |
| 29 | 12.3 | 0.58 | 73 | <1 | 60 | 7.5 | 8.06 |
| 30 | 4.8 | 0.82 | 284 | <1 | 233 | 32 | 28 |

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables**
**Ions 2008**

| Site | Dissolved Chloride (mg/L as Cl) | Total Fluoride (mg/L as F) | Dissolved Bromide (mg/L as Br) | Total Dissolved Solids Residue At 180 Deg. C (mg/L) | Total Solids Residue at 105 Deg. C, (mg/L) |
|---|---|---|---|---|---|
| | | MCL = 4.0 mg/L | | SDWR = 500 mg/L | |
| 1 | 170 | <.12 | 0.04 | 497 | 591 |
| 2 | 9.15 | 0.13 | 0.04 | 259 | 260 |
| 3 | 24.3 | 0.28 | 0.05 | 274 | 269 |
| 4 | 2.21 | 0.12 | E.02 | 226 | 233 |
| 5 | 48.2 | 0.28 | 0.04 | **865** | 886 |
| 6 | 23 | 1.72 | 0.15 | 439 | 455 |
| 7 | 36.5 | 1.04 | 0.13 | 339 | 342 |
| 8 | 6.31 | 0.21 | 0.07 | 328 | 334 |
| 9 | 74.5 | 0.71 | 0.07 | **536** | 535 |
| 10 | 0.29 | <.12 | <.02 | 116 | 118 |
| 11 | 0.38 | <.12 | <.02 | 119 | 114 |
| 12 | 0.41 | E.07 | <.02 | 97 | 97 |
| 13 | 1.44 | E.11 | E.01 | 109 | 108 |
| 14 | 0.85 | <.12 | E.01 | 145 | 138 |
| 15 | 37.3 | 0.16 | 0.04 | 313 | 315 |
| 16 | 24.6 | 1.32 | 0.07 | 361 | 365 |
| 17 | 21.5 | 0.37 | 0.06 | 229 | 239 |
| 18 | 0.71 | 0.19 | <.02 | 92 | |
| 19 | 42.3 | 0.64 | 0.15 | 376 | 376 |
| 20 | 14.5 | E.07 | 0.04 | 137 | 175 |
| 21 | 4.67 | 1.24 | E.02 | 306 | 303 |
| 22 | 0.75 | E.11 | <.02 | 62 | |
| 23 | 4.14 | 0.17 | E.01 | 289 | 283 |
| 24 | 34.3 | 0.16 | 0.1 | 386 | 366 |
| 25 | 41 | 0.12 | 0.15 | **531** | 553 |
| 26 | 3.27 | E.08 | E.02 | 52 | 53 |
| 27 | 3.15 | 0.13 | 0.04 | 236 | 230 |
| 28 | 42.7 | 0.24 | 0.29 | **712** | 734 |
| 29 | 1.93 | 0.12 | 0.02 | 90 | 79 |
| 30 | 5.89 | 0.42 | E.01 | 320 | 324 |

MCL = Maximum Contaminant Level
SWDR = Secondary Drinking Water Regulations
E = Estimated

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions and Metals 2008**

| Site | Total Nitrogen, Nitrite (mg/L as N) | Total Nitrogen, $NO_2$+$NO_3$ (mg/L as N) MCL = 10 mg/L | Total Nitrogen, Ammonia (mg/L as N) | Total Nitrogen, Ammonia (mg/L as $Nh_4$) | Total Nitrogen, (mg/L as N) | Ortho-Phosphate (mg/L ) | Ortho-Phosphate, (mg/L as P) |
|---|---|---|---|---|---|---|---|
| 1 | <.002 | 0.67 | E.017 | | 0.7 | 0.067 | 0.022 |
| 2 | <.002 | <.04 | 0.136 | 0.18 | 0.13 | 0.355 | 0.116 |
| 3 | <.002 | <.04 | 0.102 | 0.13 | 0.1 | 0.294 | 0.096 |
| 4 | <.002 | <.04 | 0.039 | 0.05 | E.04 | 0.074 | 0.024 |
| 5 | <.002 | <.04 | 0.203 | 0.26 | 0.21 | 0.029 | 0.01 |
| 6 | <.002 | <.04 | 0.063 | 0.08 | 0.09 | 0.075 | 0.025 |
| 7 | <.002 | 0.04 | 0.101 | 0.13 | 0.15 | 0.051 | 0.017 |
| 8 | <.002 | <.04 | 0.314 | 0.4 | 0.35 | 0.223 | 0.073 |
| 9 | <.002 | <.04 | 0.145 | 0.19 | 0.15 | 0.083 | 0.027 |
| 10 | <.002 | 0.07 | <.020 | | 0.07 | 0.028 | 0.009 |
| 11 | <.002 | <.04 | E.018 | | <.06 | 0.037 | 0.012 |
| 12 | <.002 | <.04 | 0.098 | 0.13 | 0.11 | 0.139 | 0.045 |
| 13 | <.002 | <.04 | 0.119 | 0.15 | 0.13 | 0.268 | 0.087 |
| 14 | <.002 | <.04 | 0.126 | 0.16 | 0.12 | 0.085 | 0.028 |
| 15 | <.002 | <.04 | 0.297 | 0.38 | 0.29 | | <.018 |
| 16 | <.002 | E.02 | 0.111 | 0.14 | 0.14 | 0.08 | 0.026 |
| 17 | <.002 | <.04 | 0.48 | 0.62 | 0.51 | 0.26 | 0.085 |
| 18 | <.002 | <.04 | <.020 | | 0.1 | | E.005 |
| 19 | <.002 | E.03 | 0.322 | 0.41 | 0.33 | 0.099 | 0.032 |
| 20 | <.002 | <.04 | 0.325 | 0.42 | 0.35 | | <.030 |
| 21 | <.002 | <.04 | 0.325 | 0.42 | 0.3 | 0.093 | 0.03 |
| 22 | E.001 | <.04 | 0.169 | 0.22 | 0.2 | 0.05 | 0.016 |
| 23 | 0.009 | 0.04 | 0.117 | 0.15 | 0.17 | | E.006 |
| 24 | <.002 | 0.49 | 0.039 | 0.05 | 0.53 | 0.022 | 0.007 |
| 25 | E.006 | <.04 | 0.134 | 0.17 | 0.13 | 0.022 | 0.007 |
| 26 | <.002 | <.04 | 0.078 | 0.1 | 0.09 | 0.026 | 0.009 |
| 27 | <.002 | 0.61 | <.020 | | 0.61 | 0.029 | 0.01 |
| 28 | <.002 | <.04 | 0.097 | 0.12 | 0.08 | 0.031 | 0.01 |
| 29 | <.002 | <.04 | 0.074 | 0.1 | 0.06 | 0.04 | 0.013 |
| 30 | <.002 | 1.01 | <.020 | | 1.01 | 0.019 | 0.006 |

MCL = Maximum Contaminant Level
E = Estimated

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Ions and Metals 2008**

| Site | Total Phosphorus (mg/L as P) | Total Recoverable Aluminum, (µg/L as Al) | Total Recoverable Antimony, (µg/L as Sb) | Total Recoverable Arsenic (µg/L as As) | Total Recoverable Barium, (µg/L as Ba) | Total Recoverable Beryllium, (µg/L as Be) | Total Recoverable Cadmium (µg/L as Cd) Total |
|---|---|---|---|---|---|---|---|
| | | SDWR = 0.05-0.2 mg/L | MCL = 6 µg/L | MCL = 10 µg/L | MCL = 2000 µg/L | MCL = 4 µg/L | MCL = 5 µg/L |
| 1 | 0.023 | E3 | E.1 | 2.6 | 319 | <.04 | <.01 |
| 2 | 0.225 | E2 | <.1 | E.37 | 163 | E.02 | <.01 |
| 3 | 0.108 | **12** | <.1 | 1.2 | 140 | <.04 | <.01 |
| 4 | 0.034 | <4 | <.1 | <.60 | 286 | <.04 | <.01 |
| 5 | 0.009 | E3 | <.1 | 0.71 | 22.6 | <.04 | <.01 |
| 6 | 0.029 | **88** | <.1 | 9.5 | 27.9 | <.04 | 0.02 |
| 7 | 0.014 | <4 | <.1 | **10.9** | 315 | <.04 | E.01 |
| 8 | 0.081 | <4 | <.1 | **14.3** | 748 | <.04 | <.01 |
| 9 | 0.03 | <4 | <.1 | 1.9 | 385 | <.04 | <.01 |
| 10 | 0.035 | 5 | <.1 | <.60 | 26.6 | E.03 | <.01 |
| 11 | 0.049 | E2 | <.1 | E.42 | 147 | E.03 | <.01 |
| 12 | 0.079 | E4 | <.1 | <.60 | 138 | <.04 | <.01 |
| 13 | 0.12 | E4 | <.1 | <.60 | 191 | <.04 | <.01 |
| 14 | 0.026 | <4 | <.1 | 1.2 | 494 | <.04 | <.01 |
| 15 | 0.015 | <4 | <.1 | 0.97 | 44.2 | <.04 | <.01 |
| 16 | 0.027 | **76** | <.1 | **10.6** | 16.4 | <.04 | 0.08 |
| 17 | 0.15 | **5** | <.1 | **16.9** | 730 | <.04 | <.01 |
| 18 | 0.23 | **321** | <.1 | 1.9 | 101 | 0.18 | 0.03 |
| 19 | 0.032 | <4 | <.1 | E.41 | 1350 | <.04 | E.01 |
| 20 | 1.1 | **14** | <.1 | 5.5 | 570 | 0.12 | <.01 |
| 21 | 0.031 | **5** | <.1 | <.60 | 45.2 | <.04 | <.01 |
| 22 | 0.21 | **110** | <.1 | **19** | 76 | 0.06 | <.01 |
| 23 | E.007 | <4 | <.1 | <.60 | 109 | <.04 | <.01 |
| 24 | E.004 | <4 | <.1 | <.60 | 276 | <.04 | 0.03 |
| 25 | 0.089 | **6** | 0.2 | **138** | 23.3 | 0.06 | <.01 |
| 26 | 0.059 | **9** | <.1 | 1.3 | 47.3 | <.04 | <.01 |
| 27 | E.006 | <4 | <.1 | <.60 | 93.5 | <.04 | E.01 |
| 28 | 0.012 | <4 | <.1 | 5.4 | 45.8 | <.04 | <.01 |
| 29 | 0.077 | <4 | <.1 | E.46 | 115 | <.04 | <.01 |
| 30 | <.008 | <4 | E.1 | 0.75 | 53.1 | <.04 | 0.02 |

MCL = Maximum Contaminant Level
SWDR = Secondary Drinking Water Regulations
E = Estimated

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals 2008**

| Site | Total Chromium (µg/L ) | Total Recoverable Iron, (µg/L as Fe) | Total Recoverable Lead, (µg/L as Pb) | Total Recoverable Manganese, (µg/L as Mn) | Total Recoverable Mercury, (µg/L as Hg) | Total Recoverable Nickel, (µg/L as Ni) | Total Recoverable Selenium, (µg/L as Se) |
|---|---|---|---|---|---|---|---|
| | | SWDR = 300 µg/L | MCL = 15 µg/L | SWDR = 50 µg/L | MCL = 2 µg/L | | MCL= 50 µg/L |
| 1 | E.30 | 13 | E.06 | 10.8 | <.010 | 0.42 | E.07 |
| 2 | <.40 | **1860** | E.03 | **290** | <.010 | 1 | <.08 |
| 3 | 0.41 | **1620** | 0.53 | **304** | <.010 | 0.84 | <.08 |
| 4 | 2.1 | **483** | 0.32 | **240** | <.010 | 2.6 | 0.1 |
| 5 | <.40 | **732** | 0.13 | **79.8** | <.010 | 0.75 | 0.09 |
| 6 | 0.43 | 147 | 5.56 | 4.5 | 0.022 | 0.56 | <.08 |
| 7 | <.40 | 34 | 0.09 | **54.4** | <.010 | 0.14 | <.08 |
| 8 | <.40 | **467** | 0.38 | **228** | <.010 | 1.3 | <.08 |
| 9 | E.21 | 178 | 0.08 | **60.1** | <.010 | E.07 | E.06 |
| 10 | <.40 | **901** | 0.22 | **298** | <.010 | 6.9 | <.08 |
| 11 | <.40 | **1660** | 0.13 | **106** | <.010 | 7.1 | <.08 |
| 12 | <.40 | **621** | <.06 | **186** | <.010 | 0.19 | <.08 |
| 13 | <.40 | **1400** | <.06 | **282** | <.010 | E.11 | <.08 |
| 14 | <.40 | 56 | 0.16 | 39.4 | <.010 | <.12 | <.08 |
| 15 | <.40 | **3590** | 0.07 | **504** | <.010 | 2.3 | <.08 |
| 16 | 0.55 | 102 | 0.11 | 5.5 | <.010 | 0.35 | <.08 |
| 17 | <.40 | **584** | <.06 | **125** | <.010 | 0.3 | <.08 |
| 18 | 2 | **19300** | 4.76 | **184** | <.010 | 7.4 | 0.6 |
| 19 | <.40 | 115 | E.04 | 33.2 | <.010 | 0.28 | <.08 |
| 20 | E.32 | **28700** | 0.21 | **1030** | <.010 | 0.33 | <.08 |
| 21 | <.40 | 28 | <.06 | 3.2 | <.010 | 0.53 | <.08 |
| 22 | 0.58 | **17100** | 0.21 | **324** | <.010 | 4 | <.08 |
| 23 | <.40 | **398** | <.06 | **78.3** | <.010 | 0.33 | <.08 |
| 24 | <.40 | **453** | 0.15 | **1840** | <.010 | 0.68 | 0.08 |
| 25 | <.40 | **7830** | 1.39 | **1530** | <.010 | 0.82 | <.08 |
| 26 | <.40 | **8370** | <.06 | **356** | <.010 | 0.93 | <.08 |
| 27 | <.40 | E4 | 0.6 | <.8 | <.010 | 0.24 | 0.29 |
| 28 | <.40 | **594** | <.06 | **210** | <.010 | 0.14 | <.08 |
| 29 | <.40 | **1390** | <.06 | **137** | <.010 | 2.3 | <.08 |
| 30 | <.40 | E5 | 0.19 | <.8 | <.010 | 0.59 | 5.9 |

MCL = Maximum Contaminant Level
SWDR = Secondary Drinking Water Regulations
E = Estimated

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Metals and Volatile Organic Compounds 2008**

| Site | Total Recoverable Thallium (µg/L as Th) | Total Recoverable Zinc, (µg/L as Zn) | Total Radon 222 (pCi/L) | Total Organic Carbon, (Mg/L as C) | 1,1,1, Trichloro-ethane (µg/l) | ,1-1 Dichloro-ethane µg/L) | 1,1 Dichloro-ethene µg/L) |
|---|---|---|---|---|---|---|---|
| | MCL = 2 µg/L | SWDR = 5000 µg/L | MCL = 300 pCi/L | | MCL = 200 µg/L | | |
| 1 | <.08 | 9.4 | 150 | 1.1 | <.1 | <.1 | <.1 |
| 2 | <.08 | 6.1 | 60 | 1 | <.1 | <.1 | <.1 |
| 3 | <.08 | 19.3 | 40 | 1.4 | <.1 | <.1 | <.1 |
| 4 | <.08 | 7.8 | 220 | 0.8 | <.1 | <.1 | <.1 |
| 5 | <.08 | E2.0 | 160 | 0.8 | <.1 | <.1 | <.1 |
| 6 | <.08 | 25.1 | **1990** | 0.9 | <.1 | <.1 | <.1 |
| 7 | <.08 | 6.8 | **1680** | 0.6 | <.1 | <.1 | <.1 |
| **8** | <.08 | 5.4 | **1280** | 0.9 | <.1 | <.1 | <.1 |
| 9 | <.08 | 2.1 | **570** | 1 | <.1 | <.1 | <.1 |
| 10 | <.08 | 15.4 | 20 | 0.4 | <.1 | <.1 | <.1 |
| 11 | <.08 | 46.5 | 10 | E.2 | <.1 | <.1 | <.1 |
| 12 | <.08 | <2.0 | 50 | E.3 | <.1 | <.1 | <.1 |
| 13 | <.08 | 25.8 | 200 | 1.3 | <.1 | <.1 | <.1 |
| 14 | <.08 | 51.7 | **910** | 0.6 | <.1 | <.1 | <.1 |
| 15 | <.08 | 5.2 | 60 | 0.5 | <.1 | <.1 | <.1 |
| 16 | <.08 | <2.0 | **2190** | 0.7 | <.1 | <.1 | <.1 |
| 17 | <.08 | 2.7 | **1530** | 0.9 | <.1 | <.1 | <.1 |
| 18 | <.08 | 37.3 | **520** | 1.5 | <.1 | <.1 | <.1 |
| 19 | <.08 | <2.0 | **1850** | 1 | <.1 | <.1 | <.1 |
| 20 | <.08 | 5.1 | **510** | 1.6 | <.1 | <.1 | <.1 |
| 21 | <.08 | <2.0 | **380** | 0.6 | <.1 | <.1 | <.1 |
| 22 | <.08 | 7.9 | 120 | 1.1 | <.1 | <.1 | <.1 |
| 23 | <.08 | <2.0 | 50 | 1.7 | <.1 | <.1 | <.1 |
| 24 | <.08 | 22.5 | **870** | 1.7 | <.1 | <.1 | <.1 |
| 25 | <.08 | 12.3 | 140 | 1.8 | <.1 | <.1 | <.1 |
| 26 | <.08 | 81.9 | 20 | 0.7 | <.1 | <.1 | <.1 |
| 27 | <.08 | 6.6 | **1880** | 0.6 | <.1 | <.1 | <.1 |
| 28 | <.08 | 2.6 | **340** | 1.2 | <.1 | <.1 | <.1 |
| 29 | <.08 | 7 | 40 | 1.3 | <.1 | <.1 | <.1 |
| 30 | <.08 | 266 | **770** | E.3 | <.1 | <.1 | <.1 |

MCL = Maximum Contaminant Level
SWDR = Secondary Drinking Water Regulations
E = Estimated

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds 2008**

| Site | 1,2-Di-Chloro-propane (µg/L) | 1,2-Di-Chloroethane (µg/L) | Benzene (µg/L) | 1,3-Di-Chloro-benzene (µg/L) | 1,4-Di-Chloro-benzene (µg/L) | Trichloro-trifluoro-methane (µg/L) |
|---|---|---|---|---|---|---|
| | MCL = 5 µg/L | MCL = 5 µg/L | MCL = 5 µg/L | | | |
| 1 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 2 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 3 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 4 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 5 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 6 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 7 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 8 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 9 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 10 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 11 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 12 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 13 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 14 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 15 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 16 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 17 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 18 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 19 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 20 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 21 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 22 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 23 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 24 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 25 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 26 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 27 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 28 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 29 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |
| 30 | <.1 | <.2 | < 0.1 | < 0.1 | < 0.1 | < 0.1 |

MCL = Maximum Contaminant Level

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds 2008**

| Site | Di-Bromo-Chloro-Methane (µg/L) | Trichloro-ethene (µg/L) | Bromo-Dichloro-ethene (µg/L) | Chloro-benzene (µg/L) | Di-Chloro-methane (µg/L) | 1-2-Dichloro-benzene (µg/L) |
|---|---|---|---|---|---|---|
| | MCL = 80 µg/L | | | | MCL = 5 µg/L | MCL = 600 µg/L |
| 1 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 2 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 3 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 4 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 5 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 6 | < 0.2 | <0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 7 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 8 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 9 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 10 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 11 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 12 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 13 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 14 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 15 | 1.5 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 16 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 17 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 18 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 19 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 20 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 21 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 22 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 23 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 24 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 25 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 26 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 27 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 28 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 29 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |
| 30 | < 0.2 | < 0.1 | < 0.1 | < 0.1 | < 0.2 | <.1 |

MCL = Maximum Contaminant Level

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds 2008**

| Site | Cis-1,2, -Di-Chloroethene (µg/L) | Dichloro-difluoro-methane (µg/L) | Di-Iso-Propyl Ether, (µg/L) | Ethyl-Benzene (µg/L) MCL = 700 µg/L | Diethyl Ether (µg/L) | Methylpentyl ether (µg/L) |
|---|---|---|---|---|---|---|
| 1 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 2 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 3 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 4 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 5 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 6 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 7 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 8 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 9 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 10 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 11 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 12 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 13 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 14 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 15 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 16 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 17 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 18 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 19 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 20 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 21 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 22 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 23 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 24 | < 0.1 | <.2 | 0.7 | < 0.1 | < 0.2 | 0.8 |
| 25 | < 0.1 | <.2 | 1.6 | < 0.1 | < 0.2 | 0.6 |
| 26 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 27 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 28 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 29 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |
| 30 | < 0.1 | <.2 | <.2 | < 0.1 | < 0.2 | <.2 |

MCL = Maximum Contaminant Level

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds 2008**

| Site | m-p- Xylene (µg/L) | t-Butyl ethyl ethene (µg/L) | Tri-bromo-methane (µg/L) | Tetrachloro-methane (µg/L) | Methyl Tertiary Butyl Ether (µg/L) MCL = 13 µg/L | o-Xylene (µg/L) | Styrene (µg/L) MCL = 100 µg/L |
|---|---|---|---|---|---|---|---|
| 1 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 2 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 3 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 4 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 5 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 6 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 7 | 0.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 8 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 9 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 10 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 11 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 12 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 13 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 14 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 15 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 16 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 17 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 18 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | 0.4 |
| 19 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 20 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 21 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 22 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 23 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 24 | <.2 | < 0.1 | < 0.2 | < 0.2 | **17.4** | < 0.1 | <.1 |
| 25 | <.2 | < 0.1 | < 0.2 | < 0.2 | 7.8 | < 0.1 | <.1 |
| 26 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 27 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 28 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 29 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |
| 30 | <.2 | < 0.1 | < 0.2 | < 0.2 | <.2 | < 0.1 | <.1 |

MCL = Maximum Contaminant Level

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Volatile Organic Compounds 2008**

| Site | Tetrachloro-ethene (µg/L) | Toluene (µg/L) | Trans-1,2, Di-chloroethene (µg/L) | Trichloro-fluoro-methane (µg/L) | Trichloro-methane (µg/L) | Vinyl Chloride (µg/L) |
|---|---|---|---|---|---|---|
| | | MCL = 1000 µg/L | | MCL = 150 µg/L | | MCL = 2 µg/L |
| 1 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 2 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 3 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 4 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 5 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 6 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 7 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 8 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 9 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 10 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 11 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 12 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 13 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 14 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 15 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 16 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 17 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 18 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 19 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 20 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 21 | < 0.1 | < 0.1 | < 0.1 | <0.2 | 0.4 | < 0.2 |
| 22 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 23 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 24 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 25 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 26 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 27 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 28 | < 0.1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 29 | <0. 1 | < 0.1 | < 0.1 | <0.2 | <.1 | < 0.2 |
| 30 | < 0.1 | < 0.1 | < 0.1 | <0.2 | 0.1 | < 0.2 |

MCL = Maximum Contaminant Level

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Semi Volatile Organic Compounds 2008**

Fifty three semi-volatile organic carbon compounds were sampled for at site 17 (Braxton County), site 19 (Marshall County), site 21 (Preston County), and sites 24, and 28 (Summers County). Below is a listing of the semi-volatile compounds that were sampled.

1,2, Diphenylhydrate
2,4,6-Trichlorophenol
2,4-Dichlorophenol
2,4Dimethylphenol
2,4-Dinitrophenol
2,4Dinitrotoluene
2,6, Dinitrotoluene
2-Chloronaphthalate
2-Chlorophenol
2-Nitrophenol
3,3 DiChloroBenzidine
4-Bromodiphenyl
4-Chloro3methylphalate
4-Chlorodiphenylene
4-Nitrophenol
9-H-Fluorene
Acenaphthene
Anthracene
Benzidine
Benz[a]anthracene
Benzo[a]pyrene
Benzo[b]fluoranthene
Benz[ghi]perylene
Benzo[k]fluoranthene
Butylbenzylphthalate
Anthracene
Benzidine
Benz[a]anthracene
Benzo[a]pyrene
Benzo[b]fluorant
Benz[ghi]perylene
Benzo[k]fluoranthene
Butylbenzylphthalate
2-Chloroethoxymet
Pentachlorophenol
Phenanthrene,
Phenol
Pyrene
1,2,4-Trichlorobenzene
Hexachlorobutadine
Hexachloroethane
Naphthalene

No semi-volatile organic carbon compounds were detected at any site in 2008.

# Appendix B (continued)

**Division of Water and Waste Management - Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables Pesticides 2008 52**

Fifty two pesticide compounds were sampled for at site 8 (Wirt County), site 9 (Ritchie County), site 11 (Pocahontas County), site 19 (Marshall County), and site 27 (Greenbrier County). Below is a listing of the pesticide compounds that were sampled.

2,6, Diethylaniline
CIAT,
AcetochlorL
Alachlor,
alpha-HCH,
Atrazine,
Azinphos-methyl
Benfluralin
Butylate,
Carbaryl
Carbofuran
Chlorpyrifos
cis-Permethrin,
Cyanazine
DCPA
Desulfinyl fipro
Diazinon,
Dieldrin
Disulfoton,
EPTC
Ethalfluralin,
Ethoprop
DesulfFipronil

Fipronil sulfide
Fipronil sulfone
Fipronil,
Fonofos
Lindane
Linuron
Malathion
Methyl parathion
Metolachlor
Metribuzin
Molinate,
Napropamide
p,p'-DDE
Parathion
Pebulate
Pendimethalin
Phorate
Prometon
Propyzamide
Propachlor
Propanil
Propargite
Simazine
Tebuthiuron,
Terbacil
Terbufos
Thiobencarb
Triallate
Trifluralin

No pesticide compounds were detected at any site in 2008.