Executive Summary:

Northern Shenandoah Regional Water Supply Plan:

This summary provides an overview of the following sections of the Plan:

- History and Purpose of the Plan
- Current Water Sources and Use
- Estimated Future Water Demand
- Drought Ordinance and Response Plan
- Statement of Water Need by 2040

History and Purpose:

The purpose of the regional water supply plan is to comply with the State Water Control Board regulation 9 VAC 25-780, Local and Regional Water Supply Planning. This regional water supply plan is designed to facilitate comprehensive assessment of existing water sources and uses, estimation of projected water demand in the Northern Shenandoah Valley to 2040, and a determination of water surpluses and or deficits to meet the projected water demands. The data contained in the attendant spreadsheets (found on NSVRC website) and in this Plan serve the following functions: meet the mandated requirements of a locality or region; provide documentation and estimates of all reportable water sources and uses within a jurisdiction for a statewide database; raise the awareness of the ability of a locality's existing water uses to meet the projected demand by 2040; aid information for future discussions across jurisdictions for potential future interconnected water sharing; and form one part of the Virginia Water Resources Plan to ensure an adequate supply for all users balanced with ecosystem needs.

To prepare the data for this Plan, a technical advisory committee (TAC) was assembled comprised of the twenty jurisdictions located within the Northern Shenandoah Valley planning region. Participating jurisdictions assigned members to the TAC representing the City of Winchester; five counties of Clarke, Frederick, Page, Shenandoah, and Warren; and the fourteen towns of Berryville, Boyce, Edinburg, Front Royal, Luray, Middletown, Mount Jackson, New Market, Shenandoah (town), Stanley, Stephens City, Strasburg, Toms Brook, and Woodstock. The twenty jurisdictions participating in the regional Plan signed a resolution before November 2008 for the Northern Shenandoah Valley Regional Commission to prepare the water supply plan on their behalf and submit it to the Virginia Department of Environmental Quality (DEQ) on or before November 2, 2011, per the regulation. The Northern Shenandoah Valley Regional Commission prepared this regional water supply plan with the involvement of all TAC members.

Current Water Source / Use:

Existing public and private community water supply systems were detailed for each locality. In addition homes and businesses served by groundwater wells were noted. These wells vary in quantity throughout the year.

In addition, agricultural water use was documented from users that report over 300,000 gallons per month. Agricultural water use by livestock was estimated based on the 2007 Census of Agriculture data for each county in the planning region. Estimates for livestock were calculated based on number and

type of animal with a water demand based on animal type. The data from the 2007 Census of Agriculture also provided County lands in crops by acreage. This data was presented; however, is not included in water demand because the quantity of water to irrigate crops is climate dependent. In general, most agriculture in the counties of the region use surface water stream intakes for irrigation with gas-run pumps to withdraw the water. No water usage estimate was calculated for the croplands and vineyards because the use of water on crops varies with annual precipitation. Nonagricultural self-supplied users were also documented in this Plan.

Estimated Water Demand:

Residential water demand was based on future population projections for 2010, 2020, 2030, and 2040. The public community water systems were compared to the future estimated population and attendant water need. The private water supply systems were estimated to remain the same throughout the timeline to 2040 (the number serviced by a trailer park or subdivision would remain static). Future estimates of users on community water systems for commercial, industrial, water sales, and unaccounted for losses were calculated based on 2008 data, locality comprehensive plans, and patterns in an area. Self-Supplied nonagricultural and agricultural users were also included in the future water use. Most of these were considered to remain the same in 2008 as they will be in 2040 (some may close, others open with the net number of self-supplied users remaining the same). These often included golf clubs, campgrounds, and other facilities. The number of people not serviced by public or private community water systems were those estimated to be on groundwater individual wells. Estimates of the future water users not serviced with residential community water supply were determined by the projected population not within a water distribution system in the future years.

Drought Response and Contingency Plan

State regulations stipulate a minimum of three drought stages be included in the Water Supply Drought Response Sections. The Northern Shenandoah Valley Regional Water Supply Plan's Drought Response Section includes these three graduated stages of a drought:

Drought Stage	Description	Action
Watch	Drought potential if conditions persist	Increase water conservation awareness; voluntary actions by citizens
Warning	Onset of drought is imminent	Water conservation awareness; precautionary measures voluntary but encouraged by localities
Emergency	Significant drought or low water event	Mandatory responses for water conservation by localities and public

Jurisdictions will have varied declarations of a drought in part due to water sources, water demands, upstream water withdrawals, groundwater's delayed response to reflect low precipitation, equipment failure, and local variations in meteorology and soil moisture.

Local ordinances adopted by the localities within this planning region will be appended to the Water Supply Plan. The ordinances document jurisdictional commitment to water conservation implementation and enforcement of the Drought Response Section.

Local Triggers:

Each locality has selected local triggers to monitor and use to declare a drought or low water condition. Typically triggers include a stream level measured at a gage or a groundwater level measured at a specified level in a well, if available. A locality may assume a trigger is activated when either their local trigger has reached a predetermined level and / or a trigger from a neighboring jurisdiction within the same sub watershed has been reached. For localities with trigger levels set at percentile flows not posted on the NSVRC.virginia.gov website, the water purveyor will calculate flows to assess if conditions warrant a drought stage declaration.

While some drought response actions are applicable to all jurisdictions in the planning region (see list below), other drought response actions are individually determined by each locality based upon the environmental setting and their position within the watershed, water source, and political circumstances. Local water managers and staff will be apprised of Drought Stage declarations through the use of automated crew messaging / emergency notification.

Note: In the event of a prolonged, multi-seasonal drought emergency, the locality reserves the right to institute a program of water rationing.

The NSVRC will act as a clearinghouse and provide public notification of any drought stage declaration within the region. The public notices will serve to build and raise awareness of the drought status and educate the public of early water conservation steps individuals and localities can implement. Drought stage downgrading will be conducted by the local water purveyor, jurisdictional CAO, or designee as determined by each locality. Decisions to downgrade a stage will be based on the local trigger, DEQ, and other designated triggers as precipitation increases and soil moisture content and water levels rise in streams and wells.

Statement of Water Need:

The projected future water demands through 2040 were assessed and are presented below alphabetically by County with their respective Towns, followed by the City of Winchester.

Clarke County, Towns of Berryville and Boyce:

Clarke County Sanitation Authority serves water to some County residents outside the Towns to the unincorporated villages of Millwood and White Post. The water demand for these areas is expected to be met by existing supplies through 2040.

Town of Berryville:

Berryville will meet future projected water needs through 2040. However, peak water usage in 2040 exceeds the current VDH permitted capacity of water. Therefore, a new permit would be necessary for increased water withdrawal. In addition, implementation of water conservation techniques will decrease water use by 20% thereby, resulting in future peak days demands to be met by existing sources.

Town of Boyce:

The existing supplies and permits for water for the Town of Boyce will meet future water demands to 2040 based on water uses projected below. It should be noted that a decrease in per capita usage of 132 gpd/user would also decrease water demand. A peak factor of 1.2 was used to predict water use on peak days.

Frederick County, Towns of Middletown and Stephens City:

In Frederick County there are two towns, both of which purchase water from another locality or entity. The Town of Middletown purchases water from the City of Winchester. The Frederick County Sanitation Authority provides water wholesale to the Town of Stephens City. In addition, Frederick County Sanitation Authority provides water to County residents located in the vicinity near the City of Winchester.

Estimates of future water demand for those serviced by the Frederick County Sanitation Authority include residential water demand, commercial demand, sales to Stephens City, and unaccounted for losses. Several assumptions were made including the demand by commercial light industrial users and will remain the same from 2008 through 2040. The quantity of water to be sold to Stephens City will remain the same from 2008 through 2040, and the unaccounted for system losses will remain the same from 2010 through 2040, assuming appliance efficiency and distribution upgrades occur. The projected number of residents to be serviced by the Frederick County Sanitation Authority was assumed to remain proportionate to the overall County population from 2008 and 2010. If the Sanitation Authority service area increases based on the projections below and the assumptions of water loss, sales, and commercial demand remain static, the demands projected through 2040 are as follows.

The permitted design capacity for the quarries supplying Frederick County Sanitation Authority is 4.928 million gallons per day (MGD). The Bartonsville well site has a capacity of 0.5 MGD totaling 5.42 MGD capacity. The Frederick County Sanitation Authority also purchases up to 2 MGD from the City of Winchester. Therefore, the sum total of existing water available to Frederick County Sanitation Authority is 7.92 MGD. Based on an available current supply of 7.92 MGD, a deficit of water in Frederick County is anticipated to occur between 2020 and 2030. If the Frederick County Sanitation Authority service area continues to serve the same percent of the County population as it increases over time, there will be a proportional increase in residents served by the Sanitation Authority. However, it should be noted that the Virginia Department of Health recommends that once a locality's water demand exceeds 80% of the source capacity, additional water should be secured. The water demand projected

for 2020 is 7.83 MGD which exceeds 80% of the 7.92 source capacity. The Sanitation Authority continuously is looking to expand its capacity to meet the growing needs of their community. In order to meet its planning needs, Frederick County Sanitary Authority is continually looking at expanding its sources and other purveyors.

Town of Middletown:

The Town of Middletown is anticipated to use water at the rates projected below. Given those rates, the Town will need to look for sources of water by 2030 to meet the demand that will exceed the existing water purchase contract with the City of Winchester. The existing water contract is capped for Middletown at 0.238 MGD. It should be noted, these preliminary projections of water are based on a per capita water daily demand that exceeds state averages (152 gallons per day). Calculations using state averages of 125 gpd per person would lower the demand. Measures of conservation and other reduction implementation strategies could also significantly reduce the water demand and thereby not necessitate additional water supplies for the future planning period.

Town of Stephens City:

The Town of Stephens City has water supplied by the Frederick County Sanitation Authority. Based on projections, the Town of Stephen City water use is expected to be met by the existing water system and supplies through 2040.

Page County, and Towns of Luray, Shenandoah, and Stanley

Based on the ubiquitous nature of groundwater underlying Page County, future demands are anticipated to be met with groundwater wells.

Town of Luray:

All future users for water in the Town of Luray are anticipated to be met by the existing water supplies and permitted capacity to the year 2040. The peak demand for 2040 potentially exceeds the permitted capacity by 2030; however, daily consumptive uses could implement conservation to extend the supply of the sources to satisfy future uses.

Town of Shenandoah:

Even with a higher than average per capita usage, the Town of Shenandoah is anticipated to have all future water demands met by their exiting supplies. See the summary below of future use projections and have a surplus of 0.3 MGD.

Town of Stanley:

Future water demands are anticipated to be met by existing water supplies for the Town of Stanley through 2040 with a surplus of 0.05 MGD for peak days by 2040.

Shenandoah County, Towns of Edinburg, Mt. Jackson, New Market, Strasburg, Toms Brook, and Woodstock:

Based on future water use in Shenandoah County the existing water supplies from Stoney Creek Sanitary District and groundwater wells are anticipated to meet future water use. It is assumed that future development outside water supply service areas will require well development to support housing in rural areas.

Town of Edinburg:

Future Water uses are anticipated to be met by the existing water supplies in the Town of Edinburg through the planning period to 2040. However, the Town will reach 80 % of their permitted capacity by 2020 for average daily use and 80% of their peak day use before 2020.

Town of Mount Jackson:

The Town of Mount Jackson will have all water demands met by existing supplies. The per capita water usage rate was fairly low for Mount Jackson. The peaking rate was also low for the Town, at 1.2. The Town will have a surplus of 0.26 MGD in 2040 for average daily use, and a surplus of 0.172 MGD for peak days by 2040.

Town of New Market:

The Town of New Market will have all future water demands up through 2040 satisfied by existing Town water sources. By 2040, there will be a surplus of 1.238 MGD on peak days and a surplus of 1.779 MGD on average daily usage days.

Town of Strasburg:

The Town of Strasburg will have water demands met through Town supplies throughout the planning period of 2040. In 2010, the Town of Strasburg was permitted to increase their stream intake to 3 MGD. Based on population projections and commercial and water users assumptions set forth in this Plan, by 2040 the Town will have a surplus of 1.45 MGD for average daily use and a surplus of 0.67 MGD for peak days. By 2040 the Town water consumption on peak days will reach 77% of its permitted capacity. The Virginia Department of Health (VDH) recommends a municipality identify methods to increase water capacity once it reaches 80% of its permitted capacity.

Town of Toms Brook:

The Sanitary District has a permitted capacity of 0.241 MGD. Calculated future water use for the Town of Toms Brook will be met throughout the planning horizon of 2040 with a surplus of water from the existing source, Toms Brook-Maurertown District.

Town of Woodstock:

The Town of Woodstock will be able to satisfy all water demands through 2040 from the Town intake on the Shenandoah River. Based on demand calculations, there will be a water surplus of 0.137 MGD by 2040 on peak days and a surplus of 0.191 MGD on average daily use days.

Warren County and the Town of Front Royal:

The projected future water demands in Warren County are anticipated to be met through 2040. In general, additional rural development will require groundwater well construction to meet future needs in areas outside community water service systems.

Town of Front Royal:

Projected water use in the Town of Front Royal was calculated from 2008 water average daily water use of 2.048 MGD and peak day usage in 2008 was 3.35 MGD. Based on projected uses, the Town of Front Royal will meet residential water use and peak uses through 2040 with a permitted capacity of 4 MGD. It should be noted that disaggregated water use for other sectors such as business and system losses is not included in this estimated demand.

Winchester:

The City of Winchester has two water sources (river intake and a spring) with a combined maximum capacity of 15 MGD. The future growth scenarios increase the demand to 9.11 MGD. This demand can be met by the existing sources, with an estimated 4.9 MGD surplus in water supply.