



west virginia department of environmental protection

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West Virginia Water Use Workplan

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CURRENT STATE WATER USE PROGRAM

WVDEP Water Use Section Overview

In 2004, the Water Resources Protection Act (Act) passed by the West Virginia legislature authorizing the establishment of a Joint Legislative Oversight Commission on State Water Resources. The Act identifies the need for the protection and conservation of our state's water resources. It recognizes that a comprehensive assessment and statewide management plan for water resources will benefit the citizens of West Virginia. Because of this, the West Virginia Department of Environmental Protection (DEP) was designated as the implementing agency for the Act, which then led to the formation of the Water Use Section within the DEP's Division of Water and Waste Management.

In 2008, the Act was amended and renamed the Water Resources Protection and Management Act. The amended Act required the development of a West Virginia Water Resource Management Plan (the Plan) for the state by November, 2013. The Plan was adopted in March of 2014 and can be viewed or downloaded from www.dep.wv.gov/WWE/wateruse.

The Water Use Section is responsible for gathering information on the quantity and use of state surface and groundwater resources, as well as implementing the Plan. The Act required that all large quantity users withdrawing more than 750,000 gallons per calendar month must report their water use to the Joint Oversight Commission on State Water Resources annually. The data has been included in an annual survey submitted by the Water Use Section. A water management plan is also required of Oil & Gas operators as part of their horizontal well permits through the WVDEP Office of Oil & Gas. The water management plan establishes a threshold that operators are required to adhere to.

Among regulatory obligations, the Water Use Section has put forth a significant effort toward the research of West Virginia's water resources to better understand the quantity available, and to a limited degree, its quality. Those research projects include a base flow study, a stream gage correlation study, an ecological study comparing macro invertebrates and fish

Promoting a healthy environment.

populations, streamflow statistics, and time of travel modeling. A mine pool study was recently completed, which focuses on the location, quantity, and quality of water within these mine pools. Currently, the Water Use section along with USGS, is currently conducting a groundwater aquifer study through geophysical well logging. Most of these projects have been conducted in collaboration with the USGS WV Water Science field office.

Water Use Programs

1. The Large Quantity User Survey

Priority #1: Improve data collection, quality assurance, and delivery of West Virginia water-use data with the intent of improving data transferability to the USGS for baseline standards for water-use data.

In past years, industries and individuals who exceeded the water withdraw threshold of 750,000 gallons in a calendar month were labeled as a Large Quantity User (LQU) and mailed a survey form at the beginning of each year. On those survey forms, large quantity users were required to report their annual water usage or certify that they used plus or minus 10% of the amount reported the previous year. That data then went through a quality assurance process by the LQU coordinator and was manually entered into an LQU database.

After analyzing withdrawal numbers for each year, a decision was made to redefine large quantity user by lowering the reporting threshold in an attempt to improve the state's water use data. Additionally, the option to simply certify usage based upon the prior year's reported total could potentially generate up to a 20% error in the data reported and the actual use data. This realization along with the effort to get closer to methods of reporting in the surrounding states, resulted in yet another amendment to the reporting requirements. On January 1, 2015, the Water Resources Protection and Management Act was amended to include a new reporting threshold of 300,000 gallons withdrawn from surface or groundwater sources in any 30-day period and for the total monthly usage to be reported for the previous year. It's important to note that the LQU classification not only includes any water users who withdraw 300,000 gallons or more in any 30-day period, but also includes any entity that bottles water for resale, regardless of the quantity withdrawn. Exemptions from the rule include water relocated for the purpose of mineral extraction and water designated for farm use (including water used for irrigation, livestock or poultry). Although, farms are encouraged to voluntarily report their monthly water withdrawals to assist with the accuracy of the survey. Entities that purchase water from a water provider are not considered large quantity users.

In the past year, the Water Use Section has made great efforts to improve the Large Quantity User database and reporting methodology. Recognizing the inefficiency and level of data inaccuracy from paper surveys, the Water Use Section sought to streamline the LQU reporting and data collection methodology via an electronic submission system (ESS) that feeds data directly into the DEP Oracle database that can be viewed by a Microsoft Access interface. The LQU reporting forms on ESS enables users to input data as efficiently and accurately as possible while allowing the Water Use Section to review and perform quality control analysis as soon as those reports are submitted.

The LQU reporting form currently uses the U.S. Department of Labor's NAICS code as well as the SIC code to categorize the facility type. This method differs slightly from the USGS, as West Virginia is more interested in industry specific categories versus the broader categories used by USGS. West Virginia water-use data is categorized differently than data collected for the USGS Water Use Data and Research Program. These differences are due in part to the

exceptions made in the reporting requirements within the Act, little to no water-use activity in a category, or limited authority in the collection of data due to exemptions from the Act. For example, it is difficult to collect water-use data for livestock as farms are not required to report water used for livestock, regardless of amount. All water treatment plants in West Virginia that exceed the 300,000-gallon threshold are required to report their water use, but they do not have to report specific water-use totals for domestic, industrial, or commercial purposes. There is no current method of retrieving domestic water-use data via springs or personal groundwater wells. It is estimated that approximately 34.2% of the population in West Virginia are dependent on groundwater wells (USGS, November 2014 report on 2010 water use). *See Table 1 for industries reported in 2015.*

In previous years, the Water Use Section's method of data transfer to the USGS WV Water Science Center was by email attachment of the previous year's LQU reports. In 2010, the LQU report consisted of water use data from large quantity users, defined as those who withdrew amounts larger than 750,000 gallons annually. Following the amendment to reporting requirements, the 2015 LQU reports contained water use data from large quantity users, defined as those who withdrew amounts larger than 300,000 gallons in any 30-day period, along with their monthly withdrawal amounts.

To improve data collection and data transferability to meet the USGS baseline standards for water-use data, the Water Use Section is proposing a multi-step program that consists of: initiating a consumptive use study, creating a more effective data collection methodology for areas of limited data, and improve upon our LQU database that will enable us to integrate West Virginia's water-use data into categories used by USGS. Table 2 outlines our goal of improving current water-use data, which should move most of the categories up a tier in the USGS baseline standards.

Steps Proposed to Address Priority #1

Steps are ranked based on priority; 1 being the highest.

1. Initiate a consumptive use study.
 - i. To verify average consumption percentage for each of the water-use categories, Public Service Districts (PSDs) will be requested to give any data available that may indicate their consumer base and water-use data for domestic, industrial, and commercial purposes.
 - ii. Compile any available water-use data on groundwater wells from West Virginia's Department of Health and Human Services (DHHR) and West Virginia's Department of Agriculture (WVDA).
 - iii. Site visits and field verification may be conducted for quality assurance purposes. This study will ultimately allow the Water Use Section to gather data on domestic water-use; a category that has been lacking in sufficient data in years past.
 - iv. This consumptive use study will be conducted by the LQU coordinator of the Water Use Section. The amount of legwork needed during this study is expected to be costly and will greatly benefit from additional monetary support through the USGS.
2. Create queries within the LQU database using SIC and NAICS codes that will re-categorize WV water-use data to better align with the USGS baseline standard categories. Create an exporting process in which data can be given in a variety of electronic formats: csv, xml, shapefiles, etc.

- i. Create a GIS package of LQU water-use data specifically for transfer to USGS WV Water Science Center.
3. Attend the Interstate Council on Water Policy (ICWP) meetings and participate in the Water-Use Open Forum hosted by USGS.
 - i. This will allow us to communicate with other states to discuss challenges and find solutions to water-use data issues. By attending these meetings and conferences, we will be able to better define areas that are lacking in data and create a data collection methodology that will allow us to track water-use in those limited categories.

2. GIS Web Applications for Water Use Management

Priority #3: Streamline data accessibility using GIS Web Applications, of which will also serve as tools to inform both private and public sectors about certain rules and regulations pertaining to WV water resources.

Water Resources Management Plan Mapping Tool

The West Virginia Department of Environmental Protection's Water Resources Management Plan Mapping tool (WRMP) was developed in cooperation with the Center for Environmental, Geotechnical and Applied Sciences (CEGAS) at Marshall University. It serves as a public information portal for data related to water resources in the state of West Virginia. The Water Use Section of the WVDEP created this tool to meet the general requirements of the Water Resources Protection and Management Act of 2008. This site provides access to LQU reports as well as other GIS data layers pertinent to water resource management in the state of West Virginia.

Currently, a WRMP tool exists for both public and internal access. The internal WRMP tool contains confidential geospatial data that can only be accessed within the WVDEP's network. Creating an internal WRMP tool became the solution to the agency's limited GIS licenses while providing agency wide access to critical geospatial data.

The WRMP was created using ESRI's ArcGIS API for Flex. ESRI's technical and maintenance support for Flex was discontinued in June of 2016 as flash based viewers are becoming increasingly unpopular in web browsers. The solution to this change is to redevelop our WRMP tool in API for JavaScript, which will allow greater flexibility in application customization. The transition from Flex based API to JavaScript will benefit our users greatly in that the WRMP tool will have the capability of displaying on both desktop and mobile devices, therefore enhancing data accessibility in the field.

Water Withdrawal Guidance Tool

The Water Withdrawal Tool (WWT) was created as an informational tool to inform the public of current stream flow conditions and provide guidance in determining appropriate conditions prior to withdrawing water from streams. The guidance is based on summer base flow for the period of record, which should afford an appropriate flow to protect the aquatic habitat. In the form of a map interface, the WWT is a spatially driven tool that uses the graphics and attributes of the National Hydrology Dataset (NHD) along with current stream flow readings of USGS stream gauges to visually display streams in various conditions. In the viewer, polygons are used to represent each drainage basin within the state of West Virginia. This allows the user

to target their area of interest by clicking on a specific area, which in turn will grab the current stream gauge readings to determine withdrawal status.

The WWT considers that larger streams generally flow longer and at higher rates than the small streams that feed into them. To represent this, the algorithm behind the WWT places a minimum and maximum threshold on current stream flow in cubic feet per second based on the readings of USGS stream gauges in that drainage basin. If the stream flow is below the minimum threshold, the guidance tool will display a message advising against withdrawing water anywhere within that drainage basin. If the threshold is greater than or equal to the minimum threshold, but below the maximum threshold, then the guidance tool will display a message advising to only withdraw water from the larger streams (the map will automatically bolden the NHD stream symbology of the larger streams in that drainage basin). If the current stream flow is greater than the maximum threshold, the guidance tool will display a message that withdrawing should be permissible in all streams within that drainage basin, provided best water management practices are observed.

It is important to note that the WWT is merely a guidance tool and professional judgement should ultimately be used to determine whether a stream is fit for water withdrawal. There are many conditions that can affect the flow of a stream, such as naturally lower flows in headwater streams, that may not align with the results of the guidance tool. The WWT also does not consider other withdrawals that are currently taking place in the stream. If a small stream is hosting multiple active withdrawals, it is best practice to find another stream.

Based on submitted user comments, we have recognized areas that could benefit from a few minor enhancements. The Office of Water Prediction (OWP) National Water Center has created a prototype output in the National Water Model (NWS) that displays current as well as short to long range forecasts of streamflow information. Just as we have linked directly to the USGS stream gauge readings, we have discussed the possibility of improving the WWT by connecting to the output of the NWS so that our tool can display predicted streamflow information as well; making the WWT more valuable as a planning resource.

West Virginia Spring and Well Reporting Tool

We recognize that there are gaps in our reported water use data. One such area being the limited recording of springs and privately owned wells within West Virginia. Domestic water use has been difficult to track due in part to the fact that many citizens depend on well and spring water. Although the WV Department of Health and Human Services is responsible for tracking those using well water, additional data such as spatial location, water quality, depth to water, etc. are limited.

To address this issue, we have proposed the creation of a WV spring and well reporting tool. The idea of this tool is to crowdsource voluntary information on privately owned wells and spring location. The Spring and Well reporting tool will be in the form of a web interface, where the user can plot the location of a known spring or private well by placing a point on the map. A reporting form will automatically appear on the screen once the point is placed. Data collected for wells will include depth to water, known elevation, and location. Coordinates will automatically be recorded based on the location of the point they placed. Additional information will include any known water quality data as well as purpose of water use (drinking, farming, etc.). The spring reporting form will also populate the coordinates based on where the point was placed on the map. Information requested on the reporting form will include flow in gallons per minute, water quality, and quantity.

The data collected from this tool will be directed to a designated geodatabase. Each location will be field verified before it is added to the final Spring and Well database. To increase the effectiveness of this crowdsourced data tool, campaigns, press releases, and

conference demos will follow in the weeks after this tool's creation. The scope of this project is projected to develop over the course of a few years before enough data is collected to be considered viable.

Steps Proposed to Address Priority #2

Steps are ranked based on priority; 1 being the highest.

1. Collaboration with the Bureau for Public Health, Department of Health and Human Resources, USGS, WV Conservation Agency, Army Corps of Engineers and others will be crucial to the success of these projects.
2. Develop A Spring and Well Reporting Tool
 - i. Create Spring and Well Reporting Tool using ESRI's Web App Builder.
 - ii. Organize public outreach campaigns, press releases, and conferences throughout the state to promote the use of this new tool.
 - iii. Designate field staff responsible for verifying location of reported wells and springs.
 - iv. WVDEP Water Use GIS Coordinator will be responsible for compiling data and transferring field verified data into final Spring and Well database.
 1. Final data may be used as resource for future reports and output of domestic water use data.
3. Redevelop both internal and external Water Resources Management Plan Mapping tool using ESRI's ArcGIS Web App Builder.
 - i. This app will be developed with assistance from the WVDEP's GIS department (TAGIS). Advanced customized widgets may possibly be deferred to a TAGIS member. Part of this grant will go towards funding work hours spent on this app creation.
4. Redevelop the Water Withdrawal Tool using API for JavaScript.
 - i. The WWT will be developed with assistance from TAGIS.
 - ii. Incorporate new National Water Model to provide short and long-term forecasts of stream conditions in the guidance tool. The addition of a predictive element will greatly enhance the use of this guidance tool.

Table 1

Year	SIC_CODE	SIC_PURPOSE
2015	1321	Oil & Gas
2015	1440	Crushed Rock
2015	13	Oil & Gas
2015	3472	Electroplating
2015	4952	Public water supply
2015	2999	Petroleum - Refine
2015	8222	Industrial - College
2015	2097	Public water supply - Ice
2015	7000	Recreation - Hotels
2015	9223	Public water supply - Courts
2015	651	Residential Management
2015	8062	Industrial - Hospital
2015	2491	Timber - Saw Mill
2015	0721	Agriculture/aquaculture - Crop
2015	6515	Residential Management
2015	2631	Timber - Pulp
2015	3069	Industrial - Rubber
2015	7033	Recreation - Hotels
2015	7992	Recreation - Golf
2015	1623	Public water supply
2015	1429	Crushed Rock
2015	7997	Recreation - Sports
2015	2861	Timber - Organic
2015	9451	Education
2015	7999	Recreation - Amusement
2015	3764	Industrial - Transportation
2015	3355	Industrial - Smelt
2015	2865	Petroleum - Organic
2015	1311	Frac - Petroleum
2015	3531	Industrial - Machinery
2015	7948	Recreation - Racing
2015	1389	Frac Water - Field Services
2015	3356	Industrial - Smelt
2015	2911	Petroleum - Refine
2015	2819	Chemical - Alkalis
2015	1941	Public water supply
2015	7011	Recreation - Hotels
2015	4971	Recreation - Irrigation
2015	122	Mining
2015	1211	Mining
2015	1220	Mining - BITUMINOUS
2015	1446	Mining - Sand Gravel

2015	0273	Agriculture/aquaculture - Animal
2015	1241	Mining - Services
2015	12	Mining
2015	2611	Timber - Pulp
2015	1381	Oil & Gas
2015	3313	Industrial - Steel
2015	1422	Mining – Non-Metal
2015	9631	Public water supply - Administration
2015	3241	Industrial - Cement
2015	1222	Mining - BITUMINOUS Underground
2015	1221	Mining - BITUMINOUS
2015	0921	Agriculture/aquaculture - Hatchery
2015	3312	Industrial - Steel
2015	2821	Chemical - Plastic
2015	2860	Chemical - Organic
2015	2812	Chemical - Alkalis
2015	2869	Chemical - Organic
2015	4941	Public water supply
2015	4911	Thermoelectric (coal)
2015	4911h	Hydroelectric

Table 2

Category	Tier 1	Tier 2	Tier 3	WV Water Use Standards
Public Supply	<ul style="list-style-type: none"> • Monthly withdrawals, reported by system and water source and water type. • Deliveries to domestic users from public-supply systems, and populations served. • Report system information relevant to HUC-8 and county, and groundwater withdrawals with aquifer designation. 	<ul style="list-style-type: none"> • Site-specific annual and monthly withdrawals (by intake and/or well or well field) reported by water source, and by water type. • Quantity of water purchased between systems and source(s) of water. • Quantity of water sold between systems. • Reporting and/or verification of water deliveries for domestic, 	<ul style="list-style-type: none"> • Interbasin transfers. • System uses (internal and other non-revenue uses) and losses. • Improve population served estimates. • Use of reclaimed wastewater for public or landscape irrigation. 	<ul style="list-style-type: none"> • Proposed consumptive use project will move WV from Tier 2 to Tier 3 by improving estimates of population served, inter-basin transfers, conservation methods, consumptive use, and sit-specific discharges.
Industrial	<ul style="list-style-type: none"> • Annual withdrawals by facility reported by water source, by water type, and industry classification. • Groundwater withdrawals reported with reference to aquifer. 	<ul style="list-style-type: none"> • Site-specific (by intake and/or well) annual and monthly withdrawals reported by water source, by water type, and industry classification. • Deliveries from public supply to Industrial and deliveries from other categories. 	<ul style="list-style-type: none"> • Site-specific consumptive use estimates • Site-specific discharges to surface water or land application. 	<ul style="list-style-type: none"> • Proposed consumptive use project will move WV from Tier 2 to Tier 3 by improving estimates of population served, inter-basin transfers, conservation methods, consumptive use, and sit-specific discharges.
Irrigation- Crop	<ul style="list-style-type: none"> • Aggregate annual withdrawals reported by water source, by water type, acres irrigated, and method of irrigation. Aggregate areas may be sub-county levels, but are feasible to summarize to county or watershed. 	<ul style="list-style-type: none"> • Site-specific withdrawals by well or diversion from surface-water feature, or delivery from reclaimed wastewater. • Monthly withdrawals reported by water source, type, acres irrigated, crop, and method of irrigation. 	<ul style="list-style-type: none"> • Consumptive use and conveyance loss estimates by aggregate area (sub-county, watershed (HUC8 or up to HUC12). • Site-specific return flows. 	<ul style="list-style-type: none"> • Exempt from reporting water use.

<p style="text-align: center;">Thermoelectric</p>	<ul style="list-style-type: none"> • Site-specific, annual and monthly withdrawals and net power generation reported by cooling-system type (once-through or recirculating), by water source and by water type, and the source of the information (plant, govt. agency, etc.). • Site-specific return flows. 	<ul style="list-style-type: none"> • Site-specific annual and monthly consumptive use. 		<ul style="list-style-type: none"> • Proposed consumptive use study has potential to raise WV from Tier 1 to Tier 2.
<p style="text-align: center;">Domestic Self-Supplied</p>	<ul style="list-style-type: none"> • Self-supplied domestic populations, by HUC-8 and county, and by water source. 	<ul style="list-style-type: none"> • Studies of actual metered domestic withdrawals, monthly by source. • Improve estimates of self-supplied populations by utilizing property data and/or public water supply service areas, or other methods. 		<ul style="list-style-type: none"> • Project 2 has the potential to raise West Virginia to Tier 1 for the Self-Supplied Domestic water use estimate by creating the Spring and Well Reporting Tool.
<p style="text-align: center;">Golf Courses - Irrigation</p>	<ul style="list-style-type: none"> • Site-specific annual and monthly withdrawals reported by water source, by water type, and acres irrigated. Groundwater withdrawals designated by aquifer. 	<ul style="list-style-type: none"> • Consumptive use estimates, by course, reported by month or annual. • Acres irrigated by system type, by course. 		<ul style="list-style-type: none"> • Project 1 will be providing estimates of surface and groundwater use, consumptive use, and acres irrigated which should satisfy both Tier 1 and 2.
<p style="text-align: center;">Livestock</p>	<ul style="list-style-type: none"> • Annual withdrawals for major facilities, reported by water source and by water type. 	<ul style="list-style-type: none"> • Site-specific annual and monthly withdrawals for all facilities reported by source of water, and by water type. • Site-specific animal counts and animal type. 	<ul style="list-style-type: none"> • Improved and verified coefficients for water use per head for animal type, confined or open-range, seasonal variability, and other variables. • Water withdrawals from sources supported by USDA programs to protect streams 	<ul style="list-style-type: none"> • Exempt from reporting water use by state law.

Mining	<ul style="list-style-type: none"> Annual withdrawals reported by HUC-8 and county, by source of water, and by water type. 	<ul style="list-style-type: none"> Site-specific annual and monthly withdrawals. Site-specific commodity identified. 	<ul style="list-style-type: none"> Evaluation/reporting on water use by process (commodity processing, dewatering, dust suppression, etc.). Reporting on return flows/dischARGE of water from dewatering. 	<ul style="list-style-type: none"> Meets Tier 2 Standards
Aquaculture	<ul style="list-style-type: none"> Annual withdrawals reported by HUC-8 and county, by source of water, and by water type. 	<ul style="list-style-type: none"> Site-specific annual and monthly withdrawals. Site-specific facility information (method, species cultured, etc.) 		<ul style="list-style-type: none"> Meets Tier 2 Standards
Commercial	<ul style="list-style-type: none"> Annual and monthly deliveries from public supply for commercial use. 	<ul style="list-style-type: none"> Site-specific annual and monthly withdrawals for self-supplied establishments 		<ul style="list-style-type: none"> Proposed project will move WV from Tier 2 to Tier 3 by improving estimates of population served, inter-basin transfers, conservation methods, consumptive use, and site-specific discharges.
Hydroelectric Power	<ul style="list-style-type: none"> Site-specific, annual and monthly water use (water use to spin turbines) by water source and water type, and the source of the information (plant, govt. agency, etc.). 			<ul style="list-style-type: none"> Meets Tier 1 standards
Wastewater Treatment	<ul style="list-style-type: none"> Site-specific, annual and monthly return flows from public wastewater treatment and industrial facilities. 	<ul style="list-style-type: none"> Site-specific discharges to surface water or land application. 		<ul style="list-style-type: none"> Water use data for wastewater treatment is collected through the NPDES permit. This data is not included in the LQU reports, but will be available on our WRMP Map Viewer.

Water Use Data Storage and Availability				
Water use database	<ul style="list-style-type: none"> Monthly and annual withdrawal data are reported to the state agency and stored in an electronic format. 	<ul style="list-style-type: none"> Withdrawal data are entered electronically into a database. Automatic QA/QC checks are integrated into the electronic database and/or data entry routines. 	<ul style="list-style-type: none"> Withdrawal data include water source, water type and location (county and HUC-12). Data are made available for export by the state agency or for download. 	<ul style="list-style-type: none"> The Water Resources Management Plan Mapping Tool along with collecting water use data through our Electronic Submission System (ESS) should raise West Virginia from Tier 1 to Tier 3 for the Water Use Database Category.