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## **Introduction:**

**PWS System Name:** Harpers Ferry Water Works

System Type: Community

PWS ID: WV 3301912

System Address: PO Box 217, Harper's Ferry, WV 25425

System Phone: 304 535 6555

### **Contact Persons:**

John Heafer, Chief Water Plant Superintendent

Harpers Ferry Water Works

### **Existing Sources:**

Elk Run

Town Spring

Potomac River Dam # 3

### **Future Potential Source:**

Abandoned Quarries

**Note:** The term, "source water" is used throughout this report to represent ground-water or surface-water sources of public drinking water.

## **Overview of Source Water Protection Program**

The 1986 amendments to the federal Safe Drinking Water Act (SDWA) required States to develop Wellhead Protection (WHP) Programs to protect ground-water sources used by public water systems from contamination. West Virginia's WHP Program under the WV Bureau for Public Health (WVBPH) was approved by U.S. Environmental Protection Agency (USEPA) in March 1993. The responsibilities for WHP are shared among many stakeholders, but the foremost responsibility for ensuring that ground water is adequately protected is at the local government level because the authority to regulate land use resides there. The program involves the delineation of wellhead protection areas for wells and springs, identification of potential sources of ground-water contaminants and the development of management measures as a means to reduce the potential for contamination of the ground-water supply.

To expand the benefits realized from WHP efforts, the 1996 Safe Drinking Water Act reauthorization (Section 1453) requires States to develop a Source Water Assessment and Protection (SWAP) Program. The SWAP program assesses the drinking water sources serving public water systems for their susceptibility to pollution. This information will be used as a basis for building voluntary, community-based barriers to drinking water contamination. The West Virginia's assessment program essentially consists of delineating the boundaries of the areas providing source water for public water systems; and identification (to the extent practicable) the origins of regulated and certain unregulated contaminants in the delineated area to determine the susceptibility of public water systems to such contaminants. Such assessments have been conducted by WVBPH and its' consultants for most of the public water systems in West Virginia. The USEPA guidance on Source Water Program implementation indicates that further development and implementation of protection and planning portions of the assessments for public water sources, should be managed by local entities.

## **Purpose and Need for Source Water Protection Plan**

The purpose of the Source Water Protection Plan is to delineate, identify new sources and potential contaminants and threats to drinking water sources within the source water protection zone, and avenues for planning and management of those threats at the local level.

By providing a comprehensive document of the potential threats to the public drinking water supplies and recommended measures that can be implemented to reduce those threats, this plan can help the jurisdictional entities identify, from the plan, recommended actions and preventive measures each entity can implement, facilitate, or support throughout their jurisdiction to protect public drinking water sources. This Source Water Protection Plan is designed to help reduce the potential threats to drinking water supplies within source water protection areas either through federal, state, or local regulatory or statutory controls, and by using non-regulatory (voluntary) measures centered around an involved public.

Based on review of available information, West Virginia Rural Water Association (WVRWA) felt that the previously prepared Source Water Assessment and Protection Plan (March 2003) needed an update. The plan does not include Source Water Protection delineation for the Town Spring which provides a raw water source for the plant. The spring water is collected in a collection concrete box and raw water is conveyed through a pipeline to the lift station. The SWAP Plan does not include Zone of Concern delineation for Potomac River upstream of the intake. This source is a back-up source and provides water during emergencies including drought conditions. The plan is limited in scope as it does not examine vulnerability issues relative to contaminants resulting from storm water, agricultural farms activities, leaking septic and sewer systems, septic tank septage, sludge from wastewater treatment facilities, and wastewaters from treatment plants.

Keeping the above in view and possible impacts of rapid residential development and vulnerability of source waters; WVRWA has examined the water sources and re-delineated the source protection area. WVRWA used hydro-geological and flow information contained in United States Geological Survey (USGS) Scientific Investigation Reports for re-delineation of the SWAP area. The plan includes Zone of Concern for Elks Run and Elks Branch (1000 feet on either side of the main tributary and 500 feet on either side of the tributaries). The plan includes contributory watershed for Elks Branch and Elks Run and potential contaminant sources within the watershed.

WVRWA has observed that the existing source is highly vulnerable due to the presence of railroad traffic which consists of a variety of commodities including tank cars containing oils, chemicals, etc. Further, WVDEP and USGS studies on Potomac River Drains Watershed indicate that there is bacterial contamination of the Potomac River upstream of the intake especially during the summer months. WVRWA recommends that Harpers Ferry Water Plant consider additional sources as backup sources of water including water from abandoned quarries.

WVRWA observed presence of sinkholes within the watershed delineated area. These sinkholes provide a conduit for flow of contaminants into groundwater. These sinkholes will need to be remediated in order to prevent contamination of the groundwater aquifer. The SWAP plan prepared by WVRWA includes sink-hole management strategy. WVRWA has brought it to the notice of WVBPH and WVDEP about the presence of sinkholes in the watershed delineated area and their need for remediation to prevent contamination of groundwater and spring water sources. The SWAP Plan also includes a management and contingency plan and a table of best management practices. The plan document also includes a list of numerous references of scientific and guidance documents that were reviewed and researched in the writing of the plan.

WVRWA considers that a Source Water Assessment and Protection Plan of Potomac River Drains Watershed (262 sq. miles) based on land uses (agricultural, commercial, industrial, municipal and residential); water resources (streams, springs, quarries) and potential contaminant sources will be useful in future development planning of Jefferson County and the neighboring county. As Potomac River Drains Watershed is extensive, it was not possible for WVRWA to do the watershed delineation with its' limited available resources. As a matter of fact, the appropriate agency to do this type of delineation with location of potential contaminant sources may be the West Virginia Department of Environmental Protection, WV Bureau for Public Health and the local agencies at the County level.

# Description of Service Area, Water Source and the Water Supply System

The Harpers Ferry Water Works serves a population of approximately 1801 with 709 residential service connections and 113 commercial connections. The Water Treatment Plant serves the population of Harpers Ferry, Bolivar, Cavalier Heights, KOA Campground, local hotels and commercial businesses. The water system is located on Bakerton Road off the State Route 340.

## Existing Sources of Water

i. **Elks Run:** Elks Run is the main source of water. The intake is located 40 feet west of the pumping station and consists of a small surface impoundment, which diverts the flow from the stream into a concrete collection box. The collection box is protected by two stainless steel screens which are cleaned manually. From the collection box, the water flows by gravity to the lift station.

ii. **Town Spring:** The Town Spring is located 2500 feet northeast of the pump station. The water flows by gravity to the lift station and the overflow from the spring flows to Elks Run.

iii. **Potomac River Dam#3:** The Potomac River Intake is used as an emergency backup source when flow from Elk Run and Town Spring is not sufficient to meet the Town's needs. The Potomac River Intake is located 1000 feet northeast of the treatment plant. The intake has 12" by 14" long intake screen. The intake is located approximately 60 feet offshore and is connected to a pre-cast concrete wet well by 10" ductile iron pipe. The intake is blown off as needed with compressed air using a portable tank, which is recharged at the treatment plant. The entry into the wet well is restricted by a locked access hatch.

## Raw Water Pumping System:

### i. Elk Run Intake:

Pump Type: Fairbanks Morse Non-clog Submersible  
Capacity: 350 gpm  
Head: 48 feet TDH  
Drive: 10 HP, 240 Volts, 3 phase  
Unmetered  
Controls: Float system in pre-sedimentation basin

### ii. Potomac River Intake:

Pump Type: Fairbanks Morse Non-clog Submersible  
Capacity: 350 gpm  
Head: 68 feet,  
Drive: 10 HP, 240 volt, 3 phase  
Controls: Float system in pre-sedimentation basin  
Un-metered

iii. **Harpers Ferry Town Spring:** The Harpers Ferry Spring is located close to Elks Run and Baltimore and Ohio rail line northwest of Harpers Ferry in Jefferson County. The spring water is collected in a precast concrete spring box. The discharge was estimated to be 85 gpm (Price and others, 1936). Bieber, USGS reports discharge estimate of 120 gpm (7/11/45) and 280 gpm

(10/5/1945). The spring derives its' water from sandstone, shale, dolomite, and limestone of Waynesboro Formation. The water from the spring collection box flows by gravity through approximately 0.5 miles of 6" ductile iron pipe to the lift station. The spring is used as secondary source of water for the town of Harpers Ferry and Bolivar.

## **Water Supply System:**

The water treatment process at the Harpers Ferry Water Plant consists of pre-sedimentation, coagulation, flocculation, sedimentation, filtration, fluoridation and chlorine disinfection. The access to the treatment plant is restricted by a chain link fence with locked gate. The plant is operated on average of 10.5 hours, producing over 0.282 million gallons per day. The system however has a capacity of 0.5 mgd.

Raw water is pumped from wet wells to a pre-sedimentation basin where settled solids are removed prior to the water entering the treatment plant. The basin is a concrete tank with a volume of 77,000 gallons and has retention of 3.5 hours approximately. The sedimentation basin has a cover to block sunlight and help prevent algae growth. Potassium permanganate is at times fed into the raw water ahead of the basin to help control taste, odor and algae growth. When potassium permanganate is being fed, the feed rate is adjusted to maintain a slight pink color ahead of the filters. The water level in the basin is controlled by a bubble system which controls the raw water pumps (ON@8ft, OFF@8.75 ft) and activates a high water level alarm at 9.25 ft. Overflow from the basin is discharged to the backwash holding tanks. A drain line for the basin also discharges to the backwash holding tank.

From the pre-sedimentation basin, the water flows by gravity to the treatment plant. A sample tap is available to monitor water quality at the entry point to the plant. The plant can treat water with maximum turbidity of 70 NTU. When raw water turbidity exceeds 70 NTU, the plant is shut down and customers are served from the distribution storage tanks.

DelPAC and chlorine are fed to the raw water. DelPAC is fed ahead of the in-line static mixer using a metering pump on a continuous basis. Records indicate that DelPAC is fed at a rate of 18mg/l. chlorine is fed at a rate of 1.9 lb/day. The coagulated water then splits and flows through dual 175 gpm Modular Aquarius Package Treatment Systems. Each system consists of dual compartment flocculation, tube sedimentation and mixed media filtration. Each flocculation chamber has a retention time of 10 minutes with mixing provided by a vertical paddle wheel mixer. The flocculated water flows through a settling basin fitted with tube settlers. The tubes are inclined and are cleaned and flushed to the backwash holding tank with each backwash cycle. Following the settling basins, water flows through mixed media filters having a surface area of 35 sq.ft and operating at 5 gpm/sq.ft. The filtration rate is controlled by Allis Chalmers frame mounted centrifugal pump, rate at 175 gpm at 34 ft. TDH, which transfers the filter effluent to the clearwell. The total depth of filter is 30 inches (18"anthracite, 9" silica and 3" garnet). The backwashing of filters is initiated based on hours of filter operation (12 hours), loss of head, or when turbidity exceeds 0.05 NTU.

Following filtration, the water is chlorinated. The disinfection facilities consist of a cylinder mounted chlorinator, two cylinder scales and an automatic chlorine leak detector. The chlorine room is isolated from other work areas and has adequate lighting, heating and ventilation. All chlorine cylinders are properly restrained. A bottle of ammonia is available for chlorine leak detection and two self contained breathing apparatus are stored outside the chlorine room.

From the clearwell, the finished water is metered and pumped into the distribution system by centrifugal pumps rate at 200 gpm at 410 ft TDH, driven by 75 HP, 230/460 volt, 3 phase electric

motors. The telemetry system which controls the service pumps is inoperable, so pumps are controlled manually with a clearwell shutoff at 10 ft.

The distribution system consists of 10" mains, two gravity storage tanks and a main line pressure reducing station. The two gravity storage tanks have a combined storage capacity of 750,000 gallons. With an average usage of 282,000 gallons per day, storage capacity is 2.65 days of normal usage. Both storage tanks are located in Bolivar Heights with access to the storage tanks restricted by chain link fence with a locked gate. The water accountability is reported to be around 56% and the water losses are the result of storage tank overflows, pipe leaks and inaccurate meters. It is recommended by WVRWA that Harpers Ferry Water Works should continue its' leak detection program, reduce periodic overflows of the tanks and plan for additional storage capacity.



# **Geology and Hydrogeology**

## **Geology of Jefferson County**

Jefferson County occupies 212 square miles in the eastern panhandle of West Virginia and lies 50 miles northwest of Washington, D.C. Jefferson County is bounded on the northwest by Opequon Creek, on the northeast by the Potomac River, on the southeast by the Blue Ridge Mountains, and on the southwest by Virginia. Most of the County is in the Shenandoah Valley of the Valley and Ridge physiographic province. In the valley part of the county, elevations range from about 400 to 600 feet above sea level (Beiber, 1961). The southeastern edge of the county is in the Blue Ridge physiographic province. In this part of the county, elevations range from about 1,100 to 1700 ft above sea level (Beiber, 1961).

The geology of the Jefferson County is complex. All of the geologic units in the county are faulted and folded, the axes of the folds trend northeast-southwest. This has produced outcrop bands with the same northeast-southwest trend. In general, the rocks strike northeast, dip southeast and northwest, and decrease in age from east to west.

## **Hydrogeology of Jefferson County and area of interest**

The main factors affecting ground-water recharge and the flow systems in Jefferson County are geology and precipitation. The annual precipitation is 39"/year. Of this amount, an estimated 28-30" is lost to evapotranspiration (Hobbs and others, 1972). About 9.5" recharge the ground-water system in the carbonate areas, and ultimately discharge to streams or springs. Because average rainfall is nearly constant over the county, geology has the dominant effect on the hydrology. Most of the county is underlain by carbonate rocks (limestone and dolomite). However, the Blue Ridge Mountain area is underlain by metamorphosed shales and sandstone, and the area near Opequon Creek is underlain by shale. Each of these areas has different hydrologic properties.

Based on the lithology, the county can be divided into carbonate and non carbonate areas. Each area has its own separate aquifer system. These aquifers are referred to as the "carbonate and non carbonate," aquifers have their own distinct characteristics.

The carbonate aquifer is composed of Cambrian rocks of Harpers and Weverton-Loudon Formations, Antietam Formation, Tomstown Dolomite Formation, Waynesboro, Elbrook and Conococheague Formations. It is bounded by the Shenandoah River to the East and Opequon Creek to the west and underlies 86% of the county. The aquifer is recharged primarily from precipitation. Water percolates into through the carbonate rocks dissolves materials and enlarges minute fractures in the rock. In Jefferson County, dissolution has produced a karst system containing caves, springs, disappearing and underground streams, and a land surface that is, in places, dotted with sinkholes.

The non carbonate aquifers occur along the eastern and western boundaries of the county. In the eastern part of the county, the aquifer consists of metamorphosed sandstones and shales of the Harpers and Antietam Formations. It is bounded by the Blue Ridge Mountains to the east and Shenandoah River to the west. The soils overlying the aquifer are permeable, but the surface runoff from precipitation can be significant, especially on the Blue Ridge Mountains.

## **Source Water Protection Area Delineation**

The source water delineation consists of delineation of the Zone of Critical Concern (ZCC) which is 1000 feet on each bank of the principal stream and 500 feet from each of the tributaries (Elks Branch & Elks Run) draining into the principal stream (Elks Run). The length of the ZCC is based on a five hour time of travel. The length of the ZCC is calculated using a mathematical model that account for stream flows, gradient and the area topography.

The source water protection area for the Town Spring is based upon the recharge area and the hydro-geological studies conducted by USGS (1991 and 2005). Studies conducted by USGS (1991) indicate that the dye Rhodamine WT moved normal to the strike of the rocks (perpendicular) to the water table contours and parallel to the strike of the rocks (nearly parallel to the water-table contours). Groundwater movement normal to the strike of the rocks was expected because of the larger hydraulic gradients in this direction, but little ground-water movement was expected parallel to strike, because the hydraulic gradients in this direction were much smaller.

The formula used for the calculation of recharge area is  $A=Q/R$ ; where A is the size of recharge area, in square miles and Q is the average spring discharge in gallons/min and R is the annual recharge rate, in gallons per square mile. The formula calculates the approximate size of the area that contributes to the flow of spring. The area so determined was adjusted to include areas within topographic divides that contribute towards recharge of the springs. The calculated SWAP area for the Harpers Ferry Town Spring is 183 acres which is based on spring discharge of 85 gpm (WVBPH & Harpers Ferry Water Works) and annual recharge of 9 inches. The area includes delineated area extending from north of Town Spring extending to topographic ridges in that area. There is another spring in the same Waynesboro Formation. This spring is located on the southern side of the Town Spring and has a discharge of 80 gpm. This spring is called the Meyer Farm Spring. The calculated SWAP area for this spring is 172 acres.

With regards to Potomac River intake, the source water protection area is considered to be 1000 feet on each bank of the Potomac River upstream of the Dam#3. The length of the stem has been considered to be the next upstream surface water intake for Shepherdstown.

With regards to the delineated area, the available information indicates that greater percentage of precipitation enters into groundwater as recharge in drainage areas having karst topography than drainage areas that do not have karst terrain. The Harpers Ferry source water protection area (West of Bakerton Road) has karst terrain with sinkholes and fractures. The ground water movement in this area is fast indicating conduit flow condition and possibility of faster flow of contaminants in case of pollution. The hydrographs developed by the USGS indicate that the spring flow increases quickly in response to recharge from precipitation, and then decreases at a slower rate after the precipitation.

### **Source Water Protection Area Delineation for Elks Run & Elks Branch Watershed:**

WVRWA has conducted watershed delineation which is shown on the map. WVRWA considers the area demarcated on the plan to be the watershed which contributes water to the streams and the groundwater shallow aquifer. The delineated watershed area is a sub-watershed of Potomac River Drains Watershed. The sub-watershed is upstream of the surface water intake and includes the area which falls within the topographic divides of the sub-watershed. The watershed is a sensitive area which has a variety of land uses including residential homes and trailer lots on septic tanks, industrial, commercial and transportation corridors including the railroad tracks. A lot of highway construction is in progress and wastewater discharges from new and proposed subdivisions are being planned and being considered at the local level.

During field investigation work, WVRWA found that a wastewater treatment facility of 0.706 millions per day capacity serving Tackley Mill/Blackford Village Subdivision has been proposed by a developer and that a Wasteload Allocation has been issued by WVDEP. The design indicates that the proposed development will consist of single family residences, apartments, town homes, school, hotel, restaurants, gas stations, several offices, retail facilities, etc and the wastewater will be treated at this facility. WVRWA has further determined that the treated wastewater from the plant will be discharged on the east of Flowing Springs Road near Duffields into the Elk Branch which is a source of drinking water for the Corporation of Harper's Ferry. The surface water intake of Harper's Ferry WTP is less than 4 miles from the wastewater discharge outlet and information obtained from USGS indicates the presence of several springs in the area in the Elks Branch area. The raw water quality of the surface streams and the springs is likely to be impacted by wastewater discharges from Tackley Mills unless some additional treatment of waste water effluent is done prior to discharge to Elks Branch. The matter has been brought to the notice of WVBPH, WVDEP and the Corporation of Harpers Ferry WTP Operator. The use of wetland treatment technology prior to discharge of effluent to Elks Run may be helpful.

**Principal Entities in the Watershed:** The principal entities that lie in the delineated watershed area include the North Jefferson Elementary School, USDA/Appalachian Fruit Research Station, Burr and Bardane Industrial Park, Shenandoah Junction Mobile Home Park, Meadow Brook Water System, Harpers Ferry Water System, C.W. Shipley Elementary School, Potomac Terrace Water HOA, Allens Wonderland, Potomac Farms Water Company, Bakerton Market, Glen Haven Utilities, Parkview Woodlands. These are briefly described below:

**i. North Jefferson Elementary School (PWSID# WV9919031):** This is a Non-Community Non-Transient Water Supply System. The source of drinking water is a well which lies in karst area of high sensitivity. The wellhead protection area is 288 acres which is based on wellhead radius of 2000 feet. The high threat sources include abandoned wells and railroad tracks. The potential contaminant sources are indicated in Table 1.

**ii. USDA Appalachian Fruit Research Station (PWSID# WV9919002):** This is a Non-Community and Non-Transient System. The source of drinking water is a well which lies in karst area of high sensitivity. The wellhead protection area acres based on wellhead radius of 2000 feet is 288 acres. The high threat sources include abandoned wells and underground storage tanks. The potential contaminant sources are indicated in Table 1.

**iii. Burr and Bardane Industrial Park (PWSID# WV9919068):** This is a Non-Community Transient System under the administration of Jefferson County Development Authority (JCDA). The system has three wells which are in karst areas of high sensitivity. The wellhead protection area is 503 acres which is based on wellhead protection radius of 2640 feet around the wells. The units have their septic tanks and the effluent is collected by Jefferson County PSD sewer system. With regards to storm water, at present there are no storm water treatment ponds and the surface run off flows to local streams or to nearby sinkholes into the groundwater aquifer. JCDA has plans to have some treatment in ponds in Phase II development.

**iv. Shenandoah Mobile Home Park (WVPWSID# WV9919031):** This is a Community Water System and has three wells which are in karst areas of high sensitivity. The supply is from two wells pumping 51000 gallons per day. The system serves a population of 545 people. Surface waters can enter the ground water regime very quickly via direct injection through sinkholes or other fracture or solution openings. The type of flow in karst areas can be conduit flow and is delivered via strike oriented cave passages or along fault planes and fault passages. The estimated area that contributes water to the wells is approximately 3678 acres. The significant potential sources of contaminants depending on the land use include contaminants from agriculture

(orchards, animal feedlots), commercial (gas stations and auto repair shops), industrial (machine and metal working shops, municipal (railroad tracks, schools, WWTP, abandoned wells). The detailed inventory is included in Table 1.

**v. Fox Glen Utilities Water System (PWSID# 3301908):** It is a privately owned housing subdivision. The subdivision has residential and commercial customers. There is no central sewer system and all residential and commercial services utilize on-site septic tank and drainfield system. The average daily production is 115, 000 gallons per day. The water supply system has three ground water sources with one back source. All ground water wells are located in karst limestone geology in Conococheague Formation.

All wells are deep wells. Well #1 (470 feet deep) has yield of 12 gpm only. Well # 2 (405 feet deep) has estimated yield of 100 gpm. Well # 3 (488 feet deep) is located near the water treatment plant and office and yields 48 gpm. Well # 4 (300 feet deep) yields 200 gpm. The well yield is located 400 feet to a Class V injection well which serves North Jefferson Elementary School and is within 800 feet of Jefferson Orchards.

**vi. Harpers Ferry Job Corps (PWSID# WV 3301915):** This community Water System has two groundwater wells. The system has been removed from the WVBPH list of systems as Harpers Ferry Job Corps is now served by Jefferson Utilities. Surface waters can however enter the ground water regime very quickly via direct injection through sinkholes or other fracture or solution openings in the area. The type of flow in karst areas can be conduit flow and is delivered via strike oriented cave passages or along fault planes and fault passages. The PCS inventory indicates two potential sources (generator and fuel tanks) that have higher threat to groundwater. There have been elevated levels of nitrates in the past from sewage wastes and agricultural fertilizers. The two sewage ponds in the area have been closed and the sewage effluent is discharged to a public sewer system. The detailed PCS Inventory is included in Table 1 of the plan.

**vii. Sam Michael's Park (PWSID# WV 9919075):** This is a Non-Community Transient Water Supply System which has been removed from the WVBPH list. The park is now served by Jefferson Utilities which gets water from Walnut Grove utilities through a 8" line. Surface waters can enter the ground water regime very quickly via direct injection through sinkholes or other fracture or solution openings. The type of flow in karst areas can be conduit flow and is delivered via strike oriented cave passages or along fault planes and fault passages. The septic tanks and sewer lines have the potential to adversely impact the groundwater. The detailed PCS inventory is included in Table 1 of the SWAP Plan.

**viii C.W. Shipley Elementary School (PWSID# WV 9919017):** This is a Non-Community and Non-Transient category system. The system serves a population of 385 consisting of students and staff. The system has two groundwater wells actually (one is not indicated in WVBPH 2003 SWAP Plan); one is used as a primary well and the other well is used as a secondary well. The pumping rate is 60 gallons/minute. The wellhead protection area is 288 acres which is based on 2000 feet fixed radius delineation. The well is in the Valley and Ridge geologic setting and has moderate risk susceptibility. The PCS inventory indicates the presence of junkyards, abandoned wells, underground storage tanks and utility substation transformers in the wellhead protection area and these sources have a higher threat level to contaminate groundwater.

**ix. Potomac Terrace Water System (PWSSID# 3301974):** This is Community based system and serves a population of 50. The supply is from one well and the average daily production is 3700 gallons per day. The well is reported to have not been grouted to standards. The well is located in the Valley and Ridge geological setting and is of moderate sensitivity. The PCS inventory indicates high level threat from abandoned well and residences on septic tanks.

**x. Potomac Terrace Homeowners Association (PWSID # WV3301974):** This is Community Public Water Supply System which serves a population of 65 residents. The supply is from one well which acts as a primary well and there is another well near an old quarry which acts as a standby well. The average daily production is 900 cu.ft/day. The wells have been drilled into Tomstown dolomitic formation. Surface waters can enter the ground water regime very quickly via direct injection through sinkholes or other fracture or solution openings. The type of flow in karst areas can be conduit flow and is delivered via strike oriented cave passages or along fault planes and fault passages. The estimated recharge area is 345 acres based on 2000 feet fixed radius delineation around the primary and secondary backup wells.

**xi. Bakerton Market (PWSID# WV9919083):** This is Non-Community Transient water Supply System. The system has one groundwater well which is located in Karst Areas of High Sensitivity. The wellhead protection area is 288 acres which is based on 2000 feet fixed radius delineation. Surface waters can enter the ground water regime very quickly via direct injection through sinkholes or other fracture or solution openings. The type of flow in karst areas can be conduit flow and is delivered via strike oriented cave passages or along fault planes and fault passages. The underground storage tanks and septic tank systems have high to moderate threat level to pollute groundwater aquifer system. The detailed PCS inventory is shown in Table 1 of the plan.

**xii. Meadow Brook (PWSID# WV3301978):** This is a Community Water Supply System. The system has two water supply wells which are located in a geological setting of Karst areas of High Sensitivity. The system serves a population of 210 people. The management of Meadow Brook public water supply is the responsibility of Jefferson Utilities, a Lee Snyder Enterprise. The wells have a daily production capacity of 31,779 gallons per day. One well is 505 feet deep and the other well is 385 feet deep. Both wells are drilled into the Elbrook Formation. The wellhead protection area is 350 acres based on 2000 feet fixed radius delineation. The potential contaminant sources are agriculture, commercial and railroad tracks. The system falls within ZOC of Elks Run.

**xiii. Parkview Woodland MHP (PWSID # WV 3301966):** This is a Community Public water supply system. The supply system has three groundwater wells with well depth of 168 feet for well #1, 171 feet for well # 2 and 415 feet for well#3. The well#2 can be used at a withdrawal rate of 45 gpm and well# 3 at withdrawal rate of 60 gpm. The well#1 has estimated yield of 10 gpm. The average daily yield is 19,500 gallons/day. The wells are located in limestone of the Conococheague Formation (Cambrian), but within one mile from the contact with the overlying Stonehenge Limestone of Beekmantown Group (Ordovician) to the west and the underlying Elbrook Limestone (Cambrian) to the east. The potential contaminant inventory prepared by RK & K consultants indicates a number of potential contaminant sources from different land uses including agricultural land farms, several industrial units in Burr Industrial and Bardane Parks, abandoned wells, aboveground storage tanks and the railroad tracks.

**Zone of Critical Concern (ZCC) Delineation:** This is the second type of source water delineation which is done for source water protection.

#### **Elks Run & Elks Branch:**

The ZCC is a corridor along streams within the WSDA which is 1000 feet from each bank of the principal stream and 500 feet from each bank of the tributaries draining into the principal stream. The length of the stream is based on a five hour time of travel. The ZCC was calculated by WVBPH using a mathematical model that accounts for stream flows, gradient, and area topography. With regards to the ZCC, a buffer zone of 1000 feet is provided for Elks Run

(following cojoining of Elks Branch and Elks Run). WVRWA has extended the ZCC in headwaters of Elks Branch as there are several springs in the headwaters. These springs were not included in the original delineation. This is based on information obtained from USGS and USDA. The redelineated area is more than the original delineated area of 524 acres.

**Potomac River Zone of Critical Concern:** This is another delineation which WVRWA has performed to delineate the ZCC along the Potomac River upstream of Dam#3. This is a zone which provides a buffer zone of 0.25 miles (1250 feet) along Potomac River and extends upstream of Dam#3 to Shepherdstown (a distance of 8 miles approximately). WVRWA identified various potential contaminant sources indicating land use, parcel numbers, acreage and potential contaminants and threat level. WVRWA has included potential contaminant sources at Table 1 of the report.

## Potential Sources of Contamination

The West Virginia Bureau for Public Health (WVBPH) has developed a Potential Contaminant Map Code which is based upon land use source category, source name, associated contaminants or chemicals and likely threat level to sources of water (See Attachment 3).

Based on the Map Code, a site specific list of potential contaminant sources has been developed by WVRWA. The list identifies Potential Contaminant Source (PCS) Category (Agriculture, Commercial, Municipal and Industrial), PCS Name, Associated Chemicals or Contaminant Type with level of threat to water supply. The site specific PCS inventory for the Harpers Ferry Water Source is based on the sub-watershed, Zone of Concern for Elks Branch and Elks Run, Potomac River upstream of water intake to Shepherds Town and is given below in a tabular form (Table 1). A map showing location of various sources of contaminants and the source water protection area is included as Attachment #5.

**Table 1: Site Specific PCS Inventory: Watershed for Elks Branch & Elks Run**

SN	Public Water System	System Type	Source Type	PCS Category	BPH Map Code	PCS Name	PCS Description	Associated Chemicals or Contaminant Type	Level of Threat to Water Supply
1	North Jefferson Elementary	NC-NT	GW Well #1	Municipal	M 5	Water Plant	Water Treatment Plant	D	L
2	North Jefferson Elementary	NC-NT	GW Well#1	Municipal	M 30	Wells: abandoned	Abandoned water well	VOC, SOC, MP, PH, NN	H
3	North Jefferson Elementary	NC-NT	GW Well#1	Residential	R 4	Residential (single family homes)	Residential single family with septic tanks	VOC, SOC, NN	L
4	North Jefferson Elementary	NC-NT	GW Well#1	Agriculture	A 6	Crops	Orchards; Apples, Nectarines, Peaches	NN, SOC	L
5	North Jefferson Elementary	NC-NT	GW Well#1	Commercial	C 41	Railroad Tracks(ROW)	Railroad Tracks	PH, M, VOC, SOC	H
6	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Municipal	M 5	Water Plant	Water Treatment Plant	D	L

7	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Municipal	M 30	Wells: abandoned	Abandoned Water well	VOC,SOC,MP,PH,NN	H
8	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Agriculture	A 5	Fruit Orchards	Crops	NN, SOC, MP	L
9	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Agriculture	A 6	Fruit Orchard	Crops	NN, SOC	L
10	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Agriculture	A 15	Greenhouse & Nurseries	Plants	MP, NN	L
11	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Agriculture	A 5	Crops, Corn, soybean, wheat	Crops	NN, SOC, MP	L
12	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Commercial	C 48	Underground Storage tanks	Fuel Storage	PH, VOC	H
13	USDA Appalachian Fruit Research Station	NC-NT	GW Well#1	Commercial	C 48	Underground Storage tanks	Storage	PH, VOC	H
14	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Municipal	M 5	Water Plant	Water Treatment Plant	D	L
15	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 1	Aboveground Storage Tanks	Fuel Storage	PH, VOC	L
16	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 1	Aboveground Storage Tanks	Schwans Sales Frozen Foods	PH, VOC	L
17	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Industrial	I 19 & I 20	Machine Shops & Metal Working	Mountain State Machine Tool	M, VOC, HM, PH, SOC	H
18	Burr Industrial Park	NC-T	GW Wells# 1,2 & 3	Industrial	I 32	Wood Products/Sawmills	McDaniel Hardwood Products	PH, VOC	M
19	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 3	Auto Repair Shops	C.A.R.S	PH,M,VOC, HM	H



20	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 41	Railroad Tracks	Railroad Tracks & Yard	PH,M,VOC, SOC	H
21	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Industrial	I 19	Sheet Metal	Stinger Sheet Metal	M, VOC, HM, PH	H
22	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 36	Advanced Pest Control	Pest Control Co	VOC, SOC	M
23	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 34	Painting Work	B & M Painting	M, VOC, SOC	L
24	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 53	Construction Company (residential & commercial)	KUBIC Construction		L
25	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 53	Air Conditioning Work	Shenandoah A/C & Heating		L
26	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 10	Equipment Storage	Snyder Environmental	M, T, PH, VOC, SOC, HM	M
27	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 53	Electrical Company	Todd Electric		L
28	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Industrial	I 20	Machine & Metal Working	Automated Merchandising Inc	M, VOC, HM, PH, SOC, H	H
29	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 53	Commercial	Premior Follfillment & Processing		L
30	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 53	Plumbing	S & G Plumbing		L
31	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Agriculture	A 5	Crops; Corn, Soybeans, small grain (cereals) , hay	Crops	NN,SOC, MP	L
	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Agriculture	A 5	Grasslands	Gap View Farm	NN,SOC, MP	L

32	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Municipal	M 23	Sewer Lines	Wastewater	M, VOC,MP, TO	H
33	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 3	Repair Garage	State Police Barracks	PH, M, VOC, HM, SOC	H
34	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 53	Magnetic Detection Devices for Surveying	Schonstedt Instruments		L
35	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Industrial	I 20	Automatic Vending Machines	Machine & metal working	M, VOC, HM, PH, SOC	H
36	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 1	Aboveground Storage tanks	State Police Barracks Repair Garage	PH, VOC	L
37	Burr Industrial Park	NC-T	GW Wells# 1, 2 & 3	Commercial	C 1	Aboveground Diesel Storage Tanks	Environmental Co	PH, VOC	M
38	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 29	Sewer Lift Station(behind Shasta North MHP)	J.C.P.S.D Waste Water	MP, D	L
39	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 29	Sewer Lift station (Jefferson High)	J.C.P.S.D Waste Water	MP, D	L
40	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 29	Municipal WWTP	WWTP	MP, D	L
41	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 5	Municipal WTP	Water Plant	D	L
42	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 21	Jefferson High School	High School	MP, D	L
43	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 29	Lift Station	Kearnesville Municipal Lift Station	MP, D	L
44	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 17	CSX RR	Right of Way	M, VOC, SOC, PH	H
45	Shenandoah Junction MHP	C	GW Well	Commercial	C 47	McCarthy Tire & Auto	Tire Refinishing	M	L

			#1						
46	Shenandoah Junction MHP	C	GW Well #1	Agriculture	A 2	Horse Farm (Animal Feedlots)	James Jettie Farm	NN, MP, TO	H
47	Shenandoah Junction MHP	C	GW Well #1	Commercial	C 44	Jefferson County Health Dept.	Lab. Testing	M, VOC, SOC	H
48	Shenandoah Junction MHP	C	GW Well #2	Residential	R 3	Migrant Housing	Twin Ridge Orchard	VOC, NN, TO, MP	L
49	Shenandoah Junction MHP	C	GW Well #2	Commercial	C 19	Gas station	Hendrick Grocery	PH, M, VOC, SOC	H
50	Shenandoah Junction MHP	C	GW Well #2	Commercial	C 44	Research Lab.	Hydrochem Lab	M, VOC, SOC	H
51	Shenandoah Junction MHP	C	GW Well #2	Commercial	C 3	Transmission Work	Jim's Circle Transmissions	PH, M, VOC, HM, SOC	H
52	Shenandoah Junction MHP	C	GW Well #2	Municipal	M 17	Railroad Right of Way	Norfolk & CSX Interchange	M, VOC, SOC, PH	H
53	Shenandoah Junction MHP	C	GW Well #2	Municipal	M 29	Waste Water Discharge	Hazel MHP WWTP Discharge	MP, D	L
54	Shenandoah Junction MHP	C	GW Well #2	Municipal	M 29	Sewer Lift Station	J.C. PSD Municipal LS (Jims Circle Transmission)	MP, D	L
55	Shenandoah Junction MHP	C	GW Well #2	Municipal	M 29	Sewer Lift Station	J.C. PSD Sewer Lift Stations (Rt 18 & Shenandoah Junction)	MP, D	L
56	Shenandoah Junction MHP	C	GW Well #2	Municipal	M 21	Municipal School	T.A. Lowery Elementary	SOC, D, VOC, PH	L
57	Shenandoah Junction MHP	C	GW Well #3	Agriculture	A 15	Nursery	Jones Nursery & Florist	MP, NN	L
58	Shenandoah Junction MHP	C	GW Well 3	Municipal	M 17	Railroad ROW	CSX Railroad	M, VOC, SOC, PH	H
59	Shenandoah Junction MHP	C	GW Well #1	Industrial	I 44	Other	Commercial Printing	Other	L

60	Shenandoah Junction MHP	C	GW Well #1	Municipal	M 21	Middle School	Jefferson Middle School	SOC, D, VOC,PH	L
61	Fox Glen Utilities	C	GW Wells (1-4)	Agriculture	A 6	Jefferson Orchards	Farm	NN, SOC	L
62	Fox Glen Utilities	C	GW Wells (1-4)	Agriculture	A 19	Jefferson Orchards	Farm (Pesticide/fertilizer/petroleum)	PH, NN, SOC	L
63	Fox Glen Utilities	C	GW Wells (1-4)	Agriculture	A 6	Twin Ridge Orchards	Crops: Orchards	NN, SOC	L
64	Fox Glen Utilities	C	GW Wells (1-4)	Agriculture	A 19	Twin Ridge Orchards	Farm (Pesticide/fertilizer/petroleum)	PH, NN, SOC	L
65	Fox Glen Utilities	C	GW Wells (1-4)	Industrial	I 13	Gravel Pits	Quarry	PH	L
66	Fox Glen Utilities	C	GW Wells (1-4)	Commercial	C 19	Gas Station	Sheetz Rt 9	PH, M, VOC, SOC	H
67	Fox Glen Utilities	C	GW Wells (1-4)	Commercial	C 18	Old Gas station	Seven Seas	PH, M, VOC, SOC	H
68	Fox Glen Utilities	C	GW Wells (1-4)	Municipal	M 29	Sewer Lift Station	J.C.PSD Sewer LS (Rt 18)	MP, D	L
69	Fox Glen Utilities	C	GW Wells (1-4)	Commercial	C 35	Fox Glen Strip Mall	Mall	VOC,PH	L
70	Fox Glen Utilities	C	GW Wells (1-4)	Commercial	C 9	Cemetery	St Paul Baptist Church	M, SOC, PH	L
71	Fox Glen Utilities	C	GW Wells (1-4)	Commercial	C 9	Cemetery	Presbyterian Church	M, SOC, PH	L
72	Harpers Ferry Job Corps (Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Municipal	M 15	Municipal Park	Park	NN, SOC	L
73	Harpers Ferry Job Corps (Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Municipal	M 29	Wastewater Treatment	Wastewater Treatment Plant	MP, D	L
74	Harpers Ferry Job Corps (Connected to)	C	GW Wells #1 &	Municipal	M 5	Water Treatment	Water Plant	D	L

	Jefferson Utilities)		2(Abandoned)						
75	Harpers Ferry Job Corps (Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Municipal	M 15	Parklands	Parklands	NN, SOC	L
76	Harpers Ferry Job Corps (Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Commercial	C 48	Diesel Oil Generator	Generator	PH, VOC	H
77	Harpers Ferry Job Corps(Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Commercial	C 48	Underground Storage Tanks	Fuel Tanks	PH, VOC	H
78	Harpers Ferry Job Corps (Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Commercial	C 34	Paint Store	Paint Store	M, SOC, VOC	L
79	Harpers Ferry Job Corps (Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Agriculture	A 5	Crops	Corn, Soybean, Wheat Crops	NN, SOC, MP	L
80	Harpers Ferry Job Corps(Connected to Jefferson Utilities)	C	GW Wells #1 & 2(Abandoned)	Agriculture	A 5	Crops	Corn, Soybean, Wheat Crops	NN, SOC, MP	L
81	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Elk Run Estates (15 Lots)(individual septic tanks, GW wells and no public water	Map # 6, (Harpers Ferry District); 177.79 acres	VOC,SOC,N	H
82	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Canvass Back Ridge (28 Lots) with own wells and septic tanks	Map # 6, 64.10 acres(Harpers Ferry District)	VOC,SOC,N	H
83	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Norwood Estates (1&2)Norwood Estates (3)Norwood Estates (4) with individual wells and	Map #5, Harpers Ferry District) Sec 1& 2: 74.94 acres Sec 3: 30.98 acres	VOC,SOC,N	H

						septic tanks	Sec 4: 12.84 acres		
84	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Gapview Village (178 Lots) with septic tanks and Jefferson Utilities Public Water	Map #5, Harpers Ferry District 171.03 acres	VOC,SOC,N N	H
85	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Cavalier Heights (North): 35 Lots South: 41 Lots with public water and septic tanks	Map # 6 A, Harpers Ferry District North of SR 340; 19.23 acres & South of 340: 23.64 acres	VOC,SOC,N N	H
86	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Oak Tree East Subdivision (33 Lots) with own water wells and septic tanks	Map # 1, Harpers Ferry District	NN,MP, T	H
87	Harpers Ferry Water Works	C	SP/SW	Agriculture	A 17	Oaktree Farms (89.32 acres)	Map #1, Harpers Ferry District Horse Farm	MP	M
88	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Oaktree East	Map#1 Harpers Ferry District	NN,MP, T	M
89	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Uvilla Estates (Map1, 19 Lots)	Map #1, Harpers Ferry District	NN,MP, T	M
90	Harpers Ferry Water Works	C	SP/SW	Agriculture	A 17	Uvilla Estates (Map 1, 171.02 acres)	Map #1, Harpers Ferry District Horse Farm	MP	M
91	Harpers Ferry Water Works	C	SP/SW	Residential	R 4	Potomac Terrace Subdivision Own Wells and Septic Tanks	(Map 3 B, 75 Lots )Harpers Ferry District 62.09 acres	NN,MP, T	H
92	Harpers Ferry	C	SP/SW	Residential	R 6	Glen Haven	Harpers	MP,VOC,SO	M

	Water Works					Subdivision (Map 3C, 102 Lots) Own Wells and Septic Tanks	Ferry District 27.90 acres	C,TO, NN	
93	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Glen Haven sections 3 & 4 (92 Lots, Map 3D) Own Wells and Septic Tanks	Harpers Ferry District 31.48 acres	MP,VOC,SO C,TO, NN	M
94	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Deer Mountain Estates (Map 3E, 70 Lots) Own Wells and Septic Tanks	Harpers Ferry District 122.60 acres	MP,VOC,SO C,TO, NN	M
95	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Deer Mountain Estates (Map 3, 35 Lots) Own Wells and Septic Tanks	Harpers Ferry District 150 acres	MP,VOC,SO C,TO, NN	M
96	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Potomac Farms Subdivision (Map 3, 49 Lots) Own Wells and Septic Tanks	Harpers Ferry District 135.05 acres	MP,VOC,SO C,TO, NN	M
97	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Stevens Minor Sub Division (Map 3, 8 Lots) Own Wells and Septic Tanks	Harpers Ferry District 20.07 acres	MP,VOC,SO C,TO, NN	M
98	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	River View Estates (Map 2, 26 Lots) Own Wells and Septic Tanks	Harpers Ferry District, 99.42 acres	MP,VOC,SO C,TO, NN	M
99	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Valley View Estates (Map 2, 53 Lots) Own Wells and Septic Tanks	Harpers Ferry District, 468.06 acres	MP,VOC,SO C,TO, NN	M
100	Harpers Ferry Water Works	C	SP/SW	Residential	R 6	Briar Patch (Map 2-1, 31 Lots) Own Wells and Septic Tanks & failing leach fields	Harpers Ferry District, 3.5 Acres	MP,VOC,SO C,TO, NN	M
101	Potomac Terrace Water Works	C	GW Well	Municipal	M-30	Abandoned Well	Abandoned Well	VOC,SOC,M P,PH,NN	H

102	Potomac Terrace Water Works	C	GW Well	Municipal	M 5	Potomac Water Treatment Plant	Water Treatment Plant Building	D	L
103	Potomac Terrace Water Works	C	GW Well	Municipal	M 31	GW Well	GW Well	VOC, SOC	L
104	Potomac Terrace Water Works	C	GW Well	Municipal	M 31	GW Well	GW Well	VOC, SOC	L
105	Potomac Terrace Water Works	C	GW Well	Municipal	M 31	GW Well	GW Well	VOC, SOC	L
106	Potomac Terrace Water Works	C	GW Well	Municipal	C 7	Highway	Highway	PH, VOC, M	M
107	Potomac Terrace Water Works	C	GW Well	Residential	R 4	Residential Home	Home	VOC, SOC, NN	H
108	Potomac Terrace Water Works	C	GW Well	Residential	R 4	Residential Home	Home	VOC, SOC, NN	H
109	Potomac Terrace Water Works	C	GW Well	Residential	R 4	Residential Home	Home	VOC, SOC, NN	H
110	Potomac Terrace Water Works	C	GW Well	Residential	R 6	Residential Home	Home	MP, VOC, SOC, TO, NN	M
111	Potomac Terrace Water Works	C	GW Well	Residential	R 6	Residential Home	Home	MP, VOC, SOC, TO, NN	M
112	Potomac Terrace Water Works	C	GW Well	Residential	R 6	Residential Home with septic tanks & leach field	Home	MP, VOC, SOC, TO, NN	M
113	Potomac Farms Home Owners Association	C	GW Wells 1& 2	Municipal	M 5	Water Treatment	Water Treatment Plant	D	L
114	Potomac Farms Home Owners Association	C	GW Wells 1& 2	Commercial	C 23	Gas Station	Gas Station	PH, M, VOC	H
115	Potomac Farms Home Owners Association	C	GW Wells 1& 2	Wooded	R 6	Residential Home with septic tanks & leach field	Residential Single Family Homes	MP, VOC, SOC, TO, NN	M



116	Potomac Farms Home Owners Association	C	GW Wells 1 & 2	Residential	R 6	Potomac Farms Residential subdivision( 60 Lots)	Residential Single Family Homes	MP, VOC, SOC, TO,NN	M
117	Bakerton Market	NC-Transient	GW Well # 1	Residential	R 6	Septic Tanks & leach fields	Septic Tanks & leach fields	MP, VOC, SOC, TO,NN	M
118	Bakerton Market	NC-Transient	GW Well # 1	Residential	R 4	Residential Single Family Homes	Residential	VOC, SOC, NN	L
119	Bakerton Market	NC-Transient	GW Well # 1	Residential	R 4	Residential Single Family Homes	Residential	VOC, SOC, NN	L
120	Bakerton Market	NC-Transient	GW Well # 1	Commercial	C 48	Underground Storage tanks	Fuel Storage	PH, VOC	H
121	Bakerton Market	NC-Transient	GW Well # 1	Municipal	M 31	Water supply Wells	Water supply Wells	VOC, SOC	L
122	Meadow Brook Water	C	GW Wells 1 & 2	Municipal	M 5	Water Treatment Building	Water Treatment	D	L
123	Meadow Brook Water	C	GW Wells 1 & 2	Municipal	M 25	Storm water Pond	Pond	M, VOC, MP	M
124	Meadow Brook Water	C	GW Wells 1 & 2	Municipal	M 7	Highway	Highway	SOC, VOC, PH	M
125	Meadow Brook Water	C	GW Wells 1 & 2	Agriculture (Not in existence)	A 18	Farm Hayfield	Hayfield	SOC, D, VOC, PH	L
125	Meadow Brook Water	C	GW Wells 1 & 2	Agriculture (Not in existence)	A 18	Farm Pasture	Pasture	SOC, D, VOC, PH	L
126	Meadow Brook Water	C	GW Wells 1 & 2	Commercial	C 9	Farm Cemetry	Cemetry	M, SOC,PH,	L
127	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 4	Residential Homes	Map#5, Harpers Ferry District	VOC, SOC, NN	H
128	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 4	Residential Homes with individual wells and septic tanks	Map#5, Harpers Ferry District	VOC, SOC, NN	H
129	Meadow Brook Water	C	GW wells 1 & 2	Residential	R 4	Residential single family	Map#5, Harpers Ferry District	VOC, SOC, NN	H
130	Meadow Brook Water	C	GW Wells 1	Residential	R 4	Residential single family	Map#5, Harpers	VOC, SOC, NN	H

			& 2			Homes	Ferry District		
131	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 4	Residential single family Homes	Map#5, Harpers Ferry District	VOC, SOC, NN	H
132	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 6	Residential Homes with septic tanks and leach field	Map#5, Harpers Ferry District	MP, VOC, SOC,TO, NN	M
133	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 6	Residential Homes with septic tanks and leach field	Map#5, Harpers Ferry District	MP, VOC, SOC,TO, NN	M
134	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 6	Residential Homes with septic tanks and leach field	Map#5, Harpers Ferry District	MP, VOC, SOC,TO, NN	M
135	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 6	Residential Homes with septic tanks and leach field	Map#5, Harpers Ferry District	MP, VOC, SOC,TO, NN	M
136	Meadow Brook Water	C	GW Wells 1 & 2	Residential	R 6	Residential Homes with septic tanks and leach field	Map#5, Harpers Ferry District	MP, VOC, SOC,TO, NN	M
137	Sam Michael's Park (Connected to Jefferson Utility)	C	Abandoned GW Well 1	Residential	R 6	Residential Homes with septic tanks and leach field	Storm water run-off	MP, VOC, SOC,TO, NN	M
138	Sam Michael's Park (Connected to Jefferson Utility)	C	Abandoned GW Well 1	Agriculture	A 5	Crops, corn, soybean, wheat	Farm	NN, SOC, MP	L
139	Sam Michael's Park (Connected to Jefferson Utility)	C	Abandoned GW Well 1	Municipal	M 5	Drinking Water treatment Plants	Water Treatment	D	L
140	Sam Michael's Park (Connected to Jefferson Utility)	C	Abandoned GW Well 1	Municipal	M 22	Sewer Lines	Sewer Lines	M, VOC,MP,TO	H
141	Sam Michael's Park (Connected to Jefferson Utility)	C	Abandoned GW Well 1	Municipal	M 29	Wells: water Supply	Water Supply	VOC, SOC	L

142	Sam Michael's Park (Connected to Jefferson Utility)	C	Abandoned GW Well 1	Municipal	M 29	Wells: water Supply	Water Supply	VOC, SOC	L
143	Sam Michael's Park (Connected to Jefferson Utility)	C	GW Well 1	Commercial	C 30	Medical/Dental Clinics	Medical	M, VOC, MP, TO	H
144	C.W. Shipley Elementary	NC-NT	GW Well 1	Municipal	M 29	Wells: water Supply	Water Supply	VOC, SOC	L
145	C.W. Shipley Elementary	NC-NT	GW Well 1	Residential	R 4	Residential Single Family Lots	Residential	VOC, SOC, NN	L
146	C.W. Shipley Elementary	NC-NT	GW Well 1	Agriculture	A 5	Crops, Corn, Soybean, Wheat	Crops	NN, SOC,MP	L
147	C.W. Shipley Elementary	NC-NT	GW Well 1	Agriculture	A 5	Crops, Corn, Soybean, Wheat	Crops	NN, SOC,MP	L
148	C.W. Shipley Elementary	NC-NT	GW Well 1	Commercial	C 25	Auto	Junk yards, Scrap, Auto	PH,VOC,M, HM	H
149	C.W. Shipley Elementary	NC-NT	GW Well 1	Commercial	C 48	Fuel Storage	Underground Storage tanks	PH, VOC	H
150	C.W. Shipley Elementary	NC-NT	GW Well 1	Commercial	C 48	Utility Substation Transformers	Allegheny Power	PH,VOC, SOC	H
151	C.W. Shipley Elementary	NC-NT	GW Well 1	Municipal	M 30	Water wells	Abandoned Wells	VOC, SOC, MP, PH, NN	H
152	C.W. Shipley Elementary	NC-NT	GW Well 1	Industrial	I 2	Cement Plant	Cement/Concrete	PH, VOC, HM, SOC	M

**Terminology Used:**

**System Type:**

C: Community Water System  
NCNT: Non Community and Non Transient Water System  
NCT: Non Community Transient Water System

**Source Type:**

GW Ground Water Well  
SP Spring Source  
SW Surface Water Stream

## **Index to Associated Chemicals**

MP	Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa
NN	Nitrate/Nitrite
VOC	Volatile Organic Compounds
HM	Heavy Metals
M	Metals
SOC	Synthetic Organic Compounds
T	Turbidity
D	Disinfection Products
TO	Taste and Odor Precursors
R	Radionuclide
PH	Petroleum Hydrocarbons

Note: The potential significant contamination sources are based on land use and are ranked according to threat level to water quality (high, medium, low). The risk ranking provides a simple approach to comparing relative risk of the potential contaminant sources land uses. The risk rankings are based on the general nature of their activities and the contaminants associated with them, not on facility specified information, such as management practices. Based on case specific information, WVBPH may reduce the threat ranking for an activity which is generally considered high to moderate or moderate to low a low ranking based on a finding that none of the contaminants of concern are associated with that activity or increase the ranking based on data obtained for a specific source.

# **ASSESSMENT OF POSSIBLE THREAT TO DRINKING WATER SUPPLY SOURCES**

The vulnerability of the Harpers Ferry Water Works water system source is assessed based on the type of source category of potential contaminant and land use of areas lying in the watershed delineated area. The following threatening land uses and potential contaminant sources were identified for the Harpers Ferry Water Supply:

## **1.0 Land Uses**

### **1.1 Residential**

There is tremendous increase in residential development (e.g., housing, commercial development, parking lots, streets, driveways). This has resulted in increase of impervious surface affecting groundwater in terms of quantity and quality in the delineated watershed.

The impervious surface has increased surface runoff which in turn has reduced soil infiltration of moisture and decrease in ground water recharge. In terms of water quality, an increase in storm water runoff has detrimental effect on receiving streams and the water quality of recharge. Further, impervious surfaces collect contaminants such as petroleum products, lawn chemicals, heavy metals, animal waste from farms and pets, fertilizers and pesticides that may be washed into groundwater, as well as other water bodies, during storms. With this rapid runoff, there is little opportunity for natural infiltration and purification.

The USEPA's Phase I & II requires National Pollutant Discharge Elimination System (NPDES) permitting, inspection and maintenance requirements for storm water management. The county has established provisions for regulating construction activities. The NPDES requires that all construction activities requiring more than one acre of disturbance be regulated; reduce pollutants to the "maximum extent practicable", mandate public education, and set forth erosion and sediment control requirements.

Most citizens are generally unaware of the effects of numerous potential contaminants stored, used and the ones that are disposed off from residential homes. The potential contaminants include household chemicals, automotive products, paints/solvents, fuel storage systems, and lawn/garden chemicals. The education of citizens through fliers and brochures is helpful.

### **1.2 Agriculture**

Farming is traditional and important component of life in Jefferson County. Nitrogen and phosphorus are necessary components of agricultural production. High application rates, excessive moisture from rainfall or irrigation, and the timing of treatments can contribute to elevated levels in both ground and surface water. High nutrient levels fuel algae blooms, degrade habitat for fish and aquatic life and contribute to spread of oxygen starved "dead zones". Chesapeake Bay has been experiencing alarming increases in nutrient levels. Since north eastern part of West Virginia lies in the contributing watershed, West Virginia has joined other states as part of the Chesapeake Bay watershed pact, which requires the state to take aggressive action to reduce the level of nitrogen and other contributors to the elevated nutrient level.

Agricultural feeding operations are potential contributor for high nutrient levels. USDA Farm Service Agency, Ranson has indicated that there are several farms located in the delineated watershed area.

Manure storage facilities and manure/septage sludge spreading can lead to high levels of E-Coli and nitrate levels in surface and groundwater due to the surface runoff. Unless properly managed, manure has the potential to cause significant runoff into streams and groundwater sources. When this happens, runoff increases the deleterious impacts of nitrogen and phosphates on farms and lawns.

Improperly applied chemicals such as pesticides, fungicides and fertilizers can leach through into the groundwater or run-off into streams and can present a contamination threat to drinking water supplies. When stored in containers, there is potential of leaks from the storage area into the ground.

### **1.3 Commercial**

In the delineated watershed area, a few commercial operations that use toxic and hazardous materials in the operation of facilities are located or are planned. The examples include automobile repair shops, gas stations, car washes, paint shops, road maintenance depots, dry cleaners, laundromats, health clinics, restaurants and bakeries. Among one of the planned development is the Tackley Development which will include several commercial businesses.

The storage, use and disposal of chemicals required by these operations can pose threat to water quality since even small amounts of the hazardous materials can contaminate surface and ground water. Storing quantities of material can also create a serious problem if they are not contained and stored properly. Leaks and spills from storage tanks and pipes can contaminate water, rendering the water unfit for human consumption.

### **1.4 Industrial**

Industrial operations generally use toxic substances as part of manufacturing, warehousing, and/or distribution. Materials such as chemicals, petroleum products, cleaning supplies, machinery, metals, electronic products, asphalt pose a potential threat to the water supply and must be managed. Other possible sources of contamination associated with industrial land uses include above ground and underground storage tanks, operating and abandoned gas wells (water supply, injection, monitoring), septage/sewer treatment lagoons, manufacturing plants, etc). In the watershed delineated area, there is a 260 acre Burr/Bardane Industrial Park.

The potential contaminant inventory for the Burr/Bardane Industrial Park is included at Table 1 of the source water protection plan. With regards to storm water management, WVRWA has noted that the Business Industrial Park needs storm water treatment pond/ponds prior to discharge of water to nearby streams including the Elks Branch and Elks Run.

## **2.0 Roadways/Transportation Corridors**

Running through the delineated watershed are the State Route (SR 9 and 230). Through SR 9, there is connection to Martinsburg and US Interstate 81. Through SR 230 there is a north-south link to Route 340 on the south to Shepherds Town on the north. The U.S. Rout 340 also crosses the southern part of the watershed and connects Charles Town, the County Seat of Jefferson County with Metro Washington through Interstate I-70.

The railroads that pass through the delineated watershed include the Norfolk and Southern Railway and the CSX Transportation which are used for commercial goods and carrying passengers. There is a commuter boarding at the Duffields and Harpers Ferry. Amtrak Service also provides commuter boarding at Harpers Ferry.

As transportation corridors serve as conduit for transportation of raw materials including chemicals, diesel, gasoline, pesticides, fertilizers they are considered as high risk to SWPA. The Harpers Ferry Water Works reported that there was a railroad related paint spill near the spring area which resulted in disruption of water supply.

**3.0 Known detects of contaminants in groundwater:** (Most commonly nitrates, coliform and organics).

### **Inorganic and Organic Contaminants**

The Harpers Ferry Water Works Consumer Confidence Report (2004) indicates that contaminant detects relative to inorganic contaminants including nitrates, lead, copper and fluorides were below the EPA MCL's. VOC contaminants which are by-product of chlorine disinfection including haloacetic acids (HAAC5), total trihalomethanes (TTHMS) were also below EPA MCL

### **4.0 Anthropogenic Potential Contaminant Sources**

The anthropogenic potential contaminant sources include hazardous waste facilities, underground storage tanks, leaking underground storage tanks, proximity of sewer lines and manholes, leaking septic tanks, septage and sludge, agricultural farms, pollution from non point and point sources and presence of underground injection wells.

#### **i. Hazardous Material Spills**

The karst topography encompasses the roads and the railroads. A fair amount of truck and rail traffic carries hazardous materials including chemicals and petroleum products. Hazmat spills can do serious damage to the surrounding ground and surface water. The primary concern is that leaks, spills or improper disposal could allow contaminants to be discharged into the ground water aquifer.

Information obtained from USGS indicates that there are several identified sink holes in the Watershed delineated area. These sink holes were investigated by USGS. So far these sinkholes have not been remediated. These sinkholes can result in flow of contaminants from surface runoff, possible highway/railroad tanker oil and chemical spills, and roadway salt solutions to groundwater, if not remediated. The groundwater flow velocity in the area as observed by USGS is high and is around 1150 feet/day. In the event of a spill, the groundwater will be soon get contaminated in a matter of hours and days.

#### **ii. Fuel Storage Tanks**

Fuel storage tanks represent a potential source of petroleum compounds which include volatile and semi volatile, and chemical additives that are present in the fuel. The potential threat of contamination from this source would be from a leak, overfill or spill. The WVDEP maintains records of gasoline underground storage tanks. The above ground storage tanks are also a concern as there are tanks that store chemicals and fertilizer spray solutions which can leak and can cause widespread pollution.

### **iii. Leaking Underground Storage Tanks**

A list of leaking underground storage tanks has been posted by WV Department of Environmental Protection (WVDEP) on its' web site (12/23/2003). WVDEP also maintains a list of closed sites that have met Action Levels stipulated in WVDEP Corrective Action Document. The list does not indicate any leaking underground storage tanks in the SWPA area.

### **iv. Sewer Lines and On-Site Septic Systems**

On-site septic systems and sewer lines represent potential sources of nitrates, chlorides, bacteria and viruses. In addition, if improperly used, such as for disposal of paints, solvents, petroleum products and other hazardous waste, they could be a source of organic compounds. WVDEP study found that certain sections of Elks Run and Elks Branch are contaminated with bacterial contamination during the summer months of 2003 & 2004. Maryland DEP reports bacterial contamination of waters of Potomac River. It is therefore very important that raw water samples are sampled and analyzed on a regular basis. WVRWA has observed that Harpers Ferry Water works and Shepherdstown Water Works (upstream of Harpers Ferry) do monitor water quality on a monthly basis.

## **5.0 Point Source of Pollution**

Point sources refer to discharges that enter surface waters through a pipe, ditch, or other well-defined point of discharge. The term applies to wastewater and storm water discharges from a variety of sources. Wastewater point source discharges include municipal (city and county) and industrial wastewater treatment plants and small domestic wastewater treatment systems that may serve schools, commercial offices, residential subdivisions and individual homes. The primary pollutants associated with point source discharges are oxygen-demanding waste, nutrients, sediment, color and toxic substances including chlorine, ammonia, and metals.

Point source dischargers must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) permit from the State. The discharge permits are issued by WVDEP under the NPDES Program delegated by the US Environmental Protection Agency (USEPA) to the State of West Virginia

Another point source covered by NPDES permits is combined sewer overflows (CSO). A combined sewer system is a wastewater collection system that conveys sanitary wastewater (domestic, commercial, and industrial wastewater) and storm water through a single pipe system to a Publicly Owned Treatment Facility. A CSO is the discharge from a combined sewer system at a point prior to the Publicly Owned Treatment Facility. CSOs are point sources subject to NPDES permit requirements including both technology-based and water quality-based requirements of the Clean Water Act.

## **6.0 Non-point Sources of Pollution**

Non-point sources are described as dispersed contamination from many sources such as soil erosion, on-lot septic systems, storm water discharges, agricultural activities, and pollution associated with resource extraction and silviculture. The most significant contamination associated with non-point sources is nitrates associated with the use of manure, fertilizer, and pesticides which drain into streams and infiltrate into ground water. Household hazardous and



commercial/industrial waste (e.g., ammonia, chlorides, paint, paint thinners, waste oil, antifreeze, solvents, etc.) are also sources of non-point pollution.

Potential groundwater contaminants associated with this activity would be nitrates and bacteria. In this regard, the local and state agencies should encourage the farming community and homeowner associations for proper and appropriate use of fertilizers and pesticide within Source Water Protection Area.

Overall, the potential risk from non-point sources makes Harpers Ferry water sources vulnerable to contamination.

## **7.0. Storm Water**

The need to manage storm water is created by increased residential, commercial, and industrial-development as impervious surfaces prevent rain from soaking into the soil and allow pollutants to accumulate. Storm water management, which has only been a subject of concern for the past ten to fifteen years, focuses on controlling the volume and peak discharge rate which increase dramatically when impervious surfaces cover an area. The increased surface run-with sediments and toxic elements impact the water quality.

It is very important that storm water management facilities are provided during construction and maintained after construction is completed of any residential and industrial facilities. There needs to be proper and adequate design, and installation of storm water facilities in residential divisional development in the watershed delineated area. WVRWA recommends that these designs are reviewed by Jefferson County Planning Commission and by the WVDEP.

WVDEP has developed certain guidelines for construction activities in karst and non karst areas. These guidelines require information relative to soil types, structure calculations, soil permeability, management and maintenance practices, etc. for all construction activities. The recommended measures require 24" clay material for ponds not excavated to bedrock and 24" clay and synthetic liner of 60 mil thickness for those ponds which are excavated to bedrock. It is very important that facilities are properly operated and maintained after completion of construction. There needs to be an approval process for construction of sediment control facilities.

However, based on available information, WVRWA has observed that buffer or setback distance requirements have not been established for springs and sinkholes. There are several sinkholes and springs in the watershed area which need to be protected. It is recommended by WVRWA, that a minimum setback distance and vegetation cover of at least 500 feet from sinkholes or spring source should be established for any construction activity. Further, WVDEP must prescribe maintenance procedures and practices during construction and post construction phase. WVDEP should institute appropriate enforcement actions during the construction phase to protect the source water quality.

## **8.0 Potential Future Development**

The undeveloped land areas within the SWP area (including areas zoned for residential, industrial and commercial land-uses) have the potential of contaminating the surface and groundwater water sources.

## **9.0 Sinkholes in Karst**

Contaminants entering the groundwater system through sinkholes present a significant health concern. In karst lands there are topographic depressions, sinkholes and caverns. Surface water enters through sinkholes into groundwater which usually resurfaces at springs and streams that are used as water supplies.

During the development of the SWAP, WVRWA observed that a sinkhole study was conducted by USGS in Jefferson County (1990's). WVRWA researched this information and has identified several sinkholes in the SWAP area. These sink holes have not been remediated so far. These sinkholes are located in farms, residential sub-divisions and closer to highways and railroad tracks. WVRWA considers that remediation of sinkholes needs immediate attention as a chemical and oil spill can contaminate ground water source for several entities in the watershed area.

## Steering Committee

John Heafer	Chief Plant Superintendent, Harpers Ferry WTP	304 267 3855
Lisa Dunn	Registered Sanitarian Jefferson County Health Dept.	304 728 8415
Jimmy Williams	Plant Operator, Bolivar Public Service District.	304 535 2390
Mark Kozar	USGS, Charleston	304 273 9621
Bill Toomey	Manager, SWAP WV Bureau for Public Health	304 558 6746
Bradley R. Reed	District Engineer, WV BPH, Kearneysville Office	304 725 9453
Dalip Sarin	Source Water Protection Specialist, WVRWA	304 562 8585
Daryl Pennwell	Jefferson County, Office of Emergency Services	304 263 1345 304 728 3290
	Blue Ridge Volunteer Fire Dept, Blue Ridge	304 715 8118
Steve Wilt	Harpers Ferry, Volunteer Fire Dept	304 535 2211
	Jefferson County Sheriff Department	304 267 7000
Twila Carr	WVDEP, Water & Waste Management	304 267 0173
Roger L. Goodwin	Planning Commission, Jefferson County	304 728 3298
John Wirts	WVDEP, Watershed Management Framework	304 926 0499
Robert W. Schnably	USDA, Natural Resources Conservation Service	304 725 3471
Donnie Buracker	Harpers Ferry Police	304 535 6366

## Management Plan

The Source Water Protection Area (SWPA) referred to in this plan is the area indicated on map (Attachment # 5). The SWPA is the land area which constitutes the Aquifer Recharge Zone for the springs and the wells. In order to reduce the potential risk of contamination to drinking water sources, the Harpers Ferry Works Local Planning Team should work with several identified entities at local, state and federal level to implement the following management measures:

### Conduct an Education and Outreach Campaign

Public education and awareness is the cornerstone of this Source Water Protection Plan. Most homeowners and business owners will work to try to protect their local groundwater if they know how to minimize contamination risks. The Harpers Ferry Water Works education and outreach campaign will include, but will not necessarily be limited to the following steps:

1. Placement of signs on thorough fares near the SWAP Areas
2. Placement of Federal Offense Warning Signs at treatment plant, groundwater wells, storage tanks and pump stations
3. Training of Emergency Responders
4. Newspaper articles in the local newspaper
5. Educational mailings to the water users and identified potential source owners
6. Educating the general public

### Drinking Water Wellhead Protection Area Road Signs

**Management Strategy:** Harpers Ferry needs to post a Source Water Protection Area sign at the Harpers Ferry Water Treatment Plant. The Harpers Ferry Water Works needs to post signs where appropriate, alerting travelers about the presence of the protection area and how to notify emergency personnel if a contamination event should occur.

The Harpers Ferry Water Works is considering placing additional SWAP area signs indicating the presence of a Source Water Protection Area.

### Posting of Federal Offense Warning Signs

**Management Strategy:** The West Virginia Rural Water Association will provide the Harpers Ferry Water Works with a warning sign that states “Tampering with this facility is a Federal Offense”. This sign has been placed on the gate to the Harpers Ferry Water Works treatment plant. The Harpers Ferry Water Works has placed these signs at the treatment plant, spring location and near elevated storage tanks. Additional Federal warning signs will be provided to the Harpers Ferry Water Works by WV Rural Water Association.



### Training of Emergency Responders

**Management Strategy:** The Harpers Ferry Water Works utilizes the services of the Harpers Ferry Volunteer Fire Department and County Sheriff’s Police Department. The Volunteer Fire Department Chief, Steve Wilt is a member of the SWAP Local Planning Team and has agreed to incorporate SWAP training within the department. The training will be performed during the regularly scheduled monthly training session.

The Local Planning team should contact the Jefferson County, Office of Emergency Services, Local Emergency Planning Committee (LEPC), and the Jefferson County Health Department to incorporate source water protection emergency response planning into their regular training program. The plan to train the Hazardous Material Responders should be a part of the Jefferson County LEPC Hazardous Material Response Plan. Specialized Training in Wellhead and Source Water Protection issues should be imparted to the responders.

It is recommended that the Harpers Ferry Water Dept. should organize training in handling of hazardous material incidents with joint efforts of the Volunteer Fire Department, the Police Department, the local LEPC, and the Jefferson County Health Department. The training should include:

- Importance of source water protection, source water delineation boundaries and location of springs
- Overview of the Emergency Contingency Plan
- Personnel to be notified in event of an emergency
- Distribution and discussion of emergency responder materials to be posted at their respective agencies' location.
- Emergency Response Planning
- Tour of the Harpers Ferry Water treatment plant, elevated tanks, and the sources of water

The training should be conducted annually or more frequently should significant change in the plan occur.

## **Articles in Local Newspapers**

**Management Strategy:** Articles will be posted in the local newspaper informing the community of disruptions in services, changes in water rates, and upcoming educational events that promote the wise-use of their water resources.

In the event of a system wide contamination of the Harpers Ferry Water Works water supply, its customers will be notified of a boil order or non-use orders via local radio stations and newspapers. The Harpers Ferry Water Works personnel will contact the media outlets by telephone. Notification to the media may be confirmed by facsimile alert as appropriate.

## **Educational Mailings to the Water Users**

### ***Owners and Operators of Identified Potential Sources of Contamination***

**Management Strategy:** As a part of its Source Water assessment and Protection Program, the Harpers Ferry Water system will notify owners and operators of identified potential sources of contaminants SWAP area. The notification will include instructions for accessing the Harpers Ferry Water Works SWPP , importance of preventing contamination of the surface streams, and springs. Educational materials on the proper management of contamination sources shall be made available at the Harpers Ferry Water Works office.

**Management Strategy:** Best Management Practices (BMPs) will be used for the above ground and underground storage tanks that are identified within the SWPA. Both unregulated and regulated tank owners, if any will be notified in writing annually to refresh them on BMPs and their importance to the community in maintaining their tank system

**Management Strategy:** Those parties that are within the SWPA identified as using, applying, storing, mixing, loading, transporting and disposing of pesticides shall be notified with information concerning the BMPs for handling pesticides.

## **Public Outreach**

### ***Distribution of Educational Materials***

**Management Strategy:** Educational materials on the proper management of contamination sources will be developed by the Harpers Ferry Local Planning Team and WV Rural Water Association. These brochures will be displayed at the Harpers Ferry Water office, Office of Mayor, Harpers Ferry and Mayor, Bolivar for pickup by the general public.

### **Water Conservation and Protection Educational Workshop**

**Management Strategy:** WV Rural Water Association organizes every year a symposium on “**Water Conservation and Protection**” in the state. In the symposium, water professionals, local citizens, non-profit organizations focused on source water and watershed protection, local governing bodies, and private consultants and specialists from related fields are invited to share knowledge and insight about equipment, supplies, management practices, and technologies related to the practice of conserving and protecting drinking water sources.

### **Consumer Confidence Report**

The Corporation of Harpers Ferry distributes the Annual Drinking Water Quality Report to their customers. The Consumer Confidence Report (2005) indicates test results of regulated inorganic and volatile organic contaminants to be below the EPA prescribed MCL’s.

**Management Strategy:** The management of Harpers Ferry Water Plant will continue to provide Consumer Confidence Reports to their customers on a timely basis.

### **Source water Protection and Assessment Planning**

**Management Strategy:** The formation and ongoing activities of the Local Planning Team (LPT) have raised the community’s awareness of the importance of protecting their source of drinking water. In this respect, the WVRWA will prepare a brochure concerning the re-delineated SWAP area for use.

### **Centralized Availability of Water Protection Plans**

**Management Strategy:** A copy of the emergency plan, contingency plan, source water protection plan, water treatment plant plans, water distribution system and street maps should be kept on file by the Corporation of Harpers Ferry. The plans should be kept and made available at the Harpers Ferry Water Works and at the Corporation of Harpers Ferry Office. These locations are:

#### **Office of the Mayor, Corporation of Harpers Ferry**

1000 Washington Street

PO Box 217

Harpers Ferry, WV 25425-0217

## **Office of the Chief Superintendent Harpers Ferry Water Works**

System Address: Bakerton Road,  
PO Box 217, Harper's Ferry, WV 25425  
System Phone: 304 535 6555

## **Handling Hazardous Materials**

### **Chemical Storage or Mixing**

Spills associated with chemical filling and refueling activities, chemical and fuel tank leaks and ruptures, and equipment maintenance activities are perceived as the greatest threat to groundwater

***Recommended Management Strategy:*** Corporation of Harpers Ferry can work with the local USDA Agency to notify all facilities that store, manufacture, or use hazardous materials of there vicinity to the public water systems. Provide information on the proper handling of hazardous materials and contact information of emergency responders incase of a release.

### **Pesticides and Herbicides**

The Corporation of Harpers Ferry, Jefferson County Commission, USDA and WVDEP agencies recognize that improper storage, application and disposal of various fertilizers and pesticides are potential mechanisms for polluting surface and groundwater.

***Management Strategy:*** The agencies feel that educating the public by providing information on the proper handling and storage of pesticide, herbicides, and fertilizers will be useful. USDA's and EPA's best management practices in the use of fertilizers and pesticides can be accessed on their web sites by farmers in the delineated watershed. If such information can be distributed by mail to farmers by respective agencies, it can go a long way to protect source waters in the watershed.

## **Non-point Source Pollution**

Non-point source pollution contributions are often difficult to assess or quantify. They can include sediment deposition from soil erosion, nutrient runoff from animal wastes and commercial fertilizers, herbicide and insecticide runoff, and oil or fuel waste runoff. Non-point source pollution can emanate from agricultural as well as urban lands. The regulatory control mechanisms now exist and these mechanisms if properly enforced can control and reduce non-point source pollution.

***Recommended Management Strategy:*** The management of urban non-point sources can be addressed through effective land use planning, site design and proper implementation of subdivision rules and guidelines. Those designs that incorporate less impervious area and more natural infiltration areas have proven effective in reducing urban non-point pollution.

***Recommended Management Strategy:*** A setback distance and restricted use of land can provide protection to all sources of water. A minimal distance of 500 feet from a spring source is recommended. In the review of such plans submitted by developers, WVDEP and Jefferson County Planning Commission should condition the approvals and require adequate setback.

***Recommended Management Strategy:*** The local planning and zoning authorities, and developers, should ensure that the site design requirements are implemented during and post construction to reduce non-point source contaminants. Site inspections must be performed by foremen, local and state agency officials to ensure that all operations and processes that can contaminate groundwater including oil leaks from vehicles, aboveground storage tanks and storm water facilities are properly maintained.

***Recommended Management Strategy:*** On completion of construction, Jefferson County Commission and WVDEP should ensure that there is a management plan for maintenance of storm water ponds, conveyance channels and other fixtures in the permitted area. No performance bond should be released until a management plan has been established to maintain ponds and associated conveyance channels by permit holders or their maintenance company or the respective local homeowners association (in case of residential sub-divisions).

***Recommended Management Strategy:*** Practicing the best management measures for non-point source pollution abatement should significantly reduce the sediment, nutrient, pesticide, and other pollutant contributions to water resources. The WVRWA can assist in developing a brochure on best management practices.

***Recommended Management Strategy:*** Local stakeholders, in cooperation with state and federal agencies, should seek additional information on water quality concerns and issues addressed in this document and make that information available to the public. Additionally, the problems associated with septic failures, soil erosion, land use issues, and riparian zones can be emphasized through meetings, training sessions, and stakeholder group discussions. Field days are excellent ways to present information and encourage discussion. Use of experts with strong background knowledge coupled with local sponsors is an effective method to convey solutions to these problems.



## **Safety and Security Issues:**

Sanitary Surveys by the WV Bureau for Public Health and In-house check surveys should address safety issues relative to water sources, treatment plant, storage facilities and distribution systems.

**Management Strategy:** The Corporation of Harpers Ferry should encourage its' employees to attend training courses developed by WVRWA for training of their operators in the field of safety and security.

**Management Strategy:** Corporation of Harpers Ferry should develop a safety and security checklist of items for the purpose of inspection of the source and the water treatment plant facilities.

**Management Strategy:** The area around the Harpers Ferry Water Works needs to have adequate number of signs prohibiting unauthorized access to the plant need to be posted at the entrance and around the facility. An installation of a 24 hour video surveillance around it's' plant and other locations with a centralized monitoring station can go a long way in ensuring safety of it's' facilities.

**Management Strategy:** Harpers Ferry Water Works should continue to provide periodic training to all employees regarding restrictive uses within the Source Water Protection Area.

**Management Strategy:** Harpers Ferry Water Works should continue to perform routine inspections of the setback area to identify and repair any drainage or security problems.

**Recommended Management Strategy:** Additional Federal Offense Warning signs should be placed in areas surrounding the intake, lift stations and the spring including entrance to all elevated storage tank areas.

## **Create an Aquifer Protection Overlay Zone:**

The SWAP area as shown in the attached map is underlain by a high yielding karst aquifer which is a major water resource for residential, industrial and commercial growth.

**Management Strategy:** The Jefferson County Commission should consider a zoning ordinance and prescribe land use development where the source water protection area has been delineated. The Source Water Protection Committee can work to reduce the potential risk of contamination of Corporation of Harper's Ferry surface and ground water resources for current and future drinking water sources by supporting the use of the ordinance to review future development projects.

## **Monitoring**

**Management Strategy:** The Harpers Ferry Water Works is following a Standardized Monitoring Framework (SMF) approved by the WV Bureau for Public Health for water sampling. The parameters monitored ensure that the quality of water derived from the well field is safe for drinking water.

Based upon this evaluation, the Harpers Ferry Water Works considers its current monitoring practices to be sufficient to detect future contamination. The Harpers Ferry Water Works will continue to evaluate its monitoring practices and will consider appropriate adjustments in the future if warranted.

## Groundwater Protection

***Sinkhole Management Strategy (I):*** WVRWA recommends that Corporation of Harpers Ferry should discuss with the Jefferson County Commission, WV Department of Environmental Protection and USDA Natural Resources Conservation Service for remediation of sinkholes in the watershed delineated area (including provision of a vegetated buffer zone and maintenance of sinkholes). Such treatment techniques will prevent contamination of ground water resources from surface run off and spills.

***Management Strategy for Sinkholes (II):*** WVRWA through scientific research has developed guidelines for mitigation of sinkholes. These guidelines are indicated at Appendix # 5.

WVDEP has developed a Sinkhole Mitigation Guidance Document (August, 2005). The Jefferson County has storm water management and sinkhole management guidelines. These guidelines include mitigation designs to allow filling of sinkholes while maintaining recharge to the aquifer, reducing potential contamination threats to groundwater, and eliminating safety hazards at sinkhole entries. The developed guidelines specify that that contaminated materials should be removed from sinkholes and direct inflow of surface water into sinkholes should be prevented. Land treatment methods that improve filtration and infiltration of surface water before it enters the sinkhole should also be considered in a sinkhole management plan. The guidance document can help other state and local authorities in review of plans.

WVRWA recommends that in addition to the specified measures in the guidance document, measures like prohibition of fertilizer, pesticides or other chemicals within at least 100 feet of a sinkhole and a vegetated zone around the sinkhole shall be helpful in reducing migration of pollutants to groundwater. The size and shape of the vegetated zone generally will depend upon the slope of the land and the watershed area draining into the sinkhole. However, a 100 feet wide grass filter strip is ideal; a 50 feet strip is helpful and can trap enough sediments

WVRWA recommends that Jefferson County Health Department should not allow or permit new septic systems, animal feedlots, animal waste lagoon or storm water basin, near known or suspected sinkholes unless adequate buffer is provided around the sinkhole. If sinkholes are located near such sources of bacterial contamination, appropriate methods to prevent runoff from these areas from entering the sinkholes are necessary.

***Management Strategy to respond to Spills in sinkhole areas along highways and railroad tracks:*** It is recommended that notification and emergency spill response procedures for oil or chemical spill near sinkholes along railroad tracks and the stretches of state route 9 and 340 which lie in the delineated watershed should be developed at the local level which should be incorporated in the state plan. The Emergency Plan should address notification procedures, emergency response team members, contact telephone numbers, training and awareness of responsible personnel, response team action requirements, availability of equipment and material, identification of sinkholes and UIC wells. Such procedures should involve WV Office of Emergency Services, County Emergency Services, District and Local Health Department, WVBPH, WVDEP, WVDOH, Spill Contractor and the Harpers Ferry Water Works.

\*It is recommended that sinkhole location information should be maintained on file at county level including the local Office of Emergency.

***Management Strategy for Oil Containment:*** The state authorities should ensure that a properly constructed secondary containment consisting of a dyke around the oil storage facility to hold 110% of contents of the largest tank is provided for contaminant sources identified in Table 1 of the plan.

***Management Strategy for Oil Spills:*** Under the WVDEP Groundwater Protection Plan, all tank owners should have a spill or leak response plan in place. In case of spill, the company is also required to inform the regulatory authorities including WVDEP, USEPA and the Spill Contractor promptly. Further, the personnel at the site are also required to mobilize all available equipment and resources for the containment and clean-up for the spill. The materials used to absorb the spill (pads) as well as contaminated soils are required to be removed by the spill contractor and disposed at an approved site.

### ***Sanitary Setback Management Plan***

***Regulatory Management Strategy:*** WV BPH is responsible for issuance of permits for the construction of municipal water supply wells and the County Health Department issues permits for all individual water wells and small commercial wells. New wells are required to be designed in accordance with appropriate standards and constructed with approved materials and installation methods.

***Recommended Management Strategy:*** Jefferson County Planning Commission and County Health department should develop sanitary setback management plans. All new wells should be properly spaced and constructed with 200 foot sanitary setback for public wells and 100 feet sanitary setback for individual wells. Springs that are source of water, 500 feet sanitary distance is recommended. The sanitary setback should be controlled by land title or easement.

### **Future Infrastructure Improvements**

#### ***Sewer & Water Line Expansion***

***Recommended Management Strategy:*** Jefferson County is undergoing aggressive growth, and public sewer and water line expansion projects are likely to continue in the watershed. Reducing the number of on-site waste disposal systems will minimize the risk of e-coli, nitrates and improperly disposed of hazardous materials from infiltrating into the groundwater aquifer. As water wells serve as a direct conduit into an aquifer, local efforts to certify that proper grouting procedures are followed and that backflow, tampering or misuse of water well is prevented should continue.

#### **Failing Septic Systems & Sewer Ordinances**

Local county health departments and other stakeholders have identified failing septic systems and straight pipe discharge from septic tanks as significant sources of water pollution in the SWAP area.

***Management Strategy:*** WVRWA and the County Health Dept. can help in preparing an educational brochure on “Installing and maintaining a system disposal system” and the same should be distributed to the communities at the local level. Such education can help in protection of surface waters in the delineated watershed.

***Recommended Management Strategy:*** The direct impact of communities discharging their septic tank effluent to water bodies needs to be studied and characterized by efforts of local health department, WVBPH. and other stakeholders. An onsite management

system needs to be developed and illegal discharges will need elimination through a cooperative effort between the homeowners and the local, state, and federal stakeholders

**Recommended Management Strategy:** Local planning, zoning, and health ordinances should be adopted or strengthened to address this problem during new development. Example of a suitable ordinance wording:

***Three Hundred Foot Sewer Connection Requirement***

*The owner of all houses, buildings, or properties used for human occupancy, employment, recreation or other purposes situated within the town and abutting any street, alley or right-of-way in which there is now located or may in the future be located near a public sewer or combined sewer of the town, is hereby required to discontinue the use of privies, cesspools, septic tanks, and similar structures and to install suitable toilet facilities therein, and to connect such facilities with the proper public sewer in accordance with the provisions of this section, within 180 days after date of official notice to do so, provided that said public sewer is available within 300 feet of the property line.*

**Recommended Management Strategy:** Local ordinances should be enforced more vigorously to correct problems with the existing systems.

**Recommended management Strategy:** An educational/outreach program on the health and environmental risks of septic system discharge, system maintenance, and system function would provide homeowners and others with basic information to better understand the impacts of inadequate systems. This kind of education effort should involve local health department and the WVBPH.

## **Water Quality**

### ***Backflow Prevention and Cross-Connection Control***

Plumbing cross-connections, which are defined as actual or potential connections between a potable and non-potable water supply, constitute a serious public health hazard. There are numerous, well-documented cases where cross-connections have been responsible for contamination of drinking water, and have resulted in the spread of disease. The problem is a dynamic one, because piping systems are continually being installed, altered, or extended.

**Recommended Management Strategy:** Local ordinance prohibiting interconnection by persons, firms, or corporation should be established whereby potable water from a private, auxiliary, or emergency water supply other than the regular public water supply of the town may enter the supply or distribution system of Harpers Ferry Water Works unless such private, auxiliary, or emergency water supply and the method of connection and use of such supply shall have been approved by the Corporation of Harpers Ferry, Water Works (EPA's *Cross-Connection Control Manual & WV Bureau for Public Health Manual* are good source of guidance in this matter).

***Recommended Management Strategy:*** Local ordinance authorizing Harpers Ferry Water Works employees to investigate any property for cross-connections should be established. Upon presentation of credentials, the representative of the Harpers Ferry water Works should have the right to request entry at any reasonable time to examine any property served by a connection to the public water system for cross-connections. The Water Department should be authorized and directed to discontinue water service to any property wherein any connection in violation of ordinance exists, and to take such other precautionary measures deemed necessary to eliminate any danger of contamination of the public water system.

## Contingency Planning

Contingency plans are designed to provide public water supplies with a plan of action in the event that a drinking water source becomes contaminated or is threatened by contamination. The plans must address locating alternate, approved supplies, and delivering those supplies to the users. Enhanced treatment of existing water supplies should also be considered as a viable option.

## Emergency Response

West Virginia has a statewide emergency response plan required under SARA Title III, to respond to threats from hazardous releases in the air, water, and / or land. In addition, the plan provides the public with information about hazardous substances stored and released into the communities. Section 1413(A)(5) of the Safe Drinking Water Act requires that the state “*has adopted and can implement an adequate plan for the provision of safe drinking water under emergency circumstances.*” The WVBPH has established notification procedures to include Office of Emergency Services, County Emergency Services, and contact with district and local health personnel.

The public water supplies represented on this committee have also taken an initiative to prepare their public water supply emergency and contingency plans and insure their effectiveness and shortcomings. In this way, the Local Planning Committee can make recommendations to county and state officials regarding their long and short term planning, emergency, and contingency needs.

## ALTERNATIVE WATER SUPPLY OPTIONS

### A. Procedure for Evaluating Alternative Water Supply Options:

Each system will initiate their Emergency Operations Plan when an event occurs that would cause the system to need to react to protect and supply their customers. The assessment team may need to consult with the WV Bureau for Public Health for implementing the recommended procedure.

### B. Alternative Water Supply Options:

i. Harpers Ferry Water Works shall use water from the Town Spring and the Potomac Water Source, if the Elks Run Water has been contaminated. If water of the spring is contaminated due to spill on railroad tracks, water from Potomac River shall be used.

ii. Harpers Ferry Water Works may consider water from the abandoned quarries which lie close to the water supply lines of the system. This option will entail additional capital expenditures.

iii. The assessment team of local officials should consider the following items in decision making when considering alternative water supply options:

\*Existing system sources (i.e. emergency or backup wells),

\*Source Management (i.e. blending of existing system sources or other source to minimize contaminant concentrations)

- \*New Wells or Surface Supplies
- \*Conservation
- \*Connections to Other Public Water Systems
- \*Emergency Treatment (i.e. chlorination of contaminated wells)
- \*New Treatment
- \*Point of Use Treatment (i.e. faucet filters)
- \*Boiled Water
- \*Point of Entry Treatment (i.e. whole house water treatment units)
- \*Bottled Water
- \*Tank Trucks
- \*Others

## **PRIORITY WATER USERS AND CONSERVATION MEASURES**

### **A. List major water users and sensitive water users and assign a priority to their use of water**

Hospitals  
 Nursing Homes  
 Dialysis Centers

#### **Harpers Ferry Medical Facilities**

Harpers Ferry Family Medicine (304) 535 6343  
 Mayhew Dental Clinic (304) 535 2409  
 Potomac Foot care

#### **Harpers Ferry & Bolivar Area Schools and Public Library**

Harpers Ferry Middle School  
 Bolivar/Harpers Ferry Public Library (304) 535 2301  
 Harpers Ferry Middle School  
 C. W. Shipley Elementary School  
 Jefferson High School, Flowing Springs Rd, Shenandoah Junction  
 Blue Ridge Elementary School

#### **Fire Department**

Friendship Fire Company (304) 535 2211  
 Blue Ridge Fire Company (304) 725 8118

#### **Commercial**

Hilltop Hotel  
 Quality Inn  
 Comfort Inn  
 7/11  
 Harpers Ferry Laundry  
 Paws (304) 535 2810

#### **Harpers Ferry Tourism and Railroad Station**

Jefferson County Convention & Visitors Bureau

Harpers Ferry National Historical Park Visitor Center  
Amtrak and MARC Station

**Local Church organizations**

St. John Episcopal Church  
Pentecostal Church  
Church of Jesus Christ of Latter Day Saints  
Good News Faith Bible Church

**Residential Sub Divisions**

Harpers Ferry Cavalier Estates  
KOA Campground  
Harpers Ferry Ridgeway Sub-Division  
Gapview Village  
Bolivar Court Apartments  
Potomac Terrace Apartments

**B. Select conservation measures to be implemented in the event of the need to reduce demand in order of priority.**

Measure to be Used	Priority
Mandatory water conservation measures	1
Curtail use by larger users	2
Other	3

If appropriate, reducing water demand by conservations measure may lessen or eliminate the necessity of utilizing an alternative water supply option. Other measures could be to reduce pressure, implement metering program, mandatory water conservation measures and public education

**NOTIFICATION ROSTER & PHONE NUMBERS**

Work Phone	Contact Person	Received Copy of Plan Y/N*	Home Phone	Work Phone	24 Hour Emergency Phone
Water System Management and Employees	John Heafer Chief Plant Supt.			304 535 6555	304 582 1569



Local Office of Emergency Services/Disaster Preparedness & Recovery				304 728 3290	
Emergency Communications Center				304 558 5380	
State Office of Emergency Services					
Community Offices and Officials	Jefferson County Planning Commission			304 728 3228	
Municipal Police				304 535 6366	
Jefferson County Sheriff				304 728 3205	
WV State Police				304 725 9779	
Voluntary Fire Dept.	Blue Ridge Volunteer Fire Company			304 728 8006	
	Friendship Fire Company			304 535 2211 or 911	
State Primacy Agency	Bill Toomey			304 558 6746	
	Brad Reed			304 754 9453	

State, Federal & Local Officials	WVDEP(UST)			304 926 0499	1 800 642 3074
	WVDEP(M & R)			304 926 0499	
	WVDEP(Waste)			304 926 0499	
	WVDOT			304 267 0060	
	NRCS (USDA)			304 263 7547	
	National Park Service			304 535 6278 304 535 6205	
	Town Hall, Harpers Ferry			304 535 2206	
Bolivar Town Hall			304 535 3100		
County & Local Dept.	Jefferson County Health Dept.			304 267 7130	
	Sewage Treatment Office			304 535 2390	
Schools	Harpers Ferry Middle School			304 535 6357	
	C. W. Shipley Elementary School			304 725 4395	
	Jefferson High School, Flowing Springs Rd, Shenandoah Junction			304 725 8491	
	Blue Ridge Elementary School			304 725 2995	
Power Company	Allegheny Power				1 800 255 3443
Telephone Company	Frontier				1 800 921 8101 1 800 921 8102
Key Vendors	Univar				1 800 283 0326

Federal Disaster Assistance	Federal Emergency Management Agency				1 800 621 3362
WV Office of Emergency Services				304 558 5380	304 558 5380 1(800) 982 2327
Hospital	Jefferson County Memorial Hospital				304 728 1600
Ambulance	Jefferson County Ambulance Service  Harpers Ferry/Bolivar Ambulance Service				304 728 3287  304 535 2211
Fire	Harpers Ferry Voluntary Fire Dept.				911
State Office for Emergency Spill Notification	Emergency Coordinator				1 800 642 3074
National Response Center for chemical, oil spills, etc					1 800 424 8802
State Rural Water Association	Debbie Britt  Dalip Sarin			304 201 1689  304 201 1689	1 800 339 4513
Nearby Water Systems	Pete Furr				304 724 6439
Home Owners Association					
Quarry Owners					304 229 1771

**Note: The distribution of Contingency Plan will be restricted to the key organizations and personnel to be determined by the Mayor of Corporation of Harpers Ferry, Jefferson County.**

### **Notification of System Users**

In the event of a system wide contamination, the Harpers Ferry Water Works will notify its' water customers of a boil order or non-use order via local radio stations and newspapers. The

utility personnel will contact the media outlets by telephone. Notification to the media may be confirmed by facsimile alert as appropriate.

## Media Relations Plan

i. The primary spokesperson for the media and public comment in the event of a contamination of water from Elks Run, Town Spring and Potomac River Intake will be:

John Heafer  
Chief Plant Superintendent, Harpers Ferry Water Works

ii. **Information checklist to be conveyed to the public and media**

- Name of water system
- Contaminant of concern and date
- Source of contamination
- Public health hazard
- Steps the public can take
- Steps the water system is taking:
- Other information:

iii. **Media Contacts**

Newspaper	The Journal (304 263 8931) Morning Herald (304 263 0879)
Television	NBC 25 (301 797 4400)
Radio	WRNR Talk Radio AM 740 (304 263 6586) WXVA 98.3 FM & WMRE AM (304 725 0402)

Other (list)

**EVENT AND ACTION LOG:** In the event of contamination, Harpers Ferry Water Works shall keep an Event and Action Log as under:

- Type of Event to be Logged \_\_\_\_\_
- Date \_\_\_\_\_
- Time \_\_\_\_\_
- Action Taken \_\_\_\_\_
- Evaluation \_\_\_\_\_

- Costs (*system's own forces*)
  - Labor \_\_\_\_\_
  - Equipment \_\_\_\_\_
  - Materials \_\_\_\_\_
  
- Contract Services \_\_\_\_\_

Note: This type of information may be needed in the event that the water system attempts to receive federal/state emergency relief funding assistance.

**Boil Water Notice:** In case a boil water notice is required, a press release may be necessary. A typical boil water notice will be required and will be issued by Berkeley PSD to its' customers. The contents of a typical boil water notice are:

**Press Release for Boil Water Notice**

Due to \_\_\_\_\_, we have reason to suspect that the water distributed to the customers of the YOUR WATER SYSTEM may be contaminated. Until further notice, water customers are advised to boil water prior to using it for drinking or food preparation. As a precaution, customers should take the following steps:

1. Prior to boiling, the water should be strained through a clean cloth to remove any sediment or floating material.
  
2. The water should then be heated to a vigorous boil, and the rolling boil should be maintained for two minutes to insure disinfection.

## **Attachment #1:       References**

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## Attachment#2: Best Management Practices

Potential Source	Structural	Non-Structural	Education/Outreach
<b>Abandoned wells</b>	1. Abandoned wells should be properly plugged by landowners or abandoned well program.	1. Conduct frequent inventories to locate any abandoned wells that have been overlooked.  2. Enact and enforce ordinances requiring well plugging.	1. Develop education materials explaining the potential impact of abandoned wells.  2. Encouraging citizens to have them plugged or to notify jurisdictional entities.
<b>Above ground Storage Tanks (AST)</b>	1. Above ground storage tanks should be constructed of non-corrodible materials and be placed on impermeable surfaces or raised above the ground.  2. Containment structures should be constructed around the facilities to contain spills.	1. Require that AST operators immediately notify water system officials in the event of a leak or spill.  2. Periodic inventory of contents to detect loss.	1. Disseminate information on the proper construction and maintenance of AST's to appropriate parties.  2. Include operators in spill response and contingency planning.
<b>Accidental Spills</b>	1. Contain, cleanup, remove, remediate. Accidental spills should be immediately contained using the appropriate methods to prevent migration of chemicals into water bodies and ground water.	1. Hazardous material carriers should be routed around source water protection areas if possible.	1. Designate one local authority to oversee and coordinate emergency response activities.  2. Include accidental spills in spill response and contingency planning.
<b>Agricultural Waste Pesticide Dumping</b>	1. Contain, cleanup, remove, remediate.	1. Work with county and extension agents to develop pesticide disposal program.	1. Educate pesticide users and citizens body on the proper handling and disposal of pesticides.
<b>Animal Feedlots</b>	1. Animal feedlots should follow the State of WV rules and EPA guidelines for best management practices for construction standards.  2. Install ground & surface water monitoring equipment around	1. Work with local agencies and extension agents to create manure management programs  2. Limit or prohibit feedlots inside source water protection areas.	1. Disseminate information on the proper handling of feedlot wastes to appropriate parties and citizens.  2. Develop education materials explaining the potential impact to source waters.



	<p>feedlots.</p> <p>3. Establish nutrient monitoring of ground and surface waters to determine nutrient loads to waters.</p>		<p>3. Encourage citizen involvement and reporting of illegal dumping of animal wastes to jurisdictional entities.</p>
<b>Artificial Recharge</b>	<p>1. Plug any dry or abandoned wells not used for artificial recharge in the area to avoid cross contamination of drinking water sources.</p> <p>2. Notify citizens in area concerning this practice.</p>	<p>1. Ensure that appropriate UIC permits are on file with WVDEP Groundwater Program.</p>	<p>1. Obtain copies of required permits and review water quality to be injected into aquifer.</p>
<b>Auto Repair Shops</b>		<p>1. Ensure that appropriate permits are on file with WVDEP to conduct this type of activity.</p> <p>2. Ask state and local inspectors to verify appropriate handling of hazardous wastes, hydrocarbons, and solvents.</p> <p>3. Verify the disposal procedure for chemical wastes from these types of businesses.</p>	<p>1. Disseminate information on the proper handling of automotive wastes to appropriate parties and citizens.</p> <p>2. Develop education materials explaining the potential impact to source waters.</p> <p>3. Encourage citizen involvement and reporting of illegal dumping of automotive wastes to jurisdictional entities.</p>
<b>Auto Salvage Yards</b>	<p>1. Sites should be situated out of source water protection areas, low-lying areas near streams, or areas where water table is near surface.</p> <p>2. Sites with soil or ground water contamination should remediate.</p> <p>3. New sites should install appropriate ground and surface water protection measures.</p>	<p>1. Automotive fluids should be properly contained and disposed.</p> <p>2. Ensure that appropriate permits are on file with WVDEP to conduct this type of activity.</p> <p>3. Ask state and local inspectors to verify appropriate handling of hazardous wastes, hydrocarbons, and solvents.</p> <p>4. Verify the disposal procedure for chemical</p>	<p>1. Disseminate information on the proper handling of automotive wastes to appropriate parties and citizens.</p> <p>2. Develop education materials explaining the potential impact to source waters.</p> <p>3. Encourage citizen involvement and reporting of illegal dumping of automotive wastes to jurisdictional entities.</p>

		wastes from these types of businesses.	
<b>Car Washes</b>	<ol style="list-style-type: none"> <li>1. Wastewater should be discharged into appropriate sewer, retention pond, or underground filtering system.</li> <li>2. Backflow prevention devices should be installed and in good operating condition.</li> </ol>	<ol style="list-style-type: none"> <li>1. Ensure that appropriate permits are on file with WVDEP to conduct this type of activity.</li> <li>2. Ask state and local inspectors to verify appropriate handling of wastes, hydrocarbons, and solvents.</li> <li>3. Verify the disposal procedure for chemical wastes from these types of businesses.</li> </ol>	<ol style="list-style-type: none"> <li>1. Disseminate information on the proper handling of automotive wastes to appropriate parties and citizens.</li> <li>2. Develop education materials explaining the potential impact to source waters.</li> <li>3. Encourage citizen involvement and reporting of illegal dumping of automotive wastes to jurisdictional entities.</li> </ol>
<b>Chemical Storage and Handling</b>	<ol style="list-style-type: none"> <li>1. Containers should be placed on impermeable surfaces within containment structures.</li> <li>2. Chemicals should be transported in accordance with applicable laws.</li> <li>3. Chemical storage facilities should be secured from unauthorized access.</li> </ol>	<ol style="list-style-type: none"> <li>1. Prohibit chemical storage near source waters, in low-lying areas near streams, or areas where ground water table is near surface.</li> <li>2. Include chemical storage facilities in emergency response planning.</li> </ol>	<ol style="list-style-type: none"> <li>1. Disseminate information on the proper handling of chemicals to appropriate parties and citizens.</li> <li>2. Develop education materials explaining the potential impact to source waters.</li> <li>3. Encourage citizen involvement and reporting of illegal dumping of chemicals to jurisdictional entities.</li> </ol>
<b>Fertilizer/Pesticide Application</b>	<ol style="list-style-type: none"> <li>1. Contour cropping, filter strips, furrow babbles, and other conservation methods should be used to minimize fertilizer and pesticide contamination of source water, surface waters, or groundwater.</li> <li>2. Apply pesticides appropriately to eliminate where possible, leaching and runoff.</li> <li>3. Pesticide application equipment should be calibrated and in good condition.</li> </ol>	<ol style="list-style-type: none"> <li>1. Monitor fertilizer and pesticide use.</li> <li>2. Ensure that persons applying fertilizers and pesticides have appropriate licenses.</li> </ol>	<ol style="list-style-type: none"> <li>1. Establish an outreach and education program for all citizens informing them of the dangers of these types of activities to source waters.</li> <li>2. Work with local agencies to educate citizens about soil testing, proper nutrient placement, and timing applications to maximize effectiveness and minimize environmental impacts.</li> <li>3. Work with local</li> </ol>

			agencies to help implement BMP's for these types of activities.
<b>Illegal Dumping</b>	<ol style="list-style-type: none"> <li>1. Install remote surveillance equipment at dump sites.</li> <li>2. Install fencing or other controls such as tire deflators to inhibit dumping.</li> <li>3. Work with local agencies and citizens groups to clean up dump sites.</li> </ol>	<ol style="list-style-type: none"> <li>1. Provide necessary support to local law enforcement to prosecute dumpers.</li> <li>2. Establish a hotline or online center for citizens to report violations.</li> <li>3. Work with local agencies to establish a program that allows citizens to dispose of materials instead of dumping.</li> </ol>	<ol style="list-style-type: none"> <li>1. Establish an outreach and education program for all citizens informing them of the dangers of these types of activities to source waters.</li> <li>2. Work with local agencies to educate citizens about recycling.</li> </ol>
<b>Underground Storage Tank (UST's)</b>	<ol style="list-style-type: none"> <li>1. UST's must be properly sited away from wells, streams, and floodplains</li> <li>2. Must be made of non corrosive material or provided with corrosion protection and have double walls.</li> <li>3. Overfill protection devices must be provided and proper filling procedures during fuel delivery must be followed.</li> <li>4. Leak detection and groundwater monitoring should be provided</li> <li>5. Proper closure provisions must be followed</li> </ol>	<ol style="list-style-type: none"> <li>1. Follow local registration, land use guidelines and setback distances</li> <li>2. Local authorities should work with WVDEP inspectors to ensure adequate inspection of such sites.</li> </ol>	<ol style="list-style-type: none"> <li>1. Work with local , state and federal agencies regarding source water protection, local ordinances, etc</li> </ol>

### Attachment #3: WV Bureau for Public Health Potential Contaminant Map Code List

Map Code	Source Category	Source Name	Associated contaminants or Chemicals	Threat to Ground Water	Threat to Surface Water
A-1	Agriculture	Animal Burial Grounds	"Bacteria, Taste, Odor"	L	L
A-2	Agriculture	Animal Feedlots	"NN, MP, TO"	H	H
A-3	Agriculture	Confined Animal Feeding Operations	"NN, MP, TO"	H	H
A-4	Agriculture	Crop Irrigation	"NN, MP, T"	L	L
A-5	Agriculture	"Crops, corn, soybean, wheat"	"NN, SOC, MP"	L	L
A-6	Agriculture	Crops: orchards	"NN, SOC"	L	L
A-7	Agriculture	Crops: other	"NN, MP, SOC"	L	M
A-8	Agriculture	Drainage canals (agricultural)	T	L	L
A-9	Agriculture	Drainage tile (agricultural)	NN	L	L
A-10	Agriculture	Drainage wells (agricultural)	NN	L	L
A-11	Agriculture	Farm chemical distributor	"NN, VOC, SOC, PH"	L	L
A-12	Agriculture	Farm machinery areas	"PH, VOC"	L	L
A-13	Agriculture	Fertilizer Application	NN	M	M
A-14	Agriculture	Fertilizer Storage	NN	L	L
A-15	Agriculture	Greenhouses/Nurseries	"MP, NN"	L	L
A-16	Agriculture	Manure spreading or Storage*	"NN, MP, T, TO"	M	H
A-17	Agriculture	Other animal facilities	MP	L	L
A-18	Agriculture	Pasture*	"MP, SOC"	L	L
A-19	Agriculture	Pesticide/fertilizer/petroleum storage and Trans.	"PH, NN, SOC, VOC"	L	L
A-20	Agriculture	Silviculture (logging)	"T, PH, VOC"	L	H
A-21	Agriculture	Slaughterhouses	"MP, TO, T, SOC, D"	H	M
A-22	Agriculture	Other			
C-1	Commercial	Above Ground Storage Tanks	"PH, VOC"	L	L
C-2	Commercial	Airports/Abandoned airfields	"PH, VOC"	H	H
C-3	Commercial	Auto repair shops	"PH, M, VOC, HM, SOC"	H	M
C-4	Commercial	Boat services/repair refinishing	"PH, VOC, NN, M HM"	M	H
C-5	Commercial	Body shops	"VOC, PH"	H	M
C-6	Commercial	Camp grounds	"MP, SOC, VOC, PH"	L	L
C-7	Commercial	Car dealerships	"PH, VOC"	H	L
C-8	Commercial	Car washes	"PH, VOC"	L	M
C-9	Commercial	Cemeteries	"M, SOC, PH"	L	L
C-10	Commercial	Construction areas	"M, T, PH, VOC, SOC,	M	H

			HM"		
C-11	Commercial	Demolition areas	"M, T, PH, VOC"	M	M
C-12	Commercial	Dry cleaners	"VOC, SOC"	H	M
C-13	Commercial	Equipment rental/repair shop	"PH, M, VOC"	H	L
C-14	Commercial	Fleet/truck/bus terminals	"M, VOC, HM, SOC, PH"	H	H
C-15	Commercial	Funeral services and crematories	"M, MP, SOC, HM, VOC"	M	L
C-16	Commercial	Furniture and fixtures manufacturers	"VOC, SOC"	H	M
C-17	Commercial	Furniture repair and finishing shops	"VOC, SOC"	H	M
C-18	Commercial	Gas Stations	"PH, M, VOC, SOC"	H	M
C-19	Commercial	Gas Stations	"PH, M, VOC, SOC"	H	M
C-20	Commercial	Golf courses	"VOC, SOC, PH"	M	M
C-21	Commercial	Hardware/lumber/parts stores	"VOV, SOC, HM, M"	L	L
C-22	Commercial	Heating oil companies	"PH, VOC"	H	M
C-23	Commercial	Historic gas stations	"PH, M, VOC"	H	L
C-24	Commercial	Hospitals	"R, VOC, MP, D"	M	L
C-25	Commercial	"Junk yards, scrap and auto"	"PH, VOC, M, HM"	H	H
C-26	Commercial	Landscaping firms	"VOC, PH, SOC, NN"	L	L
C-27	Commercial	Laundromats	"VOC, SOC"	L	M
C-28	Commercial	Lawn/farms stores	"VOC, SOC, NN"	L	L
C-29	Commercial	Leaking Underground Storage Tank	"PH, VOC"	H	L
C-30	Commercial	Marina/boat docks	PH	L	H
C-31	Commercial	Medical/dental offices/clinics	"MP, D, R"	M	L
C-32	Commercial	Nursing Homes	"MP, D"	M	L
C-33	Commercial	Office building/complexes	"PH, VOC, SOC"	L	L
C-34	Commercial	Paint stores	"M, VOC, SOC"	L	L
C-35	Commercial	Parking lots/malls	"VOC, PH"	L	M
C-36	Commercial	Pest control company	"VOC, SOC"	M	L
C-37	Commercial	Pharmacies	"VOC, SOC"	L	L
C-38	Commercial	Photo processing/printing	"M, VOC, SOC"	M	L
C-39	Commercial	Print shops	"VOC, SOC"	L	L
C-40	Commercial	Printer/publisher	"VOC, SOC"	M	L
C-41	Commercial	Railroad Tracks and Yards	"PH, M, VOC, SOC"	H	H
C-42	Commercial	Recreational vehicle/mini storage	"PH, VOC"	L	L

C-43	Commercial	"Repair Shops (engine, appliances, etc.)"	"PH, VOC, SOC"	H	M
C-44	Commercial	Research laboratories	"M, VOC, SOC"	H	H
C-45	Commercial	Rust Proofers	"M, VOC, SOC"	L	L
C-46	Commercial	Sawmills and planers	"PH, VOC, SOC"	M	M
C-47	Commercial	Tire Dumps	M	L	M
C-48	Commercial	Underground Storage Tanks	"PH, VOC"	H	L
C-49	Commercial	Utility Substation Transformers	"PH, VOC, SOC"	H	H
C-50	Commercial	Veterinary offices	"MP, R"	M	L
C-51	Commercial	Waste Incinerators	"H, HM, VOC, SOC"	L	L
C-52	Commercial	Welding Shops	"M, VOC"	M	L
C-53	Commercial	Other			
I-1	Industrial	Asphalt plants	"PH, VOC"	M	H
I-2	Industrial	Cement/concrete plants	"PH, VOC, HM, SOC"	M	M
I-3	Industrial	Chemical Drums/Storage	"PH, M, VOC, SOC"	H	H
I-4	Industrial	Chemical Landfills	"PH, M, VOC, SOC"	H	H
I-5	Industrial	Chemical Manufacture	"PH, R, M, VOC, SOC"	H	H
I-6	Industrial	Chemical Spills	"PH, M, VOC, SOC"	H	H
I-7	Industrial	Chemical/petroleum pipelines	"PH, M, VOC, SOC"	H	H
I-7	Industrial	Clandestine Dumping	"M, VOC, SOC, TO, HM"	H	H
I-8	Industrial	Communication Equipment Manufacturers	"M, VOC, HM, SOC"	M	M
I-9	Industrial	Electrical / electronic manufacturing	"M, VOC, HM, SOC"	M	M
I-10	Industrial	Electroplaters	"M, VOC, HM, SOC"	H	M
I-11	Industrial	Foundries and metal fabricators	"M, HM, VOC, SOC, PH"	H	H
I-12	Industrial	Fuel Oil Distributors	"PH, VOC"	M	M
I-13	Industrial	Gravel pits	PH	L	L
I-14	Industrial	"Hazardous waste storage, treatment, recycling"	"PH, R, M, VOC, SOC"	H	H
I-15	Industrial	Industrial pipelines	"PH, M, VOC"	H	M
I-16	Industrial	Lagoon/Pond/Pit	"VOC, PH, SOC"	H	M
I-17	Industrial	Landfills: hazardous wastes	"PH, M, VOC, SOC"	H	H
I-18	Industrial	Landfills: Industrial non hazardous	"M, VOC, TO"	L	L
I-19	Industrial	Landfills: Unregulated dumps	"PH, M, VOC, SOC"	H	H

			SOC, TO"		
I-20	Industrial	Machine and metalworking shops	"M, VOC, HM, PH, SOC"	H	M
I-21	Industrial	"Material stockpiles (coal, metallic ores, phosph."	"M, HM, T"	H	H
I-22	Industrial	Metal and Drum cleaning/reconditioning	"M, VOC, SOC"	H	H
I-23	Industrial	Mines: abandoned	"M, T"	H	H
I-24	Industrial	Mining: Surface	"M, T"	M	M
I-25	Industrial	Mining: underground	"M, T"	H	H
I-26	Industrial	Paper Mills	"M, VOC, HM, SOC, TO"	M	H
I-27	Industrial	Permitted Discharge Pipe (outfall)	ALL	L	M
I-28	Industrial	Petroleum production and storage facilities	"PH, M, VOC"	H	M
I-29	Industrial	Plastics/synthetics producers	"VOC, SOC, M"	H	H
I-30	Industrial	"Public Utilities (phone, gas, electric power)"	"M, VOC, SOC"	M	M
I-31	Industrial	Quarry	"M, T, PH, VOC"	M	L
I-31	Industrial	Radioactive Waste Disposal Site	"R, M, HM, SOC"	H	H
I-32	Industrial	Sawmills	"PH, VOC"	M	M
I-33	Industrial	"Stone, clay and glass manufacturers"	M	M	L
I-34	Industrial	Surface Impoundments	"VOC, TO, M"	H	H
I-35	Industrial	Tanneries	"VOC, TO, M"	H	H
I-36	Industrial	Unsealed Abandoned Mines used as Waste Pits	M	H	H
I-37	Industrial	Waste Tailings ponds (common for mining waste)	"M, HM, T"	M	M
I-38	Industrial	Wells: brine injection	"M, VOC, PH"	H	H
I-39	Industrial	Wells: Injection	"M, VOC, PH, SOC"	H	M
I-40	Industrial	Wells: oil and gas	"PH, M, VOC"	H	M
I-41	Industrial	Wood preserving/treatment facilities	"M, VOC, SOC"	H	H
I-42	Industrial	Wood/pulp/paper mills	"M, VOC, TO"	H	H
I-43	Industrial	Clandestine Dumping			
I-44	Industrial	Other			
M-1	Municipal	Artificial ground water recharge areas	MP	L	L
M-2	Municipal	Combined Sewer Overflows	"MP, TO, VOC, PH"	L	H
M-3	Municipal	Composting facility/yard wastes	"MP, TO, SOC"	L	L
M-4	Municipal	Demolition Debris Landfills	"M, HM"	L	L
M-5	Municipal	Drinking Water Treatment Plants	D	L	L
M-6	Municipal	Fire Stations	"PH, VOC"	L	L

M-7	Municipal	Highway	"PH, VOC, M"	M	H
M-8	Municipal	Historic railroad right-of-ways	"M, PH"	M	L
M-9	Municipal	Historic waste dumps/landfills	"M, VOC, SOC, NN"	H	L
M-10	Municipal	Illegal Dump	"PH, M, VOC, SOC"	H	H
M-11	Municipal	Incinerators (municipal)	"M, HM"	L	L
M-12	Municipal	Landfills/municipal	"M, VOC, HM, SOC, NN"	L	L
M-13	Municipal	Managed forest	SOC	L	L
M-14	Municipal	Military Base (past and present)	"PH, R, M, VOC, SOC"	H	M
M-15	Municipal	Park lands	"NN, SOC"	L	L
M-16	Municipal	Radioactive waste disposal sites	"R, M, HM, VOC, SOC"	H	H
M-17	Municipal	Railroad Tracks (right of way)	"M, VOC, SOC, PH"	H	M
M-18	Municipal	Railroad yards/maintenance/fueling areas	"PH, VOC, SOC, HM, M"	H	H
M-19	Municipal	Recycling/reduction facilities	"M, VOC, HM, SOC"	L	L
M-20	Municipal	Road maintenance depots/deicing operations	"PH, VOC, M"	H	M
M-21	Municipal	Schools	"SOC, D, VOC, PH"	L	L
M-22	Municipal	Sewage sludge/Biological Solids application	"M, VOC, MP, TO"	L	L
M-23	Municipal	Sewer Lines *	"M, VOC, MP, TO"	H	L
M-24	Municipal	Storm Drains	"M, VOC, MP, PH"	L	M
M-25	Municipal	Storm water basins/drains	"M, VOC, MP"	M	M
M-26	Municipal	Swimming Pools	Chlorine		
M-27	Municipal	Waste transfer/recycling stations	"PH, M"	M	M
M-28	Municipal	Wastewater application	"MP, D"	L	L
M-29	Municipal	Wastewater Treatment Plant	"MP, D"	L	M
M-30	Municipal	Wells: abandoned	"VOC, SOC, MP, PH, NN"	H	L
M-31	Municipal	Wells: water supply	"VOC, SOC"	L	L
M-32	Municipal	Other			
R-1	Residential	Fuel Oil Storage	"PH, VOC"	L	L
R-2	Residential	Pesticide Application	"VOC, SOC"	L	L
R-3	Residential	Residential (multi-units)	"VOC, NN, TO, MP"	L	L
R-4	Residential	Residential (single family homes)	"VOC, SOC, NN"	H	H
R-5	Residential	Septic Systems (discharging to stream or surface)	"MP, TO, NN"	H	H
R-6	Residential	Septic Systems (leach field)*	"MP, VOC, SOC, TO, NN"	M	M
R-7	Residential	Other			



## **Index to Associated Chemicals**

MP	Microbiological Pathogens: Total/Fecal Coliform, Viruses, Protozoa
NN	Nitrate/Nitrite
VOC	Volatile Organic Compounds
HM	Heavy Metals
M	Metals
SOC	Synthetic Organic Compounds
T	Turbidity
D	Disinfection Products
TO	Taste and Odor Precursors
R	Radionuclide
PH	Petroleum Hydrocarbons

Note: The potential significant contamination sources are based on land use and are ranked according to threat level to water quality (high, medium, low). The risk ranking provides a simple approach to comparing relative risk of the potential contaminant sources land uses. The risk rankings are based on the general nature of their activities and the contaminants associated with them, not on facility specified information, such as management practices. Based on case specific information, BPH may reduce the threat ranking for an activity which is generally considered high to moderate or moderate to low a low ranking based on a finding that none of the contaminants of concern are associated with that activity or increase the ranking based on data obtained for a specific source.

## **Attachment #4**

### **Sinkhole Management**

**By**

**Dalip Sarin PE, CSP**

Sinkholes are a characteristic feature of karst terrain which is prevalent in the eastern part of West Virginia. The term “karst” describes a distinctive geology that indicates dissolution of underground soluble rocks by surface water or ground water. Although commonly associated with carbonate rocks (limestone and dolomite), other soluble rocks such as gypsum and rock salt can also be sculpted into karst terrain. This landscape features underground streams and aquifers which supply wells and springs as source of drinking water.

Sudden collapse of underground cavern or opening of a sinkhole can severely damage or destroy overlying structures such as buildings, bridges and highways. Sewage, animal wastes, agricultural and industrial chemicals and ice control chemicals can enter sinkholes bypassing the natural filtration system through the soil and provide a direct conduit for contaminants to karst aquifer. Groundwater can travel quickly through the underground networks (upto several miles a day) and contaminants can be transmitted to wells and springs in the vicinity.

Sinkhole management techniques include diverting surface runoff away from the sinkhole to nearby streams, providing a vegetative barrier around the sinkhole to improve surface runoff water quality by filtration and adsorption of contaminants prior to water reaching the mitigated sinkhole. The vegetated buffer area is installed within the sinkhole drainage contribution area and begins at the treated sinkhole. The use of appropriate type vegetation as buffer is important and use of native vegetation is recommended. A plant nursery should be consulted for selection of appropriate type of vegetation. The size and shape of the vegetated zone around the sinkhole depends upon the slope and size of the drainage area. A 100 feet grass filter strip around the mitigated sinkhole is ideal. The filter strips will remove sediments from shallow, sheet type flows; they are less effective in steeper ground where there is rapidly flowing water and there is ravine and gully formation.

In mitigation of identified sinkholes, the following procedures are recommended:

- i. Stormwater from the designated sinkhole watershed should be diverted to a surface stream or to a surface water storm water system. However, it is important that the water quality of the existing stream is not degraded and that the existing storm water infrastructure is not compromised.
- ii. The area around the sinkhole to be mitigated should be cleared of vegetation (especially the anticipated area of excavation). The sinkhole should then be cleared of materials dumped in and around the sinkhole and these materials should be disposed off safely to a landfill, if necessary.

iii. The sinkhole should be excavated down to bedrock to remove loose soil and rock fragments. Remove all wet and soft soils that indicate presence of solution features or that yield under the weight of heavy construction equipment. The excavation may bottom out at 25-30 foot depth if bedrock is not encountered. After excavation is completed, the sinkhole must be inspected for features such as openings that directly or indirectly lead into the bedrock, condition of the bedrock surface, the width depth and shape of sinkhole by a geotechnical investigation specialist.

iv. The interior of the sinkhole should be then lined with suitable geotextile filter fabric. Shot rock or boulder size rock should be used to cover and fill the throat opening. Clean concrete rubble or graded rock should then be placed to minimize voids.

v. A sequentially smaller size stone and gravel above the rock should then be installed. No.2 stone, #57 coarse stone, crusher stone and coarse sand should be placed in layers of one to four feet depending on the size of sinkhole. A layer of geo-textile fabric may be used in place of crusher run stone.

vi. Backfill over the top of filter layer or engineering fabric with soil material to the surface. Reuse of soil material excavated from the sinkhole should be done to cover the mitigated sinkhole. Additional quantity of top soil may be necessary. Overfill by about 5% is recommended to allow for settling.

vii. Finally, vegetation on the mitigated sinkhole and other disturbed areas of the site should be established.

viii. The mitigated sinkhole should be properly maintained. Mowing grass and plantings is necessary to promote vigorous growth. The sinkhole should be inspected after every major rain event and at least biannually. Repairs to sinkhole mitigation measures should be made promptly.

#### **References:**

i. USDA Natural Resources Conservation Center, January 2004. Maryland Conservation Practice Standard, Sinkhole and Sinkhole Area Treatment, Code 725

ii. Living on Karst by Cave Conservancy of the Virginias

iii. Sinkholes in Western Maryland by Resource Conservation and Development Council, Inc

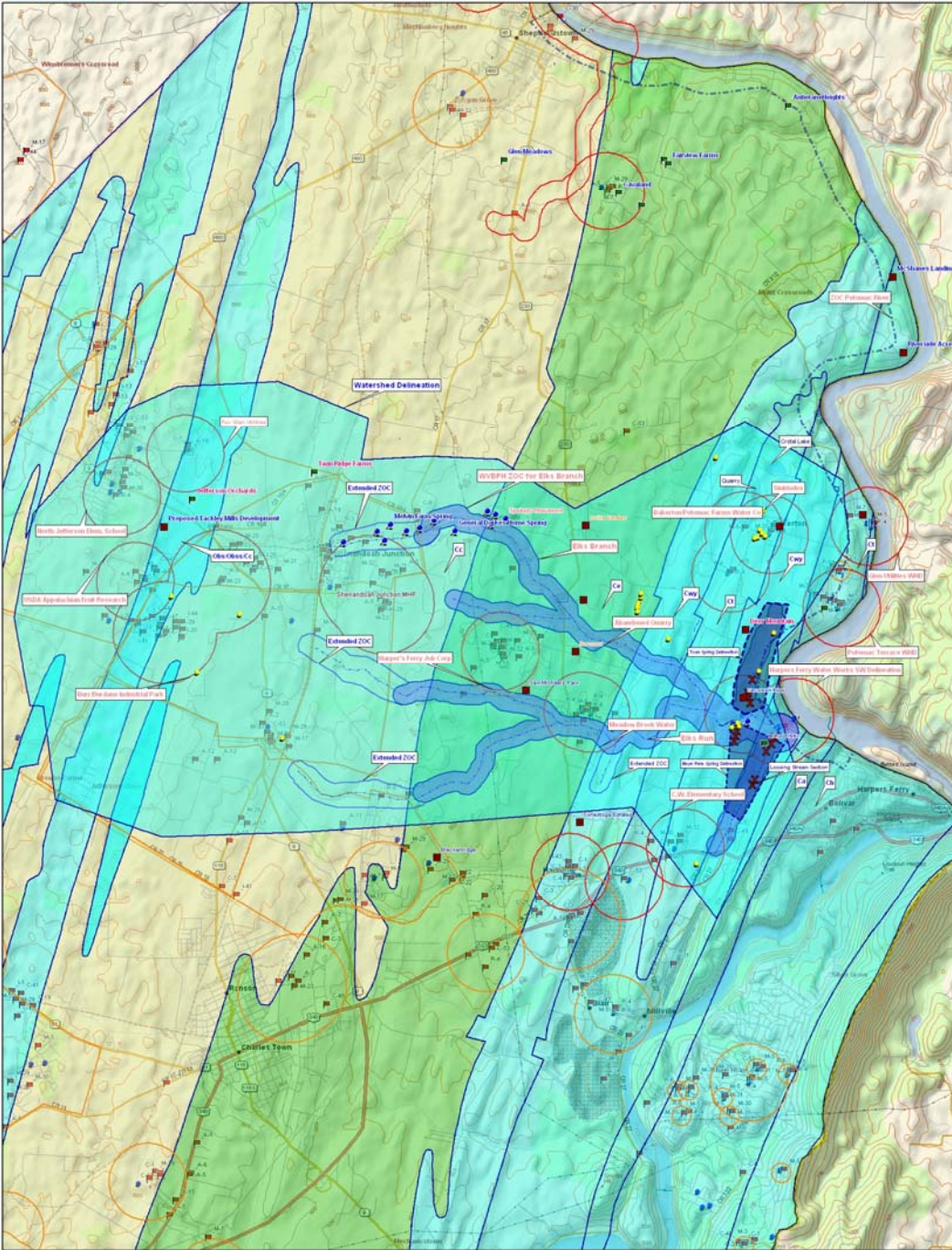
## Attachment #5: Contamination Source and State Regulatory Agency Contacts

Source of Contamination	Agency	Department Division	Telephone Number
	Emergency Services Coordinator		911
	Well Shut Down Contact		(304) 273-5437
	Water Hauler		
	State Office of Emergency Services		(304) 558-5380
Abandoned Water Wells	Dept. of Health and Human Resources	Office of Environmental Health Services	(304) 558-2981
Residential Septic Systems	Dept. of Health and Human Resources	Office of Environmental Health Services	(304) 558-2981
RCRA - Federal Regulations	WV Division of Environmental Protection	Hazardous Materials Emergency Response	(304) 558-5938 or (304) 926-0465
CERCLA Sites	WV Division of Environmental Protection	Office of Environmental Remediation	(304) 926-0465
Underground Storage Tanks	WV Division of Environmental Protection	Waste Management Section	(304) 558-6371
Leaking Underground Storage Tanks	WV Division of Environmental Protection	Office of Environmental Remediation	(304) 420-4635 or 304 926-0465
Landfills	WV Division of Environmental Protection	Solid Waste Management	(304) 926-0499 Ext 1279
Land Applications of Sludge	WV Division of Environmental Protection	Environmental Enforcement Office	(304) 926-0499
Mining Operations	WV Division of Environmental Protection	Office of Mining and Reclamation	(304) 926-0499
Underground Injection Wells Class II & III	WV Division of Environmental Protection	Oil and Gas Section	(304) 926-0499

Underground Injection Wells Class I, IV & V	WV Division of Environmental Protection	Program Management / Technical Support	(304) 926-0499
Pollution Spills, Dam Emergency (Non-Coal / Non-Oil & Gas)	WV Division of Environmental Protection  WV Office of Emergency Services	Spill Hotline	OUT OF STATE: 1(800) 424 8802  IN STATE: 1(800) 642 3074  304-558-5380 1(800) 982 2327 Pin #8588
Pesticide and Fertilizer Application	WV Department of Agriculture	Pesticide Division	(304) 558-2209
Land Application of Industrial Wastewater Sludge (one source in the state)	WV Division of Environmental Protection	Water Resources	(304) 558-8855
Land Application of Municipal Wastewater Sludge	WV Division of Environmental Protection	Water Resources	(304) 558-4086
Storm Water Infiltration Ponds	WV Division of Environmental Protection	Water Resources	(304) 558-4086
Municipal Wastewater Lagoons Sludge	WV Division of Environmental Protection	Water Resources	(304) 926-0499

## **Attachment # 6**

**Map showing delineation of Source Water Protection Area for Harpers Ferry Elk Run Intake, Town Spring and Potomac River Intake, Geology, Faults, Spring Location, Sinkholes, Streams and contamination sources in Harpers Ferry Watershed, Jefferson County**



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