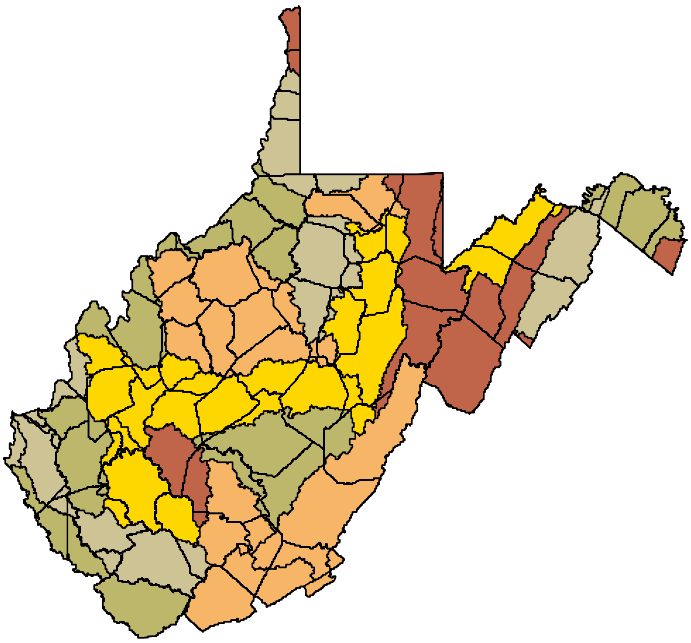
Groundwater Programs and Activities Biennial Report to the West Virginia 2002 Legislature Bob Wise, Governor West Virginia



Michael O. Callaghan, Secretary
Department of Environmental Protection

Allyn G. Turner, Director
Division of Water Resources

David P. Watkins, Groundwater Program Manager

Compiled by
Chad C. Board, Geologist, Groundwater Program
Don Criss, Geologist, Groundwater Program

Editor's Notes

This biennial report was compiled and edited by the Division of Water Resources' Groundwater Program staff from information submitted by those agencies with ground water regulatory authority. Copies of this report can be obtained on-line at www.dep.state.wv.us or from:

Division of Water Resources
Groundwater Program
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-2108
FAX (304) 558-2780
TDD (304) 558-2751

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 2002 LEGISLATURE

I. EXECUTIVE SUMMARY

Under the Groundwater Protection Act, West Virginia Code Chapter 22, Article 12, Section 6.a.3, the West Virginia Division of Environmental Protection (WV DEP) is required to provide a biennial report to the Legislature on the status of the state's groundwater and groundwater management program, including detailed reports from each agency which hold groundwater regulatory responsibility. This is the fifth Biennial Report to the Legislature since the passage of the Act in 1991 and covers the period from July 1, 1999 through June 30, 2001. The WV DEP Division of Water Resources (DWR) Groundwater Program is responsible for compiling and editing information submitted for this report. The WV Department of Environmental Protection (WV DEP), the WV Department of Agriculture (WV DOA), and the WV Department of Health and Human Resources (WV DHHR) all have groundwater regulatory responsibility and have contributed to this report. Additionally, several boards and standing committees which currently share the responsibility of developing and implementing rules, policies, and procedures for the Ground Water Protection Act (1991) 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.

This report endeavors to provide a concise, yet thorough, overview of those programs that are charged with the responsibility of protecting and insuring the continued viability of groundwater resources in West Virginia. It is also the intent of this report to express the challenges faced and the goals accomplished as we work together to protect and restore West Virginia's water resources.

Many of the programs and offices in the reporting divisions express a need for an accessible central and statewide electronic data system. Currently all groundwater (and other) data is collected by individual programs and offices. The WV DEP, Information Technology Office (ITO) is currently working on the implementation of two such systems called the Environmental Resource Information System (ERIS) and the Environmental Quality Information System (EQuIS).

Another theme expressed is the need for a systematic approach to groundwater complaint investigations to involve and coordindinate agencies with groundwater protection responsibilities.

Programs and agencies have also identified the need for specific hydrogeologic information on the state's groundwater such as regional and local potentiometric surfaces (water levels), ground water flow studies, and access to statewide dedicated groundwater monitoring data. The installation of a centralized database linked to GIS coverages accessible to the various agencies and the public will go a long way in resolving this problem. Additional themes include greater outreach to the citizens of

West Virginia on issues such as nonpoint source pollution, protecting individual ground and drinking water sources, and the installation of toll free help lines to enhance statewide consistency and a unified approach to the implementation of groundwater rules. Much of this need is being addressed by five-year cooperative studies performed jointly between the Office of Water Resources and the United States Geological Survey (USGS). The current Division of Water Resources/USGS study is presented in section D of this report.

The Ambient Groundwater Quality Monitoring Network was established by the DEP-DWR in cooperation with the USGS in 1992 and is an on going project. The Ambient Groundwater Quality Monitoring Network will provide critical data needed for proper management of West Virginia's groundwater resources. The major objective of this USGS study is to assess the ambient groundwater quality of major systems (geologic units) within the state of West Virginia and to characterize the individual systems. Characterization of the quality of water from the major systems will help to (1) determine which water quality constituents are problems within the state, (2) determine which systems have potential water-quality problems, (3) assess the severity of water quality problems in respective systems, (4) and prioritize these concerns. Only by documenting present ambient groundwater quality of the State's major systems can regulatory agencies assess whether water quality degradation has occurred in certain areas and whether potential degradation is a result of natural processes or those associated with human activity.

Spatial variability in water quality will be determined for specific geologic units based on sampling of approximately 30 wells annually. The sampling will continue over a period of time lasting approximately five years and will provide a database of over 175 wells from which comprehensive water samples will be collected. Wells will be selected in specific drainage basins in given years, rotating annually to new basins, thus providing sampling of ground water in all watersheds of the state over the five year period. The watershed samples will correspond with those from which the West Virginia Division of Environmental Protection, Division of Water Resources (DEP-DWR) will be collecting stream water quality samples as part of its watershed initiative and will provide a linked dataset of both groundwater and surface water quality data which can be used to assess water quality conditions throughout the state. Upon completion of the five year sampling effort certain wells may be resampled if deemed necessary for the watershed program and comprehensive statistical analyses of all groundwater quality data will be conducted. An interpretative report summarizing ambient groundwater quality in West Virginia will be prepared at the end of the five year data collection period. An assessment of future data needs will also occur at that time. All associated groundwater quality data for each well sampled and summaries of groundwater quality for each respective watershed will be published annually in the U.S. Geological Survey (USGS) Water Resources Data for West Virginia annual report. The U.S. Geological Survey will report the results of this study annually to the Division of Water Resources. These results will be incorporated into reports submitted by the Division of Water Resources. The thirty water sampling sites in the Group A and E watersheds that were sampled in the ambient

groundwater quality study are listed in the data tables in Appendix B. These tables provide a detailed analysis of geochemical field parameters, ionic concentrations, concentrations of metals, radon, nutrients, organic carbon, volatile organic compounds, and pesticides.

While many challenges remain, much has been done to provide protection and continued viability of the groundwater of the state of West Virginia. The WV DEP, WV DOA, and WV DHHR continue to work closely to fulfill the mission of the Department of Environmental Protection, “To use all available resources to protect and restore West Virginia’s environment in concert with the needs of present and future generations”.

II. Groundwater Protection and Watershed Management

Under the guidance of EPA and the signing of the West Virginia Watershed Management Framework Document in 1997, a new approach to management of the state's groundwater has begun. Total watershed management attempts to bring a holistic approach to protecting the waters of the state. The signing of the 1997 document by those agencies which 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 WV DEP has chosen to participate as a partner and stakeholder in watershed management in West Virginia.

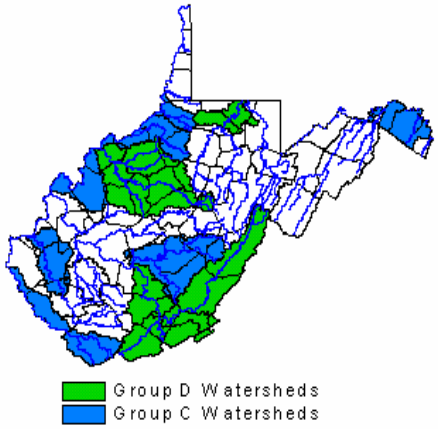
The groundwater program has included in this document maps of the fifteen West Virginia watershed groups for 1999-2001 as well as twelve maps for the West Virginia watershed groups for 1997-1999. The year indicates the time frame in which those watersheds were characterized by the Watershed Assessment Program (WAP). However, that program is charged primarily with characterizing the surface waters using predominantly recent water data. The maps of the watersheds are intended to illustrate the activities and facilities found in those watersheds, and to provide a clear picture of the environmental stressors to the ground and surface waters in those watersheds.

All agencies with groundwater regulatory authority and responsibility provide repositories for ground and surface water data collected by those facilities under their authority. As stated in the executive summary, compilation of the available groundwater data into a collective database continues as a work in progress. This report provides the reader with a picture of the state's groundwater protection activities and how those programs that have contributed to this report are contributing to groundwater protection. In time, all groundwater data that is generated by each of these activities and facilities will be housed in a central location and data repository overseen by senior scientists from each agency under the guidance of the Groundwater Coordinating Committee and the Office of Information Technology of WV DEP. We anticipate that population of the central database will be implemented using a watershed approach. Each watershed has within it smaller watersheds, called sub-watersheds, which comprise the larger watershed. Data will be gathered from the component sub-watersheds and entered systematically until the larger picture is obtained.

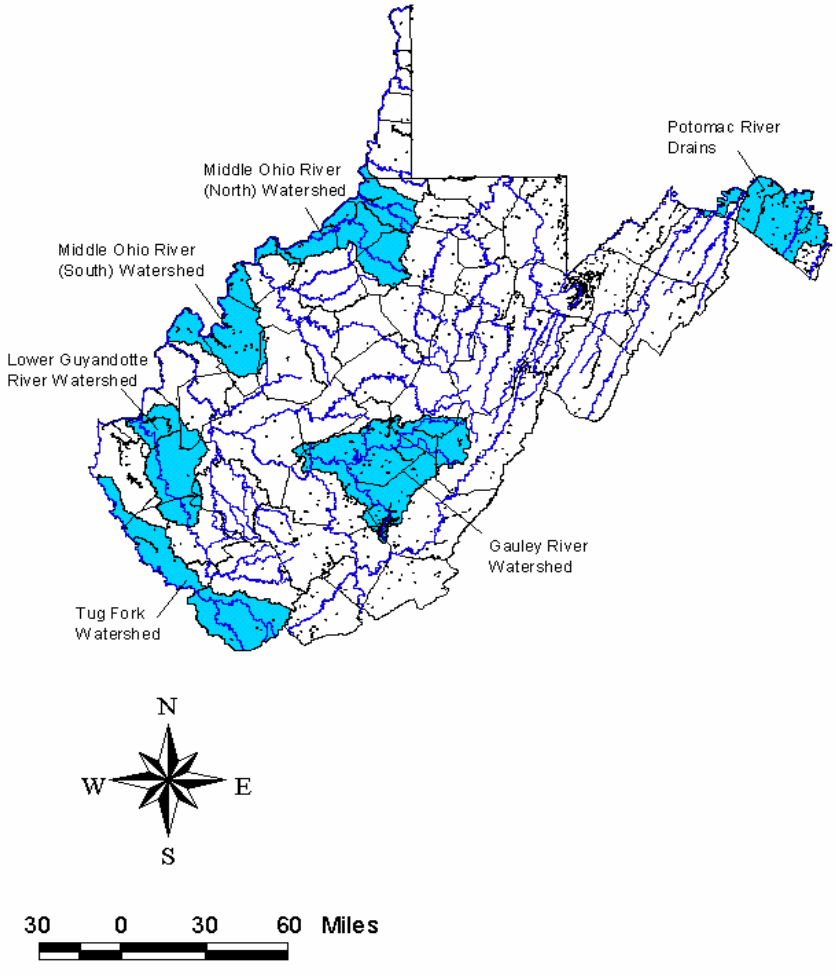
Maps of Watershed Groups for 1997-1999

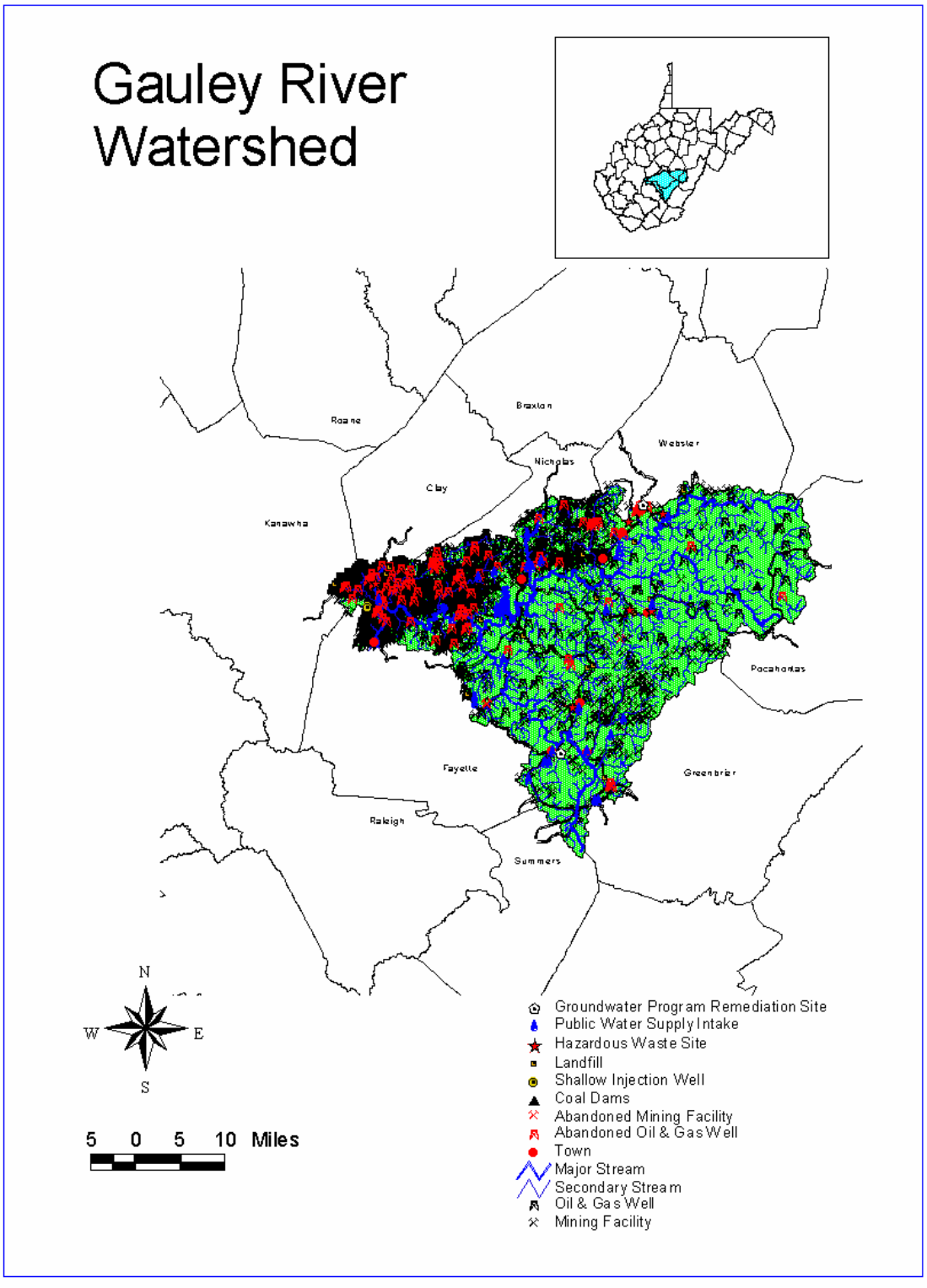
Watershed Groups C and D from the WV Priority Watersheds list, and individual maps of these watersheds, are shown on the following pages. A list of the major rivers in each watershed group appears in the following table.

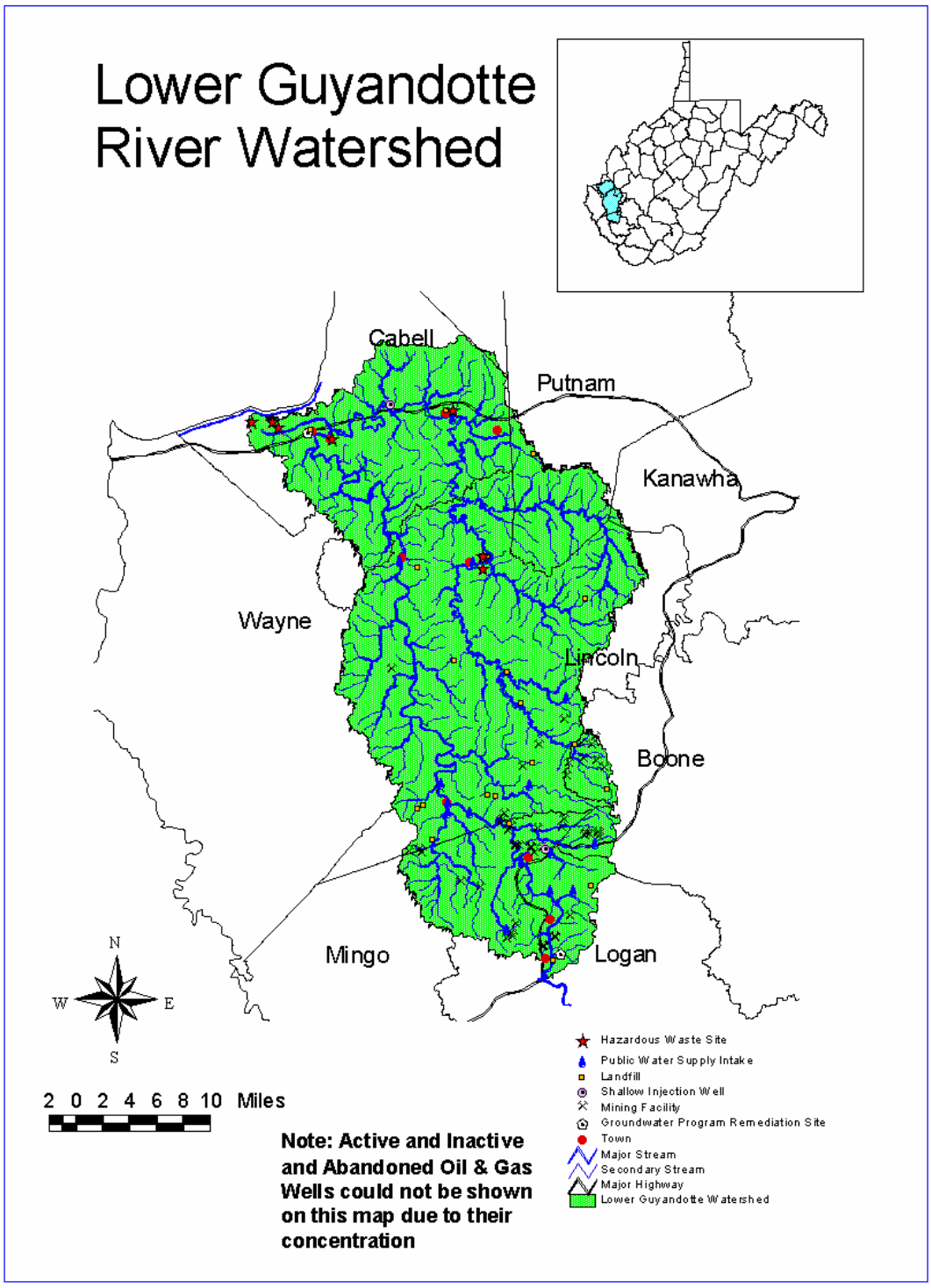
WEST VIRGINIA WATERSHED GROUPS	
Group C - 1998	***Group D - 1999***
Gauley River	Greenbrier River
Lower Guyandotte River	James River
Middle Ohio River - North	Little Kanawha River
Middle Ohio River - South	Lower New River
Potomac Drains	Monongahela River
Tug Fork	Upper New River

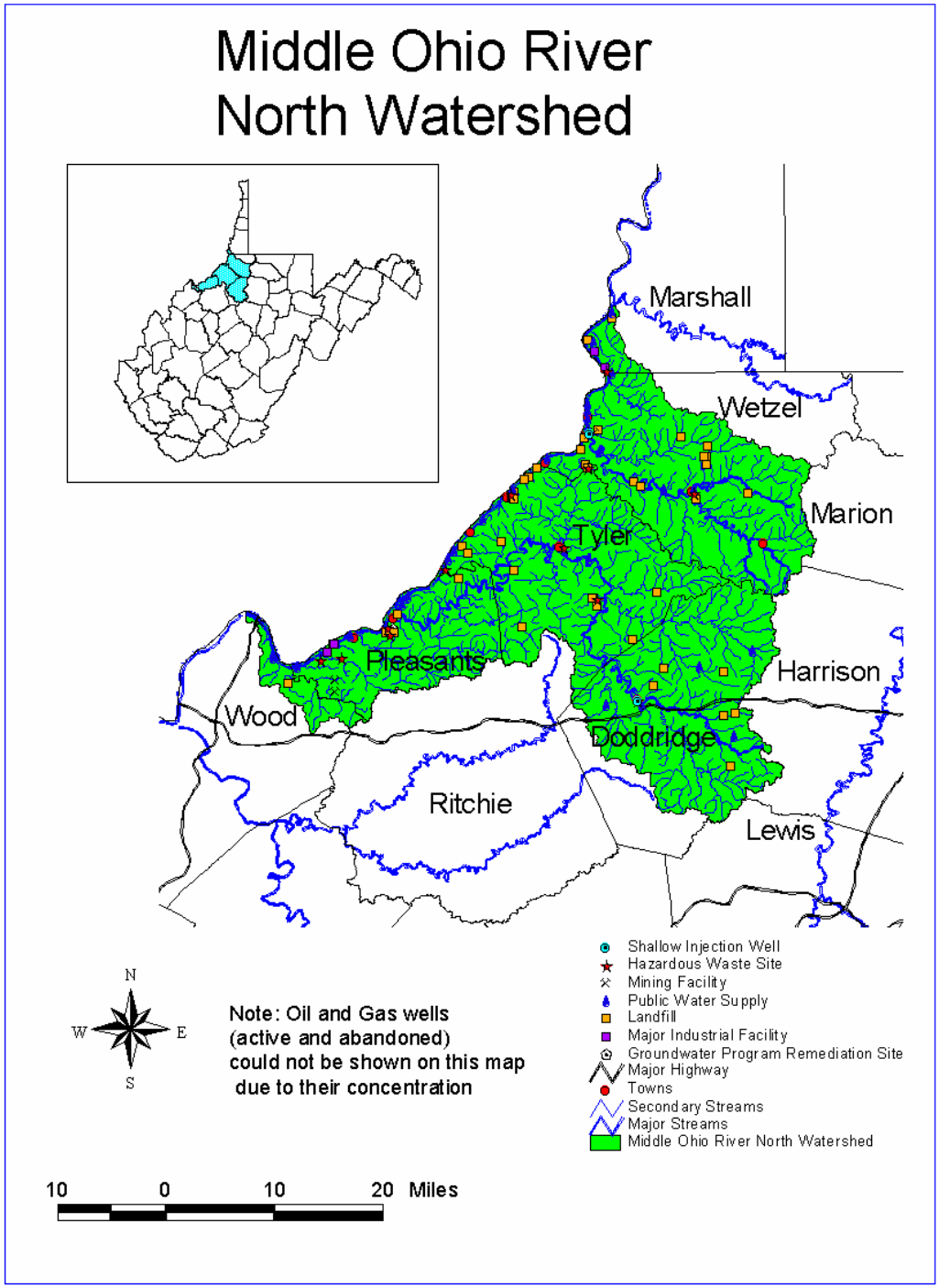


Group C Watersheds

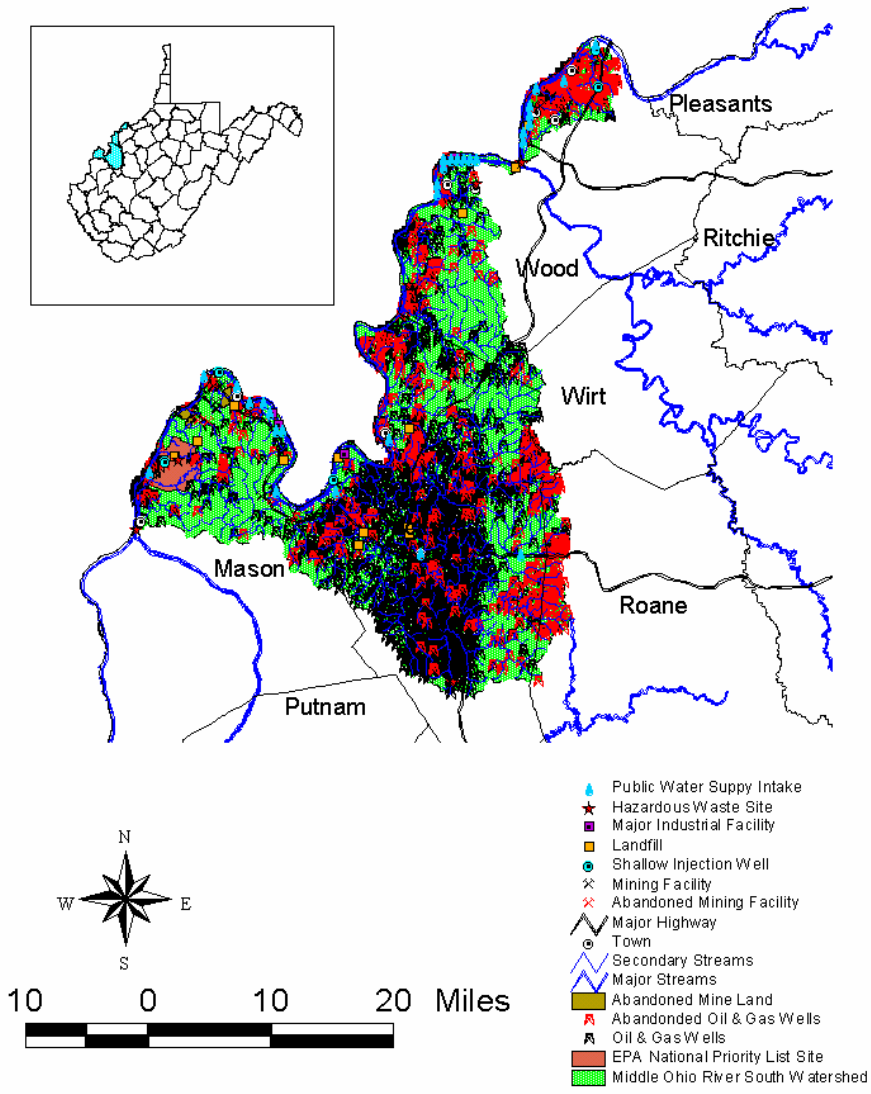



Gauley River
Watershed
Roane
Braxton
Webster
Nicholas
Clay
Kanawha
Pocahontas
Fayette
Greenbrier
Raleigh
Summers
N
W
E
S
5 0 5 10 Miles
Groundwater Program Remediation Site
Public Water Supply Intake
Hazardous Waste Site
Landfill
Shallow Injection Well
Coal Dams
Abandoned Mining Facility
Abandoned Oil & Gas Well
Town
Major Stream
Secondary Stream
Oil & Gas Well
Mining Facility

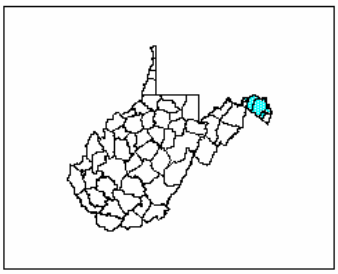

Lower Guyandotte River Watershed
Cabell
Putnam
Kanawha
Wayne
Lincoln
Boone
Mingo
Logan
N
W
E
S
2 0 2 4 6 8 10 Miles
Note: Active and Inactive and Abandoned Oil & Gas Wells could not be shown on this map due to their concentration
Hazardous Waste Site
Public Water Supply Intake
Landfill
Shallow Injection Well
Mining Facility
Groundwater Program Remediation Site
Town
Major Stream
Secondary Stream
Major Highway
Lower Guyandotte Watershed

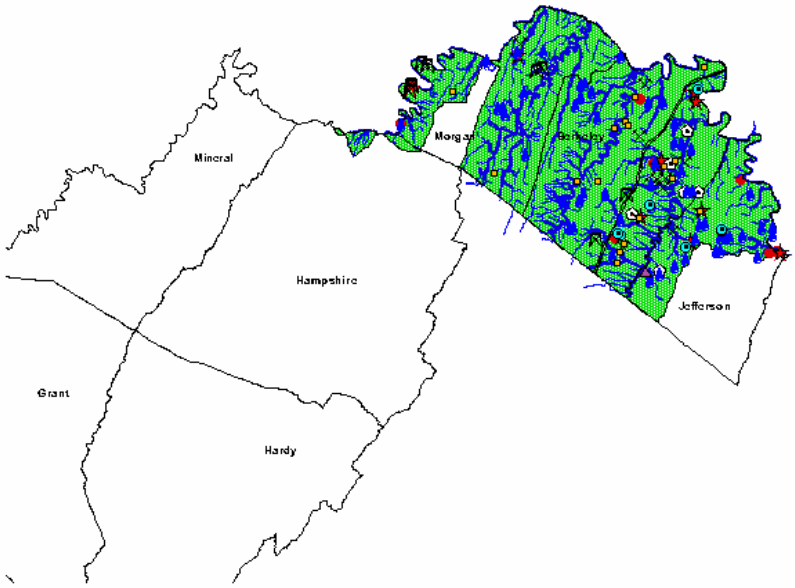

Middle Ohio River
North Watershed
Marshall
Wetzel
Marion
Tyler
Pleasants
Harrison
Wood
Doddridge
Ritchie
Lewis
N
W
E
S
Note: Oil and Gas wells
(active and abandoned)
could not be shown on this map
due to their concentration
Shallow Injection Well
Hazardous Waste Site
Mining Facility
Public Water Supply
Landfill
Major Industrial Facility
Groundwater Program Remediation Site
Major Highway
Towns
Secondary Streams
Major Streams
Middle Ohio River North Watershed
10 0 10 20 Miles

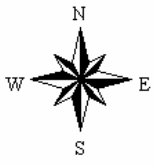
Middle Ohio River South Watershed



Potomac River Drains

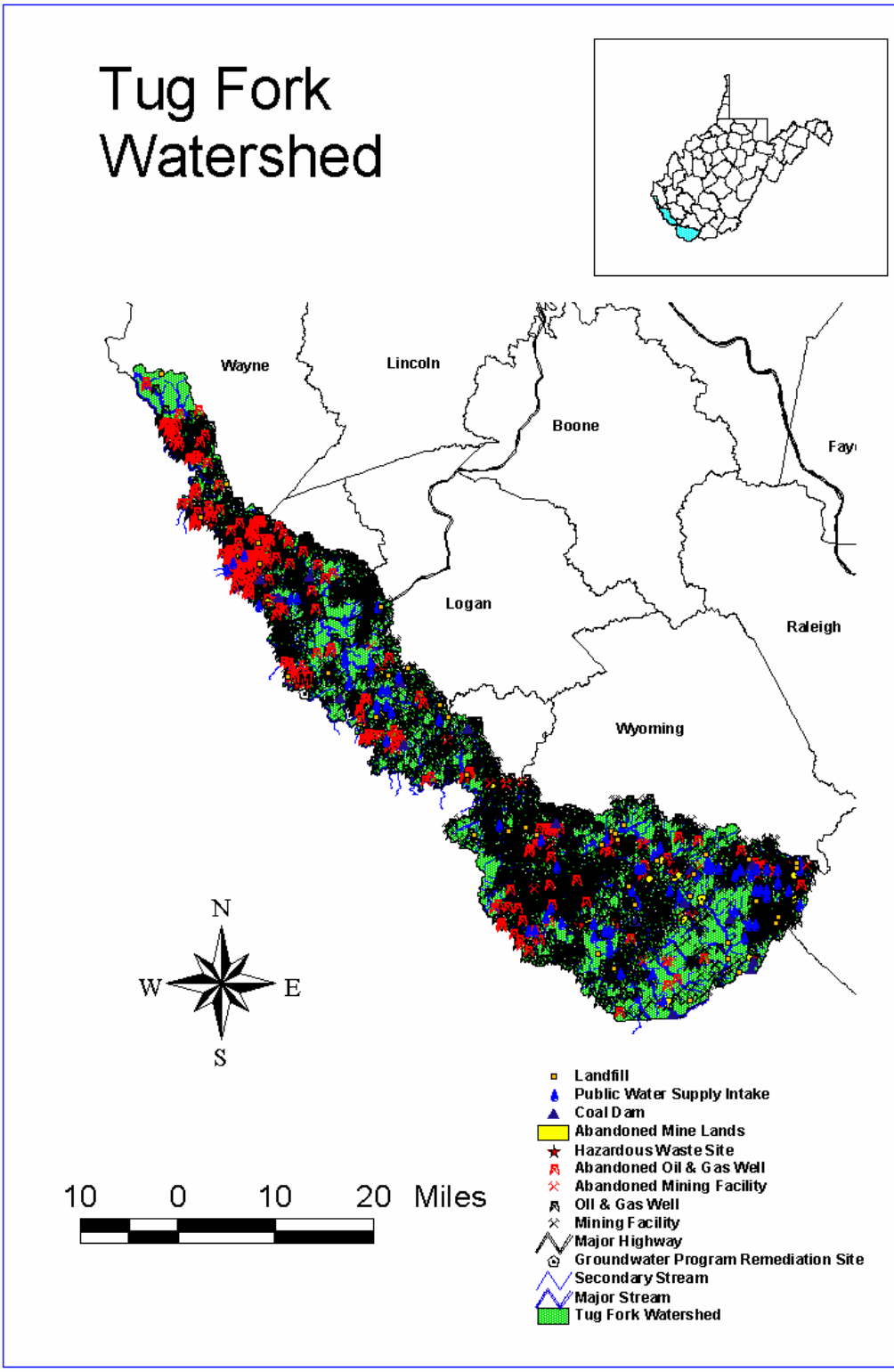




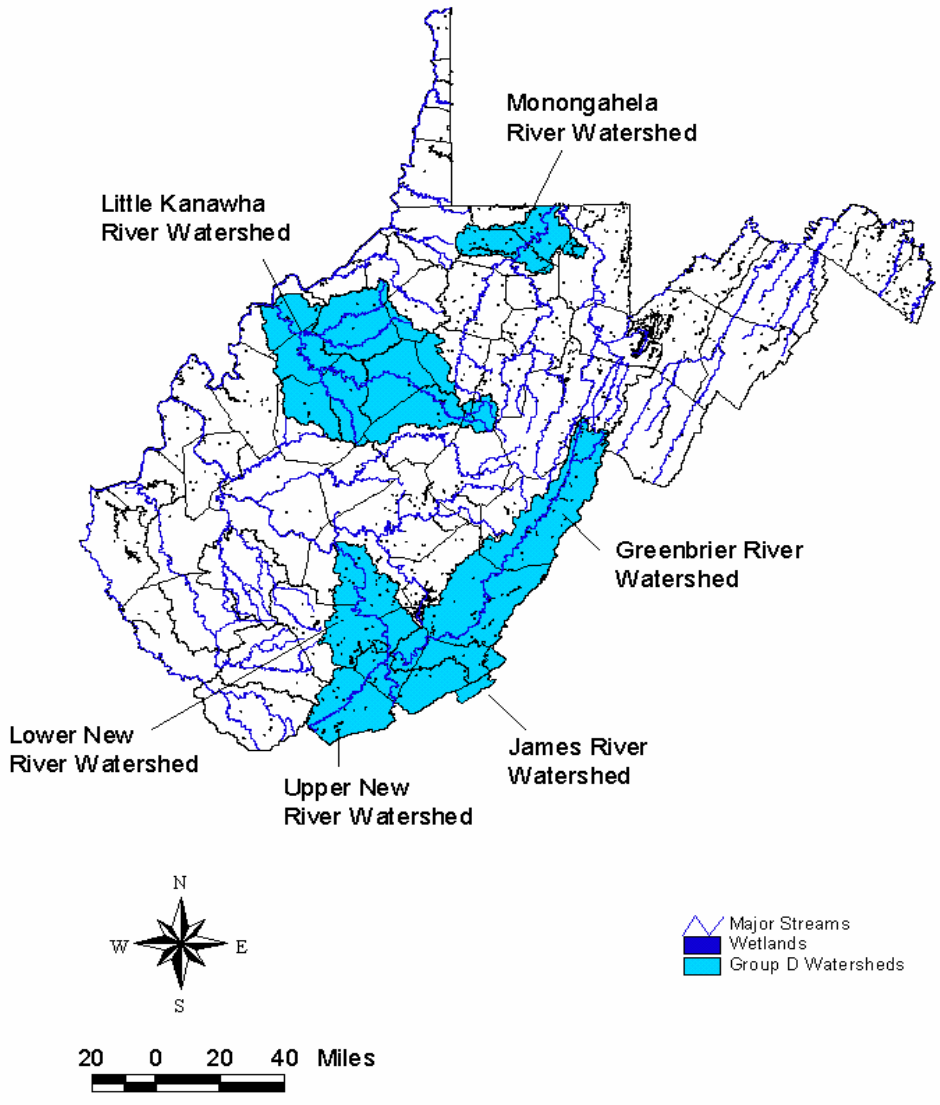


5 0 5 10 Miles

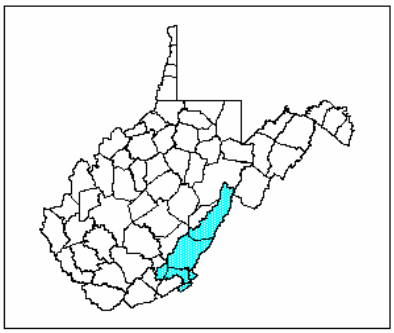
- Major Industrial Facility
- Shallow Injection Well
- Landfill
- Public Water Supply Intake
- Oil &Gas Well
- Abandoned Oil & Gas Well
- Mining Facility
- Hazardous Waste Site
- Major Highway
- Groundwater Program Remediation Site
- Major Stream
- Secondary Stream
- Town
- Potomac River Drains

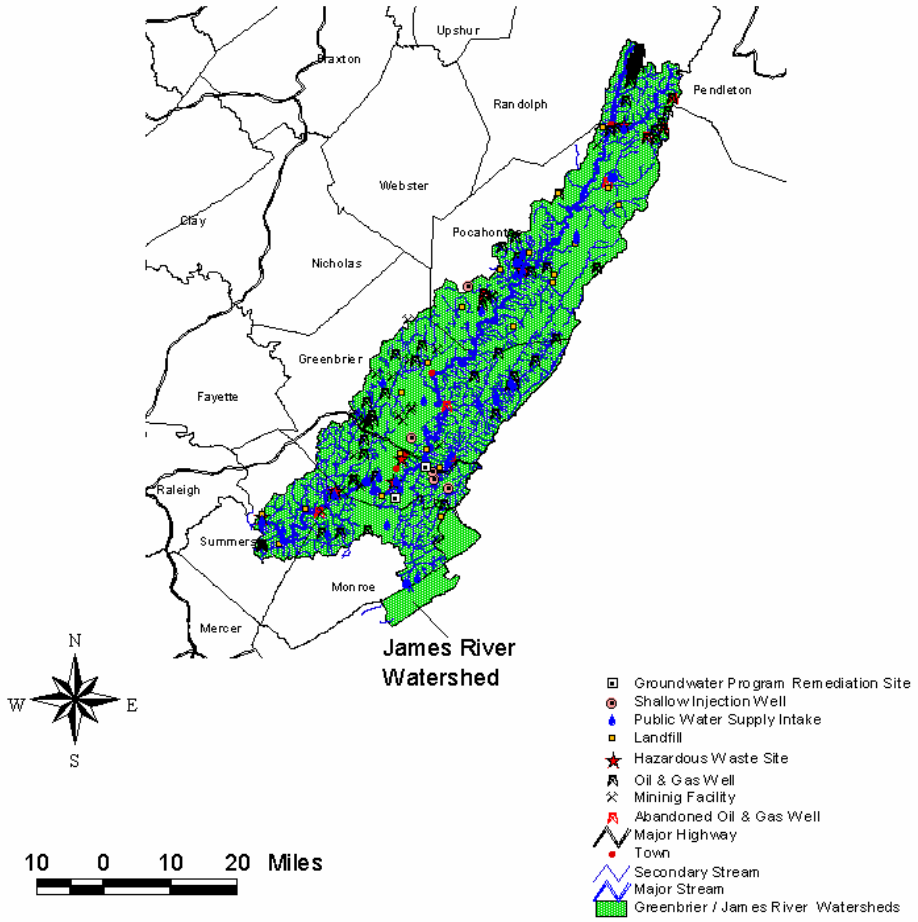

Tug Fork Watershed
Wayne
Lincoln
Boone
Logan
Raleigh
Wyoming
N
W
E
S
10 0 10 20 Miles
Landfill
Public Water Supply Intake
Coal Dam
Abandoned Mine Lands
Hazardous Waste Site
Abandoned Oil & Gas Well
Abandoned Mining Facility
Oil & Gas Well
Mining Facility
Major Highway
Groundwater Program Remediation Site
Secondary Stream
Major Stream
Tug Fork Watershed

Group D Watersheds

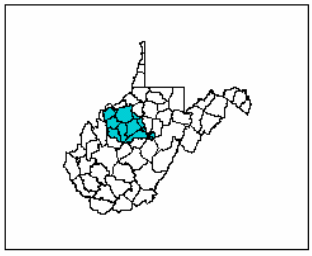


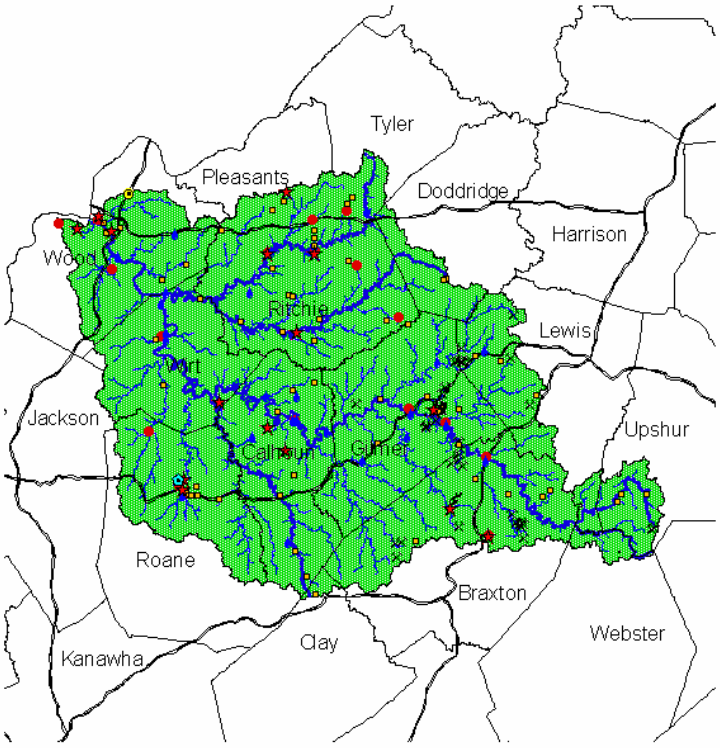
Greenbrier River and James River Watersheds





Little Kanawha River Watershed



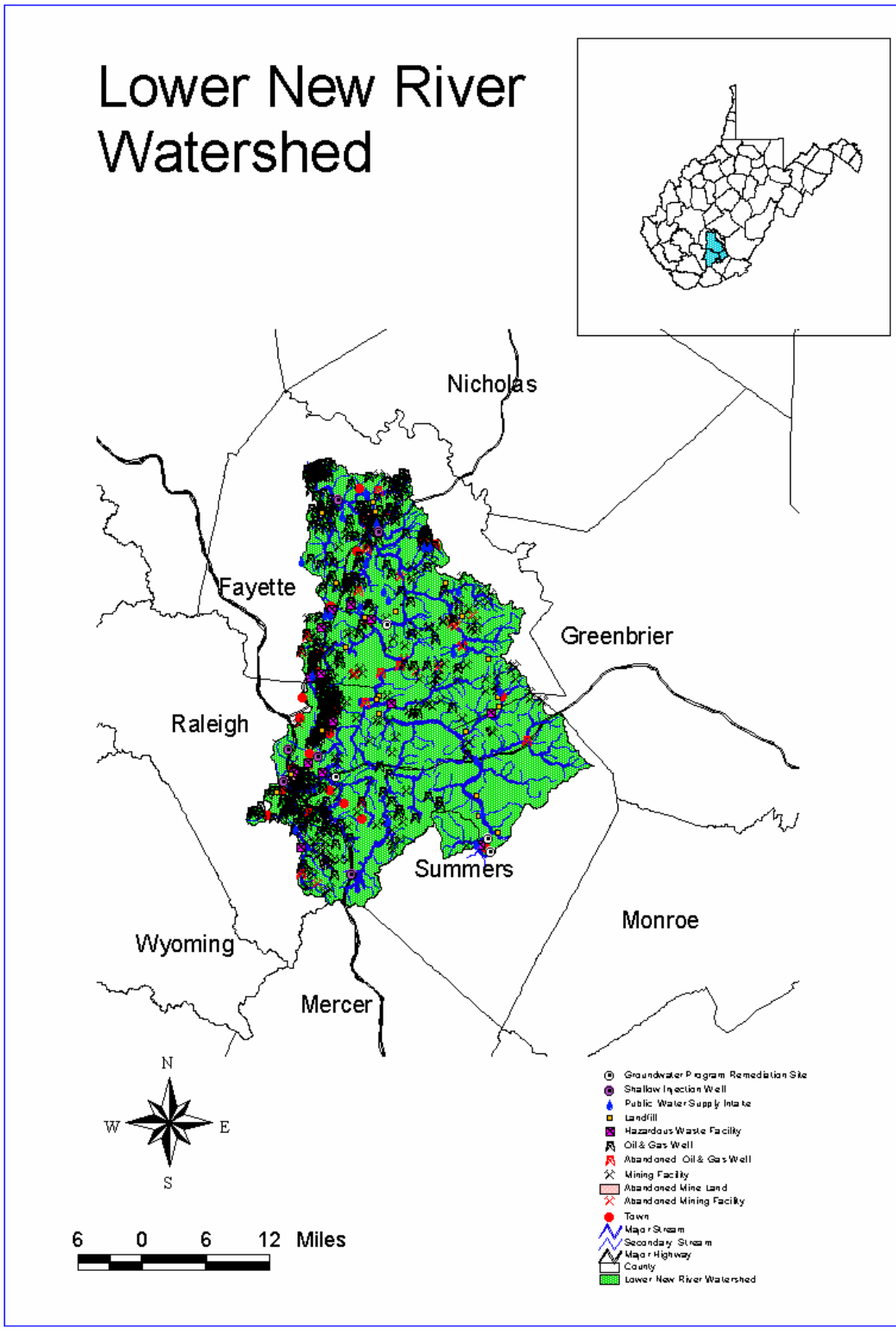


N
W E
S

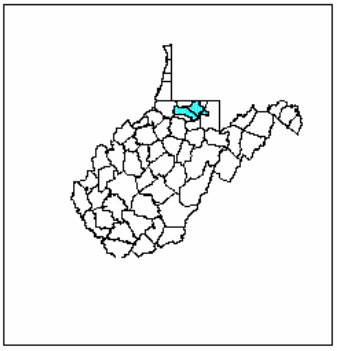
Note: Active and Inactive and Abandoned Oil & Gas Wells could not be shown on this map due to their concentratation

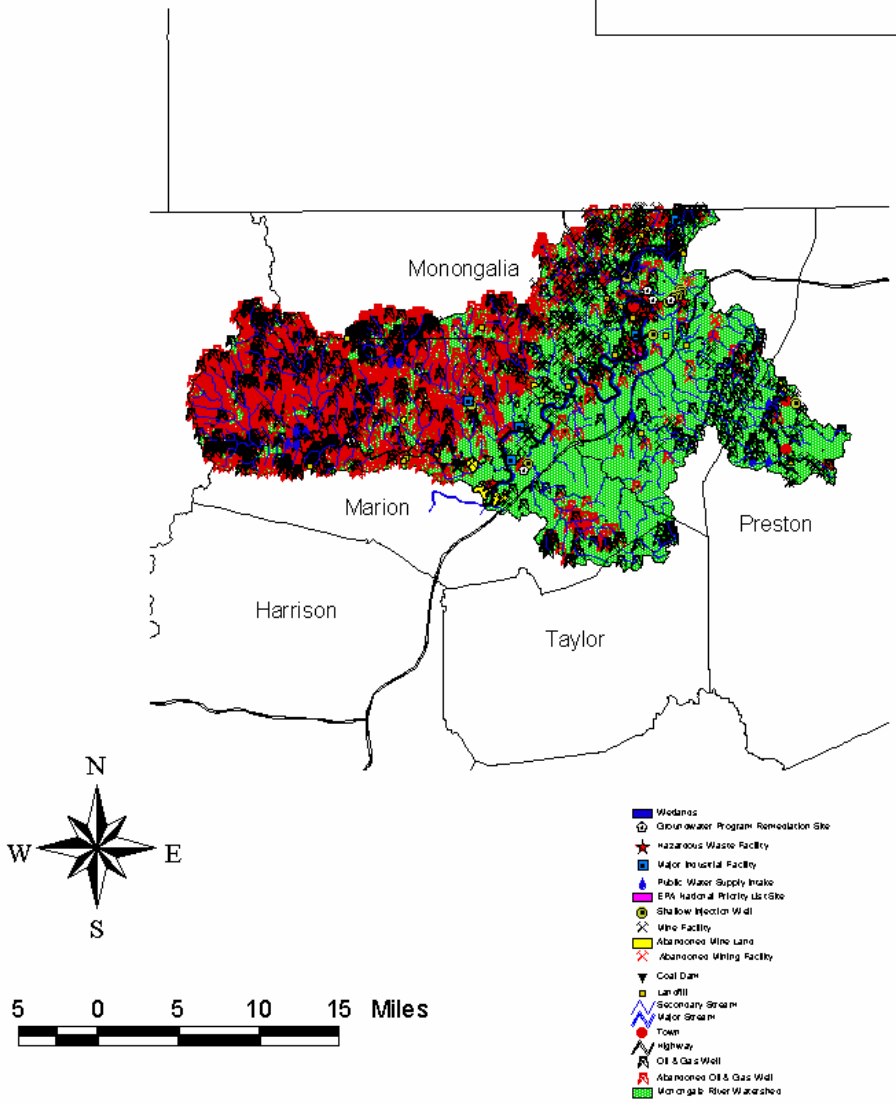
20 0 20 Miles

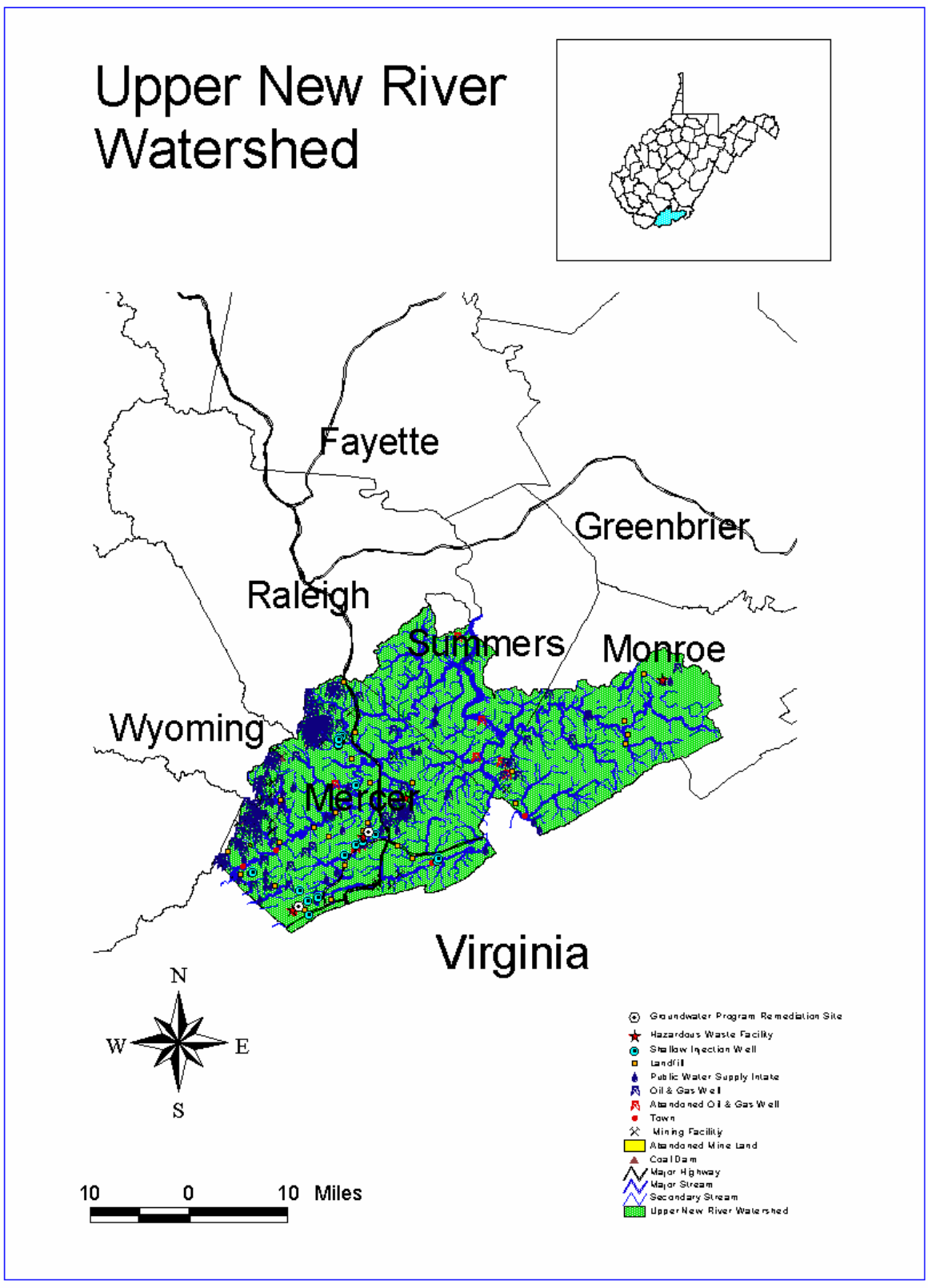
- Groundwater Program Remediation Site
- Major Industrial Facility
- Hazardous Waste Facility
- Shallow Injection Well
- Landfill
- Public Water Supply Intake
- Mining Facility
- Town
- Highway
- Major Stream
- Secondary Stream
- Little Kanawha River Watershed


Lower New River Watershed
Nicholas
Fayette
Greenbrier
Raleigh
Summers
Monroe
Wyoming
Mercer
N
W
E
S
6 0 6 12 Miles
Groundwater Program Remediation Site
Shallow Injection Well
Public Water Supply Intake
Landfill
Hazardous Waste Facility
Oil & Gas Well
Abandoned Oil & Gas Well
Mining Facility
Abandoned Mine Land
Abandoned Mining Facility
Town
Major Stream
Secondary Stream
Major Highway
County
Lower New River Watershed

Monongahela River Watershed



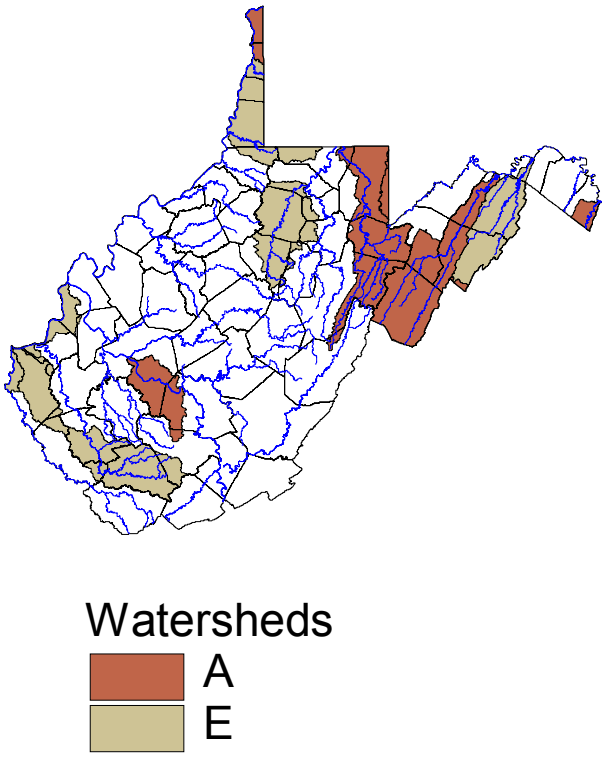


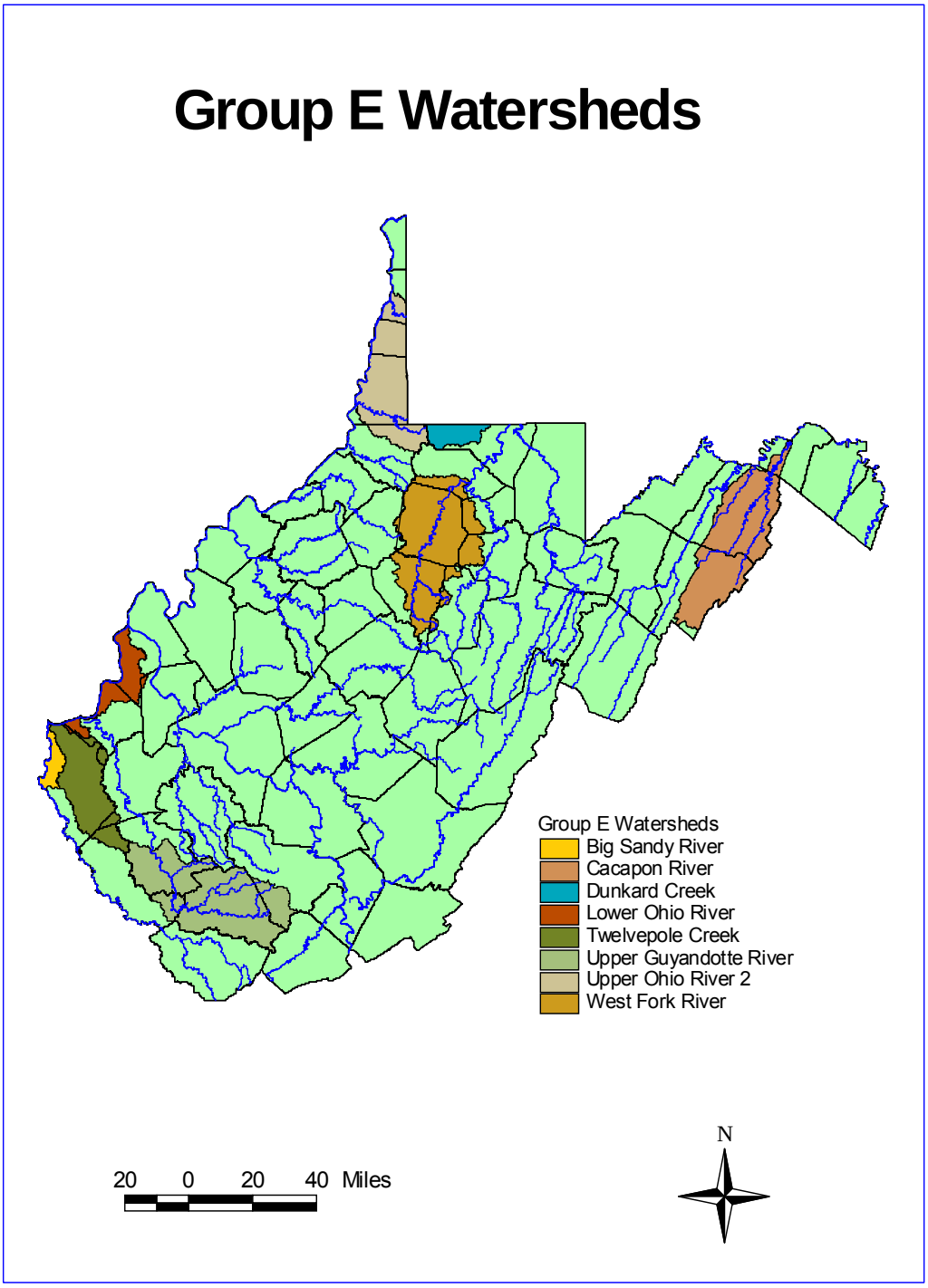

Upper New River Watershed
Fayette
Greenbrier
Raleigh
Summers
Monroe
Wyoming
Mercer
Virginia
N
W
E
S
10 0 10 Miles
Groundwater Program Remediation Site
Hazardous Waste Facility
Shallow Injection Well
Landfill
Public Water Supply Intake
Oil & Gas Well
Abandoned Oil & Gas Well
Town
Mining Facility
Abandoned Mine Land
Coal Dam
Major Highway
Major Stream
Secondary Stream
Upper New River Watershed

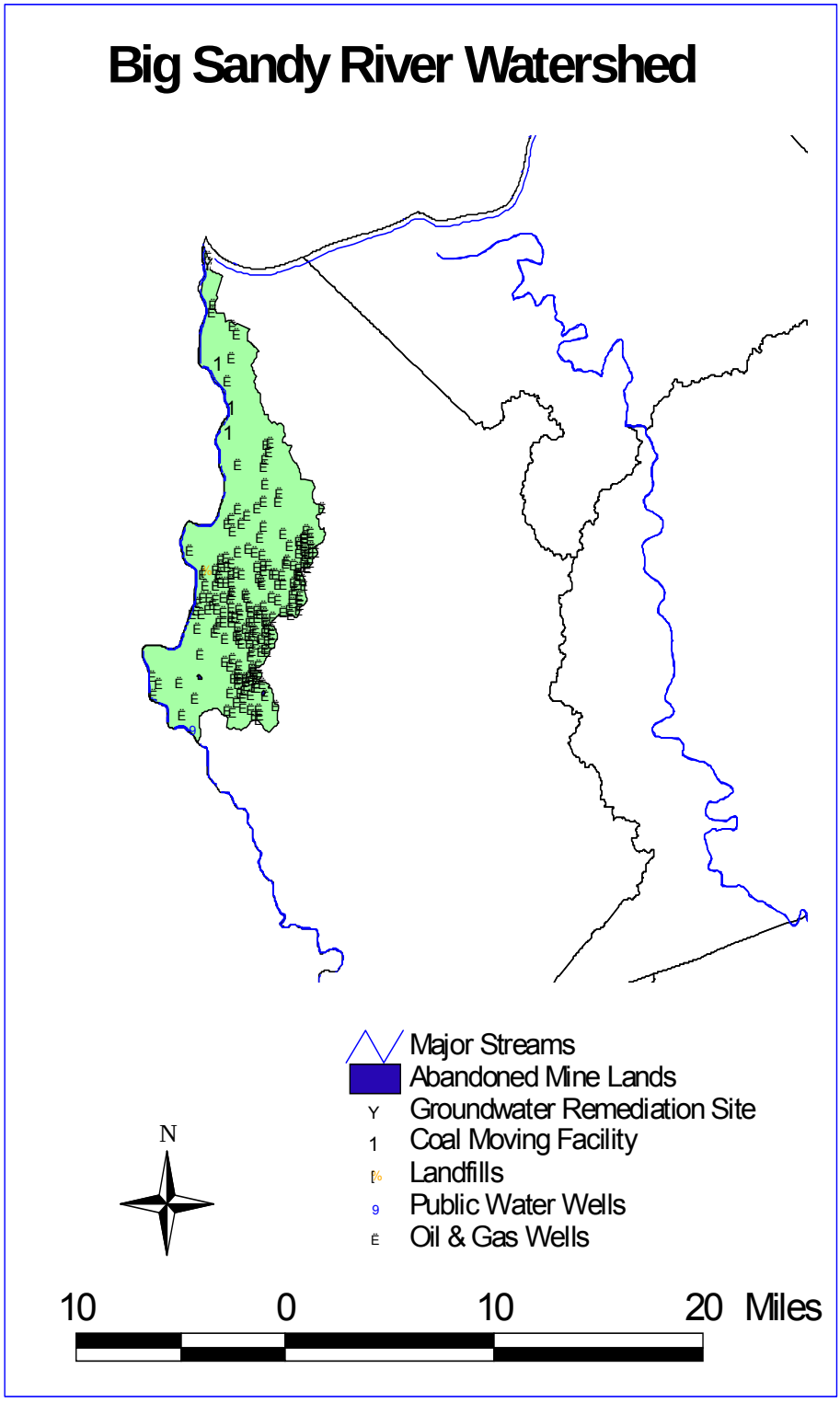
Maps of Watersheds for 1999-2001

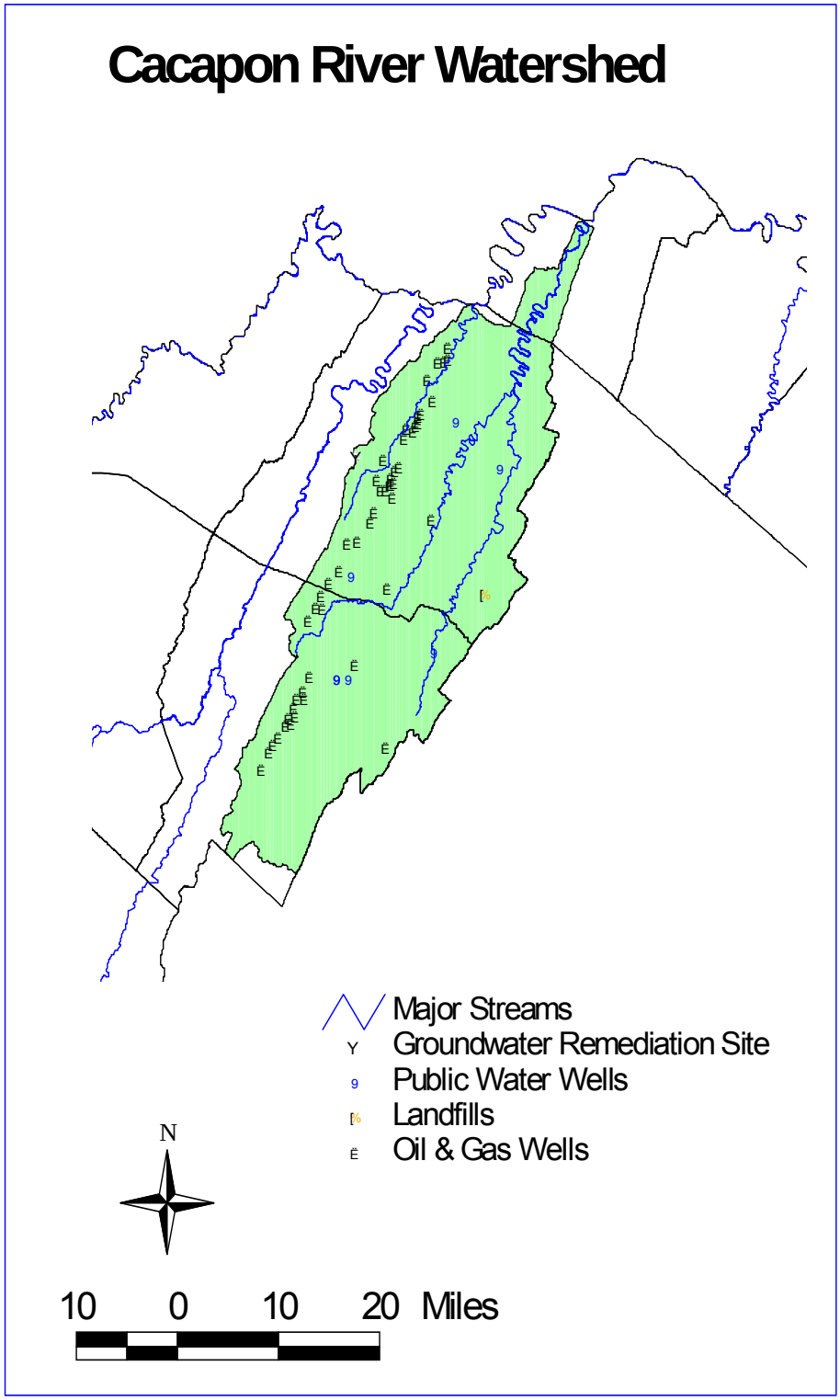
Watershed Groups A and E from the West Virginia Watersheds list, and individual maps of the watersheds are shown on the following pages. A list of the major rivers in each watershed group appears in the following table.

West Virginia Watershed Groups	
Group A - 2000	Group E - 2001
Cheat River	Big Sandy River
Shenandoah River - Jefferson	Cacapon River
Shenandoah River - Hardy	Dunkard Creek
South Branch of the Potomac River	Lower Ohio River
Upper Kanawha River	Twelvepole Creek
Upper Ohio River North	Upper Guyandotte River
Youghiogheny River	Upper Ohio River South
	West Fork River



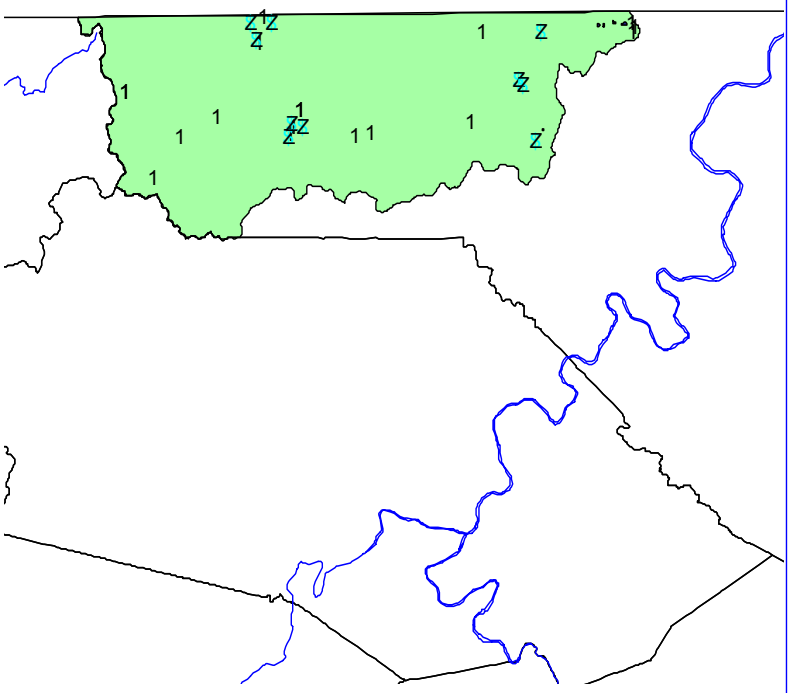

Group E Watersheds
Group E Watersheds
Big Sandy River
Cacapon River
Dunkard Creek
Lower Ohio River
Twelvepole Creek
Upper Guyandotte River
Upper Ohio River 2
West Fork River
20 0 20 40 Miles
N


Big Sandy River Watershed
Major Streams
Abandoned Mine Lands
Groundwater Remediation Site
Coal Moving Facility
Landfills
Public Water Wells
Oil & Gas Wells
N
10 0 10 20 Miles


Cacapon River Watershed
Major Streams
Groundwater Remediation Site
Public Water Wells
Landfills
Oil & Gas Wells
N
10 0 10 20 Miles

Dunkard Creek Watershed

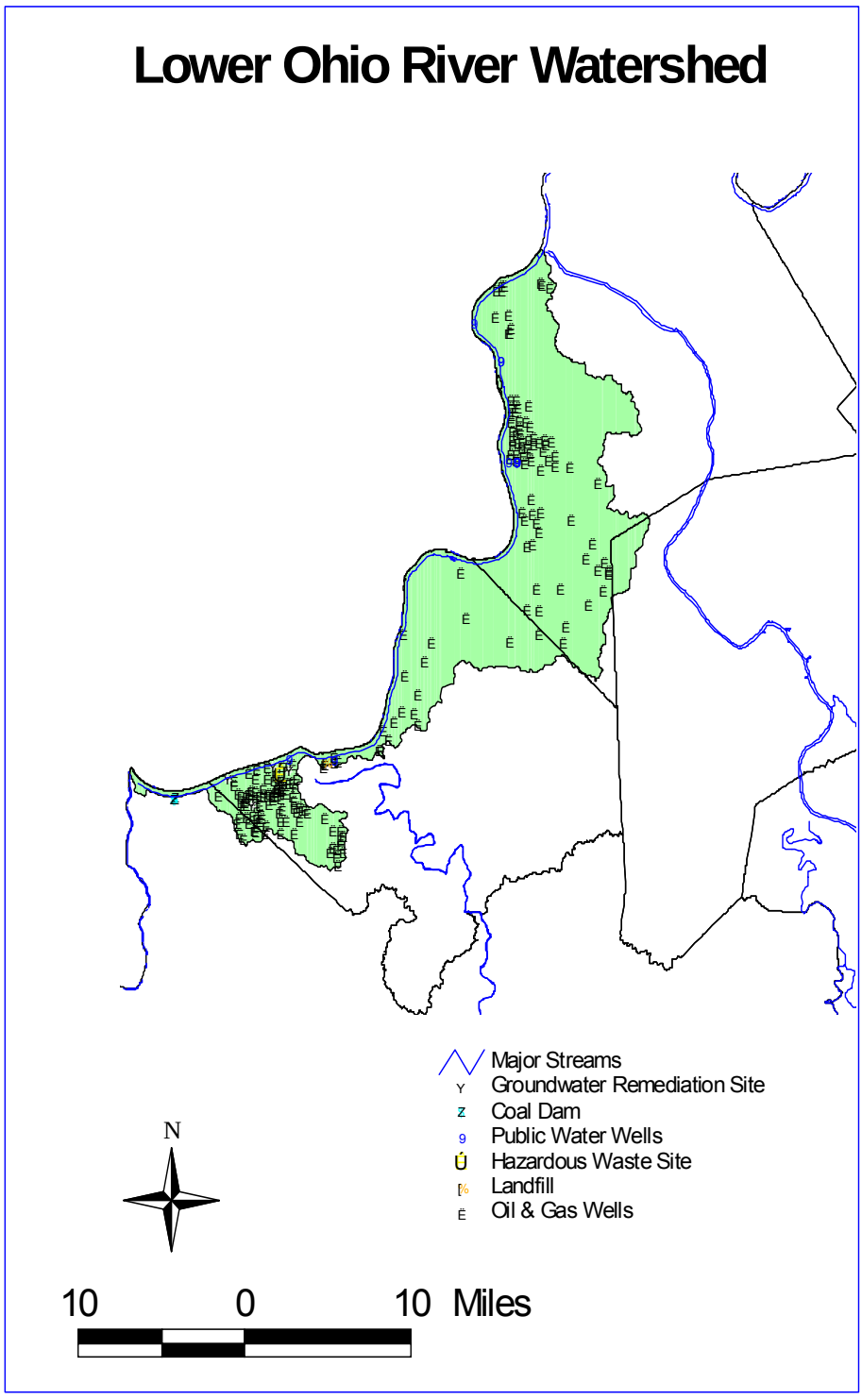
Note: Oil & Gas Wells could not be displayed due to the concentration. There are 2303 Oil & Gas Wells in this watershed.

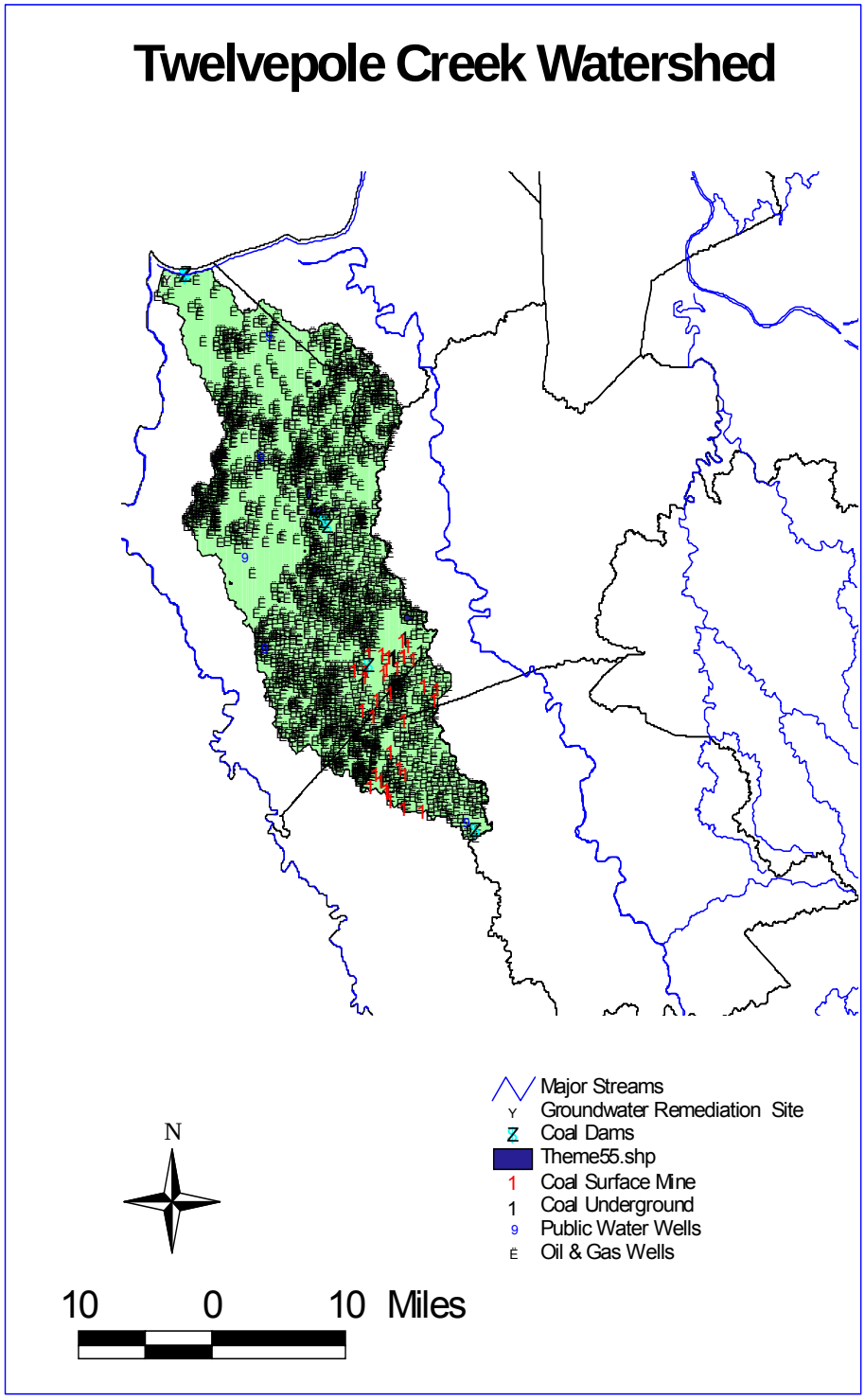


Major Streams
Abandoned Mine Lands
Coal Dams
Coal Surface Mine

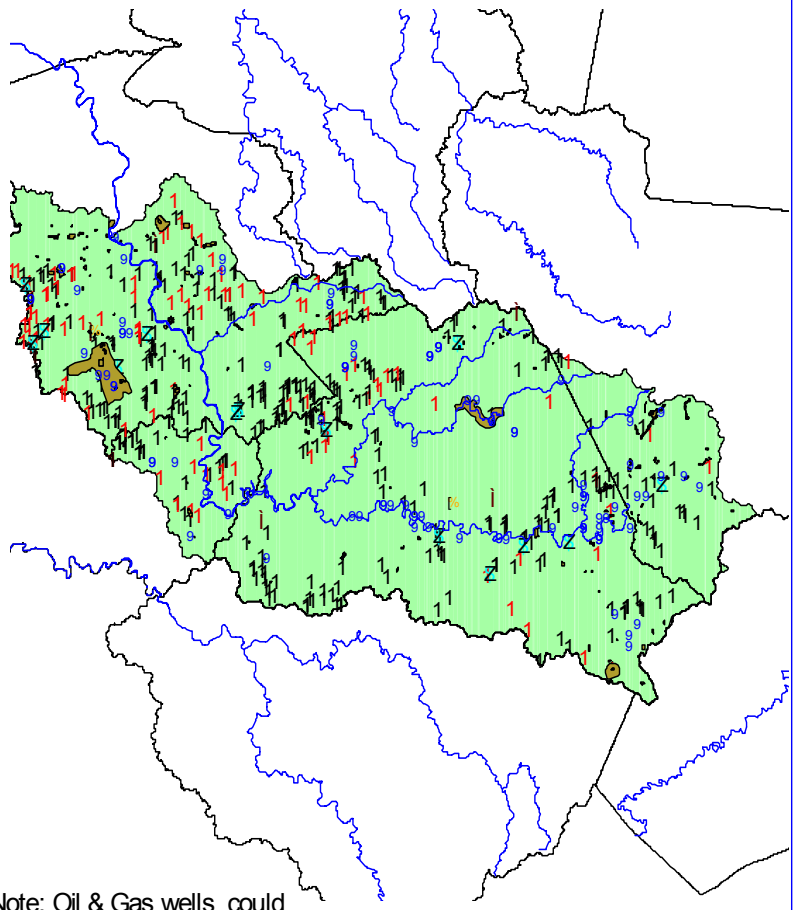
N

10 0 10 Miles


Lower Ohio River Watershed
Major Streams
Groundwater Remediation Site
Coal Dam
Public Water Wells
Hazardous Waste Site
Landfill
Oil & Gas Wells
N
10 0 10 Miles


Twelvepole Creek Watershed
Major Streams
Y Groundwater Remediation Site
Z Coal Dams
Theme55.shp
1 Coal Surface Mine
1 Coal Underground
9 Public Water Wells
Ë Oil & Gas Wells
N
10 0 10 Miles

Upper Guyandotte River Watershed



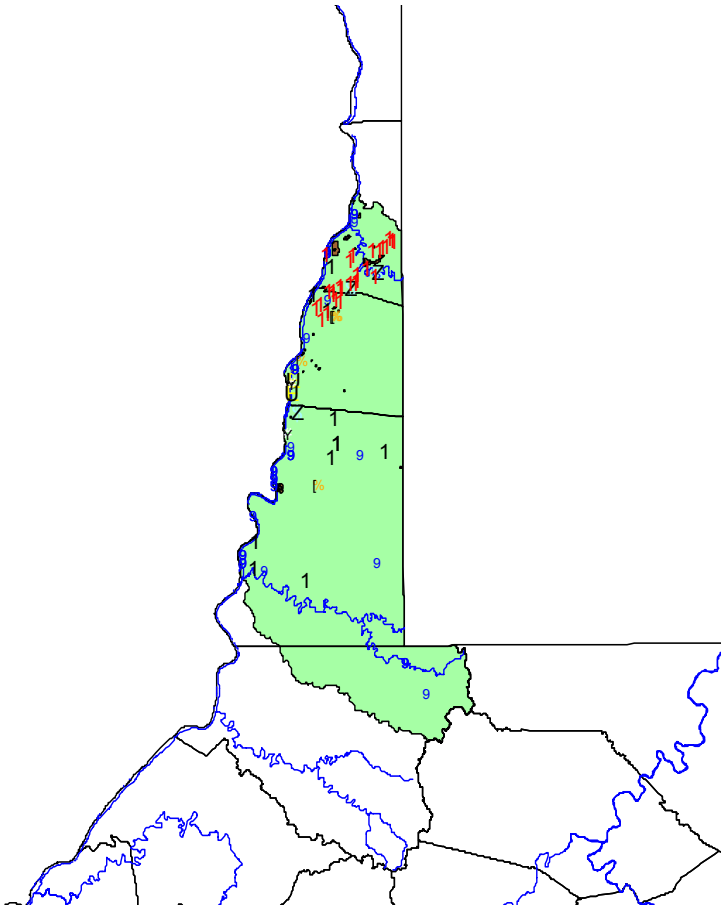
Note: Oil & Gas wells could not be displayed due to the concentration. There are 2380 Oil & Gas wells in this watershed.

N

10 0 10 Miles

Major Streams
Public Water Wells
Landfills
Abandoned Mine Lands
Coal Dams
Coal Surface Mine
Coal Underground
Quarry

Ohio River South Watershed



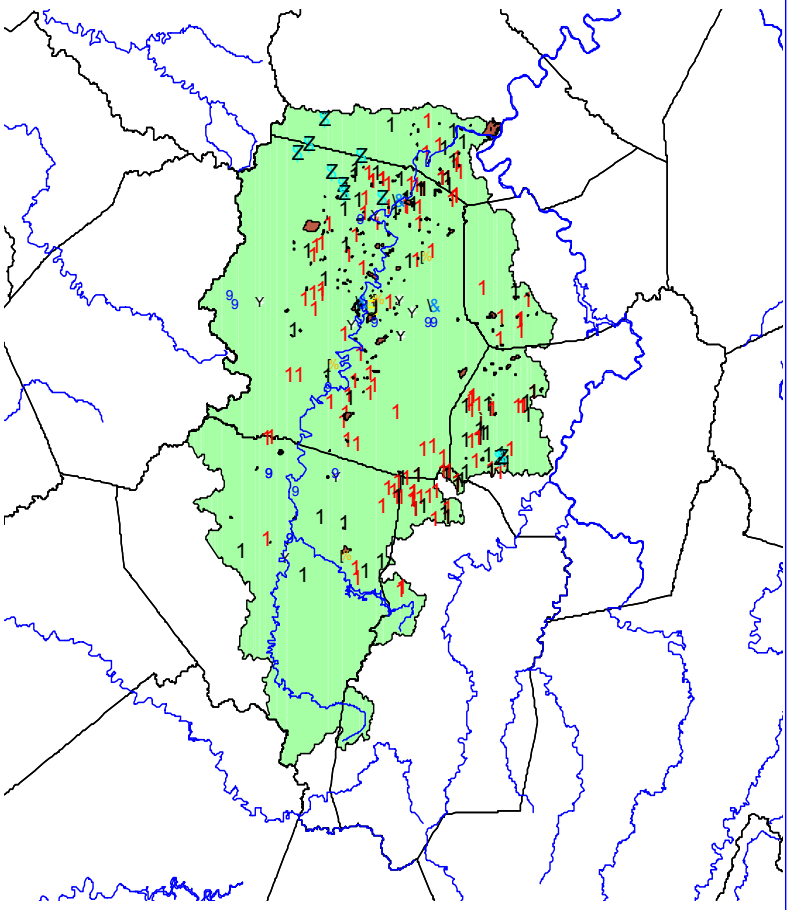
Note: Oil & Gas wells could not be displayed due to the concentration. There are 3769 Oil & Gas wells in this watershed.

N

10 0 10 Miles

Major Streams
9 Public Water Wells
Y Groundwater Remediation Site
Ú Hazardous Waste Site
Landfills
Abandoned Mine lands
1 Coal Surface Mine
1 Coal Underground

West Fork River Watershed



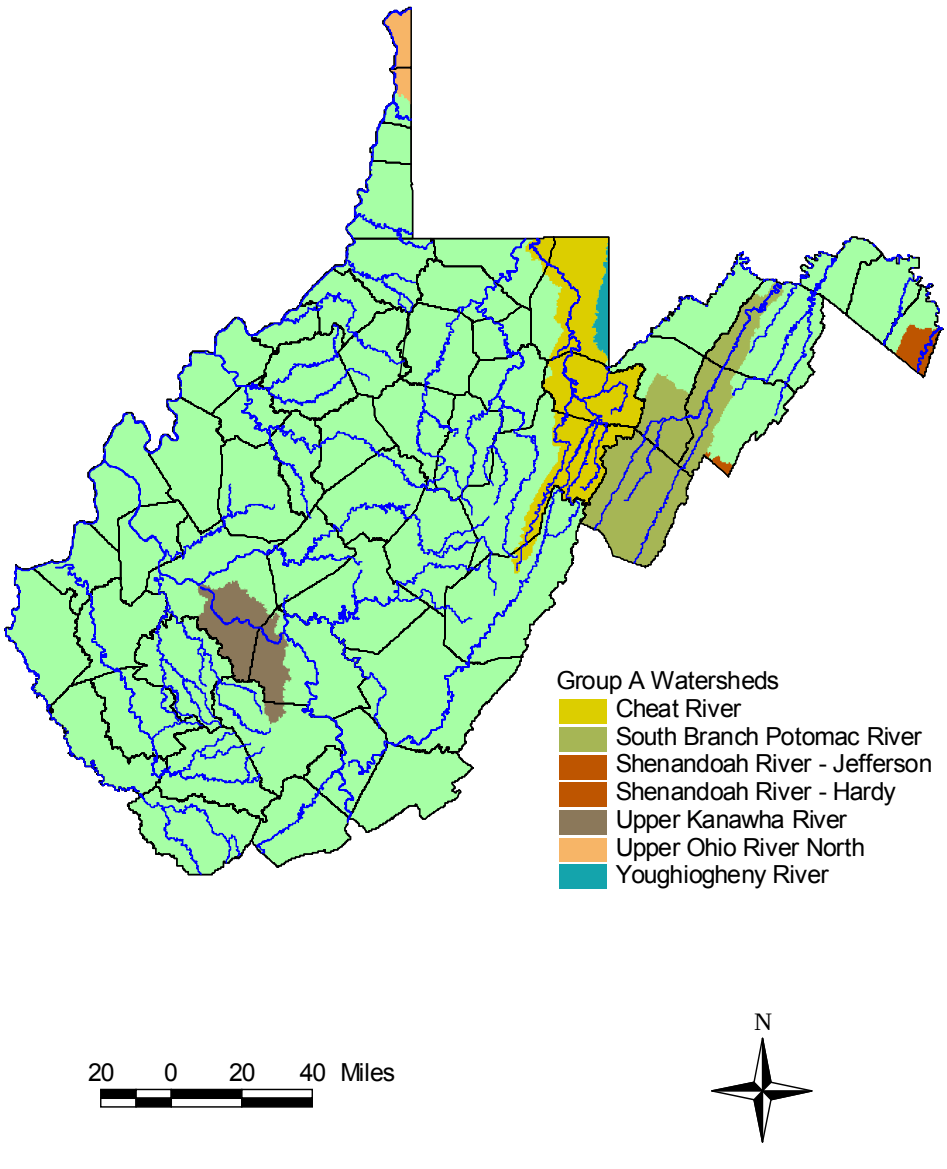
Note: Oil & Gas wells could not be displayed due to the concentration. There are 14382 Oil & Gas wells in this watershed.

N

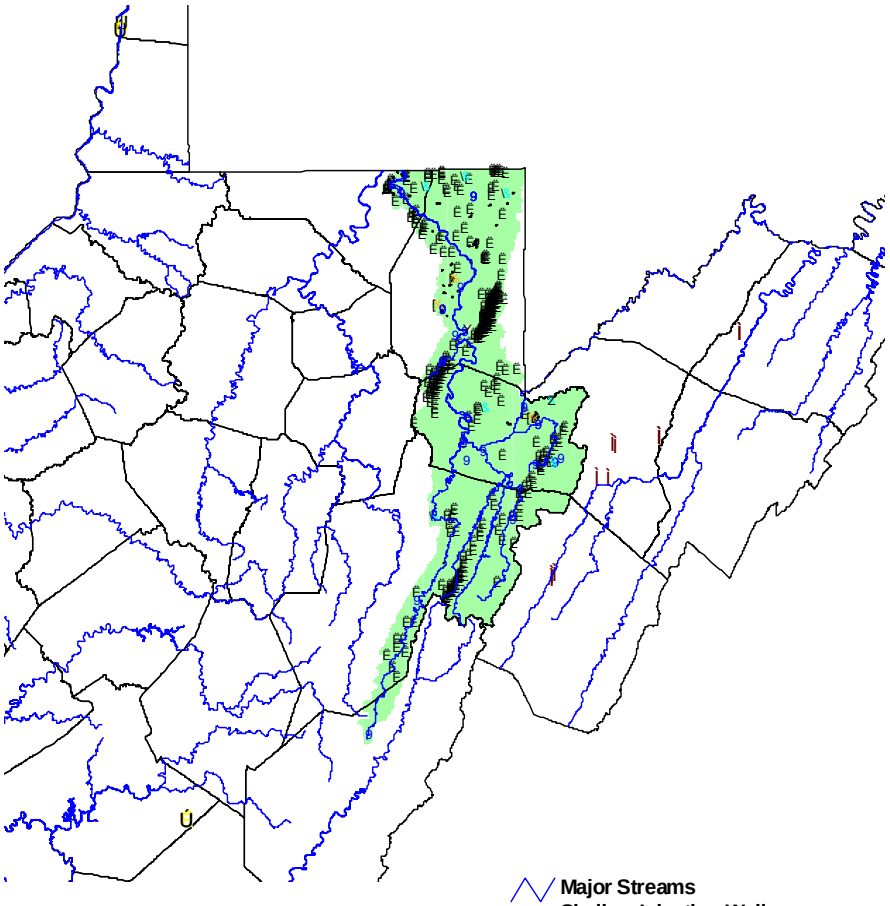
10 0 10 Miles

Major Streams
Public Water Wells
Shallow Injection Wells
Groundwater Remediation Site
Hazardous Waste Site
Landfills
Coal Dams
Abandoned Mine lands
Coal Surface Mine
Coal Underground
Quarry

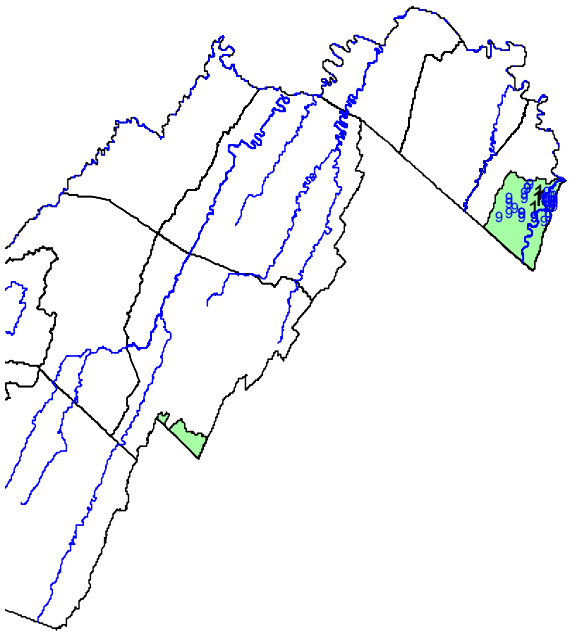
Group A Watersheds



Cheat River Watershed



Shenandoah River Watershed (Jefferson and Hardy Counties)



Major Streams

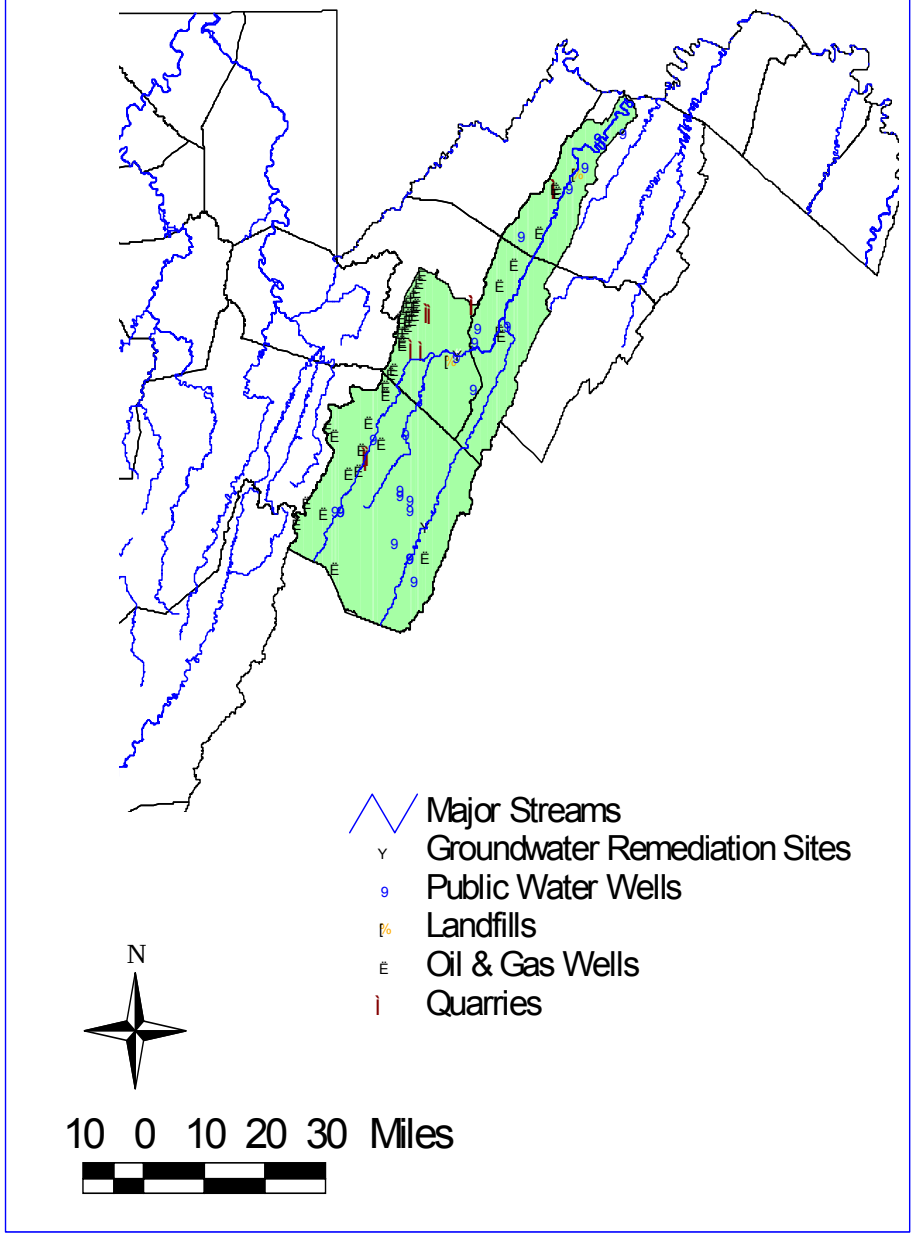
9 Public Water Wells

1 Coal Underground

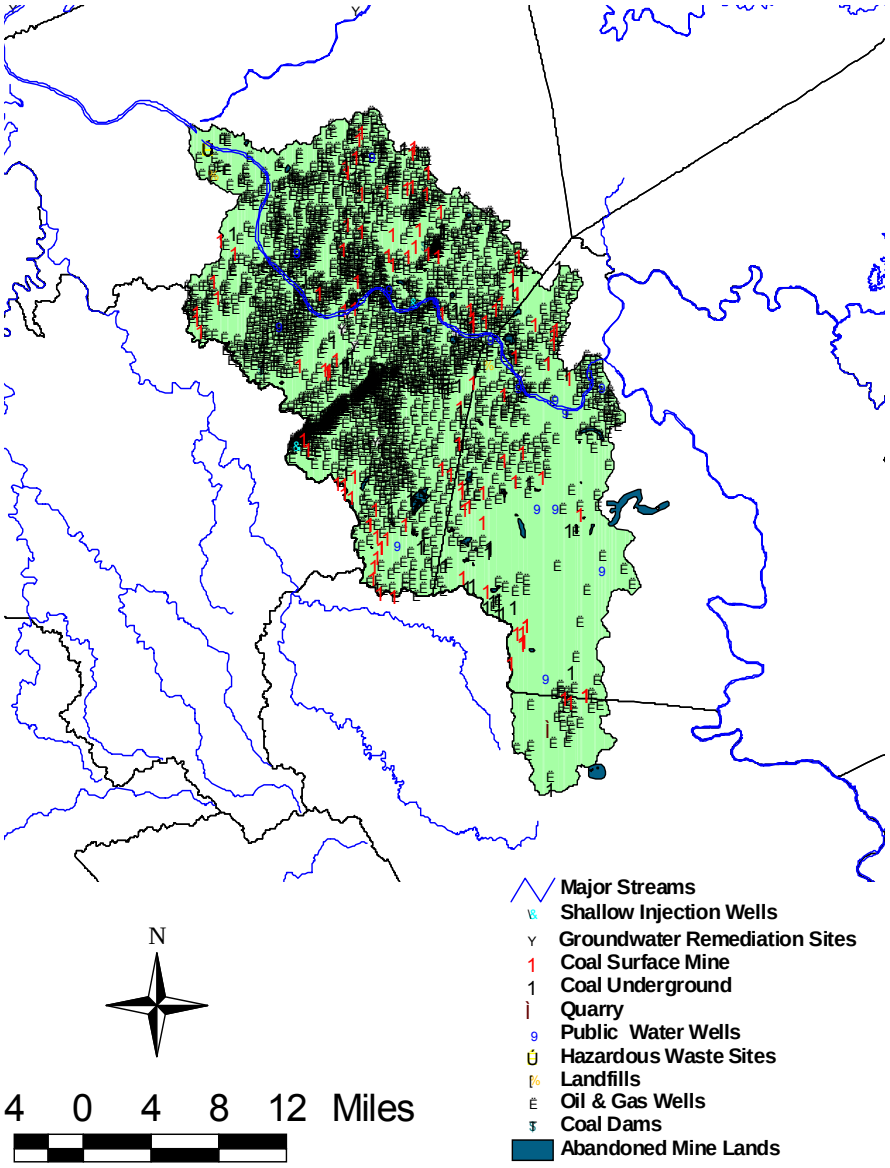
N

10 0 10 20 30 Miles

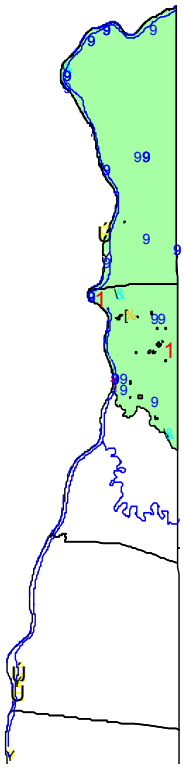
South Branch of the Potmac River Watershed



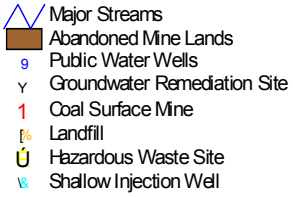
Upper Kanawha Watershed



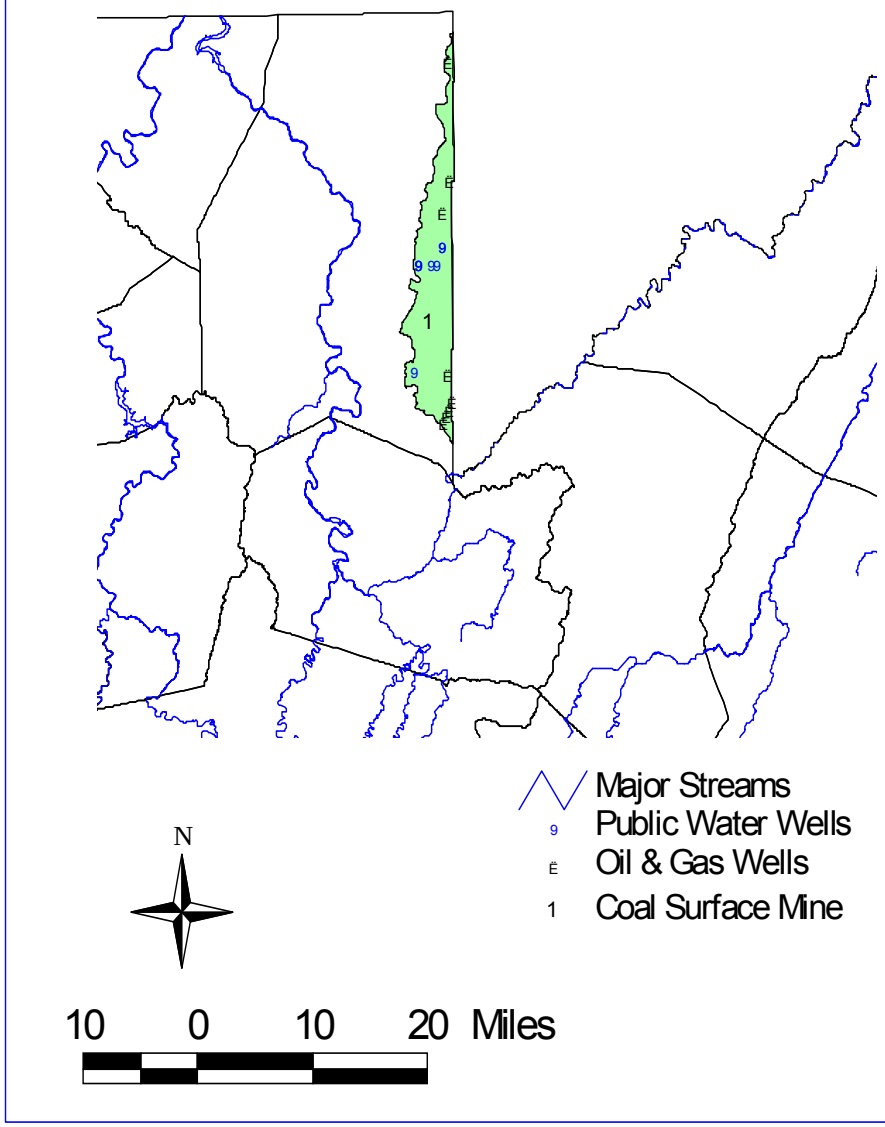
Upper Ohio River North Watershed



Note: Oil & Gas wells could not be displayed due to the concentration. There are 1438 Oil & Gas wells in this watershed.



Youghiogheny River Watershed



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

The Environmental Quality Board is authorized by the West Virginia Groundwater Protection Act (Act) to carry out several duties. Section 22-12-4 authorizes the Board to promulgate standards of purity and quality for groundwater located within the State. Section 22-12-11 provides that parties aggrieved by actions taken by the state pursuant the Act may appeal those actions to the Board. Legislative Rule 47 CSR 57 provides a role for the Board to confer with the WV DEP on variances from groundwater standards before submittal to the West Virginia Legislature for approval.

Rulemaking Activities
Requirements Governing Groundwater Standards, 46 CSR 12

Pursuant to the authority outlined in Section 22-12-2 of the Act, the Board proposed a revision to the Groundwater Standards and filed it with the Legislature in August 2001 for consideration in the 2002 session. The proposed amendment adds a new criterion, arsenic, to the table of constituent concentrations in Appendix A of the rule. The numeric value for arsenic proposed by the Board is 0.05 mg/l, which is the US Environmental Protection Agency's current Maximum Contaminant Level (MCL) promulgated pursuant to the federal Safe Drinking Water Act.

The Board proposed this revision after publishing a notice and holding a public hearing to accept comments on the proposal. The hearing was held on June 28, 2001. Both the WV Department of Environmental Protection and the WV Bureau for Public Health support the proposed revision.

Appellate Activities
Groundwater Protection Act

The following appeals of agency actions taken pursuant to the Act were filed with the Board during this biennium:

Appeal #99-07-EQB Lignetics appealed OWR's issuance of an order under the Water Pollution Control Act and the Groundwater Protection Act. Lignetics manufactures wood pellets at its plant in Gilmer County, WV. After an inspection DEP issued an order to Lignetics on June 3, 1999. Water samples taken at the time indicated exceedences of several water quality standards. It was also noted that the company did not have a Groundwater Protection Plan. The Order that is appealed here was issued on June 3, 1999. This appeal settled without a hearing.

Appeal #00-05-EQB Ellen Sparks, pro se, filed this appeal of a coal NPDES permit issued to Loyal G. Forman & Son. The issues raised in the appeal were primarily about her water supply. In the permit application, the mine acknowledges four domestic water supplies within one-half mile of the surface mining operation. The Appellant's water supply, a spring, was indicated in the permit application. According to the application, the spring will be monitored throughout the term of the operation. However, the Appellant sought a permit requirement for groundwater monitoring. Before a hearing was held, the Appellant withdrew her appeal.

Appeal Nos. 01-01-EQB; 01-02-EQB; 01-03-EQB; 01-04-EQB These four appeals were filed by Exxon Mobile Refining & Supply Company of an Order issued under the Groundwater Protection Act to four facilities owned by the Appellant. The appeal was settled without a hearing.

Groundwater Quality Standard Variance Rule, 47 CSR 57
Groundwater Variance Request Activites

The Groundwater Protection Act authorizes the Director to propose variances for classes of activities which by their nature cannot be conducted in compliance with the Groundwater Standards in 46 CSR 12. The Groundwater Quality Standards Variance Rule (47 CSR 57, section 6.9) requires the Director to consult with the Board when the terms and conditions of a groundwater variance include alternative groundwater quality standards.

The Board reviewed a request for alternative groundwater criteria from Virginia Electric and Power Company, doing business as Dominion Generation in April, 2001. The variance application included a request for alternative groundwater criteria for beryllium, cadmium, chromium, lead and nickel in the vicinity of a coal storage pile at the facility. The alternative criteria are to apply to the groundwater at the interface with Mount Storm Lake.

Upon review of the application, and discussion with representatives of the DEP and Dominion Generation, the Board concurred with the DEP's position in support of the applicant's request. A letter memorializing the consultation and the Board's concurrence was sent to the agency in May 2001.

B. Groundwater Coordinating Committee

This committee consults, reviews, and makes recommendations on the implementation of the GWPA by the groundwater regulatory agencies. The committee is authorized and empowered to promulgate legislative rules as may be necessary to implement the GWPA. The committee also reviews programs for compliance and recommends necessary changes.

This committee is comprised of senior managers from the various groundwater regulatory agencies which includes:

Commissioner of the Bureau for Public Health,
Commissioner of the Department of Agriculture,
Director of the Division of Environmental Protection,
Chief of the Office of Water Resources, and
Chairman of the Environmental Quality Board.

C. Ground Water Protection Act Committee

This committee deals with the development of groundwater policies, groundwater protection practices, and addresses past, present, or future rule-making issues. This committee consists of program managers from groundwater regulatory agencies.

D. Groundwater Monitoring Well Drillers' Advisory Board

This board was created to advise WV DEP on the certification of monitoring well drillers, and to assist WV DEP in the development of Groundwater Monitoring Well Design Standards. This board consists of representatives from the drilling and coal industries, Division of Water Resources, Division of Oil and Gas, Division of Waste Management's Underground Storage Tank Section, Bureau for Public Health, and West Virginia Geologic Survey.

The board works closely with WV DEP Division of Water Resources' Groundwater Program's Monitoring Well Driller Section in the development of policies relating to monitoring well design standards, documentation, testing, and drilling related issues. During this reporting period, the board has assisted in the Monitoring Well Driller development of the following policies:

1. Driller's whose license has expired for longer than 1 year must retest.
2. Driller may review their written examination at Bureau for Public Health's Office of Environmental Health Services (OEHS) upon written request.
3. Defined recourse procedure to protect a driller from enforcement action when he/she has been denied access to a well that he/she has been working on by the landowner or responsible well party.
4. Defined recourse procedures to protect a driller from enforcement action when he/she has been requested by the landowner or responsible well party to deviate from the minimum well design standards without the approval of a written variance request.
5. All temporary wells must be installed with lockable caps and annular space seals to a minimum of one foot below groundwater level with impervious bentonite or similar impervious material.
6. Procedures for the reporting of multiple boreholes on a contaminated or suspected contaminated site.

7. Any borehole, which could contribute to or cause the alteration of water quality either a private or public drinking water source, must be abandoned in accordance with the monitoring well design standards. This includes those boreholes (*e.g.* high risk) drilled on contaminated or suspected contaminated sites.
8. All wells installed by cone penetration must meet monitoring well design standards and the boreholes created by cone penetration must be abandoned by monitoring well design standards.
9. Horizontal well installers and cone penetration operators are required to be a certified WV monitoring well driller if the borehole and/or well intersects groundwater.
10. Jurisdiction was established by OEHS and DWR on whose responsibility it is on the construction and abandonment of wells. OEHS responsibility is for public water supply wells, exploratory/observation wells used in determination of drinking water and production wells, irrigation wells and those industrial water wells not located on contaminated sites. Local health department's responsibility is for private water supplies; exploratory/well observation wells used in the determination of private wells, heat pump wells and de-watering wells. DEP's responsibility is for all groundwater monitoring wells, driven point wells, recovery wells, piezometers, UIC wells and those industrial wells located on contaminated sites.

The board approved 2 monitoring well designs to be used on abandoned mine sites which eliminated the need to submit a written variance request from the minimum monitoring well design standards.

The board's support has been instrumental in the development of electronic submission of the *Monitoring Well Construction Documentation Form* and the *Abandonment of Monitoring Wells/Boreholes Forms* via the Internet. This service is planned to be available to all monitoring well drillers by January 2002.

E. Well Head/Source Water Protection Committees

These committees deal with groundwater and source water issues in source water protection areas. This committee essentially consists of the same members as the Groundwater Protection Act committee. In addition, representatives from the Public Service Commission, the Rural Water Association, Division of Highways, and the Office of Emergency Services serve on this committee.

F. Nonpoint Source Coordinating Review Board

Due to the number of State agencies involved in coordinating and/or regulating nonpoint sources, the various technical advisory committees must assure that State Requirements are understood and met. This is important since funding sources, other than National Clean Water Act, Section 319 funds, are available to support implementation of BMP's. To maximize utilization of these funds, requirements of the

various agencies that manage the funds must be addressed during the evaluative, priority watershed selection, planning and implementation phases.

This requires an interagency mechanism to allow review of individual agency requirements and to discuss conflicts in objectives for specific types of nonpoint source prevention. Therefore, an interagency NPS Coordinating Review Board made up of representatives from each of the NPS Technical Advisory Committees has been created to integrate the efforts of all category agencies into a unified NPS watershed management approach. It will be the responsibility of the Coordinating Review Board to guide implementation, identify specific BMP's for multi category targeted watersheds and resolve conflicts in accordance to meeting Section 319(b)(2)(F) Federal Consistency requirements.

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

I. 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 protection 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 insure the protection of the groundwater resource.

The Commissioner may develop chemical-specific regulations or generic mandatory best management practices 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 other than 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 Department has maintained a cooperative and evolving pesticide management process under the Federal Groundwater Protection Initiative in which State primacy and flexibility have been maintained. 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 best management practices. 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 Plant Industries Division/ Pesticide Regulatory Programs operates within the parameters as delineated in the West Virginia

Groundwater Protection Act and is the State lead 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 insured 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). Environmental concerns are also addressed through additional State legislation as reported in the first and second Biennial reports.

Agricultural best management practices (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 Department of Agriculture. The Department does maintain a quality assurance and label compliance monitoring program for commercial fertilizers. Bulk fertilizer dealers are required to register with the Department and are subject to inspections as outlined in the regulation. These duties are delegated to the Department of Agriculture's Field Services Section of the Regulatory Protection 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 Department. The Department will consult with appropriate Federal and State agencies in the establishment of protection and monitoring priorities to insure the continued protection of public health.

Improper disposal of surplus or waste pesticides and pesticide containers continue to be a potential source of groundwater contamination. The Department has continued the Surplus and Waste Pesticide and Disposal Program and the Pesticide Container Collection and Recycling program. Over this report period, the Department has collected and disposed of 13 tons of waste pesticides, and recycled approximately 20,000 pesticide containers. Pesticide applications are monitored though inspectors observing their actual use. The minimum number of inspections (use observations) of all types (i.e. agricultural, general pest, etc.), are determined as part of the grant funding negotiations. These inspections are comprehensive in nature in that all aspects of use and potential detrimental impacts are observed. Evaluations to determine compliance with groundwater regulations (section II) are an integral part of use observations.

As of this report, there are no documented point sources of pesticide contamination of groundwater. Commercial pesticide application business bulk pesticide dealers, and private applicators are registered with the Department. Contamination source inventories and assessments of groundwater impacts due to pesticide manufacturing are outside the jurisdiction of the Department. In the absence of confirmed contamination by any potential sources at a point source level listed or registered by the Department, protection priorities are determined by general geologic vulnerability assessments and chemical use.

II. Groundwater Rules

The West Virginia Department of Agriculture is monitoring fertilizer through legislative and procedural rules. These rules include:

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

The Primary and Secondary Containment of Fertilizer rule establishes standards for the purpose of protecting the groundwater resources of the State of West Virginia. We currently have eight (8) firms registered that must comply with this rule. Inspections are performed at these facilities to insure compliance.

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.

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 Department 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.

Best Management Practices 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 this State. Best Management Practices for Fertilizers and Manures call 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 Department of Agriculture during the report period which pertains 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 taken as a result of the regulation.

The Department 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 12 I and CSR 22A.

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The Department has consulted with the U.S. Department of Agriculture and Natural Resource Conservation Service (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 have not been identified in West Virginia, the promulgation of 61CSR22A 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 Department 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, restrictions on product labels, increasing use of commercial applicators, and the low frequency and level of detection of pesticides in groundwater do not necessitate promulgation of additional regulations at this time. The Department 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.

III. Groundwater Projects

Moorefield Water Quality Efforts

Several programs are in place at the Moorefield Agricultural Center to monitor groundwater and improve existing water quality. Best management practices (BMPS) are utilized in an effort to reduce pollution and nutrient runoff. All poultry producers and integrators are required to have Nutrient Management Plans (NMPS) which 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 arrive at recommendations concerning amounts of fertilizers to be applied to each field. Several government agencies make recommendations and participate with landowners on developing NMPS. To further assist poultry growers, additional meetings and workshops are routinely conducted by representatives of the West Virginia Department of Agriculture (WVDA) and the West Virginia University Cooperative Extension Service (VVVUCES). To facilitate NMP development, Moorefield's Nutrient Management Laboratory of the VVVDA has routinely analyzed over 300 litter/manure samples for each of the last seven years.

In an effort to incorporate nutrient management in all existing poultry operations, the staff of the Potomac Interagency Water Quality Office provides technical assistance to local integrators in developing nutrient management plans. These plans supplement plans written under the PL-534 Potomac Headwaters Land Treatment Project. The WV Department of Agriculture in cooperation with “The Partnership” has developed a certification program, 66 professionals have been certified.

In spite of nutrient management efforts, several streams and tributaries in the Potomac Highlands Region of West Virginia have been identified as being contaminated with excessive amounts of fecal material. Consequently, identification of point and nonpoint sources of contamination is being addressed by the WVDA. Intensive sampling during FY99 confirmed the presence of fecal contamination and the WVDA worked with Marshall University's Forensic Department to fingerprint *E. coli* from the various regions.

DNA studies utilizing pulse gel electrophoresis are continuing in an effort to identify the source(s) of pollution. Microbiologists at Moorefield are specifically examining the *E coli* from humans, deer, bovine, chickens, and Canadian geese in an effort to match them with the *E. coli* found in water samples. Once the source(s) is determined, efforts will commence to minimize the contamination.

TMDL studies indicate that high levels of iron and aluminum exist in the Little Kanawha River which contribute to the river's high turbidity and silt. Since bound ions are probably not particularly utilized by plants and animals and usually precipitate in the stream bed, the soluble iron and aluminum levels would be more appropriate for monitoring water quality in this type of stream. WVDA has sampled 19 sites on the Little Kanawha River between Burnsville and Parkersburg. Data for soluble and total iron and aluminum will be collected at each site. It is anticipated that DEP will utilize this data and set soluble standards for these two metals in future TMDL studies.

The Moorefield Agricultural Center will be participating in a study funded by the United States Geological Survey, Department of Environmental Protection, and other agencies to compare various biological source tracking techniques. The intent of the study is to document the usefulness of several methods for identifying bacterial source contamination in groundwater.

IV. Groundwater Data Collection and Management

During this report period no additional data has been collected or generated by monitoring or enforcement relative to groundwater quality. Monitoring and survey data from previous programs are maintained as hard copy site evaluations program reports, as well as laboratory and analysis reports at the Department of Agriculture, Guthrie Complex, Charleston WV. A preliminary electronic database has been initiated in dBASE format.

The Department has been actively involved in the development of a centralized groundwater database as required under the Groundwater Protection Act. Existing data supports the Department's efforts on pesticide collection and disposal initiatives in the Eastern Panhandle. There have been no current applications of Global Positioning System/Geographic Information System (GPS/GIS) systems in the program. Initial inquiries have been made toward establishing either a dedicated or shared GPS/GIS within the Plant Industries Division.

Efficient data sharing between groundwater-related programs would be facilitated by the creation of a centralized database by the WV DEP as mandated under the Groundwater Protection Act.

V. Deficiencies

Currently the Department of Agriculture sees the following deficiencies, which need to be corrected in order to improve West Virginia's groundwater protection efforts:

- ❖ Lack of specific hydrogeologic information i.e. potentiometric surface mapping, and groundwater flow studies
- ❖ Lack of access to dedicated monitoring wells
- ❖ Lack of resources for dedicated area or site evaluations

VI. Public Participation and Education

Public participation in the Department's efforts to protect groundwater is best represented by the increase in participation in the pesticide container recycling program. It has increased dramatically over the reporting period due to the voluntary participation of growers. All regulations promulgated by the Department are open to a public comment period as directed under State Code.

Groundwater protection, in both regulated and non-regulated communities, has been integrated into a general pesticide safety program for civic and social clubs, agricultural awareness and promotional displays (WV State Fair, Legislative Ag-Day) and commercial and private certification and training programs.

All data collected during monitoring or quality assessment programs are available to regulators, the regulated community, and to the public. Data collected as part of an official enforcement or investigation activity is available after the final disposition of the case.

The Department utilizes every opportunity to address groundwater and related environmental issues in the course of producer visits or compliance assistance programs.

V. DEPARTMENT OF AGRICULTURE
B. Pesticides Section

The Department of Agriculture has remained active in both States and Federal groundwater protection programs and initiatives. The Department receives seventy-five thousand dollars from the groundwater protection fees generated from pesticide registrations. These monies, support two fulltime positions and associated cost. They have been eroded by inflation to the point that they are no longer sufficient to support the objectives of the program. The Department has exercised its authority to regulate all aspects of pesticide use in a manner consistent with the protection of groundwater resources. Activities of the Department include demonstration and research, specific regulatory and inspection activities for pesticide handling areas, bulk pesticide dealer registrations and emergency response plan review for bulk pesticide storage areas, pesticide users' educational programs, investigations of pesticide misuse relating to groundwater protection and potential pollution source reduction through recycling and disposal programs.

Demonstration and research:

As specified under 61CSR12I "Non-bulk Pesticide Rules for Permanent Operational Areas" secondary containment is required in areas where pesticides are regularly handled. A demonstration site was constructed by the Department at an active orchard in Inwood, Berkeley County, to demonstrate compliance strategies for this regulation. Funding for this project was obtained through an Environmental Protection Agency, Pesticide Environmental Stewardship Program grant (PESP). The formal research associated with the project was concluded in January of 2000 and the facility evaluation and demonstration aspects are ongoing. The containment structure proved to an effective and low cost approach to compliance under 61CSR12I. A prototype wastewater collection and recycling unit was designed and incorporated into the PESP demonstration project. Laboratory trials were conducted by the West Virginia University Research Corporation to evaluate final remediation processes. The collection and recycling prototype was found to be effective and should be compatible to up scaling for larger facilities. As of this report three additional sites using this design have been constructed. Similar units of private design were monitored to evaluate design and operational parameters. Copies of the project report are available upon request from the Plant Industries Division.

PESP DEMONSTRATION SITE, BERKELEY COUNTY

Compliance Assistance and Enforcement:

As required under 61CSR12H, "Bulk Pesticide Operational Rules," the registration of bulk pesticide storage facilities as defined under the regulation has been completed. The agricultural operations falling under the regulation have come into compliance by either constructing operational containments or moving pesticide handling operations into the application areas.

PESTICIDE HANDLING AND CONTAINMENT FACILITY IN A COMMERCIAL ORCHARD, BERKELEY COUNTY

Turf management operations, primarily golf courses, also fall under this regulation. Compliance assistance has included presentations at association meetings, individual site evaluations and recommendations for chemical handling. An increasing number of herbicides have specific application restrictions designed to protect groundwater resources. These restrictions include the reduction of the amount of chemicals applied per acre per season and specified "set backs" or "no spray zones" around vulnerable areas. During this period one incident of a set back violation was investigated and appropriate enforcement action was taken against the violator.

Procedures under 61CSR12C, "Wood Destroying Insect Treatment Standards" were developed to help protect domestic wells from contamination during termite treatments. Commercial applicators are required to inspect the treatment site prior to application and document conditions that may lead to well contamination. Product labeling has also been revised to minimize the chances of a well contamination. The majority of the enforcement actions taken by the Department in this area have resulted from the failure of the applicator to document pre-treatment inspections as required under the regulation.

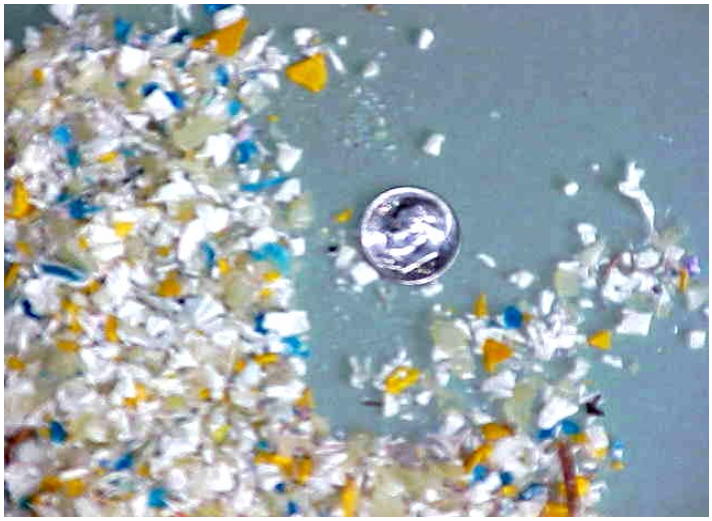
Pollution Prevention Activities

The Department has been participating in a nation wide initiatives to collect and recycle plastic pesticide containers. Approximately ten thousand containers are collected annually in West Virginia. The orchard industry of the Eastern Panhandle has generated the bulk of the materials but the program is continually expanding to include all aspects of commercial pesticide application. Under Federal regulations properly rinsed pesticide containers are solid waste, which does not, requires special handling or disposal. West Virginia solid waste definitions classify rinsed containers as a "special waste' that is not permitted in many municipal landfills but are routinely incorporated into normal household waste streams. Although there are no known incidents of ground water contamination due to improper container disposal, the Department is continuing this program as a part of the comprehensive strategy of pesticide stewardship and waste reduction.

CONTAINER INSPECTION

ams, commonly referred to as "Clean Sweep" or
ective strategy in the prevention of illegal pesticide
le during this report period to support any additional
ent is maintaining a list of waste materials available for
6,000 pounds. The inventory includes materials
tra
ab
ce i
ad
p

CONTAINERS BEING PROCESSED AT COLLECTION SITE



PROCESSED PLASTIC SHOWN IN RELATION TO A DIME. PLASTIC WILL BE REUSED FOR SHIPPING PALLETS AND OTHER NON-FOOD CONTACT USES

IV. DEPARTMENT OF AGRICULTURE
C. WV Soil Conservation Agency

The West Virginia Soil Conservation Agency undertook the following activities which either directly or indirectly protect West Virginia's groundwater resources.

MANAGEMENT OF ORGANIC ANIMAL WASTE AND CHEMICAL FERTILIZERS

582 nutrient management plans were developed on 89,959 acres of agriculture land.

Through these plans approximately 225,000 pounds of nitrogen and 37,200 pounds of phosphorus were properly managed and applied to agriculture lands, reducing the potential for leaching of these nutrients into groundwater resources.

173 litter storage sheds were constructed to properly store poultry litter on concrete pads and under roofed structures. This eliminates the potential for nutrient leaching under poulty litter storage sites.

32,200 tons of poultry litter were distributed outside of the Potomac watershed, reducing the potential for leaching.

241 animal feeding areas were stabilized or relocated.

40 tons of manure were managed through composting.

West Virginia instituted the use of the phosphorus index (P Index) for nutrient management planning, to reduce the potential for overapplication of phosphorus on West Virginia Soils. The P Index will also reduce the likelihood of phosphorus leaching to groundwater sources.

PESTICIDE MANAGEMENT

Integrated pest management plans were developed on 13,324 acres of farm land reducing the potential for over application and leaching of pesticides.

5 educational programs were provided to farmers as well as homeowners on pesticide usage.

EDUCATIONAL PROGRAMS

5 West Virginia Watersafe presentations were given to approximately 350 individuals. The West Virginia Watersafe program assists landowners in identifying potential risks to their well water.

A pesticide survey was distributed to 1800 individuals in the Spring Creek watershed in Roane and Wirt counties of West Virginia. A pesticide workshop was also held in the Spring Creek watershed.

Published *Residential Land Use Management: A Homeowner's Guide* which includes chapters on "Controlling Pests", "Septic Systems", "Your Well", and "Hazards in Home/Garage". This booklet provides information on what individuals can do in their own homes and yards which will ultimately protect West Virginia's surface and groundwater.

BIOSOLIDS LAND APPLICATION

91 site evaluations were conducted on 4776 acres for the land application of biosolids. Of those, 21 nutrient management plans were developed on 1595 acres approving the land application of biosolids. Again, through this process, biosolids are only applied to those areas deemed suitable, and the potential for nutrients leaching into groundwater is minimized.

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
A. Division Of Mining And Reclamation

The Division of Mining and Reclamation (DMR) of the West Virginia Department of Environmental Protection (WVDEP) is charged with the responsibility and authority to administer regulatory programs and practices for the protection of groundwater from activities involving coal extraction, handling, preparation, storage, and loading. DMR's approach to this endeavor is twofold: 1) to ensure that the groundwater is protected from man-made contaminants which are utilized in the operation of equipment or to facilitate coal handling on the surface, and, 2) to regulate and control the injection of fluids generated from certain mining activities through Class 5 underground injection wells into abandoned mine voids, protecting drinking water sources and preventing the unpermitted migration of the injectate underground or to the surface.

Title 38Series2F (Groundwater Protection Regulations: Coal Mining Operations), promulgated under the authority of Chapter 22, Article 12, establishes groundwater protection practices for coal mining activities and facilities. Priorities in groundwater protection are determined by similar criteria as are those for surface water: potential for release of a contaminant, potential harm to the environment and/or human health due to the nature or amount of a contaminant, difficulty of remediation, cleanup, or handling, cost to the operator, sensitivity of the receiving waters, etc. However, groundwater impacts due to coal extraction and earth-disturbing activities directly involved in coal extraction are excluded from groundwater protection regulation by specific language in the law.

As promulgated under Chapter 22 Article 11, the underground injection control program applying to Class 5 well activities, including mining and quarrying operations, is administered under the authority of Title 47 Series 13 (Underground Injection Control), which regulates the emplacement of fluids into the subsurface by permitting the siting, construction, operation, and abandonment of shallow injection wells. The specific type of injection well involved in mining operations is the 5X13, wherein preparation plant slurry, Acid Mine Drainage treatment sludge, or other waste generated from the mining or handling processes is injected into coal seam voids in abandoned underground mines.

Groundwater protection is administered through DMR's Hydrologic Protection Unit (HPU), facilitating the regulatory link between surface water protection and groundwater protection. In HPU, one staff position, a Geologist III, is designated for the technical implementation of groundwater protection policies and regulations for mines and quarries. This position interfaces with DMR's regional Inspection and Enforcement (I and E) staff, geologists, engineers, and SMCRA and NPDES permit writers in the administration of Title 38 Series 2F, although, until November 1999, Title 47 Series 13 regulations as applied to mining operations were administered in conjunction with NPDES permits or via the Division of Water Resources (DWR), Groundwater Programs.

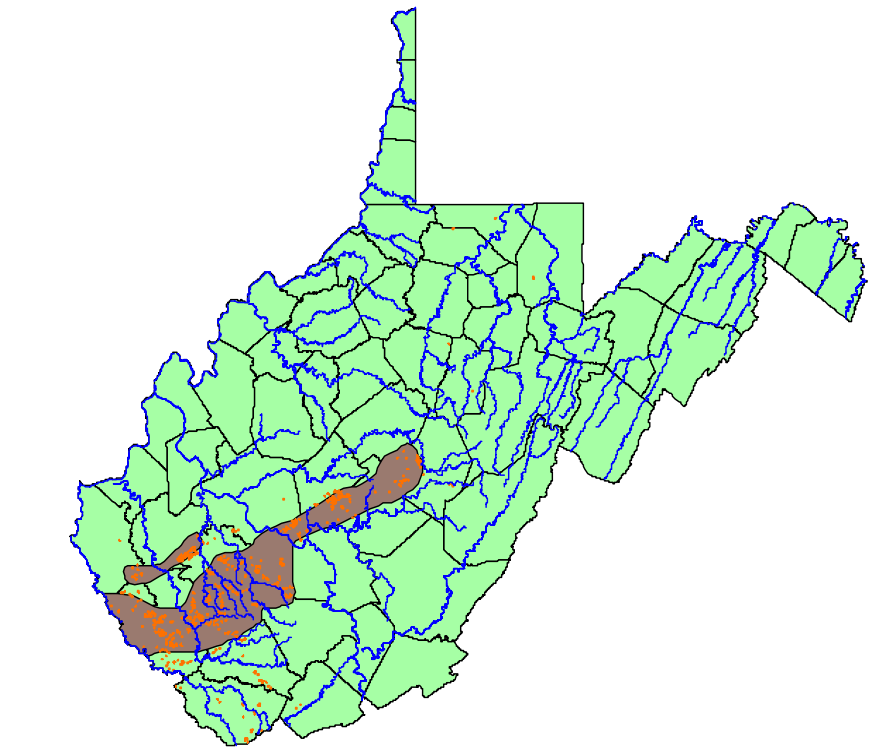
However, in November 1999 the duties of the HPU's geologist were expanded to include Underground Injection Control (UIC). Since then, a program based on Title 47 Series 13 has been developed to facilitate the application, review, inspection, permitting, and regulation of 5X13 wells specifically for mining operations.

An Intragency Agreement, signed by the Directors of DMR and DWR, effective 1 July 2001, stipulates that DWR is currently delegated by the USEPA to administer the Federal Underground Injection Control Program in West Virginia and perform final technical review of draft UIC permits written by DMR prior to issuance or denial. The Agreement establishes that the HPU geologist will be headquartered in the DWR and supervised by the DWR Groundwater Program Manager. This position includes all groundwater-related duties affecting DMR's permittees, including the arbitration of groundwater protection fee disputes and enforcement of groundwater laws and rules; additionally, the HPU geologist must maintain Monitoring Well Driller Certification and Hazardous Waste Training for any application of such regulations to the mining industry.

Where appropriate, DMR consults with federal, local, and other state agencies to establish a balanced approach to groundwater protection. Other states are also considered, although it is more often that West Virginia is contacted for consultation.

DMR has assiduously striven to provide information and instruction in its groundwater program to the public, to the regulated industry, and to other agencies as needed or requested. As the Class 5 Injection Well Program is still relatively new, informational seminars are being planned for the near future similar to those conducted when the West Virginia Groundwater Protection Program was first established.

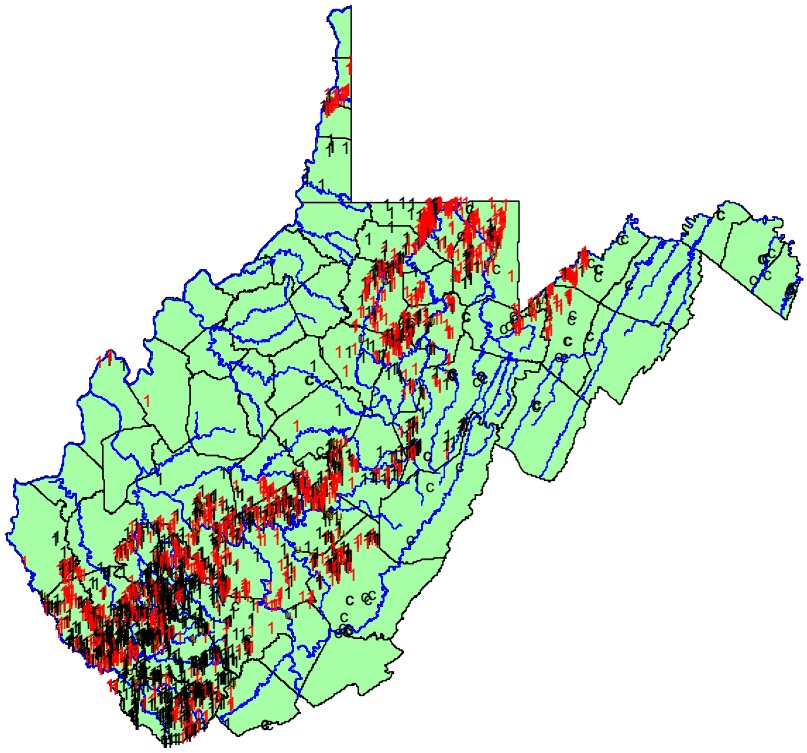
Mountain Top Removal Activity in West Virginia



20 0 20 40 Miles

Major Streams
Valley Fills
Mountain Top Removal Regions

Mining Activity in West Virginia



N

20 0 20 40 Miles

1 Underground Coal Mines
u Prep Plant
c Quarry
a Wildcat Operation
1 Surface Coal Mine
Major Streams

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
B. Office of Oil and Gas

The Office of Oil and Gas (OOG) regulates West Virginia's oil and natural gas industry to protect the environment including groundwater. This is achieved through the permitting, inspection and enforcement of exploration, production, plugging and injection activities of the industry. Over 44,000 active wells are maintained by the OOG. Regulations aimed at protecting groundwater have been in existence since 1929. Additional regulations have been added in the years to follow to further aid in the protection of groundwater. 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

Fresh water casing must be set, by the operator, 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 1000 feet of a proposed well drilling site. At the request of the landowner, the operator shall sample and analyze water from any wells or springs within this 1000 feet. If no requests are made, then the operator shall choose an existing well or spring from within the 1000 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 inventory consists of 68 brine disposal wells, 550 secondary recovery wells and 35 solution mining wells. Primary focus of this program is the protection of groundwater from injection operations. Operators are required to submit reports monthly of each

injection wells daily activity. UIC permits are issued for five-year periods and must be renewed for injection to continue. During permitting 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 relating 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. Contaminants that may affect groundwater quality include 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 which 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 their wells which are not plugged and which 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 this site and indicate the method for treating and disposing of the pit contents. Most pit contents are land applied after proper treatment and aeration. Primary function of this general permit is the prevention of pollution to the waters of the state relating to the handling and disposing of these wastes.

Wellhead Protection Program

The OOG participates in the Wellhead Protection Program by determining if a proposed well drilling site is located within a protected water supply area prior to permit issuance.

Spill Prevention and SPCC Plans 35CSR1

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

Well Plugging Certification Program

OOG is evaluating the need and implementation of this program. This program would provide training and testing of industry personnel. It will provide the OOG with some increased assurance that operators or contractors have personnel that are familiar with requirements and procedures for plugging wells. Once this program is initiated the OOG expects to require, through policy, that at least one operator or contractor representative, certified through the program, be on-site during plugging operations.

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 1000 feet of this 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 (MBAS). Results are currently being submitted in paper form and kept on file with its corresponding permit.

Operators applying for an Underground Injection Control (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 in paper form 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 in paper form and kept in the corresponding investigation file.

The OOG does not currently track via computer any groundwater data submitted although the need for such a system has been realized for several years. The OOG has had a representative on the committee created to address this database issue. Upon implementation of a system linking all DEP offices, the OOG will actively participate with the hopes that all analytical data will be submitted electronically in the near future.

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 in paper form on a 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.

The OOG has made a significant commitment in the GIS/GPS area. Over the past few years, the OOG has invested in the purchase of Trimble hand held GPS units for our entire field staff, along with a UNIX workstation and color laser printer. As a complement to the GPS units, Trimble software has been purchased to provide for differential correction of the collected data. Two field laptop computers are configured with Aspen software and can be connected to the GPS units to provide navigational capabilities to known points. We are also currently running Arcview mapping software on the workstation and are tied directly into the GIS server, which is managed by the TAGIS ITO group.

To date, the OOG has collected GPS data on over 2,000 wells. This data if first corrected for various external degredational 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) locational database.

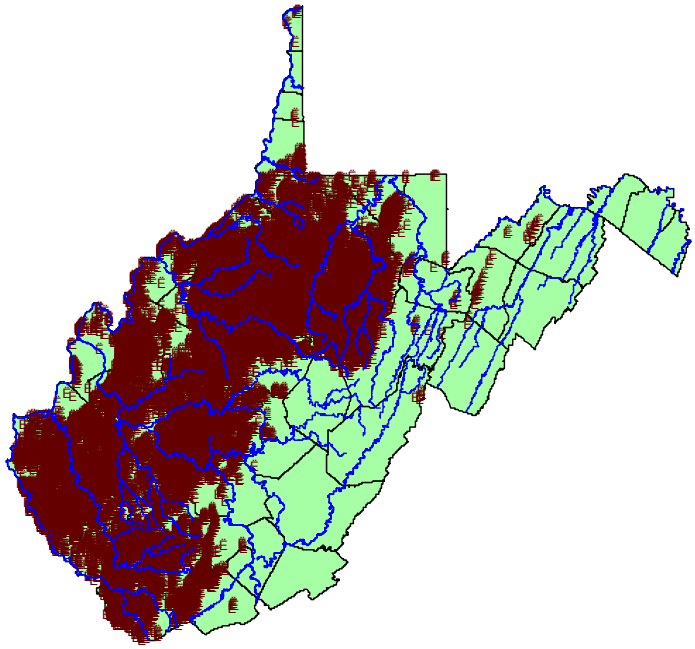
Presently, in our GPS work, we are focusing on the “abandoned” well population, as many of these wells are not mapped and often tend to be sources of groundwater contamination. The GIS provides us the capability of relating our well locational information with such basic coverages as topography, roads and streams. A vast amount of other, more area specific, coverages 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.

The GIS environment provides an opportunity to link groundwater quality data with a specific location. This would be a powerful visual tool for groundwater studies/investigations. At the present time, this data is not available on the GIS server. The OOG, along with other offices, needs to establish a mechanism to allow for utilization of this technology in this manner.

Often times, the citizens of West Virginia encounter contamination of their water wells, possibly due to oil and gas wells or their operations or other unrelated surface or underground activities. An alliance should be formed between the offices within DEP 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 DEP and outside agencies may not have the funding to provide the total solution to a particular situation, some funding from each 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.

Active Oil & Gas Wells



There are 41,872 active wells plotted on this map.

N

Major Streams
Active Oil & Gas Wells

30 0 30 60 Miles

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Waste Management

1. 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 40CFR264 Subpart F and 40CFR265 Subpart F, which pertains 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 the United States Environmental Protection Agency (EPA). In general, 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.

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 as follows:

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

Define the contaminants, source, and extent of contamination.

By 2005, have 75% of all sites with contamination under engineering control and stabilized to prevent additional contamination to groundwater and eliminate further migration of contaminated groundwater.

Mechanisms to Regulate and Protect Groundwater at Permitted Units

The groundwater monitoring regulations in 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 units 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 wastes 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 if 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.

Mechanisms for Corrective Action

The Hazardous and Solid Waste Act of 1984 (HSWA) required 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. A 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 permit, post-closure permits, and permits-by-rule after November 8,1984.

Under HSWA, Congress also gave EPA the authority to Issue orders requiring cleanups at interim status facilities. Interim status TSDF's 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 from an interim status facility. 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 comprise 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.

Facilities with Permitted Units and Groundwater Status

There are 26 permitted facilities in West Virginia that address groundwater issues at their sites as a part of their permit. Table 1 addresses these facilities, describes the permitted units, and gives GPRA goals telling whether groundwater is under adequate control.

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
1	Allegany Ballistics Lab Plant 1	WV0170023691	Stor. Containers	PI	OP	03/21/1995	03/21/2005	yes	WV Secondary Rte 956	Rocket Center	WV	26753
	Allegany Ballistics Lab Plant 1	WV0170023691	Alodine Treat. Tank	PI	CC	12/09/1987		yes	WV Secondary Rte 956	Rocket Center	WV	26753
2	American Environmental Svc(Regeneration)	WVD981107600	Bay No. 8	PI	OP	12/20/1991	12/20/2001	yes	1000 Dupont Rd Bldg 170	Morgantown	WV	26505
	American Environmental Svc(Regeneration)	WVD981107600	T-11	PI	OP	12/20/1991	12/20/2001	yes	1000 Dupont Rd Bldg 170	Morgantown	WV	26505
	American Environmental Svc(Regeneration)	WVD981107600	T-12	PI	OP	12/20/1991	12/20/2001	yes	1000 Dupont Rd Bldg 170	Morgantown	WV	26505
	American Environmental Svc(Regeneration)	WVD981107600	T-21	PI	OP	12/20/1991	12/20/2001	yes	1000 Dupont Rd Bldg 170	Morgantown	WV	26505
	American Environmental Svc(Regeneration)	WVD981107600	T-22	PI	OP	12/20/1991	12/20/2001	yes	1000 Dupont Rd Bldg 170	Morgantown	WV	26505
3	Appalachian Timber Service	WVD063461958	Primary Runoff Pnd	PC	IN	02/15/1989	12/15/1999	yes	525 East Stonewall Street	Sutton	WV	26601
4	Bayer (Miles)	WVD056866312	Carb. Regen. Unit	IS	CC	11/05/1997	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
	Bayer (Miles)	WVD056866312	Fluid-Bed-Incin	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	Bayer (Miles)	WVD056866312	Silo	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
	Bayer (Miles)	WVD056866312	WW-Tank System	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
	Bayer (Miles)	WVD056866312	Container Storage Bldg	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
	Bayer (Miles)	WVD056866312	WW Holding Tanks-2	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
	Bayer (Miles)	WVD056866312	Sludge/Soil Tank	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
	Bayer (Miles)	WVD056866312	Waste Pile	PI	OP	12/09/1998	12/09/2008	yes	Rte 2	New Martinsville	WV	26155
5	Chemical Leaman Tank Lines Inc	WVR000001719	Contam. Site	PC	IN	03/06/1997		yes	Rte 25	Institute	WV	25112
6	CK Witco (O S I-Witco)	WVD004325353	Landfill - #2	PI	OP	08/28/1992	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	T-1143	PI	CC	01/24/1994	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Tank - 768	PI	OP	11/08/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Tank - 769	PI	OP	11/08/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Tank - 873	PI	OP	11/08/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	CK Witco (O S I-Witco)	WVD004325353	Tank - 452	PI	OP	11/08/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Tank - 872	PI	OP	11/08/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Tank - 874	PI	OP	02/07/1989	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Kiln Inc	PI	OP	11/02/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Panic/Settling Pond	PI	OP	11/02/1988	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
	CK Witco (O S I-Witco)	WVD004325353	Tank R - 72	PI	OP	09/01/1992	11/02/1998	yes	3500 S State Rt 2	Friendly	WV	26146
7	Cytec_WV	WVD004341491	Fluid-Bed-Incin	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Clarifier	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Filter Press #1	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Filter Press #2	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	WWTP Sludge Stor.	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Equal. Basin	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Aeration Basin	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	Cytec_WV	WVD004341491	Fluid-Bed-Incin	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Sludge Impound.	PC	CP	01/25/1991	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Ash Disp. Impound	PC	CP	01/27/1998	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
	Cytec_WV	WVD004341491	Waste Pile	PI	OP	05/05/1999	05/05/2009	yes	#1 Heilman Ave	Willow Island	WV	26134
8	Dupont - Belle	WVD005012851	4-A OSD Tank #1	PI	CC	12/01/1998	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	4-B OSD Tank #2	PI	CC	09/22/1999	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	4-C OSD Tank #3	PI	CC	09/22/1999	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	24-Vazo Area AN Tank	PI	CC	03/06/1998	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	26-A Vazo Area AN.	PI	OP	09/28/1992	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	47-DMF Waste Tank	PI	OP	09/28/1992	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	63-SLM Tank	PI	OP	09/28/1992	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	70-Ammonia Head Tank	PI	OP	09/28/1992	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	Dupont - Belle	WVD005012851	75-SLM J Tank	PI	CC	11/28/1997	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	Drum Storage Area	PI	OP	09/28/1992	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	Tank Storage Area	PI	OP	09/28/1992	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	SAR Furnace	IS	CC	07/29/1999	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
	Dupont - Belle	WVD005012851	Boiler #114	IS	CC	12/07/1999	09/29/2002	yes	901 W Dupont Ave	Belle	WV	25015
9	Dupont - Washington	WVD045875291	5	PI	OP	11/08/1989	10/28/2008	yes	Dupont Rd	Washington	WV	26102
	Dupont - Washington	WVD045875291	S01-236	PI	OP	10/30/1998	10/28/2008	yes	Dupont Rd	Washington	WV	26102
	Dupont - Washington	WVD045875291	Tank Storage Unit	PI	OP	10/30/1998	10/28/2008	yes	Dupont Rd	Washington	WV	26102
	Dupont - Washington	WVD045875291	Incinerator	PI	OP	07/05/1996	10/28/2008	yes	Dupont Rd	Washington	WV	26102
10	F M C - Nitro	WVD005005087	1-S01	PI	CC	06/28/1998		yes	200 Pickens Rd.	Nitro	WV	25143
11	G E Specialty Chemicals (2)	WVD980552384	3-S01 (12375.G)	PI	OP	04/10/1988	01/05/1997	yes	Morgantown Industrial Park	Morgantown	WV	26505
	G E Specialty Chemicals (2)	WVD980552384	S02 (3000.G)	PI	OP	04/10/1988	01/05/1997	yes	Morgantown Industrial Park	Morgantown	WV	26505

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
12	General Elec - Washington	WVD088911854	Dimer Tank	PI	OP	10/29/1992	10/29/2002	yes	State Route 892	Washington	WV	26181
	General Elec - Washington	WVD088911854	New	PI	OP	10/29/1992	10/29/2002	yes	State Route 892	Washington	WV	26181
	General Elec - Washington	WVD088911854	Tech Ctr	PI	OP	10/29/1992	10/29/2002	yes	State Route 892	Washington	WV	26181
13	Koppers-Colliers (Beazer)	WVD980707178	02-Landfill	PC	CP	03/23/1994	03/23/2004	yes	RD 1 Crosscreek District	Colliers	WV	26035
14	Koppers-Follans (Beazer East)	WVD004336749	Basins A&B	PC	CP	03/04/1996	03/04/2006	yes	100 Koppers Rd	Follansbee	WV	26037
15	Koppers-Green Spg(CSXT)	WVD003080959	A&B Impounds	PC	CP	06/17/1997	06/17/2007	yes	Railroad St	Green Spring	WV	26722
16	P P G Industries	WVD004336343	CS2 Storage	PI	OP	03/24/1998	03/24/2008	yes	RD 2 North	New Martinsville	WV	26155
	P P G Industries	WVD004336343	Marshal Plant	PI	OP	03/24/1998	03/24/2008	yes	RD 2 North	New Martinsville	WV	26155
17	Pechiney Rolled Prod LLC(Century, Ravenswood)	WVD009233297	S04 (Impound #2)	IS	OP	05/08/1985		no	98 Willow Grove Rd	Ravenswood	WV	26164
	Pechiney Rolled Prod LLC(Century, Ravenswood)	WVD009233297	S04 (Impound #1)	IS	OP	05/08/1985		no	98 Willow Grove Rd	Ravenswood	WV	26164
18	Rhone - Poulenc	WVD005005509	Boiler 3	IS	OP	12/18/1991		no	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Boiler 4	IS	OP	12/18/1991		no	Rte 25	Institute	WV	25112

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	Rhone - Poulenc	WVD005005509	Tank #1021	PI	OP	08/29/1991	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Landfill	PI	OP	12/19/1990	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Container Storage	PI	OP	11/07/1988	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Tank #1043	PI	OP	11/07/1988	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	5	IS	OP	10/15/1984		no	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Tank #4623	PI	OP	11/07/1988	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Surface Impoundment	PI	OP	12/19/1990	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Sludge Filler Press	PI	OP	12/10/1990	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Tank #1044	PI	OP	12/10/1990	02/12/2000	yes	Rte 25	Institute	WV	25112
	Rhone - Poulenc	WVD005005509	Surface Impoundment	IS	IN	02/12/1988		no	Rte 25	Institute	WV	25112
19	Safety-Kleen Systems Inc	WVD981034101	AREA #1	PI	OP	11/06/1992	11/06/2002	yes	10 Industrial Park Dr	Wheeling	WV	26003
	Safety-Kleen Systems Inc	WVD981034101	AREA #2	PI	OP	11/06/1992	11/06/2002	yes	10 Industrial Park Dr	Wheeling	WV	26003

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	Safety-Kleen Systems Inc	WVD981034101	Tank #1	PI	OP	11/06/1992	11/06/2002	yes	10 Industrial Park Dr	Wheeling	WV	26003
20	Solutia (Flexsys, Monsanto)	WVD039990965	S01 (13200/G)	IS	CC	02/05/1998	03/27/2008	yes	1 Monsanto Rd	Nitro	WV	25143
	Solutia (Flexsys, Monsanto)	WVD039990965	S02 (8500/G)	IS	CC	02/05/1998	03/27/2008	yes	1 Monsanto Rd	Nitro	WV	25143
	Solutia (Flexsys, Monsanto)	WVD039990965	S01 (960/G)	IS	CC	02/05/1998	03/27/2008	yes	1 Monsanto Rd	Nitro	WV	25143
	Solutia (Flexsys, Monsanto)	WVD039990965	Container Storage	PI	OP	03/27/1998	03/27/2008	yes	1 Monsanto Rd	Nitro	WV	25143
21	Specials Metals Corporation(Inco Alloys)	WVD076826015	Spent Acid	PI	OP	08/07/1995	08/07/2005	yes	3200 Riverside Dr	Huntington	WV	25705
	Specials Metals Corporation(Inco Alloys)	WVD076826015	Container	PI	OP	08/07/1995	08/07/2005	yes	3200 Riverside Dr	Huntington	WV	25705
22	UCC – So. Charleston (Arco)	WVD005005483	Boiler 15	IS	CC	12/06/1999		yes	437 MacCorkle Ave SW	South Charleston	WV	25303
	UCC – So. Charleston (Arco)	WVD005005483	Boiler 16	IS	CC	07/30/1998		yes	437 MacCorkle Ave SW	South Charleston	WV	25303
	UCC – So. Charleston (Arco)	WVD005005483	Boiler 25	IS	OP	12/31/1991		no	437 MacCorkle Ave SW	South Charleston	WV	25303
23	UCC Tech Center	WVD060682291	Bldg 735 (Drums)	PI	OP	03/16/1998	03/16/2008	yes	200 Kanawha Turnpike	South Charleston	WV	25303

Table 1
WV Companies with Hazardous Waste Permits – Types of Permitted Units – GPRA Goals

	Facility Name	RCRA ID #	Type of Unit	Status Codes		GPRA Date	Permit Expires	Meets GPRA Goal	Address	City	State	Zip
	UCC Tech Center	WVD060682291	Bldg 787 (Bunker)	PI	OP	03/16/1998	03/16/2008	yes	200 Kanawha Turnpike	South Charleston	WV	25303
24	Union Carbide - PTO	WVD000739722	3	IS	CA	12/17/1987		yes	31350 First Ave So	Nitro	WV	25143
	Union Carbide - PTO	WVD000739722	5	IS	CA	12/17/1987		yes	31350 First Ave So	Nitro	WV	25143
	Union Carbide - PTO	WVD000739722	6	IS	CA	12/17/1987		yes	31350 First Ave So	Nitro	WV	25143
25	Weirton Steel	WVD000068908	I.S. Units-S01	PI	CC	11/06/1995		yes	Wv State Route 2	Weirton	WV	26062
	Weirton Steel	WVD000068908	Tanks-8	PI	IN	09/30/1997		yes	Wv State Route 2	Weirton	WV	26062
26	Wheeling - Pitts Steel	WVD004319539	1	LI	CA	11/09/1985		yes	Rt 2	Follansbee	WV	26037

Table 2
West Virginia Corrective Action Universe

HE = Human Exposure Under Control
GW = Groundwater Under Control

	Facility	Facility_ID	HE	HE Date	Projected HE Fiscal Year	GW	GW Date	Projected GW Fiscal Year	Investigation Underway	Clean-up Started	Construc Comple (CA550
1	AEP Kanawha River Plant	WVD980554588	YE	11/03/1999		YE	11/03/1999		X	X	
2	Airco Welding	WVD980554760	YE	07/17/2000		YE	07/17/2000		X	X	09/22/1
3	Appalachian Timber Service	WVD063461958	IN	08/10/1995	FY'02	IN	08/10/1995	FY'02	X	X	
4	Aventis Cropscience USA LP (Rhone-Poulenc)	WVD005005509	IN	08/20/1996	FY'02	IN	08/20/1996	FY'02	X	X	
5	BASF - Huntington	WVD000068601	IN	08/14/1998		IN	08/14/1998		X		
6	Bayer (Miles)	WVD056866312	IN	02/15/2000	FY'01	YE	10/29/1998		X	X	
7	Crompton (O S I-Witco)	WVD004325353	YE	08/19/1996		YE	08/19/1996		X	X	09/25/1
8	Cytec_WV	WVD004341491	IN	04/23/1996	FY'02	IN	04/23/1996	FY'01	X	X	
9	Dupont - Belle	WVD005012851	IN	09/05/1996	FY'02	IN	09/05/1996	FY'05	X	X	
10	Dupont - Martinsburg	WVD041952714	IN	09/05/1996	FY'02	IN	09/05/1996	FY'03	X		
11	Dupont - Washington	WVD045875291	IN	09/05/1996	FY'00	IN	09/05/1996	FY'00	X	X	
12	FMC - So. Charleston	WVD005005079	YE	04/22/1999		YE	04/22/1999		X		
13	G E Speciality Chemicals (1)	WVD061776977	IN	02/29/1996	FY'01	IN	02/29/1996	FY'03	X	X	
14	G E Speciality Chemicals (2)	WVD980552384	IN	02/29/1996	FY'01	IN	02/29/1996	FY'03	X		
15	G M C - Martinsburg (med)	WVD044145209	YE	11/06/1998		YE	11/06/1998		X	X	09/27/1
16	General Electric - Washington	WVD088911854	IN	08/22/1996	FY'03	IN	08/22/1996	FY'00	X	X	
17	Great Lakes Chemical Corp (F M C - Nitro)	WVD005005087	IN	10/29/1999		IN	10/29/1999		X	X	

Table 2
West Virginia Corrective Action Universe

HE = Human Exposure Under Control
GW = Groundwater Under Control

	Facility	Facility_ID	HE	HE Date	Projected HE Fiscal Year	GW	GW Date	Projected GW Fiscal Year	Investigation Underway	Clean-up Started	Construc Comple (CA550
18	KACC Spl Pile	WVD988766127	YE	09/29/1995		YE	08/15/1995		X	X	
19	Koppers-Follans (Beazer East)	WVD004336749	YE	11/12/1999		IN	11/12/1999	FY'03	X	X	
20	Koppers-Green Spg(CSXT)	WVD003080959	IN	10/24/1999	FY'01	IN	10/24/1999	FY'01	X		
21	Koppers - Colliers (Beazer)	WVD980707178	YE	03/22/2000		YE	03/22/2000		X	X	09/22/1
22	Occidental Chem Corp (med)	WVD005010277	IN	03/18/1996	FY'01	IN	03/18/1996	FY'03	X	X	
23	P P G Industries	WVD004336343	YE	09/26/2000	FY'00	YE	08/31/2000	FY'00	X	X	
24	Pechiney Rolled Products LLC (Century Alum; Ravenswood)	WVD009233297	IN	08/14/1995	FY'01	YE	09/29/1995		X	X	
25	Quaker State-Congo	WVD057634776	IN	03/16/1999	FY'01?	IN	03/16/1999	FY'01?	X	X	
26	SMR Tech (BF Goodrich)	WVD980555395	YE	03/21/2001	FY'01	YE	03/21/2001	FY'01?	X		
27	Solutia (Flexsys; Monsanto)	WVD039990965	IN	08/20/1996	FY'00	IN	08/20/1996	FY'04	X	X	
28	St. Mary's (Quaker State)	WVD004337135	IN	05/28/1999	FY'02	NO	05/28/1999	FY'02	X		
29	UCC - So. Charleston (Arco)	WVD005005483	IN	08/27/1998	FY'05	IN	08/27/1998	FY'05	X		
30	UCC Tech Center	WVD060682291	IN	08/27/1998	FY'01	IN	08/27/1998	FY'03	X	X	
31	Union Carbide - PTO	WVD000739722	IN	08/27/1998	FY'02	IN	08/27/1998	FY'03	X	X	
32	Weirton Steel	WVD000068908	IN	10/04/1996		IN	10/04/1996		X	X	
33	Wheeling - Pitts Steel	WVD004319539	IN	03/16/1999	FY'??	IN	03/16/1999	FY'??	X	X	

Facilities With Ongoing Corrective Action

There are 33 sites, either presently under permit for operation of a TSDF, for post-closure, or which at one time had a permit or interim status or should have had interim status, that are addressing corrective action issues. Table 2 shows the facilities under corrective action and their current status.

Present Progress of Corrective Action

American Electric Power

EPA has determined that no further action is necessary at this time under the federal RCRA Corrective Action program. A forty-five (45) calendar day public comment period on the draft proposal that no corrective action will be required at this facility extended from November 24, 1999 to February 10, 2000 and no comments were received. Therefore, EPA issued a final Agency determination.

Appalachian Timber Services, Inc.

The soil bioremediation Pilot Test was started on Oct 12,2000 at the site. Representatives from EarthFax Engineering began inoculation of two different substrates using the primary inoculums of the white-rot-fungus. The next step will require mixing creosote contaminated soil with the colonized substrate.

In February, 2001, ATS will conduct a seismic study to identify ground water contamination. The goal is to maximize the existing groundwater recovery efforts by identifying any pockets of creosote product.

BASF - Huntington

BASF Corporation entered into the Facility Lead Corrective Action Program with a letter of commitment on December 7, 1999. A Workplan was submitted on June 28, 2000, and EPA is currently reviewing that workplan.

EPA Region III will complete its review of the Workplan and give BASF approval to start the investigation.

Bayer Corporation

This facility is one of EPA Region III's high priority RCRA corrective action sites. Extensive progress has been made with the cleanup of the Bayer Corporation Site. This facility is approximately *45* years old and is located on the Ohio River, in New

Martinsville, West Virginia. In 1987, EPA issued a RCRA corrective action permit to the company to proceed with site cleanup. EPA and the facility are working jointly to complete the requirements of the permit which include:

Conducting a RCRA Facility Investigation (RFI) of 30 Solid Waste Management Units to determine the extent and nature of any contamination;
Implement interim measures to stabilize known areas which pose a risk to human health or the environment;
Conduct a groundwater model study to determine if contaminated groundwater is leaving the site;
Conduct a Corrective Measures Study (CMS) to propose the final cleanup actions needed.

A Final RFI report was submitted by Bayer in January 2000. EPA reviewed the Final RFI report and discussed a number of items with Bayer representatives. Based on discussions with EPA, Bayer submitted proposed revisions to the Final RFI report in February 2001. EPA will review the proposed revisions from Bayer.

Cytec Industries, Inc.

The Cytec Willow Island facility, in operation for approximately the past 50 years, is located on the banks of the Ohio River, approximately 15 miles north of Parkersburg, West Virginia. In 1986, EPA issued a Resource Conservation and Recovery Act (RCRA) Permit for Corrective Action (Corrective Action Permit) directing the company to proceed with site cleanup. Since 1986, EPA has issued three modifications to the permit documenting additional cleanup tasks. The requirements of the permit include:

Sampling and investigation at 11 Solid Waste Management Units (SWMUs);
Structural stability study of a surface impoundment's earthen embankment and implementation of corrective measures if warranted;
RCRA Facility Investigation (RFI) if warranted, to provide more in-depth information about the SWMUs; and
Corrective Measures Study (CMS) if warranted, to propose and implement final cleanup actions needed.

Three of the SWMUs, two landfills and a container storage area have been clean closed. The structural stability study of the surface impoundment has been completed and concluded that the embankment is stable and no further action is required. Additionally, a Phase I RFI has been completed for two SWMUs, both landfills, and source stabilization measures at each SWMU has been implemented to minimize and manage the migration of constituents to groundwater.

E. I. duPont de Nemours & Company, Inc. - Belle

In September 1998, EPA issued the Corrective Action portion (i.e., HSWA permit) of RCRA Permit (Permit No. WVD 00-501-2851) to Dupont. The Corrective Action portion of the permit requires DuPont to conduct investigations and determine if corrective measures, of on-site solid waste management units (SWMUs) are necessary.

In the past two years, DuPont addressed the initial requirements of the HSWA permit by submitting a Current Conditions report and Phase 1 RCRA Facility Investigation (RE) Workplan. The Current Conditions report documents current information for the plant's 199 SWMUs and Areas of Concern (AOC) defined by EPA in the April 1991 RCRA Facility Assessment (RFA) report. The Phase I RFI Workplan presented a plan for environmental sampling and analysis of areas, which pose the greatest threat to human and ecological receptors at or near the site.

DuPont began implementing the RET field program in March 2000. Activities included well installation, and soil, sediment, and groundwater sampling and analysis. DuPont will conclude the fieldwork with a final round of groundwater sampling in Spring 2001 and a report will be submitted to EPA in the Fall of 2001.

With submittal of the Phase I RFI report in Fall 2001, DuPont will include recommendations for the Phase II RFI. It is anticipated that DuPont and EPA Region III will reach agreement on the scope of work for the Phase II RFI by early 2002 in time to begin implementation in Spring 2002.

E. I. duPont de Nemours & Company, Inc. - Potomac River Works

In February 1999, EPA issued to the DuPont Potomac River Works the Corrective Action portion (i.e., HSWA permit) of their site RCRA Permit (Permit No. WVD041952714) to conduct investigations and determine if corrective measures of on-site solid waste management units (SWMUs) is necessary.

In June 1999, DuPont addressed the first requirement of the HSWA permit by submitting a draft Release Assessment (RA)/RCRA Facility Investigation RFI Workplan. The RFA/RFI was designed to evaluate soil and groundwater quality beneath/near fourteen SWMUs and Areas of Concern (AOCs) located on facility property.

EPA approved a final RA/RFI Workplan in September 2000. Shortly thereafter, in October 2000, DuPont initiated implementation of the RFA/RFI field program. The RA portion of the investigation focused on sampling shallow soils underneath SWMUs/AOCs to determine if a release had occurred. The RFI portion of the investigation included a detailed evaluation of the site's geology and hydrogeology. Specific items that were characterized included unconsolidated and consolidated geologic units, geologic unit stratigraphy, groundwater occurrence, groundwater quality,

and groundwater flow directions, flow rates and discharge locations. An evaluation of site surface water characteristics was also conducted.

DuPont will conclude the fieldwork portion of the RFA/RFI in spring 2001. Upon conclusion of the field program, DuPont will begin preparation of the RFA/RFI final report. This effort will include Dupont's recommendations for corrective action of SWMU areas determined to pose a significant exposure risk to human health or the environment. In addition, if data gaps were identified, DuPont will include recommendations for further investigation. A schedule for both of these activities will be mutually developed between EPA and DuPont.

E. I. duPont de Nemours & Company, Inc. - Washington Works Facility

In 1989, EPA issued to DuPont Washington Works the Corrective Action portion of their site RCRA Permit to conduct investigations and determine if corrective measures were necessary for on-site solid waste management units (SWMUs).

Under EPA direction, DuPont is currently implementing a RCRA Facility Investigation (RFI). The RFI is a follow-up investigation to the Verification Investigation (VI), which was conducted in 1992 to evaluate whether soil and groundwater quality was impacted by five Solid Waste Management Units (SWMUs) located on facility property. The VI determined that four SWMUs might have released hazardous constituents to soil and/or groundwater. The RFI is designed to expand on the VI work by further investigating soil and groundwater quality beneath the four SWMU locations, and determined if corrective measures are necessary. The RFI final report was submitted to EPA in June 1999 and is currently under review by EPA.

DuPont's RFI Plan for Washington Works includes construction of a sitewide groundwater flow model in order to fully characterize the site groundwater system's flow directions, flow rates, and discharge locations. This holistic approach to groundwater investigation is being conducted because the site currently operates a large system of production wells, which supply water to the manufacturing processes. Previous evaluations of the groundwater system have determined that ongoing production well pumping controls aquifer gradients. The groundwater modeling work will confirm these historical evaluations.

In April 1991, DuPont discovered a groundwater seep containing elevated levels of methylene chloride at the toe of the west end of the Riverbank Landfill SWMU. DuPont soon thereafter installed a French drain type seepage collection system to capture this water and prevent further migration. The water collected in this system is passed through an activated carbon treatment system and then discharged to the Ohio

River via an NPDES permitted outfall. The RFI report is currently being reviewed by EPA.

FMC Corporation

The FMC Corporation has completed the environmental investigation of its Spring Hill Plant located in South Charleston, WV. EPA and the facility entered into a RCRA Section 3013 Administrative Consent Order to conduct a RCRA Facility Investigation (RFI) to:

1. Determine if a release(s) of hazardous wastes and/or hazardous constituents has occurred from the two waste management areas, the flash basin and a former landfill area; and

2. Determine the nature and the extent of the release(s).

The project combined resources of the facility, the WV Department of Environmental Protection Clean Water Act NPDES Program and EPA to complete the environmental investigation of the site. The investigation combines data developed in the NPDES monitoring program with the RCRA results and conclusions from the Phase I and Phase II hydrogeologic and waste characterization investigations conducted at the FMC South Charleston, WV facility. EPA has completed its review of the investigation and determined that the facility has provided adequate characterization of the extent of contaminants, which shows that contaminants are below levels of EPA concern and remedial measures are not required.

On August 30, 2000, presented its Final Determination which concluded that no further corrective action is required at the facility.

G. E. Specialty Chemicals - Morgantown

On June 23, 1990, EPA issued a RCRA Corrective Action Consent Order to GE Specialty Chemicals, Inc. to investigate releases of hazardous constituents from this facility, to complete a corrective measures study, and, if necessary, prepare and implementation interim Measures workplan.

Several phases of investigation have been completed at the facility. Soil borings and monitoring well installations were completed on February 27, 1992. Surface water, seep, and sediment samples from locations at the North Plant and on property adjacent to the Morgantown facility were collected on April 14, 1992. On October 10, 1995, EPA approved plans for field investigation of the facility. GE completed the field activities on December 14, 1995 and submitted a report of all investigations to EPA on September

20, 1996, along with requests to complete a limited investigation of the presence of dichloroethane in groundwater and to remove coal tar contaminated areas.

In August and September, 2000, GE removed two former above ground coal tar tanks, coal tar contaminated debris, and coal tar contaminated soil from one area. The coal tar and the contaminated soil and contaminated debris were managed as hazardous waste at offsite hazardous waste disposal facilities. The Corps of Engineers provided oversight of the removal for EPA.

With respect to hazardous waste permitting requirements related to the GE Specialty Chemicals Facility, on December 19, 2000, the State of West Virginia Department of Environmental Protection Division of Waste Management issued a Hazardous Waste Management Permit for operation of one (1) container storage area and two (2) storage tanks for ten years.

EPA continues to review the facility wide investigation results, analytical results verifying the removal of coal tar, and the proposed limited investigation submitted by GE. The submitted information requires further review to determine whether risk decisions proposed by GE in their submittals are acceptable to the EPA.

General Motors Corporation

Extensive progress has been made with the cleanup of the General Motors Corporation Service Plans Operation (AGMSPO) facility. This facility is approximately 31 -years old and is located in Martinsburg, West Virginia.

In October 1993, EPA issued a RCRA administrative order directing the company to proceed with site cleanup in accordance with the Corrective Measures Alternative selected in EPA's August 3, 1992 RCRA Record of Decision (AROD) for the facility. EPA and the facility are working jointly to meet the remedial endpoints described in the order, which include:

Reduction of naphthalene in the bedrock aquifer to the protective level of 0.400 parts per million (ppm).

Removal of paint thinner that exists as free product in the clay soil and shallow bedrock near the source of the leak.

Releases from an above ground tank containing paint thinner had contaminated the soil and groundwater at the facility. To remediate the soil and groundwater, GMSPO has installed a remedial system consisting of a groundwater dewatering system with soil vapor extraction (SVE). The groundwater dewatering and treatment system was designed to lower and control the localized water table to enhance both

dissolved and separate phase constituent removal, while enhancing the SVE system recovery of paint thinner. The remedial system has been in operation since July 1997.

GE Plastics, Inc.

In 1992, EPA issued a RCRA corrective action permit to the company to proceed with site cleanup. EPA and the facility are working jointly to complete the requirements of the permits that include:

Conduct a Verification Investigation (VI) and RCRA Facility Investigation (RFI) of Twenty-three Solid Waste Management Units (SWMUs) and five Areas of Concern (AOCs) to determine if they warrant any cleanup action;

Develop and implement interim measures at 7 Solid Waste Management Units and 2 Areas of concern where warranted;

Conduct an air investigation model to determine if air emissions are at an acceptable health-based level; and

Corrective Measures Study (CMS) to propose the final cleanup actions needed.

The facility has initiated or completed interim measures at 13 SWMUS or AOCS. These interim measures include; upgrades or replacement at eight units, soil waste removal at three units and slope stabilization at two units. Six of the thirteen interim measures have been completed with the remaining seven continuing. The remaining interim measures are still under investigation and will be addressed in the near future. The facility has also submitted its REX that covers all remaining units. This report is currently under EPA review.

Great Lakes Chemicals (formally FMC Corporation)

This facility is over 60 years old and is located on the banks of the Kanawha River, within ten miles of Charleston, WV. EPA has reviewed the Corrective Action Stabilization Questionnaire and the Preliminary Review, 6/30/93, which identified over twenty-five Solid Waste Management Units (SWMUs) at the site. For one of these SWMUs, the WV Department of Environmental Protection (WVDEP) and EPA combined resources in determining closure of the RCRA permitted container storage area at the Nitro, WV facility. Under the WV state order, the facility developed environmental investigation activities and determined the extent of contamination at the unit and in related soils at the site. FMC submitted its November 1998 report, Additional Sampling and Analyses for the Former Hazardous Waste Container Storage Area, of the FMC Nitro, WV plant. EPA completed its review and recommended to WVDEP acceptance of the November 1988 report for closure on the SWMU in accordance with

RCRA. In January 1999, the state accepted the report as evidence of clean closure and terminated its closure order. In June 1999, the state released the facility from the financial responsibility requirements of 40 CFR 264.115(e) 10(u) for closure of the RCRA storage area. The remaining SWMUs require additional environmental investigation to determine the extent of control of human exposures to contaminants and releases to groundwater. EPA and the State will pursue characterization and remediation of the remaining SWMUs.

In January 2001, EPA forwarded to the facility a corrective action administrative order under RCRA to complete the environmental investigation of the entire facility. EPA will pursue remediation of any releases of contaminants as appropriate.

Kaiser Aluminum & Chemical Corporation - Spent Potliner Pile

The Spent Potliner (SPL) Pile is a 2.7-acre, encapsulated deposit of aluminum-smelting wastes located southwest of Ravenswood, West Virginia. The site is surrounded by an active aluminum smelting facility (Century Aluminum).

An Administrative Order on Consent requiring investigation of the site was signed by EPA and the owner on April 3, 1995. In compliance with the order, the following activities have been completed:

A RCRA Facility Investigation (RFI) was performed to evaluate the impact of the site on surrounding soils and groundwater. The RFI was completed on March 10, 1997.

A Part I Corrective Measures Study (CMS) was completed on January 22, 1998, and identified the need for testing of the facility cover.

A Part II CMS involved field and laboratory testing of the cover material. The draft CMS Report was submitted to EPA on May 28, 1998.

The draft CMS Report concluded that the most effective option for elimination of risk due to the facility was leaving the material in its present location, performing initial repairs to the seams in the cover, and then continuing to maintain the cover, replacing as necessary.

The draft CMS Report is currently under EPA review. Following EPA comment on the draft report, a final document will be prepared and submitted to EPA within 45 days. The actions identified in the final report will then be implemented.

Koppers Industries - Follansbee

The facility is currently owned and operated by Koppers Industries. In October 1990, EPA issued a 3008(h) Consent Order to Beazer East, former owner of the facility,

to conduct a site clean-up investigation. Beazer East is operating two interim programs to control contaminated groundwater migration:

(1) The first program, installed in 1983 by a previous owner, involves the operation of five groundwater recovery wells to provide hydraulic containment for portions of the shallow perched zone aquifer. The recovered groundwater is processed in an on-site wastewater treatment plant before discharge under a permit to the Ohio River. The effect of this program has been to control seepage to the neighboring Wheeling-Pittsburgh Steel Corporation coal pits, as well as to control releases to the Ohio River banks. Beazer East recently performed upgrades to optimize the performance of this recovery system. EPA has requested Beazer East to provide a demonstration of the effectiveness of this system. Beazer East is presently completing additional field investigations to fulfill this objective.

(2) The second program, known as an interim Dense Non-Aqueous Phase Liquid (DNAPL) removal program, was initiated in April 1999 to collect coal tar product from the bedrock with one recovery well. A coal-tar DNALPL pool, up to 7 feet thick, was detected in several bedrock wells. The DNAPL removal system has been running continuously since April 1999. As of December 2000, over 12,000 gallons DNAPL have been recovered at a rate of about 48 gallons per day, declining to about 36 gallons to date.

The site has been the subject of environmental investigation since the early 1980s. Pursuant to the 1990 Consent Order, Beazer East is required to complete a RCRA Facility Investigation RFI and a Corrective Measures Study (CMS). The objective of the RFI was to develop a technically sound Site Conceptual Model and to complete a risk assessment. This information will be used to identify necessary corrective actions for which applicable remedial technologies will be evaluated in the CMS.

Koppers Industries - Colliers

This facility is one of EPA Region III high priority RCRA corrective action sites. EPA has determined that both the Human Exposure and Groundwater Environmental Indicators have been met.

On March 22, 2000, EPA determined that both the Human Exposures and Groundwater Environmental Indicators have been met. EPA is currently evaluating the information to determine if all of the corrective action requirements have been met.

Koppers Industries - Green Springs

In January 2001, Koppers Industries, Inc. (Koppers) conducted soil and groundwater investigation. The objectives of this investigation were to evaluate the extent of ground water contamination in the area where an oil sheen on the North Branch of the Potomac River was observed and to gather additional data to confirm the preliminary environmental indicator determinations.

Occidental Chemical Company

In September 1992, OxyChem and EPA entered into a Administrative Order on Consent to conduct a RCRA Facility Investigation and Corrective Measures Study at the Facility. Under EPA direction, OxyChem is currently implementing a RCRA Facility Investigation RFI. The RFI is being implemented in two phases: the purpose of Phase I, which was completed in July 1998, was to evaluate whether soil and groundwater quality was impacted by the solid waste management units located on facility property. Phase I field work included extensive surface, subsurface soil and groundwater sampling, aquifer testing, geophysical studies and collection of sediment and surface water samples. The results of Phase I work indicated that there are three major source areas. The Phase II RFI was designed to expand on the Phase I RFI work by further investigating soil and groundwater quality associated with these sources. In addition, Phase II evaluated the potential ecological impact from releases at the site, and included other data collection activities, such as additional surface soil analysis, necessary for the completion of the RFI. Phase II work was initiated in the Spring of 1999 and completed by the summer of 2000. EPA and OxyChem are currently working out issues relating to the approach for the human health risk assessment. EPA is also reviewing the results from the Phase II ecological assessment.

PPG Industries

Extensive progress has been made with the cleanup of the PPG Industries. This facility is approximately 56 years old and is located on the Ohio River, in New Martinsville, West Virginia. In 1989, EPA issued a RCRA corrective action permit to the company to proceed with site cleanup. EPA and the facility are working jointly to complete the requirements of the permit which include:

Conducting an RCRA Facility Investigation (RFI) of 46 Solid Waste Management Units and 21 Areas of Concern to determine the extent and nature of any contamination; Implementing Interim Measures that included; removal of contaminated soil at four SWMUS capping one SWMU, implementing institutional controls at four SWMUS, and removing tanks at five SWMUS.
Conduct a groundwater investigation, including constructing a groundwater model;
Conduct a Corrective Measures Study.

The final RFI report was submitted by PPG in July 1998 for EPA. EPA reviewed and approved the final RFI with revisions. A groundwater monitoring program has been approved and is presently in place.

Pechiney (formerly Century Aluminum of West Virginia, Inc.)

EPA and the facilities are working jointly to complete the requirements of the order, which include:

Interim Measures (short-term actions) to remove free-product oil from the water table in one area of the site; RCRA Facility Investigation (RFI) to provide more in-depth information about other areas of the site (a total of 18 areas were investigated);
Continued operation of the existing groundwater migration control system; and
Corrective Measures Study (CMS) to propose final cleanup actions, if needed.

Extensive progress has been made with the investigation and interim measures activities of the CAWV site. The groundwater migration control system has been in operation since 1976. The interim measure for free-product oil removal has been in operation since September 1995. The RCRA Facility Investigation, which was implemented in two phases in 1995 and 1997, has involved collecting more than 300 soil samples from 103 borings and collecting more than 40 groundwater samples from 24 monitoring wells. The RFI report was submitted to USEPA in December 1999 and is being reviewed by USEPA Region III.

Quaker State - Newell

In December 1993, EPA issued Quaker State(QS) a Unilateral Order. The purpose of this Order is to require QS 1) to perform Interim Measures (IM) to prevent or mitigate threats to human health or the environment, 2) to perform a RCRA Facility Investigation (RFI) to determine the full nature and extent of any releases of hazardous waste and/or hazardous constituents at or from the facility; and 3) to perform a Corrective Measures Study (CMS) to identify and evaluate alternatives for corrective action necessary to prevent or mitigate migration or releases of hazardous wastes and/or hazardous constituents at or from the facility.

QS has completed the Phase 1 RFI and submitted an RFI report. EPA is currently reviewing the RFI report to determine if the company has fully determined the nature and extent of contamination.

Based on EPA's review of the RET report it will be determined if further action is needed under the RFI or to proceed to the CMS portion of the project.

SMR Technologies

This facility is one of EPA Region III's high priority RCRA corrective action sites. EPA and West Virginia's Department of Environmental Protection (WVDEP) attended a site visit to evaluate the status of the facility and to complete the Environmental Indicator (EI) determinations discussed below under the section entitled Environmental Cleanup Indicators.

The facility was previously owned by B.F. Goodrich and was sold to SMR Technologies, Inc. in 1988. At that time, SMR determined that 90-day storage of their hazardous wastes was acceptable and applied to WVDEP to close the Hazardous Waste storage facility. The area was a covered, curbed storage pad used for the accumulation of waste solvents from the rubber products fabrications operations. WVDEP approved the closure activities, which included sampling the soils surrounding the pad to ensure no contaminants were present from potential past releases in the area. This area is currently used as less than 90-day storage for wastes generated at the facility and are disposed of off-site.

Solutia Incorporated

Extensive progress has been made with the cleanup of the Solutia Incorporated Industries. This facility is approximately 82 years old and is located on the Kanawha River, in Nina, West Virginia. In November, 1990, EPA issued a RCRA corrective action permit to the company to proceed with site cleanup. EPA and the facility are working jointly to complete the requirements of the permits that include:

Conducting a RCRA Facility Investigation (RFI) to investigate possible contamination at fourteen Solid Waste Management Units (SWMUs); Implement Interim Measures/Stabilizations where contamination threatens human health or the environment including recovery of kerosene and trichloroethylene from groundwater and the replacement of sanitary sewer lines; Conduct a Corrective Measures Study (CMS) for those areas that require further corrective action.

The facility has submitted a groundwater pump and treat effectiveness report which presents the results of the ongoing pump and treat operation and is preparing a corrective measures study to address the remaining contamination. The facility is also continuing to replace the sewer system as an interim measure.

St. Mary's Refining Company

In April of 1997, Saint Mary's Refining Company (SMRC) entered into an administrative RCRA 7003 Consent Order with EPA. Under the terms of an agreement with SMRC, Pennzoil Quaker State retains responsibility for remedial work under the 7003 order. Fifteen Solid Waste Management Units (SWMUs) and five Areas of

Concern (AOC) have been identified at the site. As part of the 7003 order, interim measures have been implemented. The interim measures consist of recovery of free phase hydrocarbons in groundwater, installation of a soil vapor extraction unit, installation of offsite wells to define the benzene plume in groundwater, integrity testing of various above ground storage tanks and quarterly monitoring well sampling. Saint Mary's also conducted a wells survey to determine existence and usage of private wells within the perimeter of the facility. The door-to-door survey of houses/basements conducted in August 1997 did not reveal evidence of impact by the refinery, nor any private wells in use in the immediate vicinity of the refinery.

Saint Mary's submitted a RCRA Facility Investigation (RFI) workplan to EPA in September 1997. The purpose of the RFI is to determine the extend of soil and groundwater contamination. EPA approved a plan to determined the extend of the offsite plume in August 1999. Saint Marys installed two additional off site wells in summer 1999. Saint Marys, Pennzoil Quaker State proposed to EPA to amend the original RFI workplan to include all sampling activities at this stage and not two phases as originally proposed. The RFI addendum was submitted in September 1999. Comments on the revised workplan were submitted to Saint Mary's in December 1999. RFI workplan was approved in July 2000. Implementation of the workplan began in September 2000.

Saint Marys will provide to EPA preliminary soil information to support any modifications necessary to the groundwater monitoring well installation program. Final RFI report will be submitted to EPA in summer of 2001. In addition, groundwater monitoring results from existing wells are submitted quarterly to EPA for review.

Union Carbide Corporation - South Charleston Plant

Union Carbide Corporation (UCC) entered into a Facility Lead agreement with EPA on October 26,1999 for conducting corrective action at their South Charleston Plant. UCC has evaluated, addressed and provided documentation to EPA for areas that were known to have a potential for off-site impacts. In addition, UCC has prioritized potential on-going sources of contamination (e.g., process sewers) and has begun their evaluation of those high priority areas.

UCC will submit a report outlining the results of the high priority' sewer evaluation in May 2001. A summary of Solid Waste Management Units (SWMUs) at the South Charleston Plant was compiled in June 2001. After potential on-going sources have been evaluated, a RFI workplan for investigating soil and groundwater conditions at the site will be prepared.

Union Carbide Corporation - PTO

Union Carbide Corporation (UCC) entered into a Facility Lead agreement with EPA on October 26, 1999 for conducting corrective action at the PTO facility. A groundwater and free-phase recovery system is currently in operation at the facility. This system is described in the Interim Measures Report submitted to EPA on August 1,2000. The main areas of concern at PTO are two former clay-lined basins that are addressed by the recovery well system, and the former drum disposal areas. A RCRA Facility Investigation (RFI) Workplan was approved by EPA on January 17, 2001. The facility will be conducting an investigation to determine if additional activities are needed to meet the Environmental Indicators (EI) and to meet the long-term environmental goals.

During the RFI process, Interim Measures will be implemented at any areas which data indicates a potential risk to human health and the environment. At the completion of the RFI, November 2001, UCC will focus on assuring compliance with the EI's.

Union Carbide Corporation - Tech Center

Union Carbide Corporation (UCC) entered into a Facility Lead agreement with EPA on October 26, 1999 for conducting corrective action at the Technical Center. UCC has reviewed existing data on the site's Solid Waste Management Units (SWMUs) and has prioritized them based on potential risk. A RCRA Facility Investigation (RFI) Workplan for the high priority SWMUs was approved by EPA in September 2000. Implementation of the RH began in December 2000. The SWMUs will be investigated to determine if additional activities are needed to meet the Environmental Indicators (EI) and to meet the long-term environmental goals.

During the RFI process, Interim Measures will be implemented at any areas which data indicates a potential risk to human health and the environment. At the completion of the RFI (May2001), a risk assessment will be conducted and a RFI Report submitted to EPA. UCC will then implement corrective measures necessary to meet the Els. After the high priority SWMUs have been adequately addressed and the Els met, the low priority SWMUs will be investigated.

Weirton Steel Corporation

This steel facility has been in operation since 1909, and covers approximately 1350 acres along the banks of the Ohio River. The facility is situated immediately adjacent to residential and commercial portions of the town of Weirton, West Virginia.

In September 1996, EPA issued a RCRA administrative order directing the company to proceed with site investigation and cleanup activities. EPA and the facility are working jointly to complete the requirements of the order, which include:

Conduct a RCRA Facility Investigation (RFI) of all spills and releases of hazardous waste or hazardous constituents to provide more in-depth information, and to evaluate remedial technologies that may be effective for cleaning up contaminated areas at the facility. Complete Interim Measures (short-term actions) to address contaminated soils, sediments, surface or groundwater that may have been impacted by a release of hazardous waste or hazardous constituents; Complete a Corrective Measures Study (CMS) to propose final cleanup actions needed for the facility.

Seven interim measures (stained soil excavation, demolition and clean-up of old coking operations) were completed in various areas of the facility between 1997 and 2000 to address soils that were impacted by oil and/or chemical releases and the demolition and clean up of an old coke plant. In August 2000, the facility submitted an interim measures workplan proposing excavation of oil-stained soils and installation of secondary containment for the Oil House portion of the facility. The majority of this work was completed in late 2000, and EPA anticipates that the remaining tasks will be finished in spring 2001. Additional interim measures have been identified in the RFI workplan for specific portions of the facility where releases occurred, or stabilization activities can be taken to prevent future releases.

EPA issued approval of the RFI Workplan in July 1999, and the fieldwork for two areas of the site was completed between 1999 and 2000. Due to the size and complexity of the facility, the RFI will be implemented in a phased manner. The facility has been divided into twelve corrective action areas based on similarity of chemicals used and type of manufacturing operations. The first two CAA's to be addressed are the highest priority from an environmental perspective and are located adjacent to receiving surface water bodies (Ohio River and Harmon Creek). Investigation activities will be completed in these areas first, and based on the findings and EPA’s review, the facility may proceed with additional interim measures to stabilize the areas, corrective measures studies and/or implementation, or no further action as appropriate.

A Draft RFI Report for CAA I (C & E Outfall Area) was submitted to EPA in March 2000, and the Agency provided recommendations for additional data collection activities to the facility in February 2001. A Draft RFI Report for CAA U (Mainland Coke Plant Area) was submitted to EPA in February 2001, and is currently under review.

Wheeling Pittsburgh Steel Corporation - Follansbee Plant

In June 2, 1998 EPA issued a Unilateral Order to WPSC consistent with Section 3008(h) of Resource Conservation and Recovery Act (RCRA) to 1) perform Interim Measures at the Facility to prevent or mitigate threats to human health or the environment; 2) perform a RCRA Facility Investigation (RFI) to determine fully the nature and extent of any release of hazardous waste and/or hazardous constituents at

or from the facility; and 3) perform a Corrective Measures Study (CMS) to identify and evaluate alternatives for corrective action necessary to prevent or mitigate migration or releases of hazardous wastes and/or hazardous constituents at or from the facility.

WPSC has initiated Interim Measures in two areas 1) the Coal Tar Pipeline Release area and 2) the Byproducts area. These actions were taken to prevent or mitigate threats to human health and the environment.

Most recently, WPSC has submitted the RFI report.

The next step for this site is the review of the RFI report.

Groundwater Data Collection and Management

Most groundwater data is collected by facilities or environmental firms on the facilities' behalf. Occasionally samples are collected by Waste Management personnel for the purpose of comparison. Regardless of who is collecting groundwater samples, sampling methodology and analytical testing procedures must comply with the protocols prescribed by the appendices to 40 CFR 261. All samples must be analyzed by laboratories certified by the Division of Water Resources.

The Hazardous Waste Permitting Unit does not have a database for the management of groundwater data. Currently facility groundwater data is submitted in paper form and reviewed by Hazardous Waste personnel assigned to the facility. In the future groundwater data will be submitted electronically and managed in EQuIS. EQuIS will allow data to be stored, managed and shared among the divisions of DEP and other agencies with groundwater certification. Some access will be available to the public as well. In addition to data screening and management, EQuIS links to a wide variety of other scientific software such as GIS. During the reporting period, Hazardous Waste has acquired groundwater modeling software and a GPS unit and associated software. Hazardous Waste needs GIS software such as ArcView.

The Division of Waste Management as a whole needs more GPS units and the necessary training to obtain accurate locational data.

Program Consideration and Needs

There are difficulties inherent with trying to clean areas to pristine levels where industry has been associated with business activities for decades. There are economic and technical obstacles that need to be considered in areas that will probably never be utilized for drinking water. However, that must be balanced with the ideal that our groundwater is a valuable resource not to be taken for granted. There are many who

have a stake in the decisions on how best to manage the environment. In the future, policy and decision-making must be addressed by Administration in a manner that each operating unit is clear as to the direction and in the manner these issues are to be decided.

As with any bureaucracy, there is a problem with communications between Divisions concerning their operational decisions and requirements. EQuIS and ERIS will help to a large extent, provide a universal data system and common terminology. From there, communications between Divisions need to be increased on a regular basis.

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Waste Management

2. Underground Storage Tank (UST) Unit

The Underground Storage Tank Unit (UST) of the Division of Waste Management's Compliance Assurance and Emergency Response 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 which are included in the federal UST law and maintains a database with a total of 22,105 registered USTs, 15,560 of which have been permanently closed. The remaining 6,545 are either active or temporarily out of service. The UST Inspectors perform UST installation, closure, and compliance monitoring inspections.

The UST Unit also administers the UST worker certification program to certify those whom install, repair, retrofit, upgrade, tightness test, permanently close UST systems or whom install, repair, or test UST cathodic protection systems. In addition the unit oversees the claims processing for the UST Insurance Trust Fund.

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 control, and spill prevention. Priority for inspections is given to facilities with bare steel tanks and/or piping and those located in the Well Head Protection Areas as designated by the Department of Health and Human Resources. Double-walled UST systems would be advisable in sensitive groundwater areas such as the Well Head Protection Areas. However, the USTA does not allow state regulations to be more stringent than the federal regulations which do not require double-walled systems.

Staffing

The creation of the Office of Environmental Remediation reduced the inspection force from a high of thirteen inspectors to seven and saw a reduction in office staff from six to two. The UST Unit currently has one vacant office position. The unit's lack of revenue resources does not allow filling this position.

Public Outreach

The USTA created a UST Advisory Committee consisting of petroleum industry representatives, the insurance commissioner, the DEP secretary, and a citizen at large. This committee meets monthly to discuss UST related issues.

An A*O & M Manual for West Virginia UST Owners and Operators* has been developed and distributed to the regulated community. The UST Unit has in the past held owner/operator 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, *ALUST in A Small Town@* and A*Tank Time@*, were mailed to all of the public libraries in West Virginia.

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Waste Management

3. Site Investigation and Response Section (SIR) Site Remediation Program

The Site Remediation Program (SRP) is required to address any groundwater contamination at a Comprehensive Environmental Response and Compensation Liability Act (CERCLA) (Superfund) site, even if the final recommendation is "no further action".

Some quantitative data is collected and kept on file for the individual sites. Generally, this data is of limited geographic coverage and usually addresses the local contaminant plumes. This data is not maintained in an electronic format, but as hard copies in files. This limits its availability to other agencies. A centralized data management system for all groundwater data is needed to improve the accessibility of information.

The Site Remediation Program also recommends that regulations be developed to address non-National Priority List sites. Currently there are no provisions in the Site Remediation Program or the Site Investigation and Response Section requiring remediation for a site which is not listed on the National Priority List (NPL).

Site Descriptions

Allegany Ballistics Laboratory (ABL)

ABL is a government-owned (Navy), contractor-operated (Alliant Missile Production Company [AMPC]) research, development, and production facility located in Mineral County, West Virginia. The facility consists of two plants. Plant 1, occupying approximately 1,577 acres, is owned by the Navy and operated by AMPC. Approximately 400 acres of Plant 1 are in the floodplain of the North Branch Potomac River, with the remaining acreage on forested mountainous land. Plant 1 was added to the National Priority List (NPL) in May 1994. The selected remedial actions at Plant 1 include site-wide groundwater extraction and treatment with future targeting of presumed dense non-aqueous phase liquid (DNAPL) zones. Contaminated surface and subsurface soils at Site 1 are still under investigation. The Site 5 inert landfill operated from the early 1960s to 1985, accepting wastes generated by ABL not contaminated with explosives nor generated at an area on the facility where explosives were managed. The remedial action selected for the soil at Site 5 has been implemented and contaminated groundwater, surface water, and sediment is still under investigation. Site 10 is situated in the south central portion of Plant 1 and has Volatile Organic Compounds (VOC) contamination. An interim remedial action has been implemented to control the migration of the groundwater contamination plume. Site 11 is situated in the

Western portion of Plant 1 and an interim remedial action has been implemented to address ground water contaminated with 1,2-dichlorobenzene, 1,4-dichlorobenzene, N-nitrosodiphenylarnine, tetrachloroethene (PCE), and manganese, while the contaminated groundwater at Site 11 is still under investigation.

Allied Signal / Hanlin / Olin

The Allied Signal / Hanlin / Olin site is located approximately three miles south of Moundsville, Marshall County, and is situated on an alluvial deposit formed from a meander of the Ohio River. The nature and extent of residual soil and groundwater contamination associated with the former chemical manufacturing, storage, and disposal activities at the site is currently being evaluated using the Engineering Evaluation / Cost Analysis (EE/CA) process. Previous investigations and preliminary analytical data include widespread soil and groundwater contamination at elevated concentration levels. Potential contaminants of concern include chloromethane compounds, mercury, and other volatile and semi-volatile organic compounds (VOCs and SVOCs). The contaminants of concern potentially threaten the Washington School Lands Public Water Supply south of the site as well as the Ohio River. The site was listed on the National Priority List (NPL) on 07/22/99.

Big John Salvage

Big John Salvage operated from 1976 to 1986 as a salvage operation; between 1925 to 1976 the facility was a coal tar refinery. The 20-acre site, now on the National Priority List, is located in Fairmont, Marion County. Time critical removal action is currently under way to prevent the migration on contamination to Sharon Steel Run and the Monongahela River. Contaminates of potential concern are Polyaromatic Hydrocarbons (PAHs), mercury, lead, benzene, toluene, xylene, napthalene, and phenol. Impacts to groundwater are known but not defined. An investigation is planned.

Fairmont Coke Works (Sharon Steel)

Fairmont Coke Works, a 107-acre facility which began operation in 1918 and ceased operation in 1986, is located in Fairmont, Marion County. The facility was placed on the National Priority List in 1998. Site restoration activities are progressing under the Project XL initiative (expedited cleanup). To date an expanded site investigation, engineering evaluation/cost analysis, removal of the formed oxidation impoundment/sludge impoundment, and a passive surface water treatment system have been completed. Corrective actions are planned for the industrial area in 2002. Impacted surface water discharges from Fairmont Coke Works have been eliminated or reduced with the actions that have been implemented.

Fike-Artel Superfund Site

The Fike-Artel Superfund site is located in Nitro, Kanawha/Putnam counties. The site was formerly used for the manufacture, processing, and storage and disposal of chemical products. The site consists of a Main Plant area (approximately 11 acres) and a Cooperative Sewage Treatment system area (approximately 1.5 acres). Residual soil and groundwater contamination associated with previous site activities was investigated under Operable Unit 4 (OU-4) as part of the Remedial Investigation / Feasibility Study (RI/FS) process. Potential contaminants of concern include VOC and Semi-Volatile Organic Compounds (SVOC) chemical waste constituents and dioxin. The Record of Decision (ROD), which describes the selected remedial actions for soils, groundwater, and World War I era sewers (OU-4) is anticipated to be issued by EPA by 10/01/01.

Morgantown Ordnance Works (MOW)

The Morgantown Ordnance Works Operable Unit 1 (OU-1) site (approximately 16 acres) is located in Morgantown, Monongalia County. The OU-1 site was formerly used for the disposal of polynuclear aromatic hydrocarbons (PAHs) containing waste materials, other chemical wastes, and construction and demolition debris. Remedial activities including the excavation, remediation, and disposal of PAH contaminated materials commenced September 2001.

Pantasote (West Virginia Ordnance Works Operable Unit – 13)

Trichloroethene (TCE) contamination in the Pt. Pleasant public water supply was traced to the abandoned Pantasote Chemical Plant on the WVOW NPL site. Further characterization of the chlorinated solvent plume is being conducted by GenCorp, which is a responsible party at the site. Field investigations began in September 2000. The chlorinated solvent plume originates from unlined ponds, lagoons, wastewater sewer lines and ditches formerly utilized on the Pantasote property.

Ravenswood Well Field Site

The Ravenswood, Jackson County Public water supply has been contaminated by tetrachloroethylene (PCE). An air stripper has been placed on the wells to assure the provision of clean water to the public. Although the source has not been definitely determined, the contaminated plume has been delineated. Additional monitoring wells are to be installed to assess changing conditions in the plume until further remedial action is undertaken, if necessary.

Vienna Tetrachloroethene (PCE)

The site is located in Vienna, Wood County. The public water supply has been contaminated by tetrachloroethene (PCE) from a dry cleaning establishment. Replacement wells were drilled to replace those contaminated near the site. A pilot program to install a vacuum vaporizer well system will be going out to bid. The system will be used to extract groundwater from both the saturated and nonsaturated zones and to remove PCE by carbon filters following air sparging. If successful, a full scale system will be put on line. The site was listed on the National Priority List (NPL) on 10/22/99.

West Virginia Ordnance Works (WVOW)

The former WVOW is located approximately 6 miles north of Pt. Pleasant, Mason County, on the east bank of the Ohio River. The facility was established in 1942 by the Department of the Army a contractor-operated plant for the manufacture of trinitrotoluene (TNT) using toluene, nitric and sulfuric acid, and was operated from October 1942 through August 1945. The facility was constructed on approximately 5,800 acres with 2,000 acres used as a safety zone. The production of TNT resulted in identified soil contamination from nitroaromatic compounds in the manufacturing areas, process facilities, and waste water disposal facilities. A pump and treat system for nitroaromatic groundwater contamination has been operating continuously since September 2000 at the former waste water disposal areas. Thirty-five acres of wetland mitigation have been undertaken at the site and is nearly complete. The groundwater plume under the TNT Manufacturing Area is currently under investigation and remedial alternatives are being evaluated. Several industrial areas of the site that meet federal and state cleanup standards have been closed out and are being proposed for partial de-listing from the NPL in the near future.

Site Assessment

The Site Assessment program is performing environmental assessments at several potential hazardous waste sites. Priority is being given to National Priority List (NPL) caliber sites and/or those sites which present an imminent danger to human health or the environment. Samples of groundwater are being taken at some sites where pathways or receptors are present or where the nature of the groundwater is unknown.

These sites include the following:

Site Name	City - County
Standard Ultramarine	Huntington - Cabell
Edna-PCB Transformer	Edna - Monongalia
Parkersburg Industrial Park / Shorty Graham Landfill	Parkersburg - Wood
Parkersburg Industrial Park	Parkersburg - Wood

Figgie International, Inc.	Ranson - Jefferson
Sterling Faucet	Reedsville - Preston
Old Standard Quarry	Charles Town - Jefferson
Alfab, Inc.	Smithville - Ritchie
Pennzoil Elk Refinery	Clendenin - Kanawha
Appalachian Timber Services	Sutton - Braxton
Otsego Capacitor	Otsego - Wyoming
Halltown Paperboard	Halltown - Jefferson
Elkem Metals	Alloy - Fayette
Montgomery Iron & Scrap	Hugheston - Kanawha
Nitro Sanitation	Nitro - Kanawha
DWR Research Chemical	Pennsboro - Ritchie
Union Carbide DNT	Institute - Kanawha
Sophia Battery Dump	Sophia - Raleigh
Roseland Wood / Acme Wood	Princeton - Mercer

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division of Waste Management

4. Solid Waste Management Section (SWMS)

The Solid Waste Management Section (SWMS) has as its primary mission the regulation, permit review and permit issuance for all types of solid waste facilities including, but not limited to sanitary landfills, solid waste transfer stations, construction and demolition landfills, asbestos landfills and tire monofills as required per the Solid Waste Management Act and Solid Waste Management Rule. The requirements of the Federal RCRA Subtitle D program serve as the fundamental guidance for the SWMS program, which may result in differences in individual requirements when compared with other state programs.

The groundwater protection goal of highest priority for the SWMS is the earliest possible detection, assessment and mitigation of negative impacts to groundwater potentially caused by operation or closure of solid waste facilities. This goal is achieved through compliance with Federal and State Solid Waste Management Rules requiring comprehensive groundwater monitoring throughout the active life and a 30 year post-closure period for all municipal solid waste landfills in the state.

At the present time there are nineteen active municipal solid waste landfills, several construction and demolition landfills and three commercial tire monofills permitted to operate by the SWMS in West Virginia. As a result of new RCRA Subtitle D regulations implemented in the early 1990's, requiring composite liners, comprehensive groundwater monitoring and other groundwater protection measures, approximately 30 municipal solid waste landfills were closed during the past few years.

At the present time, none of the nineteen municipal solid waste landfills, construction demolition landfills or waste tire monofills are imposing any negative impacts to the State's groundwater which would require treatment or remediation under the Federal or State Solid Waste Management Rule. This is achieved as a result of the groundwater protection design criteria for each of these facilities specified in the rules as well as through the monitoring and inspection of these facilities provided by the WVDEP's Enforcement personnel.

SWMS has created the following goals, which will serve to intensify the level of groundwater protection associated with the activities involved with the operation of the state's solid waste facilities.

- Require and receive completed Groundwater Protection Plans from all active municipal solid waste landfills

- ❖ Load baseline data and past two years of groundwater monitoring data in EQuIS (Environmental Quality Information System) database for all open and closed solid waste landfills

- ❖ To continue to work in conjunction with the Division of Waste Management, Environmental Restoration Section's Landfill Closure Assistance Program (LCAP) to insure that proper and adequate groundwater protection standards are met during each of LCAP's landfill closure projects.

- ❖ Insure that all closed landfills meet their regulatory groundwater monitoring obligations.

I. Groundwater Protection Goals and Priorities

The groundwater program goals of the SWMS are to ensure that all Solid Waste Facilities meet their regulatory responsibilities regarding groundwater monitoring and protection described in the applicable sections of the Solid Waste Management Rule (33 CSR 1), which specifies the requirements for sampling and analyzing groundwater as well as for management of the data and remediation of impacts if necessary.

Over the next two years the SWMS goals include loading all necessary baseline data and transferring recent historic groundwater monitoring data (data less than 2 years old) into the EQuIS database for all open and closed solid waste landfills. Given the large number of facilities involved (55 open and closed landfills), this process will probably require at least a year to complete. A second goal will be to require submittal of Groundwater Protection Plans (GPPs) from all active landfills currently operating. Since only one active landfill now has a GPP on file with the SWMS, this will require the submittal of GPPs from 19 other active facilities.

Potential sources of contamination are addressed by the SWMS in the following ways.

(1) Every entity wishing to operate a solid waste facility in West Virginia must submit a Solid Waste Facility Permit Application for review to the SWMS. This permit application is required to provide an assessment of the groundwater aquifers beneath the proposed facility before any waste is placed in the new landfill.

(2) The permit Application is also required to provide design descriptions of various structures (liners, leachate collection zones, leachate detection zones, run-off diversion ditches, etc.) which will directly address potential sources of groundwater contamination at each solid waste facility.

The SWMS regulates 55 Solid Waste Landfill Facilities in West Virginia (25 closed landfills and 20 currently operating landfills). As previously mentioned, only one facility has an approved Groundwater Protection Plan on file with the SWMS.

The Part I Permit Application is used as a mechanism for the protection of public and private water supplies as well as other waters of the State. As part of the requirements of the Part I, all water supply wells, springs, natural wetlands and any other water bodies within 1500 feet of the site boundary must be delineated on a large scale map. The Solid Waste Management Rule requires the Part I Application to address any adverse impacts which may occur to any such water resources within 1500 feet of the proposed solid waste landfill.

The Solid Waste Management Section's high priority on groundwater protection activities is reinforced through its requirements under its Solid Waste Management Rule. These requirements include: Facility Annual Reports, Minor and Major Permit Applications, Groundwater Monitoring Reports and Monitoring Well Installation Reports. The Solid Waste Management Section with assistance from WVDEP's Environmental Enforcement insures full compliance from each permitted facility for all groundwater requirements. Specific protection mechanisms (protecting groundwater as well as surface water) are mandated through NPDES as well as Solid Waste Facility Permit Application. These mechanisms include but are not limited to the following: semi-annual groundwater monitoring, leachate monitoring, leachate collection and treatment, composite liner design, storm water diversion and other design features.

Presently, the past problem concerning the failure of the closed solid waste facilities to submit semi annual groundwater monitoring results is being addressed by the SWMS's LCAP program. They are at this time proposing to undertake the financial burden of the groundwater monitoring for all closed facilities in West Virginia. Submittal problems, QA/QC problems and sampling problems could then be closely controlled. If successful, this action would solve the greatest groundwater monitoring problem the SWMS encounters.

Also at this time (as previously alluded to in this document), the historic SWMS groudwater data storage problem is being solved by the implementation and installation of the Environmental Quality Information System (EquIS). This electronic data storage and retrieval system will provide a final solution to the SWMS's soil and groundwater data storage and management needs.

II. Groundwater Protection Projects

The Solid Waste Management Section regulates 55 solid waste facilities in West Virginia. Presently, 22 of these facilities are open, with 3 of these facilities temporarily closed. Closed facilities comprise the majority of the landfill facilities (33 of the 55 total)

that the SWMS regulates. A list of monitoring wells installed in the upper-most significant aquifer beneath each open solid waste landfill is included at the end of this section. A list of closed facilities is not available (however, this list should be compiled by the next reporting period). Most have the minimum number of monitoring wells (one background and 3 down-gradient wells) on-site. Each site's monitoring well issues (damaged wells, replacement wells, groudwater maps etc.) are being addressed as our LCAP program properly closes each facility in the state.

Quality Assurance and Quality Control in groundwater monitoring well installation and aquifer sampling is addressed in the SWMS groundwater program through the requirements specified in the Solid Waste Management Rule (33 CSR 1), through on-site inspection provided by Environmental Enforcement and Compliance Assurance programs under Waste Management and by review of Monitoring Well Installation Plans required by SWMS for all new monitoring well installations.

As it continues to properly close old landfills on its list, the greatest contribution to the protection of the State's groundwater over the past two years by the SWMS is the Environmental Restoration Section (ERS) Landfill Closure Assistance Program's (LCAP) capping and proper closure of the state's landfills. Through the proper closure of these old facilities, leachate production is greatly reduced, thus protecting groundwater.

The West Virginia Municipal Landfill Monitoring Well Inventory for Currently Operating Facilities

MUNICIPAL LANDFILL MONITORING WELL INVENTORY		
Brooke County Landfill (11 wells)		
Upgradient: 1 well MW-1		Downgradient: 10 wells MW-2, MW-3, MW-4, MW-5,

		MW-6, MW-7, MW-8, MW-9, MW-10, MW-11
Charleston Landfill (5 wells)		
Upgradient: 2 wells MW-4 & MW-5		Downgradient: 3 wells MW-1, MW-2, & MW-3
Disposal Services, Inc. (4 wells)		
Upgradient: 1 well MW-4R2		Downgradient: 3 wells MW-1R, MW-2R & MW-3R
Elkins/Randolph Landfill (8 wells)		
Upgradient: 1 well MW-4		Downgradient: 7 wells MW-1, MW-2, MW-3, MW-5 MW-6, MW-7, MW-8
Greenbrier County Landfill (4 wells)		
Upgradient: 1 well MW-2		Downgradient: 3 wells MW-1, MW-4 & MW-5
HAM Landfill (4 wells)		
Upgradient: 1 well MW-2R		Downgradient: 3 wells MW-1R, MW-3RR, & MW-4
LCS Services, Inc. (21 wells)		
Upgradient: 4 wells MW-16, MW-17, MW-18, MW-19		Downgradient: 17 wells MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-14, MW-15, MW-20, MW-21
Meadowfill Landfill (8 wells)		
Upgradient: 2 Wells MW-1R-92 & MW-2-89		Downgradient: 6 wells MW-3-89, MW-5, MW-6, MW-8R, MW-9R, MW-4R-99
Mercer County Landfill (6 wells)		
Upgradient: 2 wells MW-3 & MW-7R		Downgradient: 4 wells MW-1, MW-2, MW-4, MW-5
Midwest Disposal (11 wells)		
Upgradient: 1well 1 well MN-11A		Downgradient: 10 wells MN-1, MN-2, MN-3, MN-4,

		MN-7, MN-8, MN-9, MN-10A, MN-10B, MN-11B
Nicholas County Landfill (6 wells)		
Upgradient: 1 well MW-101		Downgradient: 5 wells MW-1, MW-2, MW-102, MW-4 & MW-5
North Fork Landfill (9 wells)		
Upgradient: None		Downgradient: 9 wells MW-1, MW-2R, MW-3R, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12
Northwestern Landfill (10 wells)		
Upgradient: None		Downgradient: 10 wells MW-6R, MW-7R, MW-91-2, MW-97-8, MW-9-99, MW-10-99, MW-11-99, MW-12-99, MW-13-99 & MW-3R-99
Pocahontas County Landfill (4 wells)		
Upgradient: 1 well MW-1		Downgradient: 3 wells MW-2, MW-3 & MW-4
Raleigh County Landfill (10 wells)		
Upgradient: None		Downgradient: 10 wells MW-1, MW-2, MW-3, MW-4 DMW-1R, DMW-2, DMW-5, DMW-6, SMW-2 & SMW-3
S & S Grading, Inc. (9 wells)		
Upgradient Closed Portion:1 well MW-G5 Upgradient Active Portion: 3 wells WTI-10, WTI-11 & WTI-12		Downgradient: 5 wells MW-8, MW-9, MW-G1, MW-G3, & MW-G6
Sycamore Landfill, Inc. (4 wells)		
Upgradient: 1 well MW-5		Downgradient: 3 wells MW-1, MW-2 & MW-6
Tucker County Landfill (8 wells)		
Upgradient: 1 well		Downgradient: 7 wells

MW-1		MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8
Webster County Landfill (4 wells)		
Upgradient: 1 well MW-3		Downgradient: 3 wells MW-1, MW-2, & MW-4
Wetzel County Landfill (6 wells)		
Upgradient: None		Downgradient: 6 wells MW-1, MW-2, MW-4, MW-5, MW-7, MW-7A
PKC Landfill (5 wells)		
Upgradient: None		Downgradient: 5 wells MW-1, MW-1A, MW-2, MW-3, & MW-4
WV Tire Disposal (1 well)		
Upgradient: None		Downgradient: 1 well GW-2

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
D. Division Of Water Resources
Groundwater Program

SUMMARY OF GROUNDWATER QUALITY IN WEST VIRGINIA

Prepared by the Office of Water Resources, Groundwater Program in conjunction with U.S. Geological Survey

Background

Water quality data from locations in the Group A and E Watersheds were collected during the period 1999-2001 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 Resources Groundwater Program.

Parameters

Data for selected properties and constituents were grouped by geologic unit, topographic setting, geologic age, well depth, and season. The constituents include field parameters such as specific conductance, pH, oxidation-reduction potential, and turbidity; dissolved oxygen and other gases; bacterial counts of fecal coliform, total coliform, and E. coli; organic carbon, hardness, and acidity; ionic concentration of calcium, magnesium, sodium, potassium, bicarbonate, alkalinity, chloride, fluoride, bromide, sulfate, and 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, and a variety of hydrocarbons, volatile organic compounds, and 47 pesticides.

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

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 thirty 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.

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 as more than 2300 gpm in some sand and gravel aquifers along the Ohio River. Average yields throughout the State are around 260 gpm.

Concerns

A major concern is 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. While no official groundwater quality standard has been finalized for radon, the USEPA 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. 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.

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 tri-halo methanes, bromoform, chloroform, bromo di-chloromethane, and chloro di-bromo methane. These compounds can be products of chlorinated hydrocarbon breakdown, or may be disinfection by-products from chlorinization of wells. Also noted was an increase in concentration of BTEX compounds (benzene, toluene, ethylbenzene, and xylene) and the gasoline additive MTBE (methyl tertiary butyl ether) in groundwater. These are most likely from gasoline residues, and are 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.

Pesticides were also found in ambient groundwater samples of this study; however these concentrations were very low, and only sporadically found. As many of these compounds are known endocrine disruptors, their presence even at the low concentrations observed may warrant additional scrutiny.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
D. Division Of Water Resources

1. Groundwater Program

a. 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 Article 3, Chapter 29 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.

Dominion Generation's Steam Electric Generating Facility has submitted a comprehensive study conducted by Resource International, LTD. to the Groundwater Program in pursuit of a request for a variance of groundwater standards at their Mt. Storm electric steam power generating plant. This proposed rule, 47CSR57B, is currently going through the Legislative process.

Groundwater sampling began in March of 1998 at the Mt. Storm electric steam generating power plant. A total of twelve (12) monitoring wells were incorporated in this study. Quarterly groundwater samples from each well were analyzed for an analyte list comprised of forty-four (44) organic and inorganic constituents. The constituents found that exceed the groundwater quality standards are Beryllium, Cadmium, Chromium, Lead, and Nickel. The exposure assessment from this study shows that exposure of the five (5) metals to humans is minimal. Also, the environmental effects of groundwater inflow to Mt. Storm Lake would be mitigated by dilution and have a minimal impact to the lake.

Groundwater Protection Regulations - Title 47, Series 58

Groundwater Protection Plans (GPP) for 91 facilities in West Virginia have been revceived (54 approved) 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. Facilities that do not have permits were mailed letters identifying the deficiencies in their GPP's, or received letters approving the document. These 91 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. As of June 30, 1999, 797 underground storage tank facilities have submitted registration forms. Six hundred-sixteen (616) of these facilities qualify for the waiver based on the information submitted. One hundred seventy-five (175) of these facilities do not qualify for the waiver based on the information submitted. The status of six (6) facilities cannot be determined from the information submitted. A database to identify gasoline dealers who have received waivers has been developed. Data entry is currently in progress on this project.

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. Other technical assistance documents are the Salt Storage Guidelines, the Above Ground Storage Tank Guidance, the Site Evaluation for Land Application of Industrial Sludge Guidance Document, the Groundwater Sampling QA/QC/SOP, and the Guidance Document for the Use of Monitored Natural Attenuation at Contaminated Sites. Short descriptions of these documents are presented below.

Groundwater Protection Plan Guidance Document

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

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 be in compliance with and understand groundwater protection measures as required by 47CSR58.

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 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 sampling monitoring and drinking water wells.

Guidance Document for the Use of Monitored Natural Attenuation at Contaminated Sites.

A guidance document was developed for the use of Monitored Natural Attenuation (MNA) at contaminated sites. The purpose of this document is to provide guidance on acceptable criteria in employing this technique in the remediation of contaminated soils and groundwater. The development of this document is considered to be essential in promoting the remediation of contaminated sites in a timely and scientifically sound manner. This document was implemented September 1,1999.

The scientific understanding of natural attenuation processes continues to evolve. The DWR recognizes that significant advances have been made in recent years, but there is still a great deal to be learned regarding the mechanisms governing natural attenuation processes and their ability to address different types of contamination problems. Therefore, while the DWR believes MNA may be used where circumstances are appropriate, it should be used with caution commensurate with the uncertainties associated with the particular application.

The DWR remains fully committed to its goals of protecting human health and the environment by remediating contaminated soils, restoring contaminated groundwater to it's beneficial uses, preventing migration of contaminant plumes, and protecting groundwater, and other environmental resources. The DWR does not view MNA to be a "no action" remedy, but rather considers it to be a means of addressing contamination under a limited set of site circumstances where its use meets the applicable statutory and regulatory requirements. MNA is not a "presumptive" or "default" remediation alternative, but rather should be evaluated and compared to other viable remediation methods (including innovative technologies) during the study phases leading to the selection of a remedy. The decision to implement MNA should include a comprehensive site characterization, risk assessment where appropriate, and measures to control sources. The DWR recommends that remedies employing MNA be evaluated to determine the need for including one or more contingency measures that would be capable of achieving remediation objectives. The DWR believes that contingency remedies should generally be included as part of a MNA remedy that has
been selected based primarily on predictive analyses rather than documented trends of decreasing contaminant.

This guidance document closely follows the USEPA's Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites, Office of Solid Waste and Emergency Response document 9200.4-17P.

Site No.	Site Name, Location	Date received	Date reviewed	Field review date	Comments or approval date
1	Davis WTP, Tucker County	10/98	2/3/99	5/5/99	
2	GM, Martinsburg	10/15/98	2/5/99	4/86	3/15/99 4/19/99
3	Koppers, Follansbee	10/28/98 4/21/99	3/25/99		3/26/99 4/23/99
4	Norfolk Southern, Bluefield	11/13/98	9/15/98 3/25/99	8/24/98	9/29/98 3/26/99
5	Summersville Hydro. Project	12/1/98	3/26/99		3/29/99
6	Mountain Transit Authority, Summersville	12/23/98	3/29/99		3/29/99
7	American Fiber Resources, Fairmont	1/4/99 4/12/99	3/29/99		3/29/99 5/25/99
8	Reiss Viking Magnetite, Poca	1/25/99	4/1/99	5/17/99	

9	Schott Scientific Glass, Parkersburg	1/28/99			5/13/99
10	Air Products, Proctor	1/31/99	7/7/99		7/16/99
11	Appalachian Log Structures, Mercer County	2/1/99	7/7/99	1/22/99	7/16/99
12	Republic Paperboard, Halltown	2/5/99	7/21/99		
13	Wampler, Moorefield	2/17/99	7/23/99		8/2/99
14	DOH, Parkersburg	2/18/99			
15	Albright Power Sta., Preston Co.	2/8/99			
16	DuPont, Martinsburg	2/8/99	10/22/99		
17	North Branch Power Sta., Bayard	2/10/99	3/19/99		3/19/99
18	Kosmos, Ceredo	2/10/99			
19	P.B.&S., Proctor	2/25/99	3/25/99		
20	WVANG, Martinsburg	2/22/99	10/18/99		10/19/99
21	Wheeling A A	2/24/99	10/22/99		
22	Camp Dawson, Kingwood	2/24/99 6/10/99	3/15/99 6/14/99		
23	Flat Top Compressor Station, Flat Top	2/26/99	10/22/99		
24	WVANG, Beckley	2/26/99			
25	WVANG, Alloy	2/26/99			
26	New Martinsville Hydro. Plant	3/5/99	3/19/99		3/19/99
27	Lamb's Concrete, Oak Hill	3/2/99			
28	Lamb's Concrete, Summersville	3/2/99			
29	Alcon Labs., Inc., Huntington	3/3/99			3/23/99
30	Reiss Viking, Fairmont	3/16/99 8/5/99	5/25/99		
31	CM Tech, New Cumberland	3/18/99			
32	Flexsys, Nitro	3/22/99			
33	FMC, Nitro	3/24/99			
34	Fenton Glass,	3/26/99	3/30/99	3/30/99	3/31/99

	Williamstown	4/7/99			4/12/99
35	APCO, Ripley	4/3/99	5/13/99		
36	Morgantown Machine & Hydraulics, Inc.	4/5/99			
37	DOH, Mill Run	4/21/99	7/24/99		10/6/99
38	A.L. Lee, Lester	4/21/99			
39	Morton Salt, Morgantown	4/22/99			
40	SMC Electrical, Barboursville	5/7/99 7/2/99	6/10/99		6/10/99 7/7/99
41	Blennerhassett Island S. P.	5/24/99			
42	Weirton Steel	6/95 5/25/99	7/28/98		11/2/98
43	Gulf Energy, Weston	6/1/99			
44	GE Plastics, Washington	6/10/99			
45	ABL-Alliant Techsystems	6/16/99	6/24/99		
46	DTC Environmental, Newell	6/17/99			
47	Enaloc – Chauncey WTP	4/15/99			6/17/99
48	Shell Chemical, Apple Grove	6/29/99			
49	Judy's Fencecraft, Bartow	7/13/99			
50	B.F.Goodrich, Union	7/18/99			
51	Davis-Lynch Glass, Star City	7/20/99			
52	White Armature, Mallory	7/20/99	8/24/99		8/24/99
53	Corning Glass, Martinsburg	5/98 7/21/99			3/2/99
54	Acme Wood, Princeton	7/29/99	8/23/99		8/24/99
55	Mountaineer Park, Chester	8/4/99			9/28/00
56	Simpkins' Mine Supply, Newtown	6/30/99			
57	Vecellio & Grogan-	8/19/99	10/20/99		

	Beckley				
58	A-1 Service Shop, Stollings	8/23/99			
59	Bluewell PSD	8/31/99	10/6/99		10/6/99
60	Celco, Inc. Lewisburg	9/14/99			
61	SMR Technologies, Fenwick	9/15/99			
62	Logan WTP, Logan County	9/14/99	12/16/99		12/16/99
63	O. Ames, Parkersburg	9/98 9/20/99	1/26/99		2/1/99
64	Mingo Co./Naugatuck	10/19/99	1/4/00		1/4/00
65	Resource, L.L.C., Bens Run, Tyler Co.	3/7/00	3/7/00		3/14/00
66	Parks Corp., Lesage, Cabell Co.	3/30/00	4/10/00		App.-4/11/00
67	Koppers, Green Spring	2/14/00	2/17/00		2/17/00 4/24/00
68	Rheox, Charleston	5/10/00			6/22/00
69	Ark Land - Quikrete	10/23/00	10/25/00		App.- 10/25/00
70	Matewan WTP	10/24/00	10/26/00		App.- 10/26/00
71	GE Specialty Chemicals	11/15/00	11/15/00		App.- 11/15/00
72	Dun Glen – New River Gorge N.R.	3/28/01	4/6/01		App. – 4/6/01
73	Callaway Car Wash	4/5/01	4/5/01		App. – 4/6/01
74	AEP – Mountaineer Plant, New Haven	4/7/00			
75	Burke-Parsons-Bowlby Corp., Reedy	4/6/01	4/13/01	5/23/01	App. – 6/12/01
76	Warwood Amoco	3/28/01	4/25/01		4/25/01
77	Verizon – Fairmont	1/30/01	2/14/01	2/14/01	3/19/01 App.-4/27/01
78	Verizon – Lorentz	1/30/01	2/13/01	2/13/01	3/19/01 App.-4/27/01
79	Verizon – Summersville	1/30/01	2/13/01	2/13/01	3/19/01 App.-4/27/01
80	Davy, McDowell Co.	3/27/01	4/30/01		App.-4/30/01

	WTP				
81	Cacapon SP	2/21/01	5/2/01		5/8/01 App.-6/18/01
82	PC WV Synthetic Fuels, Chelyan	4/01 5/8/01	4/ /01 5/8/01		4/ /01 App.-5/8/01
83	Appalachian Timber Sutton	5/8/01	5/8/01		App.-5/8/01
84	WVAWC Kanawha Valley WTP Residuals Handling	5/3/01	5/3/01		App.-5/3/01
85	Vinetta–Rt. 46 Car Wash Keyser	4/5/01	5/4/01		App.-6/13/01
86	Grandview – New River Gorge N.R.	11/29/00	11/30/01		App.-12/5/00
87	American Rock Salt, Fairmont	6/22/01	6/28/01		App.-6/28/01
88	Panda Energy	7/27/01	8/2/01		App.-8/10/01
89	O'Dells Exxon	7/31/01	8/9/01		App.-8/10/01
90	Crystal Car Wash	7/27/01	8/3/01		App.-8/10/01
91	J's Hillbilly Mart, Red House	9/18/01	9/21/01		App.-9/24/01

c. Monitoring Well Driller Certification/Recertification Program

The Monitoring Well Driller Program (MWDP) instructs and certifies monitoring well drillers in the design, construction, alteration, and abandonment of monitoring wells and boreholes. This program, as authorized by 47CSR59 *Monitoring Well Regulations*, was established to ensure industry, well owners, and the regulatory community that all monitoring wells installed or abandoned would meet a minimum set of standards.

Although the Department of Environmental Protection (DEP) 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 DEP, while eliminating the need for increased staffing. During this period a total of 79 individuals applied for certification to become a Monitoring Well Driller. More specifically 70 of the 79 passed the exam, 2 failed the exam, and 7 failed to appear for the testing/training sessions.

As of June 30, 2001, the Monitoring Well Driller Program (MWDP) has certified three hundred and twelve (312) monitoring well drillers. Twenty-eight (28) new drillers 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, 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.

During this same reporting period 207 drillers were recertified. This total includes those drillers who recertified in 1999, 2000, and 2001. To track the driller certification and recertification process the DEP's Information Technology Office developed a monitoring well driller modular to the ERIS (Environmental Resource Information System). ERIS is a flexible client/server system of Windows programs which allows DEP 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 that are currently certified, and those whose certification has expired. As of June 30, 2001 there are 207 active drillers and 105 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.

d. 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 47CSR60 *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 47CSR60.

As is the case of any rule there are unforeseen circumstances that require alternatives and exceptions when compliance with the rule is infeasible or unnecessary.

The alternative 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* will be available by Internet access by January 2002. The format for the electronic submission consists of drop down menus for choices of materials and procedures and areas for written comments. The information from the electronic forms will be stored in a database that can be access for use with other state agencies modeling and environmental programs, as well as for public access on the Internet within the next year through WVDEP TAGIS site at www.dep.state.wv.us/mapping. The information will also be stored in EQuIS along with water quality and site information.

The Monitoring Well Driller Program (MWDP) is doing field verification of the locational data for well installations. The field locational data obtained by GPS (Global Positioning System) is compared to locational data from the submitted installation forms. This comparison is being done to determine whether or not to accept only GPS data or continue the practice of accepting locational data from surveying and topographic maps. Enough locational data will have been collected to make a determination by January 2003.

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

Forms Received and Reviewed Between July 1, 1999 and June 30, 2001	Totals
Monitoring Well Construction Forms	1111
Monitoring Well Abandonment Forms	449
High Risk Borehole Abandonment Forms	254

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

The following table details the number of wells constructed, abandoned and high risk boreholes by counties during this reporting period.

Monitoring Well & Borehole Count from July 1, 1999 - June 30, 2001			
Counties	**MW Installed**	**MW Abandoned**	**Boreholes Installed and Abandoned**

Barbour	17	6	4
Berkeley	41	4	0
Boone	10	14	0
Braxton	9	0	0
Brooke	9	5	0
Cabell	69	13	16
Calhoun	1	1	0
Clay	0	2	3
Doddridge	0	3	0
Fayette	5	0	0
Gilmer	5	0	0
Grant	18	4	0
Greenbrier	13	3	21
Hampshire	2	0	0
Hancock	3	4	0
Hardy	0	0	0
Harrison	59	31	149
Jackson	5	3	1
Jefferson	23	11	3
Kanawha	214	63	9
Lewis	39	15	0
Lincoln	6	0	0
Logan	18	19	0
Marion	15	37	3
Marshall	56	23	4
Mason	47	9	0
McDowell	0	2	0
Mercer	28	41	2
Mineral	33	23	4
Mingo	29	3	0
Monongalia	48	6	1
Monroe	1	1	0
Morgan	0	0	0
Nicholas	1	0	0
Ohio	48	18	0
Pendleton	3	3	2
Pleasants	7	16	0
Pocahontas	28	0	0
Preston	16	4	0
Putnam	14	0	0
Raleigh	33	13	0

Randolph	14	7	0
Ritchie	3	0	0
Roane	0	6	0
Summers	12	0	0
Taylor	0	8	0
Tucker	3	3	0
Tyler	2	0	0
Upshur	6	4	0
Wayne	12	3	0
Webster	2	0	0
Wetzel	26	2	3
Wirt	1	0	0
Wood	43	16	28
Wyoming	14	0	1
TOTALS	**1111**	**449**	**254**

e. Complaints and Calls

The Division of Water Resources Monitoring Well Driller Program responded to approximately one thousand eight hundred ninety-two calls/requests for information concerning monitoring well drillers certification and recertification, monitoring well design standards, documentation, variances and enforcement. This does not include minor telephone call requests for basic information.

f. Public Outreach:

Personnel from the Groundwater Program have held training sessions for Barbour, Lewis, Lincoln, Tyler, Upshur, Wetzel, Tyler, Cabell, Mingo, Raleigh, Hardy and Pendelton county health department sanitarians and staff members on the use of their Global Positioning System (GPS) for the location of septic tanks and water well installations. The GPS information, septic tank system permit number, septic tank seal number, owner's mailing address, and written directions to the site where the well and/or tank is located will be housed in a database that is to be in operation by the end of 2001. This database is being developed by DEP's Information Technology Office

County health departments issued a total of 8,837 septic tank permits from July 1, 1999 through June 30, 2001. Although permits were issued, not all septic tanks have been installed. The following table details the number by county that have been issued septic tank registrations.

Septic Tank Registrations from July 1, 1999 - June 30, 2001

County	# of Registrations
Barbour	153
Berkeley	797
Boone	167
Braxton	93
Brooke	60
Cabell	301
Calhoun	81
Clay	32
Doddridge	40
Fayette	272
Gilmer	35
Grant	133
Greenbrier	304
Hampshire	589
Hancock	57
Hardy	291
Harrison	88
Jackson	258
Jefferson	616
Kanawha	248
Lewis	189
Lincoln	148
Logan	97
Marion	141
Marshall	178
Mason	205
McDowell	88
Mercer	168
Mineral	133
Mingo	10
Monongalia	237
Monroe	126
Morgan	113
Nicholas	26
Ohio	0
Pendleton	143
Pleasants	56
Pocahontas	112
Preston	373
Putnam	38

Raleigh	251
Randolph	135
Ritchie	80
Roane	139
Summers	67
Taylor	102
Tucker	64
Tyler	29
Upshur	195
Wayne	138
Webster	131
Wetzel	32
Wirt	70
Wood	208
Wyoming	0
Totals	**8,837**

Note: 0 indicates no information was available/submitted.

g. Underground Injection Control Program (UIC)

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 Resources' UIC program mainly regulates the subsurface emplacement of effluents into or above underground sources of drinking water by permitting the siting, 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. Two types of Class 5 injection wells have recently been banned by the federal government and subsequently by the state UIC program. New large capacity cesspools (well code 5W10) are prohibited nationwide as of April 2000. Existing large capacity cesspools will be phased out nationwide by April 2005. Motor vehicle waste disposal wells (well code 5X28) have also been banned as of April 2000. When such injection wells (usually a floor drain disposing waste into a subsurface distribution system i.e. septic tank with leach field), are encountered by UIC personnel, the facility owner is instructed to permanently plug and abandon the injection point and devise alternative appropriate disposal methods for such waste. Seventy two floor drains in vehicle service areas were abandoned by plugging with cement during this reporting period.

The Underground Injection Control Program takes great pride in pointing to the many improvements made in the last two years. Although the UIC Program operates with minimal staffing, tremendous progress has been made in clearing the backlog of UIC permit applications. Currently, the only bottle neck in the permitting process comes from the occasional lack of information submitted by applicants, resulting in placing the application on hold pending information submittal. Integration of UIC data into the ERIS database has commenced and will enhance the efficiency of the permitting process, fee tracking, and sharing of data with other DEP programs and the public.

In addition to the greatly improved flow of the actual permitting process, and perhaps of greater importance, is the refining of the UIC permit itself. UIC industrial permits have been improved to assure a higher level of regulatory compliance. UIC industrial permits require that constituents of the waste stream are identified, and each permit stipulates that the appropriate EPA approved testing method is used in the analysis of the injected fluids. Discharge limits are set to insure that all injected fluids meet WV DEP groundwater quality standards, maximum concentration levels (MCL's) established by the federal Environmental Protection Agency, health advisory limits, or other risk-based limits as appropriate. These refinements in UIC permits insure the greatest degree of protection to human health and the environment.

Improvements to the UIC industrial permit also include greater regulatory control over sampling, reporting schedules, construction details regarding the subsurface distribution system, and how the subsurface distribution system is to be properly closed.

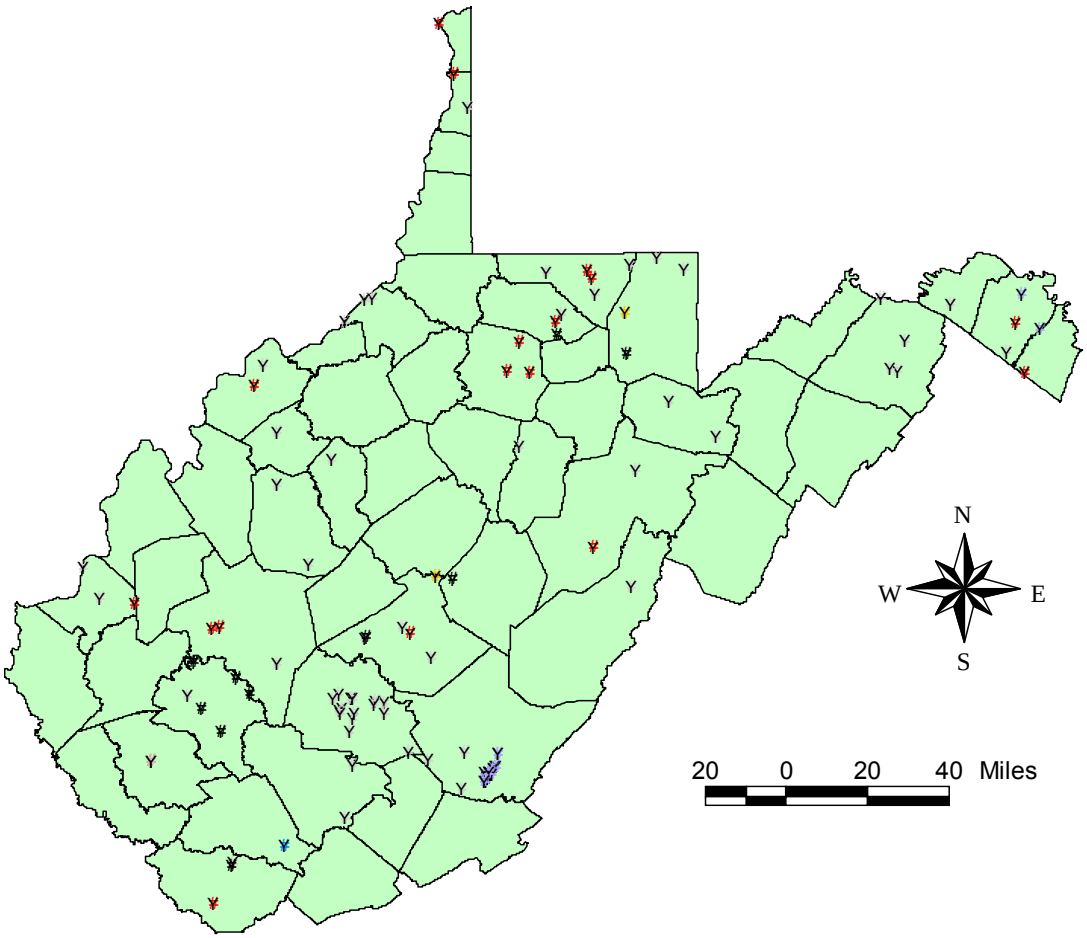
One of the greatest challenges faced by the UIC program has been to design an environmentally sound method of permitting storm water disposal in karst and other environmentally sensitive areas. The UIC program has worked closely with state and local government officials to develop best management practices that keep potential contamination from entering the subsurface distribution systems to the greatest extent possible. This has included the development of an Emergency Response Plan to close off the injection point in case of fuel spills or other accidents. The Emergency Response Plan is integrated with local emergency response personnel. UIC storm water permits insure groundwater protection by requiring adequate monitoring, sampling and the routine cleaning and maintenance of the injection points.

The UIC program has achieved a greater degree of regulatory compliance with the addition of an enforcement and inspection person. Since this position has been filled, 326 UIC inspections have been performed. This has resulted in finding and correcting potential environmental problems.

The UIC program continues to refine and improve its role in the protection of our water resources. Works in progress include the development of environmentally sound

methods of permitting waste water disposal from car washes, meat processing facilities, and other commercial/industrial operations in unsewered areas that depend on subsurface injection of waste water.

Division of Water Resources
Underground Injection Control Program



UIC Permits Issued July 1, 1999 - June 30, 2001

- Special Drainage Wells
- Commercial/Industrial Wells
- Septic Wells
- Mining Related Wells
- Remediation Wells
- Storm Water Wells

Permitting

The permitting of UIC wells provides for minimum standards and technical requirements for the proper siting, construction, operation, monitoring, and abandonment of injection 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 91 locations have been issued during this reporting period. These facilities are listed in the table on page **X**. A map showing locations of UIC wells permitted during this reporting period is shown on page **Y**. Permits for facilities at 89 locations have been closed during this reporting period.

	Year	Permits Issued - Facility Name	County
1	1999	Mountain State Outdoor Center	Fayette
2	1999	Shannon Pocahontas	McDowell
3	1999	Rendezvous Roller Rink	Tyler
Total 1999 (July 1 – Dec. 31) = 3			
4	2000	Ace of Clubs	Berkeley
5	2000	Ecolab	Berkeley
6	2000	Eagle Energy Powellton seam deep mine	Boone
7	2000	Fork Creek Mining Nellis deep mine	Boone
8	2000	Green Valley Mobile Home Park	Boone
9	2000	Omar Mining Chesterfield prep plant	Boone
10	2000	Ona Air Park	Cabell
11	2000	Parks Corporation	Cabell
12	2000	Beckwith Elementary	Fayette
13	2000	Bridge Haven Golf Club	Fayette
14	2000	Divide Elementary	Fayette
15	2000	Emmanuel Baptist Church	Fayette
16	2000	Extreme Expeditions of WV Inc.	Fayette
17	2000	Gatewood Elementary	Fayette
18	2000	Grandview Unit New River Gorge Nat'l Park	Fayette
19	2000	Lost Paddle Mt. State Outdoor Center	Fayette
20	2000	Lost Paddle River Runners	Fayette
21	2000	Midland Trail Campground	Fayette
22	2000	Nuttall Elementary	Fayette
23	2000	Som' Pin' Diff'rnt Club	Fayette
24	2000	Boxley Aggregates of WV Inc (aka Greenbrier Limestone)	Greenbrier
25	2000	Dawson Inn	Greenbrier
26	2000	DOH District 9	Greenbrier
27	2000	John J. Cornwell Elem. School	Hampshire

28	2000	Koppers Industries Inc.	Hampshire
29	2000	RiverView Estates	Hampshire
30	2000	Slainesville Elem. School	Hampshire
31	2000	Mountaineer Race Track	Hancock
32	2000	7-11 # 184	Harrison
33	2000	Dairy Mart #12	Harrison
34	2000	Dairy Mart #15	Harrison
35	2000	7-11 # 20685	Jefferson
36	2000	Former Jackson Grocery	Jefferson
37	2000	Exxon # 2-8827	Kanawha
38	2000	Oakhurst Chevron	Kanawha
39	2000	Quikrete of West Virginia	Kanawha
40	2000	Former Tenneco # 13946 c/o ESCM	Logan
41	2000	Tenneco Facility # 139-46	Logan
42	2000	Martinka Coal Levels Road Facility	Marion
43	2000	7-11 # 130	McDowell
44	2000	Shannon Pocahontas Mining Capels water treatment site	McDowell
45	2000	Coastal Lumber Co.-Hazelton Wood Components	Mingo
46	2000	Dairy Mart # 7	Monogahela
47	2000	Main Chico Dairy	Monogahela
48	2000	Chestnut Ridge Regional Park	Monongalia
49	2000	Dairy Mart # 73 c/o Blake & August	Monongalia
50	2000	Paul Wilson/Kim Larew	Monongalia
51	2000	Brier Run Farm	Nicholas
52	2000	Lamb's Concrete	Nicholas
53	2000	Power Mountain	Nicholas
54	2000	Power Mountain Coal Beth Energy mine 81	Nicholas
55	2000	Coastal Coal Whitetail K Complex	Preston
56	2000	Double Image Beauty Salon	Preston
57	2000	Girl Scouts of SW Pa. Camp Roy Weller	Preston
58	2000	Stuart Recreational Area	Randolph
59	2000	YMCA Camp Horseshoe	Tucker
60	2000	Resource LLC	Tyler
61	2000	Sistersville Country Club	Tyler
62	2000	Coastal Coal D&K mine 4A	Webster
63	2000	47 Carry Out	Wood
64	2000	Hope Gas Inc.	Wood
65	2000	Alpoca Water Works	Wyoming
Total 2000=66			
66	2001	Hunter Development Corp.	Berkeley
67	2001	Kanawha Eagle L.L.C.	Boone
68	2001	Remington Coal Company	Boone
69	2001	Clark 1767	Brooke
70	2001	Riggs Properties	Brooke

71	2001	Grief Bros. (Sonoco)	Cabell
72	2001	High Rise Pizza	Calhoun
73	2001	Chestnut Creek Campground	Fayette
74	2001	Dun Glen New River Gorge Nat'l Park	Fayette
75	2001	Fayette Co. Park	Fayette
76	2001	Sedona Grille	Fayette
77	2001	Teachers Lounge	Fayette
78	2001	Greenbrier River Campground	Greenbrier
79	2001	Verizon	Marion
80	2001	Jakes Run Head Start School	Monogahela
81	2001	Pennzoil Star City	Monogahela
82	2001	Cacapon Resort State Park	Morgan
83	2001	Panther Creek Elementary School	Nicholas
84	2001	Verizon	Nicholas
85	2001	Ryder's Restaurant & Chevron	Pocahontas
86	2001	Eva Sanders	Raleigh
87	2001	Burke Parsons Bowlby	Roane
88	2001	Melda O'Dell	Roane
89	2001	Timberline 4 Seasons Utilities	Tucker
90	2001	Verizon	Upshur
91	2001	Giovanni's of Elizabeth	Wirt
Total 2001 (Jan. 1 - June 30) = 26			

Inspections

The UIC inspections are conducted at business facilities, residential multiple dwellings (i.e. trailer parks and apartment complexes), schools not serviced 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 serviced 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. Information was collected for 174 Class 5 UIC permits during this reporting period. The UIC Program has conducted 362 UIC inspections during this reporting period.

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 DEP regulations. During this reporting period, 148 verbal enforcements were given to owners/operators of facilities. Groundwater Protection Plans (GPP's) and Best Management Practices (BMP'S) 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.

Locational data and information regarding underground storage tanks (UST'S) and aboveground storage tanks (AST'S) is gathered and made available to the Department of Environmental Health, the Division of Waste Management's Underground Storage Section, and other regulatory agencies. Data was collected on 373 UST'S and 144 AST'S at 147 facilities during this reporting period.

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", DWR 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.

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.

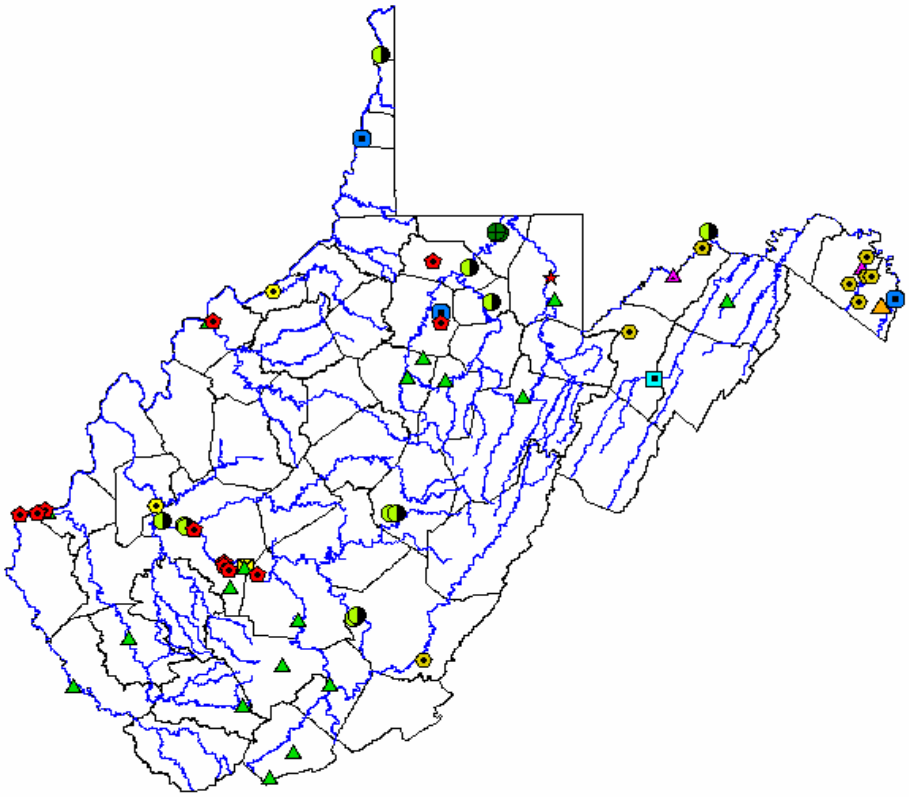
h. Groundwater Remediation

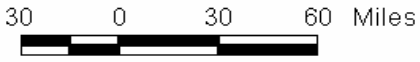
The Groundwater Program is responsible for the investigation and remediation of those sites with contaminated groundwater within West Virginia that do not fit under the jurisdiction of other state agency programs, such as RCRA, CERCLA, Leaking Underground Storage Tanks, Mining and Reclamation, Oil and Gas, and Voluntary Remediation.

The remediation section of the Groundwater Program (of the Division of Water Resources) has worked on 103 different facilities, 47 of which are active at this time. This is an addition of 34 facilities in the past two years. These facilities vary between equipment yards, above-ground tank releases, old petroleum bulk terminals and refineries, both active and abandoned railyards, vehicle wrecks, manufacturing plants, and various other odds and ends. Most of the contamination is a hydrocarbon (usually diesel fuel); however, we also have sites with chlorinated solvent contamination, as well as some Aunique@ problems involving road salt, propylene glycol and large quantities of cow manure. Our office is the lead state agency at some sites, while we provide Environmental Enforcement advice at other locations. In general, our office handles those sites with subsurface contamination that do not fit easily under some other regulatory authority.

Locations of the sites are shown on the map on the following page.

Groundwater Program Remediation Sites
Office of Water Resources





Groundwater Program Remediation Sites
- Benzene
- Diesel
- Diesel & Solvents
- Fuel Oil
- Hydraulic Oil
- Hydrocarbon
- JP8 Jet Fuel
- Kerosene
- Motor Oil
- Propylene Glycol
- Solvents
- Unknown
- Major Streams

Table of Groundwater Program Remediation Sites

#	*Site*	*County*	*River Basin*	*Contamination*	*Aquifer*	*OWR Status*
1	ABL--Building 341	Mineral	North Branch Potomac	Hydrocarbon	Alluvium	Site has been referred to Waste Management
2	ABL--Steam Plant #2	Mineral	North Branch Potomac	Fuel Oil	Alluvium over karst	No further action letter issued on 25 May 1998
3	ATF Building in Martinsburg	Berkeley	Lower Potomac	Fuel Oil	Hilltop colluvium	Facility has begun post-remediation groundwater monitoring
4	Ace Tank	Upshur	Monongahela	Hydrocarbon	Alluvium	Site is now inactive; Enforcement is the lead
5	Anderson of West Virginia (Anmore)	Harrison	Monongahela	Diesel	Alluvium	No further action letter issued on 12 June 1999
6	Anderson Equipment (Charleston)	Kanawha		Diesel	Fill	First investigation has been proposed and approved
7	Appalachian Oil Purchasers	Harrison	Monongahela	Crude Oil	Hillside	Provided Environmental Enforcement with technical advice
8	Arrow Concrete Scary Creek	Putnam	Lower Kanawha	Benzene	Alluvium	Continuing groundwater monitoring and pump and treat system
9	Ashland Caldwell Bulk Terminal	Greenbrier	Greenbrier	Fuel Oil	Hillside	Contaminated soils removed; groundwater monitoring continues
10	Ashland Coal	Cabell	Lower Ohio	Fuel Oil	Hillside	No further action letter issued 3 February 2000

11	Ashland Kenova Refinery	Wayne	Lower Ohio	Hydrocarbon	Alluvium	Site is inactive
12	Avis Rent-a-Car	Kanawha	Lower Kanawha	Hydrocarbon	Hillside	No further action letter issued on 31 August 1995
13	Bowen Tools Clarksburg	Harrison	Monongahela	Hydraulic Oil	Hillside	No further action letter issued 8 May 2000
14	Brandywine Diesel Spill	Pendleton	South Branch Potomac	Diesel	Hillside	Referred to Environmental Enforcement
15	Charles Town Cave	Jefferson	Lower Potomac	Kerosene	Karst	Inactive
16	Chevron Caldwell Bulk Terminal	Greenbrier	Greenbrier	Fuel Oil	Hillside	Totally inactive
17	Chevron North Charleston Bulk Terminal	Kanawha	Lower Kanawha	Diesel	Alluvium	Site has been referred to the Office of Environmental Remediation
18	Clarksburg Service Center	Harrison	Monongahela	Hydraulic Oil	Unknown	Company has proposed soil removal
19	Continental Bakery	Ohio	Upper Ohio	Hydraulic Oil	Unknown	Company still recovering small amounts of contaminated liquid and free product
20	Corning Glass Factory	Berkeley	Lower Potomac	Fuel Oil	Karst	Groundwater monitoring continuing; less TPH-DRO contamination is being found
21	Cowabunga Holsteins	Monroe	Upper New	Manure	Karst	Environmental Enforcement is lead

22	CSX Benwood Railyard	Marshall	Upper Ohio	Diesel	Alluvium	Site has been referred to the Office of Remediation
23	CSX Cane Fork Railyard	Kanawha	Upper Kanawha	Diesel	Alluvium	No further action letter issued on 19 September 2000
24	CSX Cowen Railyard--Engine house	Webster	Gauley	Unknown	Alluvium	First investigation completed; no contamination found
25	CSX Cowen Railyard--Refueling area	Webster	Gauley	Unknown	Alluvium	Company has proposed bioremediation, which our office has denied
26	CSX Danville Railyard	Boone	Coal	Diesel	Alluvium	No further action letter issued in February 1996
27	CSX Elkins Railyard	Randolph	Tygart Valley	Diesel	Alluvium	No further action letter issued on 1 December 1997
28	CSX Fairmont Railyard	Marion	Monongahela	Unknown	Alluvium	Groundwater monitoring with some remediation
29	CSX Grafton Railyard	Taylor	Tygart Valley	Unknown	Alluvium	Continued groundwater monitoring with remediation planned
30	CSX Green Springs Railyard	Hampshire	North Branch Potomac	Heavy Oils	Alluvium	No further action letter issued on 27 September 1996
31	CSX Handley Railyard (TCE)	Kanawha	Upper Kanawha	Solvents	Alluvium	Continued groundwater monitoring with air sparging

32	CSX Handley Railyard (TPH-DRO)	Kanawha	Upper Kanawha	Diesel	Alluvium	Soil vent system, fluid recovery system, and UIC system on line
33	CSX Hinton East Railyard	Summers	Lower New	Hydrocarbon	Alluvium	No further action letter issued on 23 November 1993
34	CSX Hinton West Railyard	Summers	Lower New	Diesel	Alluvium	Post-remedial groundwater monitoring has found continued TPH contamination
35	CSX Huntington Railyard	Cabell	Lower Ohio	Diesel	Alluvium	High vacuum system did not work; proposed natural attenuation with groundwater monitoring
36	CSX Keyser Railyard (TPH-DRO)	Mineral	North Branch Potomac	Diesel	Alluvium	No Further Action letter issued on 13 April 2001
37	CSX Keyser Railyard (solvents)	Mineral	North Branch Potomac	Solvents	Alluvium	Soil removal, natural attenuation, and continued groundwater monitoring
38	CSX Martinsburg Railyard	Berkeley	Lower Potomac	Diesel & Solvents	Alluvium over karst	No further action letter issued on 20 March 1998
39	CSX Maryland Junction Railyard	Mineral	North Branch Potomac	Unknown	Alluvium over karst	Soil removal completed; groundwater monitoring continues

40	CSX Parkersburg Railyard	Wood	Little Kanawha	Diesel	Alluvium	Natural attenuation, and continued free product recovery and groundwater monitoring
41	CSX Peach Creek Railyard	Logan	Guyandotte	Diesel	Alluvium	Groundwater sampling found free product; additional samplings planned
42	CSX Rainelle Car Repair Shop	Greenbrier	Meadow	Unknown	Hillside	First investigation completed; no contamination found
43	CSX Rainelle Railyard	Greenbrier	Meadow	Unknown	Alluvium	Continued groundwater monitoring with remediation planned
44	CSX Raleigh Railyard	Raleigh	Lower New	Diesel	Alluvium	No Further Action letter issued on 3 July 2001
45	CSX Ronceverte Railyard	Greenbrier	Greenbrier	Unknown	Alluvium	No action required
46	CSX Rowlesburg Railyard	Preston	Cheat	Diesel	Alluvium	Soil removal, bio-vent system, and continued groundwater monitoring
47	CSX Saint Albans Railyard	Kanawha	Lower Kanawha	Unknown	Alluvium	Continued groundwater monitoring
48	CSX South Charleston Car Repair Shop	Kanawha	Lower Kanawha	Unknown	Alluvium	Continued groundwater monitoring
49	CSX South Charleston Railyard	Kanawha	Lower Kanawha	Unknown	Alluvium	No further action letter issued on 19 March 2001

50	CSX Thurmond Railyard	Fayette	Lower New	Diesel	Alluvium	Continued groundwater monitoring and product recovery
51	DOH Buckhannon	Upshur	Monongahela	Heavy Oil	Alluvium	No further action letter issued 16 Nov 1999; DOH still bioremediating soils
52	DOH Hurricane	Putnam	Lower Kanawha	Unknown	Unknown	Approved the DOH's first proposed investigation
53	DOH Oak Hill	Fayette	Lower New	Hydrocarbon	Unknown	Soil removal and tests planned for this site
54	DOH Piedmont	Kanawha	Lower Kanawha	Unknown	Fill	Soil testing completed; waiting on report
55	DOH Weston	Lewis	Monongahela	Diesel	Alluvium	Technical advice provided to Environmental Enforcement
56	DOW Petersburg	Grant	South Branch Potomac	Solvents	Alluvium	No further action letter issued on 25 April 1997
57	Dunn Residence	Berkeley	Lower Potomac	Fuel Oil	Karst	Enforcement's lead; home residence fuel oil tank leaked, with contaminated soils
58	DuPont Dry Run Landfill	Wood	Lower Ohio	C8	Hillside	Preliminary investigation begun
59	DuPont Letart Landfill	Mason	Lower Ohio	C8	Hillside	Preliminary investigation begun
60	Dupont Local Landfill	Wood	Lower Ohio	C8	Hillside	Preliminary investigation begun

61	Dupont Washington Works Landfill	Wood	Lower Ohio	C8	Alluvium	Preliminary investigation begun
62	Edray Diesel Spill	Pocahontas	Greenbrier	Diesel	Karst	Environmental Enforcement lead
63	Exit 13 Diesel Spill	Berkeley	Lower Potomac	Diesel	Karst	Environmental Enforcement lead
64	Exxon Boomer Bulk Terminal	Fayette	Upper Kanawha	Hydrocarbon	Alluvium	Site has been referred to the Office of Environmental Remediation
65	Exxon Charleston Bulk Terminal	Kanawha	Upper Kanawha	Hydrocarbon	Alluvium	Intermittent high vacuum extraction with on-site system
66	Exxon Huntington Bulk Terminal	Cabell	Lower Ohio	Hydrocarbon	Alluvium	Site has been referred to the Office of Environmental Remediation
67	Exxon Parkersburg Bulk Terminal	Wood	Little Kanawha	Hydrocarbon	Alluvium	Site has been referred to the Office of Environmental Remediation
68	Exxon Westover Bulk Terminal	Monongalia	Monongahela	Hydrocarbon	Alluvium	Site has been referred to the Office of Environmental Remediation
69	FWA Drilling	Kanawha	Lower Elk	Hydrocarbon	Hillside	No Further Action letter pending site visit
70	Halltown Paperboard Plant	Jefferson	Lower Potomac	Hydraulic Oil	Karst	No Further Action letter issued on 11 January 2001
71	Hampshire Distributor Bulk Terminal	Hampshire	South Branch Potomac	Diesel	Hillside	Environmental Enforcement lead

72	Handy and Harmon	Berkeley	Lower Potomac	Fuel Oil	Karst	No further action letter issued on 21 August 1997
73	Harrison Power Plant	Harrison	Monongahela	Fuel Oil	Fill	Further remediation on hold
74	Hedgesville Fuel Oil Problem	Jefferson	Lower Potomac	Fuel Oil	Hillside	Provided technical advice to Environmental Enforcement
75	Huttonsville Diesel Spill	Randolph	Monongahela	Fuel Oil	Hillside	Enforcement's lead; company is still recovering dissolved-phase contamination
76	Imation (TPH-DRO)	Jefferson	Lower Potomac	Fuel Oil	Karst	No further action letter issued on 9 September 1999
77	Keesee Jeep	Cabell	Guyandotte	Diesel	Hillside	No further action letter issued on 11 June 1997
78	Midas Muffler Bridgeport	Harrison	Monongahela	Hydrocarbon	Hillside	No further action letter issued on 1 May 2001
79	N&W Bluefield Railyard (fuel transloading)	Mercer	Upper New	Diesel	Alluvium over karst	Soil excavation proposed and approved
80	N&W Bluefield Railyard (locomotive area)	Mercer	Upper New	Old Hydrocarbon	Alluvium over karst	Continued groundwater monitoring
81	N&W Kenova Railyard	Cabell	Lower Ohio	Diesel	Alluvium	Further remediation pending
82	N&W Mullens Railyard	Wyoming	Guyandotte	Diesel	Alluvium	Product recovery and UIC systems on line; groundwater monitoring continuing

83	N&W Princeton Railyard	Mercer	Upper New	Diesel	Alluvium	Site referred to Office of Environmental Remediation
84	N&W Williamson Railyard	Mingo	Tug Fork	Diesel	Alluvium	Continued groundwater monitoring and bioremediation of soils
85	Pantry Store Anmore (Benzene)	Harrison	Monongahela	Gasoline	Hillside	Continued groundwater monitoring with intermittent high-vacuum system on line
86	Pantry Store Anmore (TPH-DRO)	Harrison	Monongahela	Diesel fuel	Hillside	Provided technical advice to Environmental Enforcement
87	Pennzoil Huntington Bulk Terminal	Cabell	Lower Ohio	Hydrocarbon	Alluvium	Approved company's proposed subsurface investigation
88	Pennzoil Mannington Compressor	Marion	Monongahela	Hydrocarbon	Unknown	Groundwater monitoring after soil removal; Enforcement's lead
89	Pennzoil Star City Bulk Terminal	Monongalia	Monongahela	Hydrocarbon	Alluvium	Approved company's proposed subsurface investigation
90	Petersburg Motors	Grant	South Branch Potomac	Motor Oil	Hillside	Further remediation pending
91	Quaker State Saint Marys Refinery	Pleasants	Middle Ohio	Benzene	Alluvium	Site has been referred to the Division of Waste Management

92	Rapps Dairy Farm	Greenbrier	Greenbrier	Manure	Karst	Environmental Enforcement is lead
93	Reynolds Bulk Terminal	Greenbrier	Greenbrier	Hydrocarbon	Karst	Have approved company's subsurface investigation
94	Spectratech (TCE)	Jefferson	Lower Potomac	TCE	Karst	Company has proposed pump and treat system
95	Union Drilling	Upshur	Monongahela	Diesel	Hillside	No further action letter issued on 23 November 1998
96	Unocal Cabin Creek East Bulk Terminal	Kanawha	Upper Kanawha	Hydrocarbon	Alluvium	Phytroremediation with continued groundwater monitoring
97	Unocal Cabin Creek North Bulk Terminal	Kanawha	Upper Kanawha	Hydrocarbon	Alluvium	Soil excavation completed; have approved company's subsurface investigation
98	Unocal Cabin Creek West Bulk Terminal	Kanawha	Upper Kanawha	Hydrocarbon	Alluvium	Phytroremediation with continued groundwater monitoring
99	VA Hospital Martinsburg	Berkeley	Lower Potomac	Fuel Oil	Karst	Continued groundwater monitoring; additional soils work has been completed
100	VEPCO Mount Storm Power Plant	Grant	North Branch Potomac	Fuel Oil	Hillside	Groundwater monitoring continues
101	Weirton Steel Browns Island	Hancock	Upper Ohio	Unknown	Alluvium	Remediation pending
102	Weatherford-Enterra	Harrison	Monongahela	Diesel	Alluvium	Site has been referred to the

						Office of Environmental Remediation
103	West Virginia Northern Railyard	Preston	Cheat	Diesel	Hillside	No further action letter issued on 14 April 1994
104	WVU-PRT Beechurst Station	Monongalia	Monongahela	Propylene Glycol	Hillside	Long-term maintenance and refurbishing of source pipe lines
105	WVU-PRT Towers Site	Monongalia	Monongahela	Propylene Glycol	Hillside	Long-term maintenance and refurbishing of source pipe lines
106	WV-USANG Camp Dawson	Preston	Cheat	JP8	Alluvium	No further action letter issued on 1 August 1997
107	Wet Branch Elementary School	Kanawha	Upper Kanawha	Hydrocarbon	Alluvium	Further remediation pending

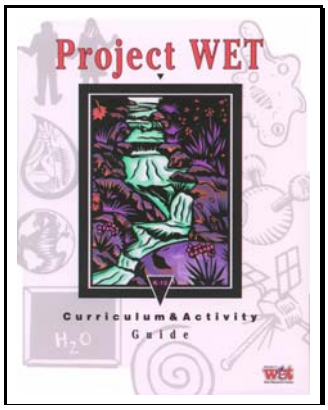
V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
D. Division Of Water Resources

2. Groundwater - Public Information Program

PUBLIC INFORMATION OFFICE

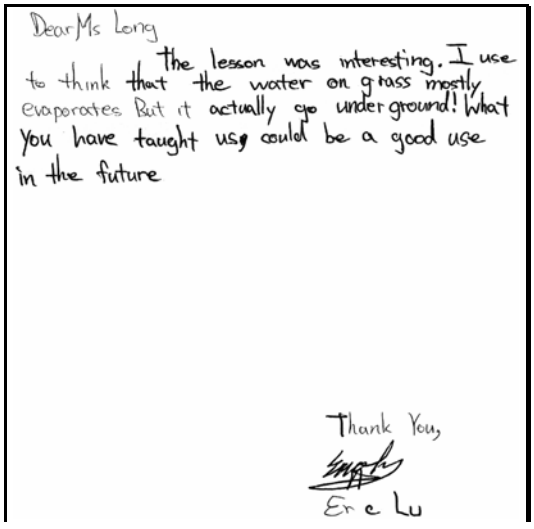
PROJECT WET PROGRAM
July 1, 1999 - June 30, 2001

Introduction. Project WET (Water Education for Teachers) is a interdisciplinary water education program for West Virginia teachers and other educators working with young people in grades K-12. The WV Department of Environmental Protection sponsors Project WET to increase teacher and student awareness of groundwater, water management, and water quality issues stemming from nonpoint sources.



How does the Project WET program work? Project WET provides teachers with classroom materials through teacher training workshops. The key publication, *the Project WET Curriculum and Activity Guide,* is a source of more than 90 interdisciplinary, hands-on classroom activities that make the study of water challenging, interesting, and fun. The workshops are conducted by the state program coordinator or by trained facilitators.

RESULTS IN BRIEF


Dear Ms Long
The lesson was interesting. I use to think that the water on grass mostly evaporates But it actually go under ground! What you have taught us could be a good use in the future

Thank You,
Eric Lu

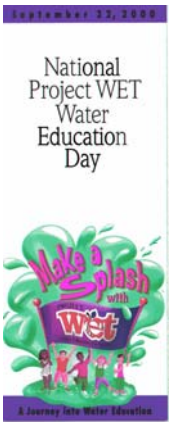
◆ **Twenty Project WET Teacher Training Workshops -** Organized and conducted 20 Teacher Training Project WET workshops. The training included first time workshops for pre-service teachers at the West Virginia University, Department of Educational Theory and Practice. A breakdown of all workshops is provided in Table A.

◆ **Twenty-four Outreach Events -** Conducted educational sessions and made information about groundwater, nonpoint source (runoff)

pollution, and watersheds available at 22 outreach events throughout the state. A breakdown of the events is provided in Table B.

◆ **Wetlands Education Training Seminar -** A two-day thematic seminar focused on wetlands and the WV Save Our Stream program was held on August 7-8, 2000, at the Southern West Virginia Community College, in Mingo County. The seminar was conducted in cooperation with the Division of Natural Resources. Funds were provided by the Division of Water Resources' Watershed Assessment Program.

◆ **Project WET Goes Underground.** Project WET and Project Underground joined forces to offer training workshops for educators in 14 West Virginia limestone counties where the potential for pollution of wells and springs is of serious concern. The objective was to increase understanding of karst resources and to build responsible attitudes and behavior. Participants learned the fundamentals about groundwater in areas characterized by caves and sinkholes (karst topography). They also took part in classroom activities selected from the Project WET *Guide* and the Project Underground *Natural Resource Education Guide.* A karst geologist from the Division of Water Resources provided technical information specific to the county where the workshop was offered. Two workshops - in Bluefield and Harman - were conducted during the reporting period.



◆ **Children's Water Festival** - Organized the West Virginia Children's Water Festival in cooperation with Marshall University Graduate College. The festival consisted of 13 learning stations where more than 230 Kanawha County students in 4th and 5th grades actively engaged in hands-on activities and investigations. Speakers included representatives from 10 state and federal agencies and the private sector.

The September 22, 2000, event was part of the national "Make a Splash with Project WET" initiative — the first of its kind in the nation — involving water festivals in 50 states and the District of Columbia. Funds for the effort were provided by the Perrier Group of America through the National Project WET program.

Governors' Environmental Stewardship Awards - Project WET helped launch the first annual Environmental Stewardship Award Program on Earth Day 2000 with a ceremony at the state Capitol. The program recognizes educators, community leaders, state industries, and municipalities who educate state citizens, strive to protect the environment, and work to be good corporate neighbors. Project WET award recipients for

outstanding leadership in the Education and Community Involvement category include:

Year 2000: ***Patricia Williams*** - High School Teacher at the Roane County High School. ***Marcel Malfregeot,*** Administrative Assistant, Harrison County Board of Education. ***Allegheny Energy Supply - Harrison Power Station***.

Year 2001: ***Dr. William Kroesser***, Professor of Environmental Programs, Marshall University Graduate School of Information Technology & Engineering. ***James Boggess,*** Science Curriculum Supervisor, Cabell County Board of Education***. Mr. C. Carter Chambers,*** Coordinator for the Appalachian Rural Systemic Initiative, Marshall University. ***Dr. William A. Carter***, Associate Professor of Science Methods of Elementary and Secondary Education, Marshall University.

◆ **DEP Public Relations Day at the Legislature -** Organized the first Department of Environmental Protection's Public Relations Day at the Capitol Building. The event took place on February 16, 2000, with the participation of 19 booths representing DEP programs. The effort was repeated on March 6, 2001.

◆ **Published the pamphlet *"Every Little Bit Hurts***" to increase understanding of the effects of pollution carried by surface runoff (nonpoint source pollution) on aquatic life. The pamphlet utilizes graphics and copy from a publication printed by the Wisconsin DNR. Additional text and graphics were added to reflect West Virginia's water quality issues. This popular pamphlet was reprinted in June 2001.

◆ **Published two issues of the Project WET West Virginia Newsletter**. The newsletter is designed to keep Project WET facilitators informed about program initiatives and events.

◆ **Completed the DEP Project WET West Virginia Web page** posted at http://www.dep.state.wv.us in the public empowerment section

◆ **Groundwater and the EnviroScape trunk program**. The Groundwater Flow Model and the EnviroScape, Watershed Model are available by loan through the Project WET program. The models were circulated in Randolph, Jefferson, Monongahela, and Kanawha counties schools.

◆ **Participated in the Oglebay Institute Exhibit Design Committee** work to provide input for the Henry Stifel Schrader Environmental Education Center in Wheeling.

◆ **Applied and received grants totaling $6,000.** A grant for $3,000 provided funding to conduct the September 22, 2000, children's water festival. In addition, the DEP Division of Water Resources provided a $3,028 grant to conduct a Save Our Streams/Wetlands workshop in Williamson, on August 7-8, 2000.

NETWORKING AND PARTNERSHIPS - Forming partnerships and networking with state and federal natural resources agencies to promote environmental education is a key component of the Project WET West Virginia Program. The following organizations provided in-kind support by making staff time and free space available to conduct or host water education training events:
State Department of Education
Southern West Virginia Community College
West Virginia University
Marshall University
National Project Underground
National Park Service
Bureau for Public Health
Division of Natural Resources
DEP Division of Water Resources
WV Rural Water Association
Sunrise Museum
Perrier Group of America
Allegheny Energy Supply

Table A
Project WET Workshops - July 1, 1999 - June 30, 2001

WORKSHOP LOCATION	DATE	NO. OF EDUCATORS	WORKSHOP DURATION
Coopers Rock, Monongahela County	July 28, 1999	15	6 hours
Charleston, Capital High School	July 29, 1999	3	6 hours
Grantsville, Calhoun County High	January 14, 2000	12	6 hours
Shepherds College, Jefferson County	Feb. 19, 2000	38	6 hours
Kingwood, Camp Dawson, Preston County	Feb. 26-27, 2000	11	16 hours Two-day training
Glen Jean, National Park Service, Fayette County	March 4, 2000	7	6 hours
Jackson's Mill, Lewis County	May 12, 2000	10	6 hours

Morgantown, Westwood Middle School	June 16, 2000	11	6 hours
Harrison Power Station, Harrison County	June 19, 2000	17	6 hours
Cowen, Glade Elementary School, Webster County	June 28, 2000	18	6 hours
West Virginia University, Morgantown	July 10, 2000	20	6
Williamson, Southern WV Community College, Mingo County	August 7 -8, 2000	10	16 Two-day training
West Union, Doddridge County	October 12, 2000	4	6
West Virginia University, Morgantown	October 30,2000	11	6
West Virginia University, Morgantown	October 31, 2000	13	6
West Virginia University, Morgantown	November 1, 2000	26	6
West Virginia University, Morgantown	March 8/15, 2001	26	6
Jackson's Mill	April 3, 2001	3	3
Bluefield, Mercer County	April 28, 2001	13	6
Harman, Randolph County	June 15, 2001	16	6

Table B
Outreach Events and Student Programs - July 1, 1999 - June 30, 2001

COMMUNITY	TYPE OF EVENT	DATE	PROGRAM LENGTH	NO. PARTICIPANTS
Charleston Marriott	Rural Net - Conference	July 1, 1999	presented 1 hour session about Project WET	20 educators
Charleston Civic Center	Leaders of Learning Conference	August 2-3, 1999	Exhibited Display. Presented two one hour sessions about	300

			Project WET	
State Fair, Lewisburg	State Fair	August 13-21, 1999	displayed watershed model	1000+ all age groups
Charleston Civic Center	Safety, Health and Environmental Conference	September 22-23, 1999	one-day event	100+
Shepherdstown	Appalachian Heritage Festival	October 1-2, 1999	1-day event	80 + general public
Science Teachers Association Convention, Charleston Civic Center	State convention. Exhibited Project WET display and gave 1 hour presentation about groundwater.	October 14-16, 1999	two-day event	500 + educators
Charleston Embassy Suites, WV Educators Association Fall Convention	State conference. Presented two sessions about groundwater and nonpoint source pollution.	October 22-23, 1999	2 hours	300 educators
Charleston Marriott, Toastmasters Convention	1 hour presentation about groundwater and nonpoint source pollution	October 30, 1999	1 hour	8 students
Stonewall Jackson Lake	Water celebration event for watershed associations. Displayed Project WET exhibit	November 13, 1999	5 hours	200 + adults
Carver Career and Technical Education Center, Malden	student program - (presentation about groundwater and nonpoint source pollution)	February 14, 2000	2 hours	6 students
State Capitol Building Public Relations Day	Outreach event featuring agency displays, plus Project WET exhibit	February 16, 2000	one-day event	150 + adults
Capitol Rotunda, Natural Heritage Day	Student program - (presentation about groundwater and nonpoint source pollution)	February 24, 2000	one-day event	300 all age groups
Governor's Office - Charleston	Environmental stewardship awards program	April 19, 2000	2 hours	30 +
Elizabeth, Wirt County. County Farm	Science Fair. EnviroScape and groundwater flow model demonstrations	May 5, 2000	one-day event	200

National Conservation Center, Shepherdstown, Shepherdstown Jefferson County	Science Olympiad, student program - (eight presentations about groundwater/ groundwater and watershed models demonstrations)	May 18-19, 2000	two-day event	50 students
Lewisburg, State Fair	State Fair	August, 2000	7-day event	1000+
So. Charleston, Marshall University Graduate college	Water Festival (Make a Splash with Project WET)	September 22, 2000	230	4th and 5th grade students
State Capitol Building DEP Public Relations Day	Trained PIO staff to organize outreach event featuring agency displays, plus manned Project WET exhibit	March 6, 2001	one-day event	200+ adults
Capitol Rotunda, Natural Heritage Day	Student program - served as contact point and helped display information about groundwater and nonpoint source pollution	March 13, 2001	one-day event	200+ all age groups
Elizabeth, Wirt County, County Farm	Wetlands Day	May 4, 2001	half-day	45 students
North Bend State Park	Youth Conservation Day	May 19, 2001	one-day event	100 students
National Conservation Center, Shepherdstown	Science Olympiad	May 24/25, 2001	Two-day event	50 students
24 events				

2. Groundwater - Public Information Program

Speakers Bureau

The Department of Environmental Protection established a speakers' bureau in September 1998 to educate the public. Speakers are available on environmental topics to educate the public about the importance of the protection and restoration of our state's environment and how they can become involved.

Sixty DEP staff members continue to reach many counties in West Virginia and the surrounding states.

For more information, please contact Anne Howell at the Public Information Office, 1356 Hansford Street, Charleston, W.Va. 25301 (304) 558-4253 or by e-mail at ahowell@mail.dep.state.wv.us.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
D. Division OF WATER RESOURCES

3. West Virginia Nonpoint Source Program

The WV Agriculture Nonpoint Source (NPS) program is an effort to prevent or reduce NPS impacts on surface and groundwater through education and technical assistance to landowners, local governments, youth, watershed associations, and the general public to build and maintain a sustainable agriculture industry.

The agriculture NPS program works cooperatively through the Conservation Partnership, consisting of the USDA-Natural Resources Conservation Service, the WV Soil Conservation Agency, and the state's 14 Soil Conservation Districts, as will as through the WV Watershed Management Framework to identify priority watersheds for protection and improvement. The agriculture program will also continue its statewide approach for education and technical assistance on agriculture best management practices.

In the Potomac Valley, increases in the production of poultry, combined with the significant recreational value of the area, has led to conflicts between environmentalists, recreational users, and the landowners/farmers of the area over concerns of bacteria contaminated recreational waters. Although there has been evidence at times of increased levels of bacteria in the watersheds of the Potomac Valley, to date, these increases have not been tied to any specific land use.

Across the state, the lack of waste management systems including manure storage facilities and nutrient management planning, improperly located livestock confinement areas and the lack of riparian buffers have the potential to lead to significant runoff of animal wastes. Many livestock confinement areas are located adjacent to intermittent and perennial streams resulting in direct run-off of manure, nutrients and pathogens into surface waters.

In general, water quality problems associated with pesticide and chemical fertilizer use in West Virginia are uncommon, however, some instances of groundwater/well water contamination have occurred. Certain areas of the state are more vulnerable to groundwater contamination from pesticides and fertilizers due to soils, geology, hydrology, and pesticide and fertilizer use patterns. Inappropriate rate or timing of application, lack of secondary containment at bulk pesticide and fertilizer

storage sites and rainwater and surface discharge management at storage and mixing sites can all lead to ground and surface water impacts.

West Virginia has initiated numerous watershed based, regional and statewide programs to address the many potential and existing agriculture nonpoint source threats to surface and ground. West Virginia's 14 Soil Conservation districts are an integral part of the planning and delivery for these programs as well as the WV Soil Conservation Agency, WV Department of Agriculture, WVU Cooperative Extension Service, US Department of Agriculture, and WVU College of Agriculture and Forestry. The WV Watershed Management Framework is the mechanism used to identify priority watersheds for targeted activities.

A new approach to identifying and solving nonpoint sources of pollution in West Virginia is the implementation of the integrated watershed management approach. This approach, led by WVDEP with the participation of all stakeholder agencies, will incorporate public notification and participation, monitoring and assessment of all 32 hydrologic regions, identification and comprehensive monitoring of sub watersheds with pollution problems or in need of protection and finally the development and implementation of a watershed management plan to restore or protect the watershed. This approach will finally allow for an integrated and holistic approach to watershed management in West Virginia. This program will be used to identify waters and their watersheds impaired by nonpoint source pollution and identify important unimpaired watersheds that are threatened or otherwise at risk. Further, this program will provide for a process to progressively address these identified waters by conducting more detailed watershed assessments, developing watershed implementation plans, and then by implementing the plans.

Goal– Continue efforts to reduce impacts to surface waters in West Virginia from 10,800,000 tons of soil erosion on agricultural lands with a focus on priority watersheds identified through the Watershed Management Framework – 2000 – 2010.

Objective 1. Review and provide technical assistance for sediment control plan development for agricultural land disturbances – 2000 – 2010.

Objective 2. Develop and implement Conservation Reserve Enhancement Program to protect riparian areas – 2000 – 2010.

Objective 3. Work with farmers to establish 100 miles of riparian areas or buffers to save 10,800,000 tons of soil and to reduce nitrogen and phosphorus from entering streams and rivers by 63% and 70% respectively – 2005.

a. Study and expand the use of bioengineering techniques to stabilize stream banks – 2003.

b. Continue working with USDA, US Fish and Wildlife Service, WV Department of Natural Resources and WV Division of Forestry to establish riparian areas or buffers on agricultural lands – 2000 – 2005.

d. Develop 100 stream management plans for landowners in accordance with the WV Stream Access Permit for Landowners Program – 2000 – 2005.

Goal– Continue emphasis on nutrient and animal waste management to reduce NPS impacts to surface and groundwater, with a focus on priority watersheds identified through the Watershed Management Framework – 2000 – 2005.

Objective 1. Develop and implement nutrient management plans with agriculture producers to manage 580,000 lbs of nitrogen and 420,000 lbs of phosphorus per year – 2000 – 2005.

a. Write or update 120 nutrient management plans in cooperation with USDA, WVSCA and CES – annually.

b. Provide technical assistance and follow up to farmers to ensure proper implementation of nutrient management plans such as appropriate timing and application rates of animal wastes, biosolids and chemical fertilizers – 2000 – 2005.

c. Work with poultry integrators, growers and others to encourage marketing and distribution of 12,000 tons of poultry litter per year outside the Potomac Valley – 2000 – 2005.

Objective 2. Reduce reliance on government for implementation of the presidress nitrogen-testing program (PSNT) to free up professional staff time to allow for broader education and technical assistance.

a. Train farmers on importance of accurate soil sampling – 2000.

b. Train farmers on use of PSNT equipment – 2000.

c. Provide supplies through transition period – 2001.

d. Investigate other nutrient management technologies – 2003.

e. Transfer information on new technology to farm community – 2003.

f. Investigate possibilities for use of volunteers or privatization of fee for service program through CES or farm cooperatives – 2000 – 2005.

Objective 3. Work with the agriculture community on the installation of agriculture best management practices with a focus on priority watersheds identified through Watershed Management Framework, TMDLs, etc – 2000 – 2005.

a. Stabilize and/or relocate 500 livestock feeding areas to reduce/manage 201,667 lbs of nitrogen and 145,833 lbs of phosphorus annually – 2003.

b. Identify and implement agriculture BMP's as needed – 2000 – 2005.

c. Work with DEP referral program for assistance to violators through system identified in the WV Agriculture Position Paper – 2000 – 2005.

Objective 4. Work with farmers to encourage and provide technical assistance on composting of 16,000 tons of animal wastes.

a. Utilize litter composting demonstration project in Potomac Valley to continue educational efforts –2000 – 2005.

b. Develop and implement litter composting demonstrations in Eastern Panhandle and Greenbrier Valley Soil Conservation Districts – 2005.

c. Develop and implement other composting demonstrations with beef and/or horse manure – 2005.

Objective 5. Obtain a better understanding of the movement or transport of phosphorus through the soil to establish appropriate best management practices – 2000 – 2005.

a. Calibrate phosphorus index – 2003.

b. Evaluate the success of the use of the phosphorus index and associated BMPs – 2005.

Objective 6. Evaluate status of Animal Feeding Operations (AFOs) in West Virginia.

a. Develop nutrient management plans and provide technical assistance to 10,900 livestock operations/potential AFOs – 2009.

b. Work with DEP, WVDA, NRCS, WVSCA, and farmers with the potential for causing NPS impacts from animal feeding operations on establishment of BMP's – 2000 –2005.

c. Identify potential sources of funding for implementing AFO BMPs through SRF, EQIP, etc – 2000 – 2005.

Goal – Coordinate with WVDA, WVSCA, USDA, CES, WV Department of Health and Human Resources and others to establish waste management guidelines for aquaculture.

Objective 1. Develop standards and specifications for waste management – 2002.

Objective 2. Publish and distribute educational and technical materials on aquaculture waste management – 2003.

Objective 3. Develop nutrient management plans for land application of by-products – 2000 – 2005.

Goal – Continue efforts to manage pesticides on 5000 acres to protect surface and ground water – 2000 – 2005.

Objective 1. Work with farmers and non-farmers to reduce unnecessary use of pesticides through ICM/IPM program – 2000 – 2005.

Objective 2. Develop an educational program for non-certified applicators of pesticides on pesticide application best management practices – 2001.

a. Conduct 5 workshops for non-certified applicators with an emphasis on identified priority watersheds – 2005.

Objective 3. Coordinate with statewide pesticide disposal committee to dispose of outdated and unused pesticides – 2000 – 2005.

Objective 4. Continue pesticide container disposal program coordinated by WV Department of Agriculture – 2000 – 2005.

a. Hold 5 pesticide container collection days annually – 2000 – 2005.
b. Collect 10,000 pesticide containers annually – 2000 – 2005.
c. Encourage the use of bags for pesticide use – 2000 – 2003.

Objective 5. Work with WV Department of Agriculture and USDA to install pesticide mixing pads/containment facilities where needed – 2000 – 2002.

Objective 6. Educate farmers and homeowners on the proper storage of pesticides – 2000 – 2005.

Goal – Continue efforts to reduce impacts to surface waters in West Virginia from bacteria, nutrients, and soil erosion on agricultural lands with a focus on priority watersheds identified through the Watershed Management Framework – 2000 – 2005.

Objective 1. Manage 3,000,000 lbs of nitrogen, 6,000,000 lbs of phosphorus and save 200,000 tons of soil through the statewide grassland management program – 2000 – 2005.

a. Educate 50 farmers annually on the importance and means for grasslands Management to reduce erosion – 2000 – 2005.
Conduct 2 forage Livestock Schools annually for farmers and others.

Conduct 14 Grassland Field Days annually for farmers and others.
Conduct 10 Pasture Walks annually for farmers and others.

b. Develop 300 grassland plans per year to manage bacteria, nutrients and soil erosion through USDA, WVCA, and CES – 2000 – 2005.

c. Provide accelerated technical assistance to farms on grassland management with a focus on identified priority watersheds – 2000 – 2005.

d. Conduct forage analysis on 75 farms and fecal sampling on 6 farms to increase vegetation and decrease soil erosion by showing the economic benefits of improved grazing management – 2003.

e. Publish and distribute information on forage sampling and fecal analysis – 2003.

f. Maintain and utilize 14 demonstration farms – 2005.

g. Establish and maintain a record keeping systems for grassland demonstration farms in order to evaluate parameters of success – 2005.

h. Distribute record keeping information to other grassland farmers in WV – 2003 – 2005.

i. Investigate and promote pasture conversion / agro forestry on lands not suitable for grazing – 2000 – 2005.

j. Work with USDA, CES and others to develop case studies on grassland demonstration farms – 2000 – 2005.

k. Continue work with multi-agency and private sector, Grazing Lands Steering Committee – 2000 – 2005.

l. Cooperate in development of Best Management Practices fact sheets including watering systems, forage analysis, grasslands management, and fencing – 2002.

West Virginia Watersafe

West Virginia Watersafe is West Virginia's equivalent and adaptation of Cooperative Extension Service's Farm/Home * A * Syst Programs. This program is a cooperative effort of the WV Soil Conservation Agency, WV Farm Bureau, USDA Natural Resources Conservation Service, WVU Extension Service, and the Rural Community Assistance Program designed to help landowners assess, determine risks, and identify solutions to groundwater contamination problems on their property.

Goal – Conduct 55 (1 per county) presentations of WV Watersafe Program – 2005.

West Virginia Agriculture Water Quality Loan Program

The WV Agriculture Water Quality Loan Program is a joint effort between U.S. EPA, WV Division of Environmental Protection, WV Soil Conservation Agency, the WV Soil Conservation Districts, USDA-Natural Resources Conservation Service and local banks to utilize the State Revolving Loan Fund for low interest loans to implement agriculture water quality best management practices. Individuals who wish to

participate in the loan program must obtain or update their conservation plan to incorporate any necessary practices to protect water quality, receive endorsement from the SCD for that plan, then take their "Certificate of Qualification" and apply at cooperating banks.

The program has been operating successfully in the Potomac Valley Soil Conservation District to address water quality problems associated with livestock and poultry production. Statewide implementation has occurred and is tied to the USDA Environmental Quality Incentive Program and 319 Incremental Watershed Project areas.

Goal – continue use of Agriculture Water Quality Loan Program (AgWQLP) in priority watersheds (including TMDL watersheds) in West Virginia to encourage implementation of needed best management practices – 2000 – 2005.

Objective 1. Coordinate loan program with USDA Environmental Quality Incentive Program, 319 Incremental Watershed projects, and other cost share programs – 2000 – 2005.

Objective 2. Monitor the program yearly to incorporate needs, practices, etc. to improve and protect water quality – 2000 – 2005.

Objective 3. Investigate the use of the Safe Drinking Water Act Revolving Loan Fund to implement agriculture water quality best management practices in source and wellhead protection areas – 2004.

Biosolids Management Program

The WV Soil Conservation Agency in cooperation with WV Division of Environmental Protection and WVU Cooperative Extension Service will oversee the program for land application of biosolids on agricultural land. The WVSCA and CES will conduct site evaluations and develop and follow up on nutrient management plans. Coordination with DEP will provide for an increase in storage capability for biosolids at waste treatment plants, a better understanding/analysis of the impact of metals on soils, and improved spreading techniques used by waste treatment plants on agricultural land. DEP will continue the regulatory and enforcement components of the biosolids program.

Goal – Plan for nutrient and animal waste to reduce NPS impacts to surface and ground water by managing 65,000 lbs of nitrogen, 45,000 lbs of phosphorus and reduce soil erosion by 6,500 tons, with a focus on priority watersheds identified through the Watershed Management Framework – 2000 – 2005.

Objective 1. Work with agriculture operations over a five-year period as outlined by the WV watershed groupings established by the WV Watershed Management Framework to ensure appropriate and environmentally sound land application of biosolids – 2000 – 2005.

a. Train field staff in status of regulatory program and WVSCA, CES and DEP responsibilities for the biosolids program – 2000.

b. Coordinate development of 50 nutrient management plans annually with regulatory requirements for trace elements, pathogens, etc. on agriculture operations land applying biosolids – 2000 – 2005.

c. Conduct 50 land application site evaluations for site approval prior to land application – 2005.

d. Train farmers on biosolids program and related best management practices – 2000 – 2005.

e. Conduct Nutrient Management Plan follow up on 100 plans – 2005.

f. Work with farmers on correct spreader calibration – 2000 – 2005.

g. Provide assistance to WTPs to conduct soil testing with metal analysis – 2000 – 2005.

h. Research the long-range effects of biosolids application – 2005.

i. Research background metals in several WV soil types – 2001.

j. Implement use of GIS/GPS to track land application sites – 2000 – 2005.

Other Goals, Objectives, Strategies

Goal – Work to address issues related to the urban/rural interface in the growing Eastern Panhandle and other areas of the State – 2000 – 2005.

Objective 1. Educate urban homeowners, and non-farm landowners on how their activities (application of chemical fertilizers and pesticides, etc.) affect water quality- 2000 – 2003.

a. Conduct 5 workshops on urban/rural issues – 2005.

Objective 2. Investigate and make available farmland protection/preservation opportunities for agriculture producers – 2000 – 2005.

Goal – Improve data management and tracking of BMPs to show and measure water quality improvements – 2000 – 2005.

Objective 1. Work with WVSCA GIS Program to establish database of BMP's, costs, and water quality improvements – 2001.

Objective 2. Develop and maintain database of biosolids information – 2002.

Goal – Conduct conservation and water quality education presentation and programs – 2000 – 2005.

Objective 1. Work with Watershed Resource Center and other pubic and private groups to develop agriculture educational materials and programs.

Objective 2. Conduct 5 agriculture workshops annually – 2000 – 2005.

Objective 3. Conduct 14 agriculture field days annually – 2000 – 2005.

Objective 4. Provide information and articles to NPS Newsletter, Today's Resources – 2000 – 2005.

Objective 5. Conduct education for schools, universities, public groups on agriculture and NPS pollution – 2000 – 2005.

Objective 6. Educate landowners on the potential problems associated with underground fuel storage and encourage the use of and conversion to aboveground facilities – 2002 – 2005.

Goal – Increase public involvement in agriculture NPS program – 2000 – 2005.

Objective 1. Continue NPS program delivery through the WV Soil Conservation districts – 2000 – 2005.

Objective 2. Cooperate with WV Watershed Management Framework, Soil Conservation Districts, Watershed Associations to include the public in the identification of problems, prioritization of watersheds and the development and implementation of watershed strategies – 2000 – 2005.

Objective 3. Continue general public outreach activities to educate the public on NPS issues and WVs approach to NPS management for agriculture – 2000 – 2005.

Objective 4. Continue publication and distribution of newsletters, news articles, etc. to keep the public involved and aware – 2000 – 2005.

Objective 5. Continue use of Agriculture Technical Subcommittee to evaluate and make recommendations for the NPS program for agriculture – Present – 2004.

Construction and development in WV is an ongoing activity. Highway construction, residential development, and commercial development are on the rise as

the state of WV attempts to improve its economy. As a rule, due to the significant amount of space available in WV, though much of this is either on steep hillsides or in flood plains, most communities grow out rather than up, causing a greater surface area of disturbance and associated run off. Such growth also increases the amount of impervious surfaces and the quantity and quality of run off.

Disturbed acreage exceeds 32,000 acres annually. Construction sites greater than 3 acres require a NPDES permit, which includes the submission of a sediment and erosion control plan, and implementation of the identified best management practices (BMPs). On construction sites of less than 3 acres, submission of a sediment control plan is highly encouraged by the NPS personnel and local Soil Conservation Districts, however, the program is voluntary. The sediment control plan includes the location of the construction site, the name address, and phone number for the landowner, contractor and/or developer, and what practices will be implemented to control sediment and erosion.

For construction sites of less than 3 acres, a system has been implemented by which Construction Sediment Control Plans are submitted to the Soil Conservation districts, and are reviewed by the NPS personnel in that area. In WV, construction sites of less than 3 acres are not subject to the regulations governing the NPDES permitting process. Therefore, it is the responsibility of the NPS personnel and the local SCDs to encourage voluntary submission of sediment and erosion control plans. This involves both education and technical assistance to get plans designed and implemented. This program has led to a considerable amount of participation by contractors and developers, however, there still remains a great deal of disturbed land in WV that is not covered under a sediment control plan.

Goal – Provide support to and coordination with WV Watershed Management Framework to identify, prioritize, and implement watershed projects – 2000 – 2005.

Objective 1. Participate in interagency steering committee to determine priority watersheds – 2000 – 2005.

Objective 2. Assist in collection and summarizing data regarding construction activities – 2000 – 2005.

Objective 3. Assist in the development of construction water quality management objectives and options for watershed restoration action strategies – 2000 – 2005.

Objective 4. Determine and document the most effective best management practices and/or management options – 2000 – 2005.

Objective 5. Provide BMP technical assistance to contractors and developers in identified priority watersheds – 2000 – 2005.

Objective 6. Assist in monitoring the progress of the construction portion of the watershed action plans – 2000 – 2005.

Goal – Provide support and guidance to local watershed associations with construction nonpoint source issues – 2000 – 2005.

Objective 1. Conduct a continuous assessment to determine where assistance is necessary – 2000 – 2005.

Objective 2. Assist in the development of local watershed plans – 2000 – 2005.

Objective 3. Coordinate with USDA, DEP, DNR, the WV Watershed Network and others to provide resources to local watershed groups – 2000 – 2005.

Objective 4. Continue support to WV Stream Partners Program – 2000 – 2005.

Goal – Improve the water quality of West Virginia by reducing erosion of 108,000 tons of soil on 1200 acres of construction sites and other disturbed areas by reviewing approximately 150 Construction Sediment Control Plans annually and offering technical assistance on all construction and disturbed areas – 2000 – 2002.

Goal – Obtain consistent implementation and maintenance of construction BMPs by contractors by providing routine, on-site technical assistance to contractors and developers in cooperation with WVDEP – 2000 – 2005.

Goal – Educate contractors, developers, engineers and other professionals on construction nonpoint source issues and best management practices – 2000 – 2005.

Objective 1. Finalize construction BMP manual for WV contractors and developers – 2001.

Objective 2. Hold watershed based construction BMP workshops for contractors, etc. through the Watershed Resource Center – 2000 – 2005.

Objective 3. Participate in WV Contractors EXPO through displays and presentation – 2000 – 2005.

Objective 4. Make nominations and award state winner of Conservation Contractor and Developer of the Year Contest – 2000 – 2005.

Goal – Educate the general public including schools on construction nonpoint source issues and best management practices using the Enviroscape® and the Watershed Resource Center – 2000 – 2005.

Objective 1. Make presentations to civic groups, schools and at other public places on the effects and benefits of construction and stormwater management – 2000 – 2005.

Objective 2. Encourage the use of the public media by Soil Conservation Districts to increase understanding of sediment and erosion control – 2000 – 2005.

Goal – Improve the understanding of local governments on the need for regulations and adequate construction and stormwater management programs in identified priority watersheds – 2000 – 2010.

Objective 1. Focus on educating the residents, contractors, engineers, local planning commissions, and governments to incorporate stormwater management, sediment and erosion control considerations and BMPs into current regulatory program – 2000 – 2005.

Objective 2. Make presentations to local planning commissions and governments on the benefits of construction and stormwater management programs – 2000 – 2005.

Goal – Improve stormwater management in West Virginia – 2000 – 2010.

Objective 1. Strengthen NPDES permitting requirements to include post construction/permanent best management practices for stormwater management – 2004.

Objective 2. Integrate urban runoff best management practices to prevent pollution due to the increase of impermeable surfaces that accompanies development – 2000 – 2005.

Objective 3. In cooperation with local government, review storm water control design simultaneously with erosion control plan review – 2000 – 2005.

Objective 4. Provide technical and financial assistance to local governments, communities, and watershed groups on stormwater management – 2000 – 2005.

Goal – Provide information to contractors, developers and landowners on the potential for groundwater impacts form construction activities and ways these might be reduced – 2000 – 2005.

Objective 1. Assist in the development of Groundwater Protection Plans (GPPs) for construction activities to reduce the potential for pollution of groundwater during construction.

Objective 2. Incorporate information on groundwater impacts from construction and associated best management practices into workshops provided through the Watershed Resource Center.

Goal – Increase public involvement in construction NPS program – 2000 – 2005.

Objective 1. Continue NPS program delivery through the WV Soil conservation districts – 2000 – 2005.

Objective 2. Cooperate with WV Watershed Management Framework, SCDs, and watershed groups to include the public in the identification of problems, prioritization of watersheds and the development and implementation of watershed restoration action strategies – 2000 – 2005.

Objective 3. Continue general public outreach activities to educate the public on NPS issues and WV's approach to NPS management for construction – 2000 – 2005.

Objective 4. Continue publication and distribution of newsletters, news articles, etc. to keep the public involved and aware – 2000 – 2005.

Groundwater Data Collection and Management

WVSCA has a GIS program maintaining a large geographic database. The majority of data stored at WVSCA has been collected from multiple state and federal agencies, as well as academic and research institutions, including the US Department of Agriculture – NRCS, USEPA, USGS, US Fish and Wildlife, and the WV GIS Technical Center. GIS is currently utilized within the agency to produce maps on an individual project basis. These maps vary in scale from statewide to local watersheds to the specific project site. ESRI's ArcView and ArcInfo are the GIS software packages used by the agency to both manage the data and produce maps.

GPS units are now being distributed through out the individual Conservation Districts offices and field staff to collect agency data. Although this part of the GIS program is in its beginning stage, the long-term goal is to have all project sites and information stored in the geographic database. The GPS units used are Garmin GPS 12XL; Waypoint Plus software is used to download the geographic coordinates.

At the present time, the WVSCA does not use the ERIS database. The agency has not played any role in the development of the EQuIS data warehouse.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
D. Division Of Water Resources

4. 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 Remediation of Petroleum Contaminated Sites, issued in 1996 and extended until January of 2002, helps to expedite groundwater clean-up by providing the permit coverage.

Recently, the General WV/NPDES Water Pollution Control Permit for Discharges from the Water Treatment Plants was issued to provide permit coverage for discharges from water treatment plants. This general permit requires submission of Groundwater Protection Plans from the applicants.

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) are 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 2000 (July 1, 2000 - June 30, 2001) is as follows:

1. Number of individual WV/NPDES permits issued: 122
2. Number of General Permit Registrations issued: 1049
3. Number of modifications of individual WV/NPDES permits and General Permits Registrations issued: 123

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
C. Division Of Water Resources

6. Watershed Assessment and Strategic Planning - WASP

WASP was created in 2000 from the joining of two existing programs, the Watershed Assessment Program (WAP) and the TMDL Program.

The WAP was designed to study tributaries, drainage areas and entire watersheds instead of specific streams or stream segments. WAP has chosen a specific combination of physical, chemical and biological variables to help determine the streams' health and what types of stressors may be operating on the benthic (aquatic bottom-dwelling) community.

The streamside and instream habitats, and the benthic macroinvertebrates (bottom-dwelling animals that do not have backbones) 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.

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.

Each year WAP will assess the water quality in approximately one fifth of the watersheds in West Virginia. All thirty-two (32) watersheds will be assessed in a five year period (see table below). After the initial round of assessments the cycle will begin again. These assessments will be used to develop and modify plans for protecting and enhancing West Virginia's water quality.

In September of 2000, the program completed its first five-year cycle, having sampled in each of the states 32 major watersheds.

West Virginia Watershed Assessment Schedule				
Group A-1996	Group B-1997	Group C-1998	Group D-1999	Group E-2000
Cheat River	Elk River	Tug Fork	Greenbrier	Cacapon

		River	River	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

The subsequent analysis of the data and drafting of reports is proceeding slower than the collection of samples. As of January 30, 2001, reports for the 1996 watersheds are complete. The Lower Kanawha and North Branch of the Potomac Watersheds, sampled in 1997 are also completed. The Elk, Coal and Tygart River watersheds reports are in draft stages and will be submitted for publication soon.

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, WAP holds a spring refresher training session before the sampling season each year to ensure all samplers are obtaining water quality and biological samples in a consistent manner at all sites.

WAP 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 criterion for fecal coliform bacteria, WAP 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 some groundwater pollution has occurred "upstream".

By identifying streams impacted by acid mine drainage, WAP has identified areas where the groundwater is also impaired by acid mine drainage. By helping identify these areas WAP has made it possible to target remediation efforts in areas before massive "blow-outs" of mine waters occur with the resulting destruction of fish and benthic communities.

The WAP 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 WAP. For example, the dioxin found in the Lower Kanawha River has been traced to groundwater seeping through abandoned hazardous waste dumps. The United States Environmental Protection Agency has recently completed a Total Maximum Daily Load (TMDL) for dioxin on this river segment.

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 the U.S. Environmental Protection Agency (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. In all, approximately 1,900 TMDLs will need developed over the course of the next 15 years.

Since the settlement of the lawsuit and the resulting consent decree, the EPA has been developing TMDLs for streams on the 303(d) list. Due to a lack of human and financial resources, the DEP has not taken the lead on TMDL development. The agency, however, has provided onsite logistical and technical support to EPA during the TMDL development process as financial and human resources have allowed.

The group was successful in its initial funding efforts, securing an appropriation of $195,000 from the 2000 Legislature.

This appropriation enabled the DEP to hire a core staff of professionals to oversee the transition of TMDLs from EPA to the state. In August 2000, an assistant

chief was named to the newly-formed Watershed Assessment and Strategic Planning Section (WASP) of the Division of Water Resources. The assistant chief will work with EPA, state water quality program staff and the TMDL stakeholder committee to create a TMDL process which will reflect the requirements of TMDL regulations, provide for the achievement of water quality standards, and ensure that adequate stakeholder participation is achieved in the development and implementation of TMDLs.

During the next two 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. WAP will then be able to propose remediation and restoration activities to improve groundwater and surface water quality in West Virginia.

WAP does not directly collect data on groundwater quality or quantity. However, WAP has an agreement with the U. S. Geological Survey to work with the *Ambient Groundwater Quality Monitoring Network*. This data is collected by USGS and stored in the STORET database on the Internet for access by interested parties. WAP currently uses Microsoft Access and the EPA's STORET database to manage surface water quality information.

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

Data collection and management could be improved by developing a series of shared "read-only" databases on the internal network accessible to all DEP employees. Development of separate databases available only to selected programs or selected people within programs will never be an acceptable option.

WAP is cooperating with the rest of DEP 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. DEPARTMENT OF ENVIRONMENTAL PROTECTION
E. Information Technology Office (ITO)

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

The Division of Water Resources (DWR) received a special appropriation from the Legislature to fund a Technology Improvement Project (TIP) for Water Resources. This appropriation made it possible for DWR to move the entire unit forward from an information technology perspective. At the same time, DWR's regular funding mechanism was enhanced by an increase in annual permit fees required from industrial permit holders.

Development of improved information systems has enhanced DWR's ability to process applications for new or revised National Pollution Discharge Elimination System (NPDES) and Underground Injection Control (UIC) permits, the ability to track and control effluent discharges of all types and the ability to track and manage information about environmental conditions in both surface waters and ground waters in West Virginia.

Environmental Resource Information System

The Department of Environmental Protection uses an internally developed and supported regulatory information management system called the Environmental Resource Information System, or ERIS. DWR's TIP project supported the improvement and implementation of ERIS to support the regulatory requirements of DWR's NPDES program as well as the Ground Water Protection program. At this time, ERIS manages all information relating to permitting applications, surface and groundwater permits, all permitted discharge or injection points and permitted effluent limits for those discharges and injections.

Web-based reporting to the regulated public and the public at large regarding application review status and permit data is now available for all of DWR's regulated activity, using data maintained in ERIS. Data currently available to the public is no more than 24 hours old, since the publicly accessible data is updated each night. Within the next two months the internet data will be totally current.

Other ERIS development initiatives accomplished by DWR over the past two years include the tracking of Certified Monitoring Well Drillers and Certified Laboratories allowed to perform chemical analysis work for use within West Virginia. Certified Laboratory audits, recertifications, and the methods to be used by approved labs are all tracked for DWR's Quality Assurance unit within DEP's ERIS regulatory information system. This data is used to validate the submissions from permittees regarding tests performed on effluent discharges to surface waters and injections to ground water within

West Virginia. The data received on Discharge Monitoring Reports (DMRs) must be validated for accuracy of analysis and for adherence to effluent and discharge limitations set by law, regulation, and as part of permit conditions as issued by DWR.

DMRs submitted by a permittee which show that the permittee is in violation of effluent limits or injection limits result in enforcement action, usually resulting in an administrative order or a consent agreement. These activities are designed to bring the discharge or injection back within the limits set by the permit or applicable regulation, and to provide a disincentive from violating these important protective limits. All information needed to detect these violations and the results of these orders and agreements is tracked within ERIS.

The development and implementation of a Fee and Invoicing Collection System integrated with the ERIS infrastructure has also taken place over the past two years. This system provides invoices which are rolled-up to a given permittee and address, so that a company with many permitted facilities receives a single invoice each month for facilities which were permitted during that month.

Other FICS improvements include the ability to automatically build a list of invoices each month for annual permit fees from existing permits issued that month. FICS can also accept external files of data to drive billing for items not yet integrated into ERIS (like Underground Storage Tank (UST) annual ground water protection fees), or from agencies outside DEP like the Department of Agriculture's annual pesticide fee.

The implementation of FICS within DEP's enterprise information technology environment has improved DWR's cash flow and given the agency better day-to-day information about both anticipated revenue and realized revenue.

Environmental Quality Information System

DEP has purchased and is implementing a scientific information management system called the Environmental Quality Information System (or EQuIS) written and supported by the EarthSoft Corp. This system tracks geological, chemical and biological information describing environmental conditions at locations of interest to DWR and other regulatory programs on DEP. Information stored in EQuIS is available for use by a wide variety of technical modeling systems which allow environmental scientists to characterize present and future environmental hazards.

An Internet Web-based Monitoring Well Construction system has been developed. This web site allows Certified Monitoring Well Drillers to use any Internet browser to submit a complete blueprint including all applicable monitoring well construction details to the DWR Ground Water Protection Program. This information will be loaded into the EQuIS Geology database and used in conjunction with other

geologic data and chemical analysis data to monitor current groundwater conditions and, by use of technical and scientific modeling systems, to project future ground water conditions in the area near a given monitoring well.

This information is vital not only to the Ground Water Protection Program of DWR, but also to other DEP Divisions and offices engaged in RCRA superfund cleanup, Leaking Underground Storage Tank site cleanup, remediation of Brownfields or Voluntary Remediation projects, or reclamation of abandoned or forfeited mining sites.

Geographic Information System enhancements

DWR's requirements regarding Geographic Information Systems and the tracking and management of spatial information and GIS layers have been addressed during the DWR TIP project. DEP's Information Technology Office and its Technical and Geographic Information Systems unit, or TAGIS, have developed and supplied many spatial layers of GIS information to DWR. This information, together with discharge and injection monitoring data from ERIS is used by the Watershed Characterization Modeling System (WCMS) as part of the input to Total Maximum Discharge Limits (TMDL) calculations for watersheds within West Virginia.

Watershed Characterization Modeling System

The development and implementation of a custom GIS spatial modeling system, Watershed Characterization Modeling System (WCMS) has also been accomplished within the biennial period. WCMS was developed and is supported by the Natural Resources Analysis Center of WVU. This system allows the evaluation and modeling of surface water information by watershed from a spatial perspective. Additional development of WCMS functionality is ongoing under a project funded by the Division of Mining and Reclamation, and these enhancements will be available to DWR as they are implemented.

In conjunction with the implementation of WCMS for DWR, DEP's Technical Application and Geographic Information Systems (TAGIS) unit has been able to continually improve and add to available layers of GIS information that can be used with WCMS and other scientific modeling software. A new LAN file server at the DWR office with adequate RAID storage has been purchased, implemented and loaded with GIS layer data for the exclusive use of DWR water quality hydrologists, geologists and permitting engineers.

Network Infrastructure Improvements

The Division of Water Resources has also invested in the purchase and implementation of improved data system networking hardware and software, which

provides DWR staff with the ability to store, access and manipulate data on Local Area Network (LAN) file servers and Wide Area Network file and database servers. The speed and capacity of the networking infrastructure available to DWR staff has improved by an order of magnitude during the period covered by this report.

Personal Computing Equipment

DWR staff has been provided with much-improved desktop and portable laptop computers and the training to make improved use of available hardware and software. The Division has allocated financial support to DEP's Information Technology Office to provide both technical hardware support and software development and maintenance and support of already implemented computer software systems.

DWR has developed a comprehensive set of internet web pages describing the activity DWR engages in to protect both West Virginia's surface and ground waters, including applicable forms the public uses when applying for permitting activity. Web pages which connect to DEP's enterprise Oracle database servers to show accurate and current status of applications being processed and permits being administered are available to the regulated public and the public at large.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
G. State Water Pollution Control Revolving Fund (SRF)

The SRF began operation in 1991 as a financial assistance program to help municipalities and public service districts comply with state and federal water quality laws. Prior to 1991 a federal construction grants program provided most of the needed funding for wastewater collection and treatment systems. These "point source" pollution control problems continue today to be the primary focus of the SRF program. Over $339 million has been committed to 144 community sewer projects since the program began ten years ago.

Federal law, however, allows states to use its SRF program to address other water quality problems, within certain limits. Nonpoint sources of pollution fall into this category. In 1997 the WV Agriculture Water Quality Loan Program was established as a pilot program within the SRF to address specifically the poultry industry and its contribution to water quality problems in the eastern panhandle. In 1999 this pilot program was expanded statewide and included other best management practices eligible for funding. As of June 30, 2001, over $3 million in SRF funds have been loaned to local participating banks which in turn make individual loans to eligible borrowers.

Another pilot program using SRF funds was developed in 1999 to address failing on site sewage disposal systems in Raleigh and Mercer Counties. This cooperative effort with the County Health Departments will be another tool to protect groundwater quality and remediate existing on site problems. Statewide implementation will be considered after a pilot program is finished. The SRF has reserved $500,000 to implement this new program.

One of the long-term goals in the SRF is to address the issue of nonpoint source pollution problems in West Virginia and to use SRF dollars if possible to correct existing problems that cause ground and surface water contamination. This is truly a total team effort among the many programs within the Division of Water Resources. The SRF may be a useful tool in the future for addressing priority watersheds where water quality standards are not being met.

V. DEPARTMENT OF ENVIRONMENTAL PROTECTION
H. Environmental Enforcement

The Environmental Enforcement (EE) office is primarily responsible for inspection and enforcement of the state and federal solid waste 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 DEP'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. DEP's present grant commitment is for six (6) 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 for Standard Operating Procedures for Groundwater Sampling 2000 is used by the Monitoring Unit as a guide when conducting GSI's.

Generally, all landfill sites will have a minimum of four (4) groundwater monitor wells. The number of wells per site will depend on the size of the landfill and could be as high as twenty (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.

Groundwater data collection methods are primarily 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 groundwater collection equipment has been recently upgraded. The old style bladder pumps were replaced by micro-purge electric pumps. Additional training on this equipment will be completed this fall.

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.

The complex interaction of groundwater, geology, and chemistry need to be addressed on a more frequent basis with technical training to all staff, and newer staff in particular. Hands on experience with groundwater monitoring and sample preservation would be of assistance.

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. EE plans to utilize the EQUIS data base to store data generated by EE personnel.

Additional ground water related activities include evaluation and corrective action of certain animal feeding operations (AFO) in the Eastern Panhandle and the Greenbrier River Valley and corrective action associated with the Allied/Honeywell groundwater remediation project.

In addition EE personnel responded to over 300 spills and complaints that had the potential to impact our groundwater.

V. WV DEPARTMENT OF ENVIRONMENTAL PROTECTION
I. Division Of Abandoned Mine Lands And Reclamation

MISSION STATEMENT

To protect and enhance the public health, safety and general welfare from adverse effects of coal mining practices through reclamation and restoration of land and water resources.

DESCRIPTION

A substantial number of acres of land in the United States have been disturbed by surface and underground coal mining. These unreclaimed acres impose social and economic costs to residents, as well as impair environmental quality. With public health, general welfare, safety and danger to property as its first priorities, AML&R corrects hazardous conditions. The conditions are: Old buildings, hazardous gases, refuse piles, abandoned equipment, subsidence, hazardous water bodies, mine drainage, clogged streams, mine entries (portals) and shafts, polluted water, mine fires, abandoned highwalls, cleaning plants and loadouts.

The Office of Abandoned Mine Lands and Reclamation (AML&R) reclaims the land, thus restoring pride in West Virginia. To do this, the office uses funds derived from a federal tax on coal producers. Established Jan. 21, 1981, AML&R receives its authority from Title IV of the Federal Surface Mining Control and Reclamation Act of 1977 (SMCRA). The mine sites abandoned before the passage of federal coal mining laws are to be reclaimed. This law enables AML&R to correct many mine-related problems, as specified in Public Law 95-87, section 403 (a), numbers 1,2,3, across the State.

AML&R is separated with the following different sections:

GRANTS SECTION

This section is responsible for the management of all grants, budgets and administration of the Office of AML&R.

PLANNING

This section decides what sites AML&R should reclaim. It determines if sites are eligible, and completes environmental assessments for each site.

DESIGN

This section administers various contracts with consulting firms to develop the most cost effective and practical methods to abate the many types of problems associated with abandoned sites. This also incorporates in-house design, which address smaller AML sites.

REALTY

This section obtains right-of-entry agreements from all private property owners and lessees for both the design and construction of all AML Regular Grant and Emergency Grant projects. This section also prepares appraisal opinions on all involved properties that are subject to the lien provisions of PL 95-87 to determine if reclamation has resulted in a significant increase in market value. In addition, this section provides realty related support to Special Reclamation Program.

CONSTRUCTION

This section is responsible for the award of the AML construction contracts and provides inspection and oversight relating to construction.

EMERGENCY

This section, in conjunction with the U.S. Office of Surface Mining (OSM), uses expedited bidding procedures to quickly correct emergency problems as specified in the Public Law 95-87, Section 410. Additionally, all complaint investigation is handled in this section.

SPECIAL RECLAMATION

This section reclaims land and maintains water quality on mining sites where the Department of Environmental Protection (DEP) has revoked operating permits and bonds. Funding comes from forfeitures, civil penalties and a special tax on all coal produced within West Virginia.

STREAM RESTORATION

This group manages the chemical, physical, and biological water quality monitoring and technical support for abandoned mine land reclamation environmental projects that address polluted water. The group conducts characterizations of watersheds containing eligible abandoned mine lands utilizing a Holistic Watershed Approach Protocol while involving various stakeholders. The group leads in the preparation of water quality feasibility studies, Acid Mine Drainage Treatment and Abatement Plans, and Appalachian Clean Streams Initiative Projects.

STREAM PARTNERS

This group manages the West Virginia Stream Partners Program that began in 1996 with the creation of the West Virginia Stream Partners Program Act. The Legislature appropriates $100,000 annually from general revenue funds to support a grant program that encourages citizens to work in partnership with appropriate state agencies to restore and protect the state's waters. The West Virginia Departments of Environmental Protection, Forestry, and Natural Resources, and the West Virginia Soil Conservation Agency jointly administer the Program.

RULES/LAWS

Title IV, Surface Mining Control and Reclamation Act of 1977 of Public Law 95-87.

WV Code Chapter 22, Articles 1 & 3A.

WV Surface Mining Reclamation Regulation, Title 38, CSR-2D.

GRANTS

Approved by the Office of Surface Mining-Federal Assistance Manual.

The Office of Surface Mining approved Grant #06900 to the West Virginia Department of Environmental Protection for FY2001 in the amount of $27,872,041. The performance period is from February 1, 2001 to January 31, 2004.

Grants Section assisted the Stream Restoration Group in submission of a grant application to the Environmental Protection Agency which in turn approved and issued a 104(b)(3) Grant to the West Virginia Department of Environmental Protection in the amount of $75,000. Performance period is from October 1, 2000 to September 30, 2001.

Patrick Park, from the Office of Abandoned Mine Lands and Reclamation and President of the National Association of Abandoned Mine Lands Program was re-elected to serve another term for the Association (2000-2001). Historically, the Association has never re-elected a seating President. The Association membership consists of twenty-six states and tribes with the purpose of:

1). Providing a forum to address current issues, discuss common problems and share new technologies regarding the reclamation of abandoned mine lands.

2). Fostering a positive and productive relationship between the states and tribes represented by the Association and the federal government.

3). Coordinating, cooperating and communicating with the Interstate Mining Compact Commission, Western Interstate Energy Board, and all other organizations dedicated to the wise use and restoration of our natural resources.

OFFICE ACCOMPLISHMENTS / FY99-FY01

During Fiscal Year 1999-2001, The Office of Abandoned Mine Lands and Reclamation lists accomplishments from each section.

PLANNING

1). Prepared and distributed to other sections of AML&R 59 Environmental Assessments and OSM-51's (which consist of project narratives, cost estimates and reclamation plans). The total cost estimates for the 59 future projects was $16,980,000.
2). Submitted 75 projects to OSM for "Authorizations to Proceed". All were approved.

EMERGENCY

1). Completed 93 emergency reclamation projects throughout the state at a cost of $3,763,454.38.
2). Conducted 494 complaint investigations throughout the state.
3). Increased the abandoned mine lands inventory by 142 sites to a total of 5,562.

REALTY

1). Exploratory right of entry obtained on 71 projects for mapping and design purposes.
2). Construction right of entry obtained on 70 projects for reclamation activities.
3). Emergency Projects - obtained exploratory and construction right of entry for the performance of 80 emergency projects.
4). Maintenance Projects - obtained approval for access for maintenance work on 44 projects.
5). Prepared 198 Appraisal Opinions documenting any increase in market value resulting from AML&R reclamation activities on properties subject to the lien provisions of PL95-87.

DESIGN

1). Projects completed - 50 Consultant Designs.
30 In-House Designs.
30 Water Feasibility Studies.

2). Issued - 63 Design Work Directives.
26 Drilling Work Directives.

35 Mapping Work Directives.
29 Water Feasibility Studies.

In addition to these, the Design Section assists all of the other sections in various aspects of their functions, such as surveying and drilling work through consultants, review of proposed alternative products and many other areas.

CONSTRUCTION

1). Bids were opened and work started on six (6) Waterline Extension Projects at a total cost of $12,000,264.00.
2). Bids were opened and work started on 87 Reclamation Projects a total cost of $22,222,645.00.
3). Final inspections were held on 69 projects.

SPECIAL RECLAMATION CONSTRUCTION GROUP

1). Three thousand two hundred three (3,203) permitted acres were forfeited on 68 permits.
2). Thirteen (13) requisitions were prepared and contracts issued to reclaim 703 acres.
3). Thirty-two (32) work directives were issued for reclamation and maintenance work.
4). Reclamation was completed on 1,640 disturbed acres and 59 permit sites.
5). Eighteen (18) complaint investigations were completed.

WATER TREATMENT GROUP

1). F&M Project
Two hundred ten tons of poultry litter was applied to 60 acres.
A biological survey was conducted in April 2000.
Eleven hundred white pine, red oak, serviceberry, and redbud seedlings were planted.

2). T&T Project
The sludge disposal system was completed with construction of a pumping station, 13,000 feet of overland pipeline, and two (2) injection boreholes.
In excess of 18,000 tons of alkaline material have been injected into the T&T underground workings.
A new power supply to the office and treatment ponds was completed in May 2000.

3). Omega Project
Approximately 800 cu. yd of sludge was hauled by vacuum truck to an open surface mine near Morgantown.
The Cobun Creek raw water collection and pumping system was completed.

4). Alton Project
The WV160 Project (Acid Mine Drainage Closeout Strategy) with the West Virginia University Research Corporation was completed.
Limestone fines were deposited in Swamp Run for stream improvement.

5). Royal Scot Project

- Constructed of four (4) diversion ditches to concentrate all water from the Buck Lilly refuse into the Buck Lilly treatment system.
- Constructed of a diversion ditch to divert the natural waters in the Buck Lilly watershed around the Buck Lilly treatment system.
- Constructed an access road around the Buck Lilly Number One treatment pond.
- A diversion ditch was constructed to concentrate drainage into the torpedo pond treatment system.
- A diversion ditch was upgraded to divert natural waters around the torpedo pond treatment system.
- Brush was removed and an access road constructed on a portion of the high voltage power line.
- All raw water sites were located, identified, and pipes installed.
- All final discharges were located, identified, and weirs installed.
- A water-sampling scheme was established and samples taken.

STREAM RESTORATION

1). Conducted twenty-seven (27) Pre-Design and forty-three (43) Post-Construction Abandoned Mine Land Reclamation Project Water Quality Assessments.
2). Conducted twenty-two (22) Post-Construction project water quality assessments for the WV10a Project, “Evaluation of Passive Treatment on Abandoned Mine Lands.”
3). Prepared and submitted three (3) Acid Mine Drainage Treatment and Abatement Plans for Blackwater River, Cheat River, and Paint Creek Watersheds.
4). Prepared and submitted three (3) Appalachian Clean Streams Initiative Watershed Cooperative Agreement Program grants for Cheat River, Deckers Creek, and Paint Creek Watersheds.
5). Prepared and submitted twenty (20) Subwatershed Abandoned Mine Land Inventory/Description reports for incorporation into West Virginia’s Watershed Management Framework.
6). Conducted twelve (12) monitoring sweeps using the Holistic Watershed Approach Protocol for watershed characterization.
7). Conducted fish surveys supplementing the characterization of two (2) watersheds.
8). Prepared, submitted, and received approval for one (1) EPA 104 (b) (3) Grant to support In-Stream Limestone Sand Treatment of Blackwater and Cheat Rivers; and
Provides outreach and education which includes: presentations and displays at conferences, meetings, and public forums; technical support for nine (9) Watershed

Associations; training sessions for two (2) Watershed Associations, AmeriCorps volunteers, OSM interns representing six (6) watersheds, and Office of Mining and Reclamation personnel; involvement in the West Virginia Natural Stream Workgroup; and involvement in the West Virginia Watershed Network.

9). Performed 8 In-stream Limestone Sand assessment monitoring sweeps conducted on 3.

10). Prepared, submitted and received approval for 1 104(b) (3) Grant for the Re-inventory of Abandoned Mine Lands.

11). Performed environmental education and outreach including:

- Presentations and/or displays for 4 conferences or public forums; 9 Office of Surface Mining interns, 2 watershed associations, Trout Unlimited, American Electric Power, National Hummer Club.
- Technical support and/or training for 9 Watershed Associations; Office of Surface Mining interns representing 9 watersheds, Rural Community Assistance Program, County Extension Office, and AmeriCorps participants.

Particpation and inclusion in special projects/committees/meetings/awards celebrations for:

a). 3 Memorandums of Understanding Signings uniting watershed associations and the Office of Abandoned Mine Lands and Reclamation;
b). TMDL development in 2 watersheds.
c). West Virginia Environmental Reclamation and Recreation Initiative;
d). Carbon Sequestration Meetings;
e). Aquatic Issue Stakeholder Meetings;
f). Flood Prevention Task Force Meetings;
g). Environmental Education (K-12) Project;
h). West Virginia Watershed Network;
i). Water Celebration Day.
j). Kelly's Creek Communities Association Watershed Association of the Year Celebration.

STREAM PARTNERS

1). Funded fifty-nine (59) community-based organizations in Fiscal Year 1999 - 2001 with grants ranging from $1,000 to $5,000, totaling $201,500.

2). Fiscal Year 1999 - 2001 grants are utilized to complete projects such as stream monitoring, public outreach and education on watershed issues, bank stabilization, habitat enhancement, flood control, and clean-up projects.

3). Twenty (20) of Fiscal Year 2000 - 2001 grant recipients are new Watershed Associations that formed as a result of the Stream Partners Program.

4). Matching contributions for Fiscal Year 1998 - 2000 grant years:

In-kind service	$184,715
Cash and other grants	$219,847
Total	$404,562

5). Assisted with technical and organizational support for the 22 watershed improvements projects, including such efforts as water quality monitoring, public outreach and education on environmental protection issues, stream bank stabilization, habitat enhancement, stream clean up projects, and recreational access.
6). Fostered the development of 5 new community-based watershed organizations. Assisted with the 2nd Annual Watershed Celebration Day to recognize watershed volunteers. Thirty-three (33) Watershed organizations were represented at the daylong event.
7). Received $5,000 as part of a settlement from Speedway Super America for a Supplemental Environmental Project. This money was given to the next watershed association on the funding list, bringing our grant total to $105,000 for the year 2000.
8). Supported the West Virginia Watershed Framework to develop and assist with existing watershed organizations in Little Sandy and Blue Creek watersheds as part of the programs goal to implement agency projects.
9). Provides resource support, and outreach and education to approximately eighty (80) Watershed Associations that includes: presentations and displays at conferences, meetings, and public forums; facilitation of meetings; involvement in the West Virginia Watershed Network; and fostering new community-based organizations.

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

A. Public Health Sanitation Division

Two Groundwater Protection Programs are operated by the Public Health Sanitation Division. They include the permitting and approval of individual water supplies and individual sewage systems. The goal of the individual water supply program is to insure 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 and assists with complaint investigations.

Individual Water Supply Program

Local health departments collect water samples as requested to determine bacteriological and chemical conditions of individual and public water 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.) insure all new building sites (planning on-site sewage disposal) have a suitable on-site sewage disposal reserve area to install the initial system and have space for future repairs to the system, and 3.) correct failing systems to prevent a 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) which qualify for a 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.

The Public Health Sanitation Division revised the individual sewer system, design standards, which will be presented to the Legislature, at a future session, for review and approval. These proposed design standards include the following groundwater protection measures:

- Eliminates homemade septic tanks and metal septic tanks, which are prone to leaking into the groundwater.

- ❖ Prohibits standard soil absorption systems in rapid permeable soils, which would not properly filter the effluent before discharging to groundwater.

- ❖ Addresses new treatment technologies not contained in the 1983 Design Standards.

The Individual Sewage Program will be faced with many new challenges in the coming year. The use of new treatment technologies coupled with the Agood@ sewage sites already occupied creates a tremendous amount of taxation of the minds and creative abilities of the Health Department personnel employed to address these problems. Diligence and perseverance will be needed to meet these challenges.

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

B. Well Head Protection Program

Section I - Ground Water Protection Goals

West Virginia's Wellhead Protection (WHP) and the Source Water Assessment and Protection (SWAP) programs are innovative programs to protect West Virginia ground and surface water from future contamination. The Environmental Engineering Division (EED) of the Office of Environmental Health Services (OEHS), Bureau for Public Health (BPH) of the West Virginia Department of Health and Human Resources (DHHR) is the lead agency for implementation and administration of these federally mandated programs. The EED 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.

The federal Safe Drinking Water Act (SDWA) amendments of 1986 required states to develop and implement the WHP program for all ground water public water supplies wells. West Virginia WHP program was approved by the United States Environmental Protection Agency (US EPA) on December 17, 1992. The WHP program will continue during and after the SWAP program inventories and assessment reports are completed. In 1996, amendments to the SDWA required states to develop and implement the SWAP program requiring assessments for both surface and ground water sources of all public drinking water supplies. The US EPA in November 1999 approved West Virginia's SWAP program. The SWAP program mandates that source water assessments will be conducted for nearly thirteen hundred (1300) public water systems using ground water and surface water. This assessment process must be completed by 2003, and will involve the cooperation of many federal, state, and local agencies. The SWAP/WHP programs do not impose any new mandates or regulations for protecting sources of public drinking water. However, the completed assessment reports will be used to encourage local communities to develop protection activities to protect their drinking water supplies.

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 2465 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, use

Geographic Information System (GIS) to map delineations and assessments and the emphasis on the local partnerships.

Section II - Program Milestones and Future Priorities

A SWAP/WHP water assessment provides information on the potential contaminant threats to public water sources. Each source water assessment:

- defines the part of the watershed or ground water area that may contribute water to the water supply (source area delineation);

- identifies the potential significant contaminant sources of drinking water contamination in those areas (contaminant source inventory);

- determines the likelihood of the water supply to become contaminated (susceptibility analysis). The finished susceptibility assessment will indicate the direction and intensity of subsequent source water protection efforts; and

- local communities and water supply systems, working in cooperation with state agencies, can use the information gathered through the assessment process to create a broader source water protection program to address current problems and prevent future threats to the quality of the drinking water supplies (emergency planning and land management).

A new procedure implemented and required by the SWAP is the susceptibility analysis, defined as the potential likelihood for a public water supply to draw water contaminated at concentrations that would pose a drinking water concern. The susceptibility analysis should provide an indicator to actions that a public water system should take to further define and present the result to the public in a summary assessment report for each public water system. The results of the assessment are to be used as a basis for developing contingency/emergency and land management plans.

West Virginia WHPP/SWAP accomplishments for currently active groundwater systems are:

- as of April 4, 2001, local wellhead protection programs have been initiated for 407 systems;

- wellhead protection areas have been delineated for 380 systems;

- contaminant surveys have been approved for 232 of these systems; and

- in addition, 203 Emergency/Contingency and land Management Plans have been approved.

Some public water supply systems have already initiated protection activities, like the Wellhead Protection Program, to protect their source water areas. Capitalizing on efforts already implemented will enable the community to achieve a greater level of detail, revision to their existing plans and a more accurate delineation. Participation directly with the activity will place the community in a key position to lead local efforts designed to safeguard the source water facility investment.

Several aspects of the SWAP/WHPP plans are of interest to local officials:

- source water assessments will help municipalities that own or operate public water systems plan source water protection efforts;

- completing source water assessments may support relief from certain water monitoring requirements, thereby reducing associated costs; and

- completing source water assessments will better define source water areas, including those that transect political and/or other inter jurisdictional boundaries.

The SWAP/WHPP programs have continued to participate in joint ground water protection efforts with the following groups:

- West Virginia Rural Water Association (WVRWA). Working under an US EPA grant through the National Rural Water Association, a ground water technician from WVRWA has helped in initiating many local wellhead protection programs and has helped those programs with their potential contaminant surveys. WVRWA has provided to EED much of the critical data used in WHPA delineations and the inventory of potential contaminants. Public meetings and seminars were also jointly held and coordinated with WVRWA.

- Supporting the efforts of the Underground Injection Control (UIC) Program of the Department of Environmental Protection (DEP) in inspecting and inventorying any potential Class 5 injection wells and underground storage tanks within the wellhead or source water protection area.

- Volunteer groups have been another significant source of assistance in the development of local WHP programs. Volunteers have contributed much valuable time in completing potential contaminant surveys. Many community leaders have donated their time on local wellhead protection committees. Without their assistance, the local WHP programs could not

have progressed beyond the initiation stage.

- A Memorandum of Understanding (MOU), consigned by all state ground water regulatory agencies, have resulted in coordinated efforts by all of the agencies to protect ground water in the delineated WHP area. These areas are top priorities in the regulatory efforts of the various agencies. The MOU has thus enhanced the WHP program ability to protect the ground water used by potable water supply systems. The existing MOU's have been updated to include the addition of the Source Water Protection Plan.

- Both the SWAP and WHP programs have technical and citizen committees composed of agency representatives and other affiliates from various Department of Environmental Protection (DEP) Offices, such as Water Resources, Waste Management, Oil and Gas, Mines and Minerals, and Environmental Enforcement. Also represented on the committee are the Department of Agriculture/Pesticide Division, the Division of Highways, the Public Service Commission, the Office of Emergency Services, the West Virginia Rural Water Association, private citizens, manufacturing, public water supplies, and the Bureau for Public Health's Office of Environmental Health Services.

In addition, the WHPP/SWAP programs have helped protect the integrity of the State's ground water sources in a number of other ways:

- Participate or develop regulations and design standards for water supply wells and monitoring wells.

- Certification program for water well drillers, based upon driller experience, examinations, and bonding/letter of credit requirements.

- Permits for new public water wells now require an initial survey for potential sources of contamination within 2000 feet of proposed well location with site specific information used when available.

- Developed a method for determining whether ground water sources are under the direct influence of surface water (GWUDI).

- Developed a new procedural guide template for the WHP and SWAP process to assist communities and consultants in preparing plans for both ground and surface water PWSS. The templates describe what level of detail should be provided for an acceptable plan.

- Problem Area Data Sheets (PADS) are sent to the WV WHPP's

Inter-Agency Coordinating Committee with a copy of the approved contaminant survey so information about potential problems can be conveyed.

- A web site was established which contains a list of available publications and a copy of the SWAP program plan. The EED plans to put the assessments on the web site as they become available. This will be an important way for the public to find out about the susceptibility of their community water supply.

- The EED is committed to working with interested communities to protect their water supplies. Particularly as the source water assessments are completed, the EED will make the information available to each community and make staff available to discuss the results of the assessments and the need for additional protection efforts. The assessment reports will help prioritize those communities where protection efforts are most critical. The EED also intends to explore ways to get counties involved in the WHP process.

- The EED is supporting efforts to develop advanced WHP delineations for communities in the state. The US Geological Survey has been instrumental in development of modflow ground water models in the state where there have been suitable geologic conditions for modeling.

- Continue to support the efforts of the West Virginia DEP, Division of Water Resources and the United States Geological Survey 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.

Section III - Ground Water Data Collection and Management:

The WHP/SWAP programs require a variety of data, including locations and characteristics of public water supply sources, point of entry, potenial contaminant sources, and description of watersheds, hydrogeologic settings and aquifer parameters. This data will be collected through field data collection activities, contractor services, as well as programs within federal, state and local agencies.

Locational data is an important aspect of the SWAP program. The Environmental Engineering Division has developed an effective Global Positioning System (GPS) program to determine accurate locations of features, such as wells and potential contaminant sources, consisting of portable receivers differentially corrected using base stations within West Virginia to compute and calibrate locations from signals from a network of twenty-four satellites.

Field information collection includes various types of information. This data includes GPS locations of drinking water wells, surface water intakes, and potential contaminant sources within the source water protection area. Information will be collected for the ground water sources including the hydrologic setting.

The organization, manipulation, analysis and interpretation of pertinent data for assessments will be accomplished primarily through use of GIS. Geographic Information System is a data base management system comprised of components for acquiring, processing, storing and managing spatial data and related attribute information on a geographic basis. ARC/Info and ArcView will be used to help perform the source water assessments. Once geographic locations and ancillary well, geologic, and hydrologic data has been obtained for drinking water wells and surface water intakes, the data will be converted to GIS layers for analysis. Data will be analyzed to determine aquifer sensitivity. Use of GIS will also facilitate the presentation and sharing of the assessment reports with stakeholders, the public, and local governments. Access via the EED Internet Home Page will probably be the preferred mechanism of distributing assessment reports in the future.

Many of the databases used by the EED reside on stand alone computers, or use data formats that cannot be accessed or manipulated by ARC/Info or ArcView. EED is moving toward the goal of an integrated database and making it available to all department programs. The potential contaminant data base will be extracted and stored in a GIS compatible format for use in the SWAP. The most significant EED databases are programmed in Oracle and can be queried by ARC/Info. These databases include the drinking water database and the WHP/SWAP water databases. The WHP/SWAP database has tables and fields that accommodate the entry of all well, geologic and hydrologic, facility and potential contaminant data as well as location and ancillary data. The EED is continuing to participate with the DEP, Division of Water Resource in organizational and developmental meetings concerning the EQUIS Environmental Data Management System for better inter-agency communication and data transfer of information.

Section IV - Future Program Needs

West Virginia BPH to date 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:

- Grants to local communities for ground water protection activities such as establishment of Wellhead Protection Programs and pursuing protection plan development and implementation. Protection strategies are the most

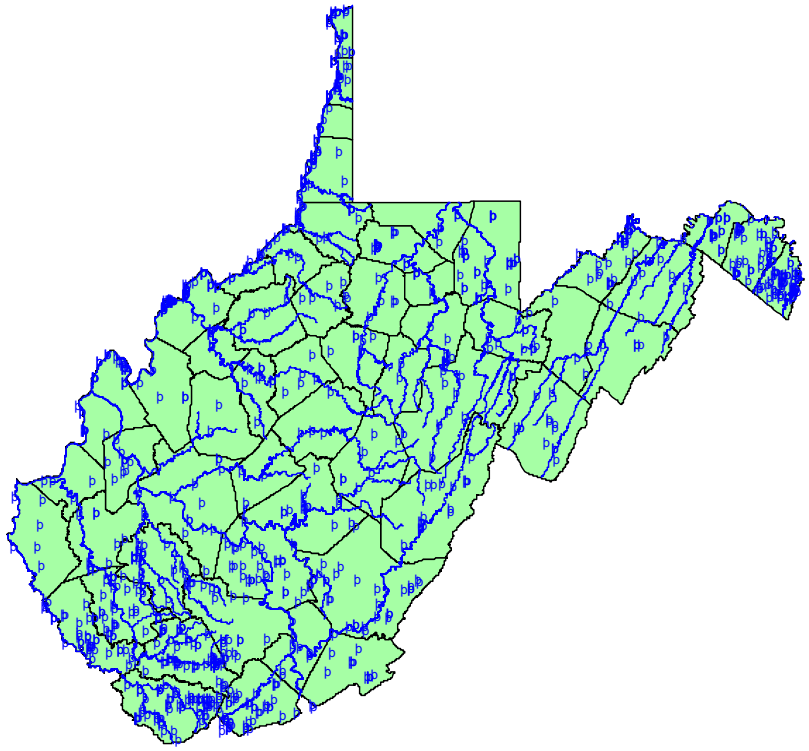
critical aspect of the program and need to be funded in the future**.**

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

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

- Ground Water quality monitoring to support activities mandated by the SDWA and the Clean Water Act.

Public Water Wells in West Virginia



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20 0 20 40 Miles

Public Water Supplys
Major Streams

Appendix A
Regulatory Agencies with Groundwater Responsibility and Authority

Department of Agriculture

Building 11
Guthrie Agricultural Center
Charleston, WV 25305
(304) 348-2209

Department of Environmental Protection

Division of Mining and Reclamation
10 McJunkin Road
Nitro, WV 25143-2506
(304) 759-0510

Office of Abandoned Mine Lands and Reclamation
10 McJunkin Road
Nitro, WV 25143-2506
(304) 759-0521

Office of Oil and Gas
1356 Hansford Street
Charleston, WV 25301
(304) 558-6075

Division of Waste Management
1356 Hansford Street
Charleston, WV 25301
(304) 558-5929

Site Identification and Remediation (SIR) Section
1356 Hansford Street
Charleston, WV 25301
(304) 558-2745

Environmental Restoration Section
1356 Hansford Street
Charleston, WV 25301
(304) 558-7763

Solid Waste Management Section
1356 Hansford Street
Charleston, WV 25301
(304) 558-6350

Appendix A
Regulatory Agencies with Groundwater Responsibility and Authority

Department of Environmental Protection

Division of Water Resources
1201 Greenbrier Street
Charleston, WV 25311

Groundwater Program
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-2108

Environmental Education
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-3614

Non-point Source Program
10 McJunkin Road
Nitro, WV 25143-2506
(304) 759-0583

National Pollutant Discharge
Elimination System (NPDES)
Permit Program/Sludge Program
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-8855

Watershed Assessment Program
1201 Greenbrier Street
Charleston, WV 25311
(304) 558-2108

Appendix A
Regulatory Agencies with Groundwater Responsibility and Authority

Department of Environmental Protection

Office of Administrative Services
Information Technology Office
10 McJunkin Road
Nitro, WV 25143-2506
(304) 759-0519

Environmental Enforcement
1356 Hansford Street
Charleston, WV 25301
(304) 558-2497

Department of Health and Human Resources

Office of Environmental Health Services
815 Quarrier Street, Room 418
Charleston, WV 25301
(304) 558-2981

Environmental Engineering Division
815 Quarrier Street, Room 418
Charleston, WV 25301
(304) 558-2981

Public Health Sanitation Division
815 Quarrier Street, Room 418
Charleston, WV 25301
(304) 558-2981

Appendix B

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia

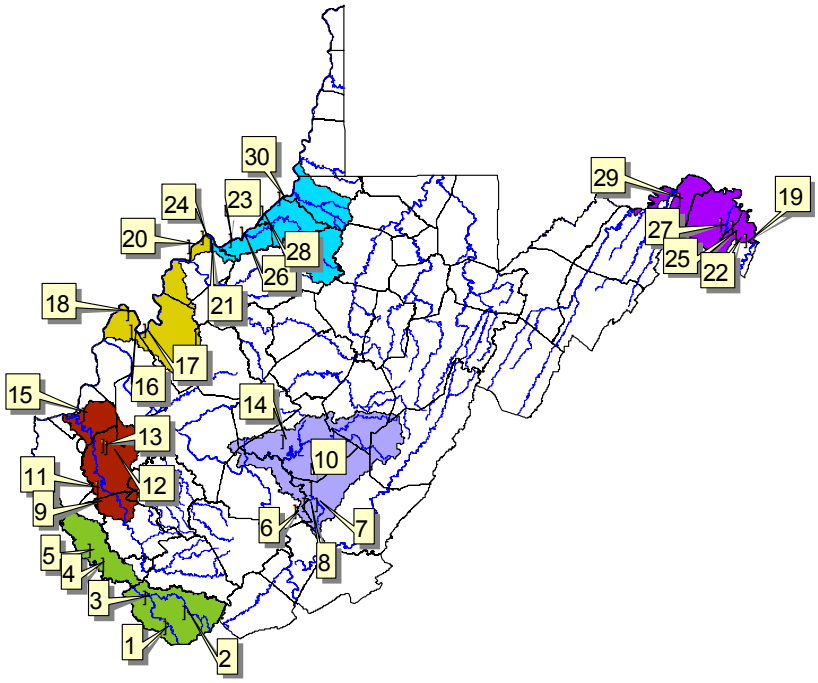
Data Tables From 1997-1999

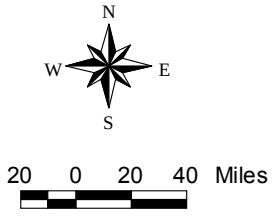
Note: Groundwater Quality Standards are noted where Groundwater Quality Standards have been established for a particular parameter. Groundwater Quality Standards are standards of quality and purity, established by the Environmental Quality Board in 46 CSR 12.

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Key to the sampling sites-1997-1999

Site	County	Watershed	Geologic Unit	Geologic Age	Total Depth of Well (feet)	Elevation (ft.above mean sea level)
1	McDowell	Tug Fork	Pottsville	Pennsylvainian	202	1340
2	McDowell	Tug Fork	Pocono	Mississippian	130	1400
3	McDowell	Tug Fork	New River	Pennsylvainian	80	1000
4	Mingo	Tug Fork	Kanawha	Pennsylvainian	--	940
5	Mingo	Tug Fork	Kanawha	Pennsylvainian	190	750
6	Fayette	Gauley River	Mauch Chunk	Mississippian	250	2460
7	Greenbrier	Gauley River	Hinton	Mississippian	157	2450
8	Greenbrier	Gauley River	Mauch Chunk	Mississippian	200	2390
9	Logan	Lower Guyandotte River	Kanawha	Pennsylvainian	78	670
10	Greenbrier	Gauley River	New River	Pennsylvainian	137	2830
11	Lincoln	Lower Guyandotte River	Kanawha	Pennsylvainian	109	625
12	Lincoln	Lower Guyandotte River	Allegheny	Pennsylvainian	89	653
13	Lincoln	Lower Guyandotte River	Allegheny	Pennsylvainian	135	650
14	Nicholas	Gauley River	Kanawha	Pennsylvainian	104	1500
15	Cabell	Lower Guyandotte River	Conemaugh	Pennsylvainian	70	576
16	Mason	Middle Ohio River South	Alluvium	Quaternary	57	600
17	Jackson	Middle Ohio River South	Alluvium	Quaternary	87	605
18	Mason	Middle Ohio River South	Alluvium	Quaternary	81	580
19	Jefferson	Potomac River Drains	Elkbrook	Cambrian	325	500
20	Wood	Middle Ohio River South	Alluvium	Quaternary	82	620
21	Wood	Middle Ohio River North	Alluvium	Quaternary	64	613
22	Jefferson	Potomac River Drains	Conococheague	Cambrian	300	600
23	Pleasants	Middle Ohio River North	Alluvium	Quaternary	75	620
24	Wood	Middle Ohio River South	Alluvium	Quaternary	83	630
25	Berkeley	Potomac River Drains	Beekmantown	Ordovician	300	489
26	Pleasants	Middle Ohio River North	Alluvium	Quaternary	78	650
27	Berkeley	Potomac River Drains	Beekmantown	Ordovician	420	500
28	Tyler	Middle Ohio River North	Alluvium	Quaternary	60	620
29	Morgan	Potomac River Drains	Devonian	Devonian	100	635
30	Wetzel	Middle Ohio River North	Alluvium	Quaternary	83	630

Office of Water Resources
Groundwater Program
- USGS Ambient Water Quality Study
Sampling Locations





Ambient Water Quality Monitoring Sites
Major Streams
Potomac River Drains
Middle Ohio River South Watershed
Middle Ohio North Watershed
Tug Fork Watershed
Lower Guyandotte River Watershed
Gauley River Watershed

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Field Parameters-1997-1999

Site	Oxidation-Reduction Potential (MV)	Water Temp. (Deg C)	Barometric Pressure (mm of Hg)	Turbidity (NTU)	Specific Conductance (Us/Cm)	Water pH (Whole Field, Standard Units)
1	26	15.1	721	0.4	465	7.2
2	95	15.6	729	0.68	1350	6.7
3	9	15.1	731	0.5	1700	7.2
4	397	14.4	739	0.32	1250	6.9
5	2	14.7	747	0.27	600	7.5
6	-72	11.8	698	0.22	240	8.1
7	-46	12.1	697	0.2	388	7
8	-60	11.9	698	0.17	385	6.8
9	40	14.7	745	0.3	335	7
10	-44	12.2	686	0.32	299	7.2
11	80	15	752	1.5	458	6.5
12	-56	14.4	749	0.68	469	7.2
13	2	14.5	746	0.47	538	6.7
14	62	12.8	724	4.4	288	7.4
15	41	14.5	733	0.88	1870	7.4
16	364	15.7	748	0.26	646	7.1
17	390	13.6	749	0.24	601	7
18	371	11.4	743	0.2	560	7.4
19	1000	12.9	743	0.91	631	7.4
20	374	13.3	737	0.21	826	7.1
21	378	13.1	752	0.26	459	6.8
22	295	12.6	744	4.9	789	6.8
23	116	13.7	738	0.6	960	6.9
24	386	14	750	0.17	641	7
25	336	14.5	749	1.2	825	6.7
26	603	12.9	745	0.23	288	6.1
27	320	10.4	750	0.8	813	7.5
28	966	13.6	746	0.2	578	6.7
29	147	12.9	743	0.86	183	6.8
30	385	14.4	747	0.18	362	5.9

Division of Water Resources Groundwater Program - United States Geological Survey
Study of Ambient Groundwater Quality in West Virginia Data Tables
Field Parameters, Bacteria, Acidity, and Ions-1997-1999

Site	Dissolved Oxygen, (mg/L)	Total Coliform, (Colonies/ 100 ml)	Fecal Coliform, (Colonies/ 100 ml)	E. Coli (Colonies/ 100 ml)	Hardness Noncarb. (mg/L as $CaCO_3$)	Acidity (mg/L as H^+)	Acidity (mg/L as $CaCO_3$)	Total Recoverable Calcium (mg/L as Ca)	Total Recoverable Magnesium, (mg/L as Mg)
1	<. 1	< 1	< 1	< 1	--	0.4	18	35	8
2	< .1	< 1	<	< 1	--	0.8	41	64	25
3	<.1	<1	< 1	< 1	360	0.3	17	52	11
4	7.8	*3	*1	< 1	--	0.4	21	120	60
5	< .1	< 1	< 1	< 1	--	0.2	7.9	23	5.8
6	< .1	< 1	< 1	< 1	--	<.1	--	17	2.9
7	< .1	< 1	< 1	< 1	--	0.2	9.4	60	5.5
8	< .1	< 1	< 1	< 1	--	0.2	11	38	5.5
9	< .1	< 1	< 1	< 1	--	0.2	8.9	22	3.7
10	< .1	< 1	< 1	< 1	--	0.1	5.5	31	8.9
11	< .1	< 1	< 1	< 1	--	0.2	9.9	30	6.5
12	< .1	*2	< 1	< 1	--	0.2	7.4	23	5.3
13	< .1	< 1	< 1	< 1	--	0.4	20	23	4.1
14	< .1	< 1	< 1	< 1	--	0.2	7.4	14	4.6
15	< .1	< 1	< 1	< 1	--	< .1	--	68	11
16	1.4	< 1	< 1	< 1	71	0.4	19	97	13
17	2.9	*1	< 1	< 1	60	0.2	11	97	13
18	3.8	< 1	< 1	< 1	100	0.1	5	84	10
19	8.1	< 1	< 1	< 1	33	0.3	12	66	31
20	1.1	< 1	< 1	< 1	27	0.2	10	88	10
21	3.6	< 1	< 1	< 1	78	0.3	12	57	7.1
22	5.2	< 1	< 1	< 1	110	0.6	32	130	22
23	.1	*2	< 1	< 1	49	0.4	22	130	13
24	1.0	< 1	< 1	< 1	49	0.4	20	100	7.3
25	3.6	*14	*1	< 1	78	0.6	29	120	11
26	1.7	< 1	< 1	< 1	41	0.8	39	36	5.1
27	8.6	*1	< 1	< 1	140	0.2	9.4	110	23
28	1.9	< 1	< 1	< 1	46	0.8	37	90	6.3
29	.1	< 1	< 1	< 1	--	0.3	14	14	8.7
30	.9	< 1	< 1	< 1	70	1	50	38	8

* = Results based on colony count outside the acceptance range (non-ideal colony count)

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Ions-1997-1999

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	43	0.9	235	< 1	192	25	0.3
2	200	2.9	562	< 1	461	180	260
3	260	2.1	284	< 1	233	28	2.3
4	50	6.3	227	< 1	186	47	470
5	88	2.4	240	< 1	197	12	0.4
6	29	0.4	136	< 1	111	1.9	0.7
7	11	0.6	216	< 1	177	34	13
8	33	0.8	215	< 1	176	54	5.2
9	40	1.4	163	< 1	134	24	0.1
10	14	1.8	149	< 1	123	17	13
11	47	2.1	175	< 1	143	83	9.3
12	80	3.4	290	< 1	238	28	7.2
13	71	2.3	167	< 1	137	48	1
14	41	1.8	175	< 1	144	12	0.2
15	280	3.8	279	< 1	229	17	2.6
16	14	1.1	264	< 1	217	35	60
17	8	1	285	< 1	234	46	48
18	16	0.8	185	< 1	152	11	120
19	13	2.8	316	< 1	259	20	20
20	64	1.6	283	< 1	232	36	74
21	19	1	122	< 1	100	29	78
22	6.2	1.6	366	< 1	304	93	85
23	44	2.2	417	< 1	342	80	29
24	15	1.3	274	< 1	225	45	47
25	28	1.9	323	< 1	268	103	36
26	11	1.8	89	< 1	73	108	34
27	15	16	281	< 1	233	14	150
28	19	1.3	253	< 1	208	79	35
29	9.2	0.5	111	< 1	91	28	3.9
30	17	2.2	59	< 1	49	141	62

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Ions-1997-1999

Site	Dissolved Chloride (mg/L as Cl)	Total Fluoride (mg/L as F) GQS = 4.0 mg/L	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)
1	22	0.1	0.05	259	260
2	2.1	0.2	< .050	882	870
3	390	0.4	2.8	904	910
4	4.7	0.2	< .050	951	920
5	67	0.4	0.2	328	320
6	11	0.2	< .050	138	140
7	9.1	<.1	< .050	243	250
8	15	0.2	0.08	231	230
9	28	0.2	0.1	201	190
10	12	< .1	0.05	177	170
11	55	0.2	0.1	260	250
12	7.8	0.2	0.06	288	290
13	90	0.2	0.4	294	300
14	4.4	0.2	< .050	168	170
15	450	0.4	2	991	990
16	30	0.2	0.08	405	400
17	12	0.2	0.05	384	380
18	14	0.3	0.07	382	380
19	32	0.2	< .050	358	350
20	71	0.1	< .050	497	510
21	28	0.2	0.06	280	280
22	15	0.2	< .050	499	490
23	98	0.1	0.5	577	570
24	22	0.1	< .050	396	400
25	77	< .1	< .050	480	510
26	17	0.1	< .050	178	180
27	24	0.2	0.05	535	540
28	30	0.2	< .050	337	340
29	2.6	0.2	< .050	114	110
30	21	0.1	0.05	222	230

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Ions and Metals-1997-1999

Site	Total Nitrogen, Nitrite (mg/L as N)	Total Nitrogen, NO_2+NO_3 (mg/L as N) GQS = 10 mg/L	Total Nitrogen, Ammonia (mg/L as N)	Total Nitrogen, Ammonia (mg/L as Nh_4)	Total Phosphorus (mg/L as P)	Total Recoverable Aluminum, (µg/L as Al)	Total Antimony, (µg/L as Sb) GQS = 6 µg/L
1	< .010	< .020	0.36	.46	0.14	<10	< 1
2	< .010	< .020	0.17	.22	<.020	<10	< 1
3	< .010	< .020	0.52	.67	0.1	< 10	< 1
4	< .010	0.26	0.02	.03	< .020	10	< 1
5	< .010	< .020	0.58	.75	0.08	< 10	< 1
6	0.014	0.02	0.15	.19	0.04	10	< 1
7	< .010	< .020	0.35	.45	0.16	< 10	< 1
8	< .010	< .020	0.29	.37	0.07	< 10	< 1
9	< .010	< .020	0.52	.67	0.2	< 10	< 1
10	< .010	< .020	0.92	1.2	0.09	10	< 1
11	< .010	< .020	0.6	.77	0.17	10	< 1
12	< .010	< .020	0.96	1.2	0.07	10	< 1
13	.010 (estimated)	< .020	1.2	1.5	0.41	20	< 1
14	0.016	< .020	0.41	.53	0.12	20	< 1
15	< .010	< .020	0.69	.89	0.03	< 10	< 1
16	< .010	1.4	0.02	.03	< .020	< 10	< 1
17	< .010	5.9	< .010	--	0.02	< 10	< 1
18	< .010	1.3	0.01	.01	0.02	10	< 1
19	< .010	4.8	0.02	.03	0.03	10	< 1
20	< .010	2.4	< .010	--	< .020	< 10	< 1
21	< .010	1.6	0.10	.01	< .020	10	< 1
22	.032	4.2	< .010	--	0.02	110	< 1
23	< .010	.290	.410	.53	0.08	< 10	< 1
24	.017	6.70	0.20	.03	< .020	< 10	< 1
25	< .010	2.50	< .010	--	0.04	10	< 1
26	< .010	2.3	0.01	.01	0.03	10	< 1
27	< .010	3.8	< .010	--	0.02	10	< 1
28	< .010	3.1	< .010	--	0.07	<10	< 1
29	< .010	< .020	0.06	.08	0.07	20	< 1
30	< .010	5	< .010	--	0.03	10	< 1

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Metals-1997-1999

Site	Total 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	Recoverable Iron, (µg/L as Fe)	Total Recoverable Manganese, (µg/L as Mn)
		GQS = 2000 µg/L	GQS = 4 µg/L	GQS = 5 µg/L		
1	< 2	700	< .5	< 1	470	140
2	< 2	< 100	< .5	< 1	1400	850
3	< 2	* 4300	< .5	< 1	1400	100
4	< 2	< 100	< .5	< 1	<10	< 1
5	< 2	800	< .5	< 1	280	130
6	< 2	400	< .5	< 1	70	37
7	< 2	1000	< .5	< 1	2800	340
8	3	900	< .5	< 1	3600	280
9	< 2	200	< .5	< 1	2900	86
10	< 2	500	< .5	< 1	1000	69
11	< 2	300	< .5	< 1	7900	180
12	< 2	1100	< .5	< 1	110	84
13	< 2	700	< .5	< 1	17000	230
14	4	1000	< .5	< 1	460	35
15	< 2	900	< .5	< 1	190	82
16	< 2	100	< .5	< 1	< 10	< 1
17	< 2	< 100	< .5	< 1	< 10	< 1
18	< 2	< 100	< .5	< 1	< 10	29
19	< 2	200	< .5	< 1	< 10	< 1
20	< 2	100	< .5	< 1	< 10	< 1
21	< 2	< 100	< .5	< 1	<10	2
22	< 2	100	< .5	< 1	160	4
23	< 2	400	< .5	< 1	2700	380
24	< 2	100	< .5	< 1	< 10	12
25	< 2	< 100	< .5	1	20	34
26	< 2	100	< .5	< 1	< 10	< 1
27	< 2	100	< .5	< 1	10	1
28	< 2	100	< .5	< 1	< 10	4
29	6	300	< .5	< 1	2000	400
30	< 2	100	< .5	< 1	20	1

GQS = Groundwater Quality Standard; * = exceeds GQS

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Metals and Volatile Organic Compounds-1997-1999

Site	Total Recoverable Lead, (µg/L as Pb)	Total Recoverable Zinc, (µg/L as Zn)	Total Radon (pCi/L)	Total Organic Carbon, (Mg/L as C)	Total 1,1,1, Trichloro-ethane (µg/l)	Total ,1-1 Dichloro-ethane µg/L)	Total 1,1 Dichloro-ethylene µg/L)
	GQS = 15 µg/L				GQS = 200 µg/L		GQS = 7 µg/L
1	< 1	< 10	67	.80	0.1	< .100	<. 100
2	< 1	20	84	1.0	0.5	< .500	< .500
3	< 1	< 10	114	.50	0.1	< .100	< .100
4	< 1	10	93	< .10	--	--	--
5	< 1	< 10	110	0.6	--	--	--
6	< 1	< 10	107	0.3	--	--	--
7	< 1	< 10	260	1	--	--	--
8	< 1	< 10	280	1.6	--	--	--
9	< 1	< 10	129	1.2	--	--	--
10	< 1	20	70	1.4	0.1	< .100	< .100
11	< 1	< 10	102	0.4	--	--	--
12	< 1	< 10	290	1.5	--	--	--
13	< 1	10	292	.50	0.1	< .100	< .100
14	< 1	10	106	0.4	--	--	--
15	< 1	30	757	1.5	--	--	--
16	< 1	10	561	0.7	--	--	--
17	< 1	10	489	0.1	--	--	--
18	< 1	< 10	442	.20	< 0.1	< .100	< .100
19	< 1	< 10	271	0.3	--	--	--
20	< 1	< 10	610	.80	< 0.1	0.254	< .100
21	< 1	< 10	450	0.5	--	--	--
22	< 1	290	386	0.2	0.136	< .100	< .100
23	< 1	< 10	495	.90	< 0.1	< .100	< .100
24	< 1	< 10	288	0.5	0.247	< .100	< .100
25	2	10	379	0.3	--	--	--
26	< 1	< 10	575	0.1	--	--	--
27	< 1	10	75	0.9	--	--	--
28	< 1	< 10	479	.30	0.1	< .100	< .100
29	< 1	< 10	226	< .10	--	--	--
30	< 1	< 10	647	.20	0.1	< .100	< .100

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1997-1999

Site	Total 1,2-Di-Chloroethane (µg/L)	Total 1,2-Di Chloropropane	Total Benzene (µg/L)	Benzene 1,3-Di-Chloro- (µg/L)	Benzene 1,4-Di-Chloro- (µg/L)	Benzene O-Di-Chloro- (µg/L)
	GQS = 5 µg/L	GQS = 5 µg/L	GQS = 5 µg/L			GQS = 6 µg/L
1	< .200	< .100	< .100	< .100	< .100	< .100
2	< 1	< .500	< .500	< .500	< .500	< .500
3	< .200	< .100	< .100	< .100	< .100	< .100
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	< .200	< .100	< .100	< .100	<.100	< .100
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	< .200	< .100	< .100	<.100	< .100	< .100
14	--	--	--	--	--	--
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	--	--	--	--	--	--
18	< .200	< .100	< .100	< .100	< .100	< .100
19	--	--	--	--	--	--
20	< .200	< .100	<.100	< .100	< .100	< .100
21	--	--	--	--	--	--
22	< .200	< .100	< .100	< .100	< .100	< .100
23	< .200	< .100	< .100	< .100	< .100	< .100
24	< .200	< .100	< .100	< .100	< .100	< .100
25	--	--	--	--	--	--
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	< .200	< .100	< .100	< .100	< .100	< .100
29	--	--	--	--	--	--
30	< .200	< .100	< .100	< .100	< .100	< .100

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1997-1999

Site	Bromo Di-Chloro-Methane (µg/L)	Total Bromoform (µg/L)	Total Carbon Tetra-chloride (µg/L) GQS = 5 µg/L	Total Chloro-benzene (µg/L)	Total Chloro-di-bromo-methane (µg/L)	Total Chloroform (µg/L)
1	< .100	< .200	< .200	< 0.1	< .200	< .100
2	< .500	< 1.00	< 1.00	< .500	< 1	< .500
3	< .100	< .200	< .200	< 0.1	< .200	< .100
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	< .100	< .200	< .200	< 0.1	< .200	< .100
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	< .100	< .200	< .200	< 0.1	< .200	< .100
14	--	--	--	--	--	--
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	--	--	--	--	--	--
18	< .100	< .200	< .200	< 0.1	< .200	< .100
19	--	--	--	--	--	--
20	< .100	< .200	< .200	< 0.1	< .200	< .100
21	--	--	--	--	--	--
22	< .100	< .200	< .200	< 0.1	< .200	0.481
23	< .100	< .200	< .200	< 0.1	< .200	< .100
24	< .100	< .200	< .200	< 0.1	< .200	0.302
25	--	--	--	--	--	--
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	< .100	.249	< .200	< 0.1	.122 (estimated)	< .100
29	--	--	--	--	--	--
30	< .100	< .200	< .200	< 0.1	<.200	< .100

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1997-1999

Site	Total Cis-1,2, -Di-Chloroethene (µg/L)	Total Di-Chloro-Di-Fluoro-Methane (µg/L)	Total Di-Iso-Propyl Ether, (µg/L)	Total Ethyl-Benzene (µg/L)	Total Ether Ethyl (µg/L)	Total EtherTertiary Butyl Ethyl (µg/L)
	GQS = 7 µg/L			GQS = 7 µg/L		
1	< .100	< .200	< .200	< .100	< .200	< .100
2	< .500	< 1.00	< 1	< .500	< 1	< .500
3	< .100	< .200	< .200	< .100	< .200	< .100
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	< .100	< .200	< .200	< .100	< .200	< .100
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	< .100	< .200	< .200	< .100	< .200	< .100
14	--	--	--	--	--	--
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	--	--	--	--	--	--
18	< .100	< .200	< .200	< .100	< .200	< .100
19	--	--	--	--	--	--
20	0.238	< .200	< .200	< .100	< .200	< .100
21	--	--	--	--	--	--
22	< .100	< .200	< .200	< .100	< .200	< .100
23	< .100	< .200	< .200	< .100	< .200	< .100
24	< .100	< .200	< .200	< .100	< .200	< .100
25	--	--	--	--	--	--
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	< .100	< .200	< .200	< .100	< .200	< .100
29	--	--	--	--	--	--
30	< .100	< .200	< .200	< .100	< .200	< .100

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1997-1999

Site	Total Ether Tert-Pentyl Methyl µg/L)	Freon 113 (µg/L)	Meta/Para-Xylene (µg/L)	Total Methylene Chloride (µg/L)	Methyl Tertiary Butyl Ether (µg/L)	Total O-Xylene (µg/L)	Total Styrene (µg/L)
					GQS = 20 µg/L	GQS = 10 µg/L	GQS = 100 µg/L
1	< .200	< .100	< .200	< 0.2	1.39	< .100	< .100
2	< 1	< .500	< 1.00	< 1.00	< 1	< .500	< .500
3	< .200	< .100	< .200	< 0.2	.156 (estimated)	< .100	< .100
4	--	--	--	--	--	--	--
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	< .200	< .100	< .200	< 0.2	< .200	< .100	< .100
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	< .200	< .100	< .200	< 0.2	< .200	< .100	< .100
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	--	--	--	--	--	--	--
18	< .200	< .100	<.200	< 0.2	< .200	< .100	< .100
19	--	--	--	--	--	--	--
20	< .200	< .100	<.200	< 0.2	< .200	< .100	< .100
21	--	--	--	--	--	--	--
22	< .200	< .100	<.200	< 0.2	< .200	< .100	< .100
23	< .200	< .100	<.200	< 0.2	0.895	< .100	< .100
24	< .200	< .100	<.200	< 0.2	< .200	< .100	< .100
25	--	--	--	--	--	--	--
26	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--
28	< .200	< .100	<.200	< 0.2	< .200	< .100	< .100
29	--	--	--	--	--	--	--
30	< .200	< .100	<.200	< 0.2	.112 (estimated)	< .100	< .100

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1997-1999

Site	Total Tetrachloro-Ethylene (µg/L)	Total Toluene (µg/L)	Total Trans-1,2, Di-Chloroethene (µg/L)	Total Tri-Chloro-Ethylene (µg/L)	Total Tri-Chloro-Fluoro-Methane (µg/L)	Total Vinyl Chloride (µg/L)
	GQS = 5 µg/L	GQS = 1000 µg/L	GQS = 10 µg/L	GQS = 5 µg/L		GQS = 2 µg/L
1	< .100	< .100	< .100	< .100	< .200	< .200
2	< .500	< .500	< .500	< .500	< 1.00	< 1
3	< .100	< .100	< .100	< .100	< .200	< .200
4	--	--	--	--	--	--
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	< .100	< .100	< .100	< .100	< .200	< .200
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	< .100	< .100	< .100	< .100	< .200	< .200
14	--	--	--	--	--	--
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	--	--	--	--	--	--
18	< .100	< .100	< .100	< .100	< .200	< .200
19	--	--	--	--	--	--
20	< .100	< .100	< .100	< .100	< .200	< .200
21	--	--	--	--	--	--
22	< .100	< .100	< .100	< .100	< .200	< .200
23	< .100	< .100	< .100	< .100	< .200	< .200
24	< .100	< .100	< .100	< .100	< .200	< .200
25	--	--	--	--	--	--
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	< .100	< .100	< .100	< .100	< .200	< .200
29	--	--	--	--	--	--
30	< .100	< .100	< .100	< .100	< .200	< .200

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	2,6, Di-Ethyl Aniline (µg/L)	Acetochlor (µg/L)	Alachlor (µg/L) GQS = 2 µg/L	Alpha BHC Dissolved (µg/L)	Atrazine (µg/L) GQS = 3 µg/L	Benfluralin (µg/L)	Butylate (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	< .0030	< .0020	< 0.002	< .0020	< .001	< .0020	< .0020
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	<.0030	< .0020	< .0020	< .0020	< .001	< .0020	< .0020
13	< .0030	< .0020	< .0020	< .0020	< .001	< .0020	< .0020
14	< .0030	< .0020	< .0020	< .0020	< .001	< .0020	< .0020
15	--	--	--	--	--	--	--
16	< .0030	< .0020	< .0020	< .0020	< .001	< .0020	< .0020
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	< .0030	< .0020	< 0.002	< .0020	0.243	< .0020	< .0020
20	--	--	--	--	--	--	--
21	< .0030	< .0020	< 0.002	< .0020	.003 (estimated)	< .0020	< .0020
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
23	< .0030	< .0020	< 0.002	< .0020	0.007	< .0020	< .0020
26	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	< .0030	< .0020	< 0.002	< .0020	< .001	< .0020	< .0020
30	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	Carbaryl (µg/L)	Carbofuran (µg/L) GQS = 4 µg/L	Chlor-Pyrifos, Dissolved (µg/L)	Cyanazine (µg/L)	DCPA (µg/L)	De-Ethyl Atrazine (µg/L)
1	--	--	--	--	--	--
2	--	--	--	--	--	--
3	--	--	--	--	--	--
4	< .0030	< .0030	< .0040	< .0040	< .0020	< .0020
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	--	--	--	--	--	--
11	--	--	--	--	--	--
12	<.0030	<.0030	<.0040	<.0040	<.0020	< .0020
13	< .0030	< .0030	< .0040	< .0040	< .0020	< .0020
14	< .0030	< .0030	< .0040	< .0040	< .0020	< .0020
15	--	--	--	--	--	--
16	< .0030	< .0030	< .0040	< .0040	< .0020	< .0020
17	--	--	--	--	--	--
18	--	--	--	--	--	--
19	< .0030	< .0030	< .0040	< .0040	< .0020	.200 (estimated)
20	--	--	--	--	--	--
21	< .0030	< .0030	< .0040	< .0040	< .0020	.0010 (estimated)
22	--	--	--	--	--	--
23	--	--	--	--	--	--
24	--	--	--	--	--	--
23	--	--	--	--	--	--
25	< .0030	< .0030	< .0040	< .0040	< .0020	.0062 (estimated)
26	--	--	--	--	--	--
27	--	--	--	--	--	--
28	--	--	--	--	--	--
29	< .0030	< .0030	< .0040	< .0040	< .0020	< .0020
30	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	Dissolved Diazinon (µg/L)	Dissolved Di-Eldrin (µg/L)	Disul-Foton (µg/L)	EPTC (µg/L)	Ethal-Fluralin (µg/L)	Etho-Prop (µg/L)	Dissolved Fonofos (µg/L)	Dissolved Lindane (µg/L)
								GQS = 0.2 µg/L
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--	--
4	< .002	< 0.001	< .0170	< .0020	< .0040	< .0030	< .0030	< .004
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	< .002	< 0.001	< .0170	< .0020	< .0040	<.0030	< .0030	< .004
13	< .002	< 0.001	< .0170	< .0020	< .0040	<.0030	< .0030	< .004
14	< .002	< 0.001	< .0170	< .0020	< .0040	<.0030	< .0030	< .004
15	--	--	--	--	--	--	--	--
16	< .002	< 0.001	< .0170	< .0020	< .0040	< .0030	< .0030	< .004
17	--	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--	--
19	< .002	< 0.001	< .0170	< .0020	< .0040	< .0030	< .0030	< .004
20	--	--	--	--	--	--	--	--
21	< .002	< 0.001	< .0170	< .0020	< .0040	< .0030	< .0030	< .004
22	--	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--	--
25	< .002	0.17	< .0170	< .0020	< .0040	< .0030	< .0030	< .004
26	--	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--	--
29	< .002	0.008	< .0170	< .0020	< .0040	< .0030	< .0030	< .004
30	--	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	Linuron (µg/L)	Dissolved Malathion (µg/L)	Methyl Azinphos (µg/L)	Methyl Parathion (µg/L)	Dissolved Metolachlor (µg/L)	Metribuzin Sencor (µg/L)	Moliunate (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	< .0020	< .005	< .0010	< .0060	< .002	< 0.004	< .0040
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	< .0020	<.005	< .0010	< .0060	< .002	< 0.004	< .0040
13	< .0020	< .005	< .0010	< .0060	<. 002	< 0.004	< .0040
14	< .0020	< .005	< .0010	< .0060	<. 002	< 0.004	< .0040
15	--	--	--	--	--	--	--
16	< .0020	< .005	< .0010	< .0060	< .002	< 0.004	< .0040
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	< .0020	< .005	< .0010	< .0060	.002 (estimated)	< 0.004	< .0040
20	--	--	--	--	--	--	--
21	< .0020	< .005	< .0010	< .0060	< .002	< 0.004	< .0040
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
25	< .0020	< .005	< .0010	< .0060	.004 (estimated)	< 0.004	< .0040
26	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	< .0020	< .005	< .0010	< .0060	< .002	< 0.004	< .0040
30	--	--	--	--	--	--	--

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	Napropamide (µg/L)	Dissolved Parathion (µg/L)	Pebulate (µg/L)	Pendimethalin (µg/L)	CIS Permethrin (µg/L)	Phorate (µg/L)	Dissolved P,P', DDE (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
13	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
14	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
15	--	--	--	--	--	--	--
16	< .0030	<. 004	< .0040	< .0040	< .0050	< .0020	< .0060
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
20	--	--	--	--	--	--	--
21	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
25	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
26	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	< .0030	< .004	< .0040	< .0040	< .0050	< .0020	< .0060
30	--	--	--	--	--	--	--

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	Prometon (µg/L)	Pronamide (µg/L)	Propanil (µg/L)	Propargite (µg/L)	Propchlor (µg/L)	Simazine (µg/L) GQS = 4 µg/L	Tebuthiuron (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	--	--	--	--	--	--	--
4	< .0180	< .0030	< .0040	< .0130	< .0070	< .0050	< .0100
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	< .0030	< .0040	< .0130	< .0070	< .0050	--
12	< .0180	<.0030	< .0040	<.0130	< .0070	< .050	< .0100
13	< .0180	< .0030	< .0040	<.0130	< .0070	<. 0050	< .0100
14	< .0180	< .0030	< .0040	<.0130	< .0070	<. 050	< .0100
15	--	--	--	--	--	--	--
16	< .0180	< .0030	< .0040	<.0130	< .0070	< .0050	< .0100
17	--	--	--	--	--	--	--
18	--	--	--	--	--	--	--
19	< .0180	< .0030	< .0040	<.0130	< .0070	< .0804	< .0100
20	--	--	--	--	--	--	--
21	.0011 (estimated)	< .0030	< .0040	<.0130	< .0070	< .0050	< .0100
22	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
24	--	--	--	--	--	--	--
25	0.0737	< .0030	< .0040	<.0130	< .0070	.0044 (estimated)	0.0112
26	--	--	--	--	--	--	--
27	--	--	--	--	--	--	--
28	--	--	--	--	--	--	--
29	< .0180	< .0030	< .0040	<.0130	< .0070	< .0050	< .0100
30	--	--	--	--	--	--	--

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1997-1999

Site	Terbacil (µg/L)	Terbufos (µg/L)	Thiobencarb (µg/L)	Triallate (µg/L)	Trifluralin (µg/L)
1	--	--	--	--	--
2	--	--	--	--	--
3	--	--	--	--	--
4	< .0070	< .0130	< .0020	< .0010	< .0020
5	--	--	--	--	--
6	--	--	--	--	--
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	--	--	--	--	--
12	< .0070	< .0130	< .0020	< .0010	< .0020
13	< .0070	< .0130	< .0020	< .0010	< .0020
14	< .0070	< .0130	< .0020	< .0010	< .0020
15	--	--	--	--	--
16	< .0070	< .0130	< .0020	< .0010	< .0020
17	--	--	--	--	--
18	--	--	--	--	--
19	< .0070	< .0130	< .0020	< .0010	< .0020
20	--	--	--	--	--
21	< .0070	< .0130	< .0020	< .0010	< .0020
22	--	--	--	--	--
23	--	--	--	--	--
24	--	--	--	--	--
25	< .0070	< .0130	< .0020	< .0010	< .0020
26	--	--	--	--	--
27	--	--	--	--	--
28	--	--	--	--	--
29	< .0070	< .0130	< .0020	< .0010	< .0020
30	--	--	--	--	--

Appendix C

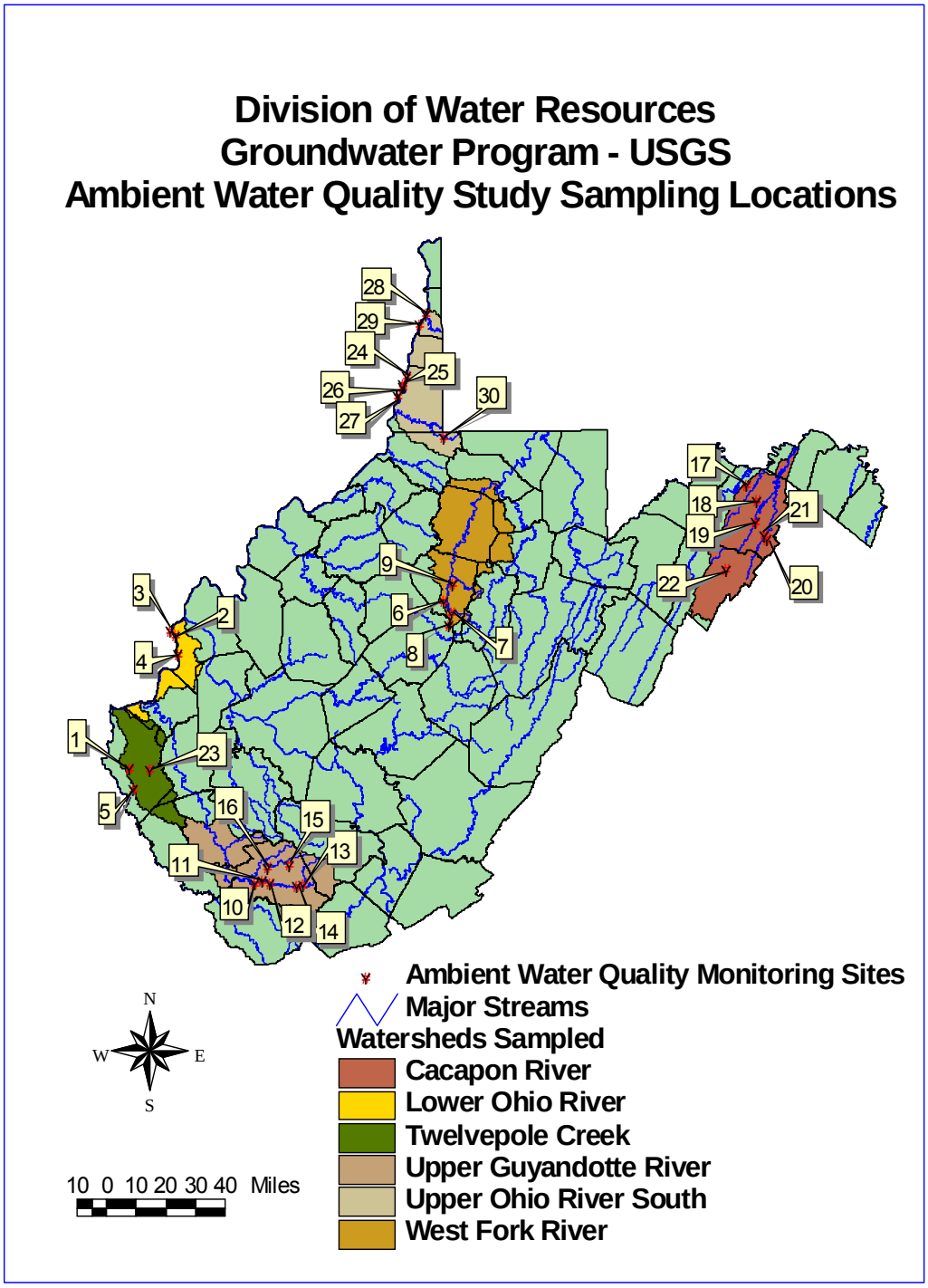
Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia

Data Tables From 1999-2001

Note: Groundwater Quality Standards are noted where Groundwater Quality 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.

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Key to the sampling sites-1999-2001

Site	County	Watershed	Geologic Unit	Geologic Age	Total Depth of Well (feet)	Elevation (ft.above mean sea level)
1	Wayne	Twelvepole	Allegheny	Pennsylvanian	56	67-
2	Mason	Lower Ohio	Alluvium	Holocene	73	540
3	Mason	Lower Ohio	Alluvium	Holocene	60	560
4	Mason	Lower Ohio	Alluvium	Holocene	87	580
5	Wayne	Twelvepole	Kanawha	Pennsylvanian	96	690
6	Lewis	West Fork	Monongahela	Pennsylvanian	100	1130
7	Lewis	West Fork	Conemaugh	Pennsylvanian	120	1090
8	Lewis	West Fork	Conemaugh	Pennsylvanian	380	1250
9	Lewis	West Fork	Monongahela	Pennsylvanian	60	1080
10	Wyoming	Upper Guyandotte	New River	Pennsylvanian	150	1160
11	Wyoming	Upper Guyandotte	New River	Pennsylvanian	417	1280
12	Wyoming	Upper Guyandotte	New River	Pennsylvanian	--	1440
13	Wyoming	Upper Guyandotte	Pottsville	Pennsylvanian	286	1410
14	Wyoming	Upper Guyandotte	Pottsville	Pennsylvanian	300	1400
15	Wyoming	Upper Guyandotte	New River	Pennsylvanian	230	1880
16	Wyoming	Upper Guyandotte	New River	Pennsylvanian	125	1360
17	Hampshire	Cacapon	UM Devonian	Devonian	740	1230
18	Hampshire	Cacapon	UM Devonian	Devonian	600	1200
19	Hampshire	Cacapon	UM Devonian	Devonian	320	890
20	Hampshire	Cacapon	UM Devonian	Devonian	400	1190
21	Hampshire	Cacapon	Marcellus	Devonian	300	890
22	Hardy	Cacapon	Oriskany	Devonian	103	1320
23	Wayne	Twelvepole	Kanawha	Pennsylvanian	93	680
24	Marshall	Upper Ohio South	Alluvium	Holocene	120	660
25	Marshall	Upper Ohio South	Alluvium	Holocene	80	650
26	Marshall	Upper Ohio South	Alluvium	Holocene	75	640
27	Marshall	Upper Ohio South	Alluvium	Holocene	78	640
28	Brooke	Upper Ohio South	Alluvium	Holocene	67	660
29	Brooke	Upper Ohio South	Alluvium	Holocene	72	670
30	Wetzel	Upper Ohio South	Dunkard	Permian	--	940


Division of Water Resources
Groundwater Program - USGS
Ambient Water Quality Study Sampling Locations
28
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10 0 10 20 30 40 Miles
Ambient Water Quality Monitoring Sites
Major Streams
Watersheds Sampled
Cacapon River
Lower Ohio River
Twelvepole Creek
Upper Guyandotte River
Upper Ohio River South
West Fork River

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Field Parameters-1999-2001

Site	Oxidation-Reduction Potential (MV)	Water Temp. (Deg C)	Barometric Pressure (mm of Hg)	Turbidity (NTU)	Specific Conductance (Us/Cm)	Water pH (Whole Field, Standard Units)
1	-19	14.8	739	15	811	7.6
2	385	14.4	742	.1	344	6.1
3	200	13.1	744	.2	641	6.4
4	226	14.1	739	.4	774	7
5	95	15.4	739	.5	721	7.2
6	90	12.9	732	.3	321	7.2
7	103	13.0	736	.5	707	6.6
8	-20	14.4	731	.2	693	8.9
9	87	11.3	736	.2	705	6.6
10	48	15.1	731	3.8	795	7.3
11	44	14.9	730	.8	687	7.4
12	-41	15.8	732	3	662	7.4
13	28	15.2	728	4	701	6.9
14	-21	14.9	728	4	635	8.2
15	69	12.2	713	1.3	499	6.8
16	89	14.4	726	1.1	382	6.4
17	669	13.6	726	1.4	431	7.1
18	-138	13.0	727	.3	265	7.1
19	-5	12.8	735	.2	251	7.1
20	238	13.2	731	12	249	6.3
21	189	13.6	738	24	345	7.0
22	218	14.0	729	.8	650	6.9
23	57	14.6	746	.3	261	7.3
24	325	15.1	751	.1	1020	6.7
25	373	13.4	754	.3	634	6.9
26	272	12.0	754	.1	981	6.5
27	225	13.5	753	.2	463	7.0
28	203	14.8	755	.1	604	6.7
29	177	11.8	753	.4	1380	6.9
30	130	12.6	745	4	730	9.0

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Field Parameters, Bacteria, Acidity, and Ions-1999-2001

Site	Dissolved Oxygen, (mg/L)	Total Coliform, (Colonies/ 100 ml)	Fecal Coliform, (Colonies/ 100 ml)	E. Coli (Colonies/ 100 ml)	Hardness Noncarb. (mg/L as $CaCO_3$)	Acidity (mg/L as H^+)	Acidity (mg/L as $CaCO_3$)	Total Recoverable Calcium (mg/L as Ca)	Total Recoverable Magnesium, (mg/L as Mg)
1	.7	*2	< 1	< 1	--	<.1	--	37	6.2
2	2.3	<1	< 1	< 1	55	0.1	5.0	39	6.8
3	2.4	*3	< 1	< 1	130	0.2	9.9	76	12
4	1.6	*2	< 1	< 1	120	0.1	5.0	110	13
5	.8	<1	< 1	< 1	--	<0.1	--	22	4.1
6	.7	*10	< 1	< 1	--	<.1	--	32	4.4
7	1.3	<1	< 1	< 1	--	<.1	--	16	2.1
8	.4	80	< 1	< 1	--	<.1	--	0.7	0.1
9	1.2	<1	< 1	< 1	160	<.1	--	89	16
10	.9	<1	< 1	< 1	--	0.1	--	6.9	2.1
11	.5	*1	< 1	< 1	--	0.2	9.9	12	3.2
12	.6	*7	< 1	< 1	--	<.1	--	28	4.8
13	.8	*2	< 1	< 1	--	<.1	--	33	7.6
14	1.6	*2	< 1	< 1	--	<.1	--	5	1.2
15	.9	*3	* 2	3	--	< .1	--	15	4
16	1.0	*4	< 1	< 1	--	<.1	--	24	5.8
17	1.6	<1	< 1	< 1	--	<.1	--	41	22
18	.9	<1	< 1	< 1	--	0.1	--	24	13
19	.6	62	* 13	12	--	<.1	--	22	4.7
20	1.3	*3	< 1	< 1	17	<.1	--	17	14
21	1.7	<1	< 1	< 1	2	<.1	--	58	5.4
22	1.0	83	< 1	< 1	66	0.2	9.9	100	17
23	.6	<1	< 1	< 1	--	<.1	--	23	6.2
24	3.1	<1	< 1	< 1	140	0.2	9.9	140	18
25	4.2	<1	< 1	< 1	59	<.1	--	85	10
26	1.2	<1	< 1	< 1	280	0..3	15	130	26
27	.5	<1	< 1	< 1	18	<.1	--	61	7.8
28	.6	<1	< 1	< 1	88	<.1	--	71	12
29	.7	<1	< 1	< 1	400	0.3	15	190	48
30	2.0	*5	< 1	< 1	--	<.1	--	2.7	0.5

* = Results based on colony count outside the acceptance range (non-ideal colony count)

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Ions-1999-2001

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	120	2.6	251	0	206	11	0.19
2	15	1.4	82	0	67	108	47
3	25	1.5	130	0	107	84	48
4	29	2.1	317	0	260	40	65
5	140	2.4	174	0	143	17	0.07
6	36	1	183	0	150	19	12
7	120	1.2	179	0	147	66	0.07
8	160	1.1	345	32	335	0.8	0.45
9	27	1.5	174	0	143	60	230
10	170	1.4	258	0	212	21	0.4
11	150	1.6	351	0	288	22	0.8
12	120	1.4	384	0	315	24	2.1
13	120	1.9	244	0	200	49	19
14	150	1	287	0	235	2.9	14
15	91	1.6	246	0	202	61	5
16	44	1.9	143	0	117	87	1.2
17	18	1.4	240	0	197	31	18
18	8.4	1.3	143	0	117	18	5.8
19	27	0.8	126	0	103	16	18
20	12	0.8	104	0	85	81	31
21	4.3	0.3	240	0	197	32	20
22	10	0.7	308	0	253	62	64
23	20	3	148	0	121	12	7
24	47	2.4	337	0	276	108	150
25	26	2	238	0	195	48	78
26	42	2.6	191	0	157	94	320
27	22	2	202	0	166	32	32
28	29	2.7	168	0	138	54	86
29	67	3.1	334	0	274	66	440
30	150	0.1	222	50	266	0.5	21

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Ions-1999-2001

Site	Dissolved Chloride (mg/L as Cl)	Total Fluoride (mg/L as F) GQS = 4.0 mg/L	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)
1	110	0.3	0.65	430	430
2	18	0.1	0.05	218	220
3	92	0.1	0.34	445	460
4	44	0.1	0.17	473	480
5	160	0.5	0.78	435	440
6	4.8	0.2	0.07	198	190
7	130	0.1	0.77	382	380
8	15	1.4	0.14	400	400
9	3.7	0.4	< 0.05	485	490
10	120	0.7	0.7	432	440
11	49	0.4	0.32	396	400
12	27	0.4	0.19	387	390
13	96	0.6	0.34	402	400
14	62	0.9	0.18	383	380
15	29	0.2	0.17	287	280
16	45	0.1	0.17	215	200
17	13	0.1	0.07	257	250
18	9	0.2	0.09	158	160
19	5.9	0.1	< 0.05	157	150
20	7.5	0.2	0.08	154	170
21	1.3	0.1	< 0.05	216	210
22	26	0.1	< 0.05	408	420
23	4.8	0.4	0.06	145	140
24	77	0.1	< 0.2	672	680
25	28	0.1	0.07	370	390
26	35	0.2	0.1	710	730
27	29	0.3	0.11	272	270
28	53	0.2	0.1	366	370
29	72	0.1	< 0.2	1070	1100
30	43	1	0.16	376	400

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Ions and Metals-1999-2001

Site	Total Nitrogen, Nitrite (mg/L as N)	Total Nitrogen, NO_2+NO_3 (mg/L as N) GQS = 10 mg/L	Total Nitrogen, Ammonia (mg/L as N)	Total Nitrogen, Ammonia (mg/L as Nh_4)	Total Phosphorus (mg/L as P)	Total Recoverable Aluminum, (µg/L as Al)	Total Antimony, (µg/L as Sb) GQS = 6 µg/L
1	< .010	< .020	0.52	0.67	< 0.02	5.8	< 1
2	< .010	4.4	< 0.01	--	< 0.02	< 3	< 1
3	< .010	2.7	0.04	0.05	< 0.02	< 3	< 1
4	< .010	2.1	0.02	0.03	< 0.02	< 3	< 1
5	< .010	< .020	0.94	1.21	0.16	< 3	< 1
6	< .010	< .020	0.11	0.14	< 0.02	< 3	< 1
7	< .010	< .020	0.54	0.7	0.15	< 3	< 1
8	< .010	< .020	0.15	0.19	0.03	3.8	< 1
9	< .010	< .020	0.27	0.35	0.08	< 3	< 1
10	< .010	< .020	0.26	0.33	0.14	< 3	< 1
11	< .010	< .020	0.31	0.4	0.08	< 3	< 1
12	< .010	< .020	0.29	0.37	0.05	< 3	< 1
13	< .010	< .020	0.36	0.46	0.06	< 3	< 1
14	< .010	< .020	0.04	0.05	0.06	18	< 1
15	< .010	< .020	0.24	0.31	0.05	3.3	< 1
16	< .010	< .020	0.5	0.64	0.18	< 3	< 1
17	< .010	.2	< 0.01	--	< 0.02	5.1	< 1
18	< .010	< .020	0.01	0.01	< 0.02	3.4	< 1
19	< .010	< .020	0.1	0.13	< 0.02	< 3	< 1
20	< .010	< .020	0.03	0.04	0.04	6.6	< 1
21	< .010	< .020	0.55	0.71	0.11	< 3	< 1
22	< .010	.2	0.14	0.18	< 0.02	3.7	< 1
23	< .010	< .020	1.4	1.8	0.07	< 3	< 1
24	< .010	4.0	0.01	0.01	< 0.02	< 3	< 1
25	< .010	2.2	< 0.01	--	< 0.02	< 3	< 1
26	< .010	.5	0.44	0.57	< 0.02	< 3	< 1
27	< .010	< .020	0.27	0.35	< 0.02	< 3	< 1
28	< .010	.8	0.28	0.36	< 0.02	< 3	< 1
29	< .010	.5	< 0.01	--	0.18	< 3	< 1
30	< .010	< .020	0.52	0.08	0.07	56	< 1

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Metals-1999-2001

Site	Total 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	Recoverable Iron, (µg/L as Fe)	Total Recoverable Manganese, (µg/L as Mn)
		GQS = 2000 µg/L	GQS = 4 µg/L	GQS = 5 µg/L		
1	< 4	550	< 1	< 0.5	3200	230
2	< 4	41	< 1	< 0.5	2.8	210
3	< 4	70	< 1	< 0.5	112	460
4	< 4	57	< 1	< 0.5	490	500
5	< 4	600	< 1	< 0.5	694	46
6	8.3	600	< 1	< 0.5	152	190
7	< 4	320	< 1	< 0.5	7500	460
8	< 4	130	< 1	< 0.5	7.7	2.3
9	< 4	54	< 1	< 0.5	9900	1500
10	< 4	400	< 1	< 0.5	1600	94
11	< 4	590	< 1	< 0.5	310	52
12	< 4	720	< 1	< 0.5	211	79
13	< 4	360	< 1	< 0.5	757	470
14	< 4	110	< 1	< 0.5	353	63
15	< 4	400	< 1	< 0.5	5000	270
16	< 4	580	< 1	< 0.5	3000	220
17	6.9	270	< 1	< 0.5	141	6
18	< 4	300	< 1	< 0.5	412	630
19	< 4	54	< 1	< 0.5	105	280
20	< 4	90	< 1	< 0.5	3400	800
21	< 4	380	< 1	< 0.5	2600	73
22	< 4	140	< 1	< 0.5	312	110
23	4.5	300	< 1	< 0.5	418	34
24	< 4	47	< 1	< 0.5	7.6	< 1
25	< 4	99	< 1	< 0.5	< 2	< 1
26	< 4	50	< 1	< 0.5	121	2700
27	< 4	64	< 1	< 0.5	49	87
28	< 4	84	< 1	< 0.5	314	1300
29	< 4	21	< 1	< 0.5	625	250
30	< 4	81	< 1	< 0.5	77	23

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Metals and Volatile Organic Compounds-1999-2001

Site	Total Recoverable Lead, (µg/L as Pb)	Total Recoverable Zinc, (µg/L as Zn)	Total Radon (pCi/L)	Total Organic Carbon, (Mg/L as C)	Total 1,1,1, Trichloro-ethane (µg/l)	Total ,1-1 Dichloro-ethane µg/L)	Total 1,1 Dichloro-ethylene µg/L)
	GQS = 15 µg/L				GQS = 200 µg/L		GQS = 7 µg/L
1	< 2	100	108	0.5	0.1	< .100	<. 100
2	< 2	4	463	0.2	0.5	< .500	< .1
3	< 2	< 2	548	0.6	0.1	< .100	< .1
4	< 2	< 2	279	0.6	--	--	< .1
5	< 2	7	560	1.6	--	--	< .1
6	< 2	5	1805	0.6	--	--	< .1
7	< 2	< 2	453	1	--	--	< .1
8	< 2	< 2	78	0.8	--	--	< .1
9	< 2	< 2	564	0.8	--	--	< .1
10	< 2	3	129	0.7	0.1	< .100	--
11	< 2	< 2	--	1	--	--	< .1
12	< 2	< 2	151	0.9	--	--	< .1
13	< 2	8	240	0.8	0.1	< .100	< .1
14	< 2	6	259	0.4	--	--	< .1
15	< 2	3	45	0.8	--	--	< .1
16	< 2	19	100	0.7	--	--	< .1
17	< 2	1900	612	1.1	--	--	< .1
18	< 2	1600	645	0.9	< 0.1	< .100	< .1
19	< 2	3	136	1.3	--	--	< .1
20	< 2	9	239	0.5	< 0.1	0.254	< .1
21	< 2	31	68	0.5	--	--	< .1
22	< 2	< 2	188	0.5	0.136	< .100	< .1
23	< 2	42	138	1.1	< 0.1	< .100	< .1
24	< 2	46	527	0.3	0.247	< .100	< .1
25	< 2	5	498	0.1	--	--	< .1
26	< 2	8	398	0.8	--	--	< .1
27	< 2	3	594	0.2	--	--	< .1
28	< 2	3	501	--	0.1	< .100	< .1
29	< 2	5	470	0.1	--	--	< .1
30	< 2	< 2	934	1	0.1	< .100	< .1

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1999-2001

Site	Total 1,2-Di-Chloroethane (µg/L)	Total 1,2-Di Chloropropane	Total Benzene (µg/L)	Benzene 1,3-Di-Chloro- (µg/L)	Benzene 1,4-Di-Chloro- (µg/L)	Benzene O-Di-Chloro- (µg/L)
	GQS = 5 µg/L	GQS = 5 µg/L	GQS = 5 µg/L			GQS = 6 µg/L
1	< .10	< .10	< .10	< .10	< .10	< .10
2	< .10	< .10	< .10	< .10	< .10	< .10
3	< .10	< .10	< .10	< .10	< .10	< .10
4	< .10	< .10	< .10	< .10	< .10	< .10
5	< .10	< .10	< .10	< .10	< .10	< .10
6	< .10	< .10	9.39	< .10	< .10	< .10
7	< .10	< .10	< .10	< .10	< .10	< .10
8	< .10	< .10	< .10	< .10	< .10	< .10
9	< .10	< .10	< .10	< .10	< .10	< .10
10	--	--	--	--	--	--
11	< .10	< .10	< .10	< .10	< .10	< .10
12	< .10	< .10	< .10	< .10	< .10	< .10
13	< .10	< .10	< .10	< .10	< .10	< .10
14	< .10	< .10	< .10	< .10	< .10	< .10
15	< .10	< .10	< .10	< .10	< .10	< .10
16	< .10	< .10	< .10	< .10	< .10	< .10
17	< .10	< .10	< .10	< .10	< .10	< .10
18	< .10	< .10	< .10	< .10	< .10	< .10
19	< .10	< .10	< .10	< .10	< .10	< .10
20	< .10	< .10	< .10	< .10	< .10	< .10
21	< .10	< .10	< .10	< .10	< .10	< .10
22	< .10	< .10	< .10	< .10	< .10	< .10
23	< .10	< .10	< .10	< .10	< .10	< .10
24	< .10	< .10	< .10	< .10	< .10	< .10
25	< .10	< .10	< .10	< .10	< .10	< .10
26	< .10	< .10	< .10	< .10	< .10	< .10
27	< .10	< .10	< .10	< .10	< .10	< .10
28	< .10	< .10	< .10	< .10	< .10	< .10
29	< .10	< .10	< .10	< .10	< .10	< .10
30	< .10	< .10	< .10	< .10	< .10	< .10

GQS = Groundwater Quality Standard

Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1999-2001

Site	Bromo Di-Chloro-Methane (µg/L)	Total Bromoform (µg/L)	Total Carbon Tetra-chloride (µg/L) GQS = 5 µg/L	Total Chloro-benzene (µg/L)	Total Chloro-di-bromo-methane (µg/L)	Total Chloroform (µg/L)
1	< .10	< .20	< .20	< .10	< .20	< .10
2	< .10	< .20	< .20	< .10	< .20	< .10
3	< .10	< .20	< .20	< .10	< .20	< .10
4	< .10	< .20	< .20	< .10	< .20	.22
5	< .10	< .20	< .20	< .10	< .20	< .10
6	< .10	< .20	< .20	< .10	< .20	< .10
7	< .10	< .20	< .20	< .10	< .20	< .10
8	< .10	< .20	< .20	< .10	< .20	< .10
9	< .10	< .20	< .20	< .10	< .20	.10
10	--	--	--	--	--	< .10
11	< .10	< .20	< .20	< .10	< .20	< .10
12	< .10	< .20	< .20	< .10	< .20	< .10
13	< .10	< .20	< .20	< .10	< .20	< .10
14	< .10	< .20	< .20	< .10	< .20	< .10
15	< .10	< .20	< .20	< .10	< .20	< .10
16	< .10	< .20	< .20	< .10	< .20	< .10
17	< .10	< .20	< .20	< .10	< .20	< .10
18	< .10	< .20	< .20	< .10	< .20	< .10
19	< .10	< .20	< .20	< .10	< .20	< .10
20	< .10	< .20	< .20	< .10	< .20	< .10
21	< .10	< .20	< .20	< .10	< .20	< .10
22	< .10	< .20	< .20	< .10	< .20	< .10
23	< .10	< .20	< .20	< .10	< .20	< .10
24	< .10	< .20	< .20	< .10	< .20	.87
25	< .10	< .20	< .20	< .10	< .20	< .10
26	< .10	< .20	< .20	< .10	< .20	< .10
27	< .10	< .20	< .20	< .10	< .20	< .10
28	< .10	< .20	< .20	< .10	< .20	< .10
29	< .10	< .20	< .20	< .10	< .20	< .10
30	< .10	< .20	< .20	< .10	< .20	< .10

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Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1999-2001

Site	Total Cis-1,2, -Di-Chloroethene (µg/L)	Total Di-Chloro-Di-Fluoro-Methane (µg/L)	Total Di-Iso-Propyl Ether, (µg/L)	Total Ethyl-Benzene (µg/L)	Total Ether Ethyl (µg/L)	Total EtherTertiary Butyl Ethyl (µg/L)
	GQS = 7 µg/L			GQS = 7 µg/L		
1	< .10	< .20	< .20	< .10	< .20	< .10
2	< .10	< .20	< .20	< .10	< .20	< .10
3	< .10	< .20	< .20	< .10	< .20	< .10
4	< .10	< .20	< .20	< .10	< .20	< .10
5	< .10	< .20	< .20	< .10	< .20	< .10
6	< .10	< .20	< .20	2.63	< .20	< .10
7	< .10	< .20	< .20	< .10	< .20	< .10
8	< .10	< .20	< .20	< .10	< .20	< .10
9	< .10	< .20	< .20	< .10	< .20	< .10
10	--	--	--	< .10	--	--
11	< .10	< .20	< .20	< .10	< .20	< .10
12	< .10	< .20	< .20	< .10	< .20	< .10
13	2.22	< .20	< .20	< .10	< .20	< .10
14	< .10	< .20	< .20	< .10	< .20	< .10
15	< .10	< .20	< .20	< .10	< .20	< .10
16	< .10	< .20	< .20	< .10	< .20	< .10
17	< .10	< .20	< .20	< .10	< .20	< .10
18	< .10	< .20	< .20	< .10	< .20	< .10
19	< .10	< .20	< .20	< .10	< .20	< .10
20	< .10	< .20	< .20	< .10	< .20	< .10
21	< .10	< .20	< .20	< .10	< .20	< .10
22	< .10	< .20	< .20	< .10	< .20	< .10
23	< .10	< .20	< .20	< .10	< .20	< .10
24	< .10	< .20	< .20	< .10	< .20	< .10
25	< .10	< .20	< .20	< .10	< .20	< .10
26	< .10	< .20	< .20	< .10	< .20	< .10
27	< .10	< .20	< .20	< .10	< .20	< .10
28	< .10	< .20	< .20	< .10	< .20	< .10
29	< .10	< .20	< .20	< .10	< .20	< .10
30	< .10	< .20	< .20	< .10	< .20	< .10

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Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1999-2001

Site	Total Ether Tert-Pentyl Methyl µg/L)	Freon 113 (µg/L)	Meta/Para-Xylene (µg/L)	Total Methylene Chloride (µg/L)	Methyl Tertiary Butyl Ether (µg/L)	Total O-Xylene (µg/L)	Total Styrene (µg/L)
					GQS = 20 µg/L	GQS = 10 µg/L	GQS = 100 µg/L
1	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
2	< .20	< .10	< .20	< 0.2	.20 (estimated)	< .500	< .10
3	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
4	< .20	< .10	< .20	< 0.2	< .20	--	< .10
5	< .20	< .10	< .20	< 0.2	< .20	--	< .10
6	< .20	< .10	2.79	< 0.2	< .20	--	< .10
7	< .20	< .10	< .20	< 0.2	1.0	--	< .10
8	< .20	< .10	< .20	< 0.2	< .20	--	< .10
9	< .20	< .10	< .20	< 0.2	< .20	--	< .10
10	--	--	--	--	< .20	< .100	--
11	< .20	< .10	< .20	< 0.2	< .20	--	< .10
12	< .20	< .10	< .20	< 0.2	< .20	--	< .10
13	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
14	< .20	< .10	< .20	< 0.2	< .20	--	< .10
15	< .20	< .10	< .20	< 0.2	< .20	--	< .10
16	< .20	< .10	< .20	< 0.2	< .20	--	< .10
17	< .20	< .10	< .20	< 0.2	< .20	--	< .10
18	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
19	< .20	< .10	< .20	< 0.2	< .20	--	< .10
20	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
21	< .20	< .10	< .20	< 0.2	< .20	--	< .10
22	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
23	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
24	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
25	< .20	< .10	< .20	< 0.2	< .20	--	< .10
26	< .20	< .10	< .20	< 0.2	< .20	--	< .10
27	< .20	< .10	< .20	< 0.2	< .20	--	< .10
28	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10
29	< .20	< .10	< .20	< 0.2	< .20	--	< .10
30	< .20	< .10	< .20	< 0.2	< .20	< .100	< .10

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Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Volatile Organic Compounds-1999-2001

Site	Total Tetrachloro-Ethylene (µg/L)	Total Toluene (µg/L)	Total Trans-1,2, Di-Chloroethene (µg/L)	Total Tri-Chloro-Ethylene (µg/L)	Total Tri-Chloro-Fluoro-Methane (µg/L)	Total Vinyl Chloride (µg/L)
	GQS = 5 µg/L	GQS = 1000 µg/L	GQS = 10 µg/L	GQS = 5 µg/L		GQS = 2 µg/L
1	< .10	< .100	< .10	< .10	< .20	< .20
2	< .10	< .500	< .10	< .10	< .20	< .20
3	< .10	< .100	< .10	< .10	< .20	< .20
4	< .10	--	< .10	< .10	< .20	< .20
5	< .10	--	< .10	< .10	< .20	< .20
6	< .10	--	.61	< .10	< .20	< .20
7	< .10	--	< .10	< .10	< .20	< .20
8	< .10	--	< .10	< .10	< .20	< .20
9	< .10	--	< .10	< .10	< .20	< .20
10	--	< .100	--	--	--	--
11	< .10	--	< .10	< .10	< .20	< .20
12	< .10	--	.11	< .10	< .20	< .20
13	< .10	< .100	< .10	< .10	< .20	8.8
14	< .10	--	< .10	< .10	< .20	< .20
15	< .10	--	< .10	< .10	< .20	< .20
16	< .10	--	< .10	< .10	< .20	< .20
17	< .10	--	< .10	< .10	< .20	< .20
18	< .10	< .100	.33	< .10	< .20	< .20
19	< .10	--	< .10	< .10	< .20	< .20
20	< .10	< .100	< .10	< .10	< .20	< .20
21	< .10	--	< .10	< .10	< .20	< .20
22	< .10	< .100	< .10	< .10	< .20	< .20
23	< .10	< .100	< .10	< .10	< .20	< .20
24	< .10	< .100	< .10	.22	< .20	< .20
25	< .10	--	< .10	.86	< .20	< .20
26	< .10	--	< .10	< .10	< .20	< .20
27	< .10	--	< .10	< .10	< .20	< .20
28	< .10	< .100	< .10	.88	< .20	< .20
29	< .10	--	< .10	< .12	< .20	< .20
30	< .10	< .100	< .10	< .10	< .20	< .20

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Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1999-2001

Site	2,6, Di-Ethyl Aniline (µg/L)	Acetochlor (µg/L)	Alachlor (µg/L) GQS = 2 µg/L	Alpha BHC Dissolved (µg/L)	Atrazine (µg/L) GQS = 3 µg/L	Benfluralin (µg/L)	Butylate (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	< .002	< .004	< .002	< .005	< .007	< .01	< .002
4	< .002	< .004	< .002	< .005	< .007	< .01	< .002
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	< .002	< .004	< .002	< .005	< .007	< .01	< .002
18	< .002	< .004	< .002	< .005	< .007	< .01	< .002
19	--	--	--	--	--	--	--
20	< .002	< .004	< .002	< .005	< .007	< .01	< .002
21	< .002	< .004	< .002	< .005	< .007	< .01	< .002
22	--	--	--	--	--	--	--
23	--	< .004	< .002	< .005	< .007	< .01	< .002
24	--	--	--	--	--	--	--
23	--	--	--	--	--	--	--
26	< .002	< .004	< .002	< .005	< .007	< .01	< .002
27	< .002	< .004	< .002	< .005	< .007	< .01	< .002
28	< .002	< .004	< .002	< .005	< .007	< .01	< .002
29	< .002	< .004	< .002	< .005	< .007	< .01	< .002
30	< .002	< .004	< .002	< .005	< .007	< .01	< .002

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Division of Water Resources Groundwater Program - United States Geological Survey Study of Ambient Groundwater Quality in West Virginia Data Tables
Pesticides-1999-2001

Site	Carbaryl (µg/L)	Carbofuran (µg/L) GQS = 4 µg/L	Chlor-Pyrifos, Dissolved (µg/L)	Cyanazine (µg/L)	DCPA (µg/L)	De-Ethyl Atrazine (µg/L)
1	--	--	--	--	--	--
2	--	--	--	--	--	--
3	< .041	< .02	< .005	< .018	< .003	< .006
4	< .041	< .02	< .005	< .018	< .003	< .006
5	--	--	--	--	--	--
6	--	--	--	--	--	--
7	--	--	--	--	--	--
8	--	--	--	--	--	--
9	--	--	--	--	--	--
10	--	--	--	--	--	--
11	--	--	--	--	--	--
12	--	--	--	--	--	--
13	--	--	--	--	--	--
14	--	--	--	--	--	--
15	--	--	--	--	--	--
16	--	--	--	--	--	--
17	< .041	< .02	< .005	< .018	< .003	< .006
18	< .041	< .02	< .005	< .018	< .003	< .006
19	--	--	--	--	--	--
20	< .041	< .02	< .005	< .018	< .003	< .006
21	< .041	< .02	< .005	< .018	< .003	< .006
22	--	--	--	--	--	--
23	< .041	< .02	< .005	< .018	< .003	< .006
24	--	--	--	--	--	--
23	--	--	--	--	--	--
25	--	--	--	--	--	--
26	< .041	< .02	< .005	< .018	< .003	< .006
27	< .041	< .02	< .005	< .018	< .003	< .006
28	< .041	< .02	< .005	< .018	< .003	< .006
29	< .041	< .02	< .005	< .018	< .003	< .006
30	< .041	< .02	< .005	< .018	< .003	< .006

GQS = Groundwater Quality Standard

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Site	Dissolved Diazinon (µg/L)	Dissolved Di-Eldrin (µg/L)	Disul-Foton (µg/L)	EPTC (µg/L)	Ethal-Fluralin (µg/L)	Etho-Prop (µg/L)	Dissolved Fonofos (µg/L)	Dissolved Lindane (µg/L)
								GQS = 0.2 µg/L
1	--	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--	--
3	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
4	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
5	--	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--	--
17	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
18	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
19	--	--	--	--	--	--	--	--
20	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
21	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
22	--	--	--	--	--	--	--	--
23	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
24	--	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--	--
26	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
27	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
28	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
29	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004
30	< .005	< .005	< .021	< .002	< .009	< .005	< .003	< .004

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Site	Linuron (µg/L)	Dissolved Malathion (µg/L)	Methyl Azinphos (µg/L)	Methyl Parathion (µg/L)	Dissolved Metolachlor (µg/L)	Metribuzin Sencor (µg/L)	Moliunate (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
4	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
18	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
19	--	--	--	--	--	--	--
20	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
21	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
22	--	--	--	--	--	--	--
23	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
24	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--
26	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
27	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
28	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
29	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002
30	< .035	< .027	< .050	< .006	< .013	< 0.006	< .002

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Site	Napropamide (µg/L)	Dissolved Parathion (µg/L)	Pebulate (µg/L)	Pendimethalin (µg/L)	CIS Permethrin (µg/L)	Phorate (µg/L)	Dissolved P,P', DDE (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	< .007	< .007	< .002	< .010	< .006	< .011	< .002
4	< .007	< .007	< .002	< .010	< .006	< .011	< .002
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	< .007	< .007	< .002	< .010	< .006	< .011	< .002
18	< .007	< .007	< .002	< .010	< .006	< .011	< .002
19	--	--	--	--	--	--	--
20	< .007	< .007	< .002	< .010	< .006	< .011	< .002
21	< .007	< .007	< .002	< .010	< .006	< .011	< .002
22	--	--	--	--	--	--	--
23	< .007	< .007	< .002	< .010	< .006	< .011	< .002
24	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--
26	< .007	< .007	< .002	< .010	< .006	< .011	< .002
27	< .007	< .007	< .002	< .010	< .006	< .011	< .002
28	< .007	< .007	< .002	< .010	< .006	< .011	< .002
29	< .007	< .007	< .002	< .010	< .006	< .011	< .002
30	< .007	< .007	< .002	< .010	< .006	< .011	< .002

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Site	Prometon (µg/L)	Pronamide (µg/L)	Propanil (µg/L)	Propargite (µg/L)	Propchlor (µg/L)	Simazine (µg/L) GQS = 4 µg/L	Tebuthiuron (µg/L)
1	--	--	--	--	--	--	--
2	--	--	--	--	--	--	--
3	< .015	< .004	< .011	< .023	< .010	< .011	< .016
4	< .015	< .004	< .011	< .023	< .010	< .011	< .016
5	--	--	--	--	--	--	--
6	--	--	--	--	--	--	--
7	--	--	--	--	--	--	--
8	--	--	--	--	--	--	--
9	--	--	--	--	--	--	--
10	--	--	--	--	--	--	--
11	--	--	--	--	--	--	--
12	--	--	--	--	--	--	--
13	--	--	--	--	--	--	--
14	--	--	--	--	--	--	--
15	--	--	--	--	--	--	--
16	--	--	--	--	--	--	--
17	< .015	< .004	< .011	< .023	< .010	< .011	< .016
18	< .015	< .004	< .011	< .023	< .010	< .011	< .016
19	--	--	--	--	--	--	--
20	< .015	< .004	< .011	< .023	< .010	< .011	< .016
21	< .015	< .004	< .011	< .023	< .010	< .011	< .016
22	--	--	--	--	--	--	--
23	< .015	< .004	< .011	< .023	< .010	< .011	< .016
24	--	--	--	--	--	--	--
25	--	--	--	--	--	--	--
26	< .015	< .004	< .011	< .023	< .010	< .011	< .016
27	< .015	< .004	< .011	< .023	< .010	< .011	< .016
28	< .015	< .004	< .011	< .023	< .010	< .011	< .016
29	< .015	< .004	< .011	< .023	< .010	< .011	< .016
30	< .015	< .004	< .011	< .023	< .010	< .011	< .016

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Site	Terbacil (µg/L)	Terbufos (µg/L)	Thiobencarb (µg/L)	Triallate (µg/L)	Trifluralin (µg/L)
1	--	--	--	--	--
2	--	--	--	--	--
3	< .016	< .017	< .005	< .002	< .009
4	< .016	< .017	< .005	< .002	< .009
5	--	--	--	--	--
6	--	--	--	--	--
7	--	--	--	--	--
8	--	--	--	--	--
9	--	--	--	--	--
10	--	--	--	--	--
11	--	--	--	--	--
12	--	--	--	--	--
13	--	--	--	--	--
14	--	--	--	--	--
15	--	--	--	--	--
16	--	--	--	--	--
17	< .016	< .017	< .005	< .002	< .009
18	< .016	< .017	< .005	< .002	< .009
19	--	--	--	--	--
20	< .016	< .017	< .005	< .002	< .009
21	< .016	< .017	< .005	< .002	< .009
22	--	--	--	--	--
23	< .016	< .017	< .005	< .002	< .009
24	--	--	--	--	--
25	--	--	--	--	--
26	< .016	< .017	< .005	< .002	< .009
27	< .016	< .017	< .005	< .002	< .009
28	< .016	< .017	< .005	< .002	< .009
29	< .016	< .017	< .005	< .002	< .009
30	< .016	< .017	< .005	< .002	< .009