Amendment to the Wellhead Protection Plan

Part I

Wellhead Protection Area Delineation
Drinking Water Supply Management Area Delineation
Well and Drinking Water Supply Management Area Vulnerability Assessments

For

Princeton Public Utilities

October 2020

DEPARTMENT OF HEALTH

CLEAN WATER LAND & LEGACY AMENDMENT

Introduction

This summary documents the amended delineation of the wellhead protection area (WHPA), drinking water supply management area (DWSMA), emergency response area (ERA), and the vulnerability assessments for the Princeton Public Utilities (PPU) drinking water supply wells and DWSMAs (PWSID 1480008). These were initially approved in January, 2011 and must now be amended as the public water supply's wellhead plan has nearly expired.

Table 1 – Water Supply Well Information

Local Well ID	Unique Number	Use/ Status	Casing Diameter (inches)	Casing Depth (feet)	Well Depth (feet)	Date Constructed/ Reconstructed	Aquifer[1]	Well Vulnerability
Well #7	578949	Primary	20 x 14	137	169	1998	QBAA	Vulnerable
Well #8	751504	Primary	18	104	139	2007	QBAA	Vulnerable
Well #9	749848	Primary	18	135	160	2007	QWTA	Vulnerable

Note: 1. QBAA: Quaternary Buried Artesian Aquifer. QWTA: Quaternary Water Table Aquifer.

Protection Area Boundaries

The amended protection area boundaries for the PPU are shown in Figure 1. Since the prior WHP Plan, Well #2 (219478) was sealed; as a result, the north DWSMA is reduced to exclude the former protection areas of Well #2. The west half of the north DWSMA is otherwise unchanged because the maximum projected volume of water pumped by Well #7 (578949) is the same as the previous plan. Similarly, the projected volume of water pumped by Wells 8 and 9 (751504 and 749848, respectively) is also the same as the previous plan. For this reason, the boundaries of the south DWSMA are only slightly refined to reflect the more recent availability of digital parcel and public land survey data. The changes to the PPU's DWSMAs are shown in Figure 2.

Except for smoothing of the polygon boundaries, the existing WHPAs for Wells 7, 8 and 9 (578949, 751504 and 749848, respectively) are determined to be adequate and are unchanged for this amendment. The ERA for Well #7 remains unchanged. However, because the locations for Wells 8 and 9 have been refined since the prior plan, there were minor revisions to the ERA boundaries for these wells with this amendment.

Vulnerability Assessments and Management Implications

The PPU wells continue to be considered vulnerable to contamination. This is primarily based on the groundwater age data showing that water from the wells is young and contains indicators of human impact (Table 2).

For the most part, the aquifer vulnerabilities remain unchanged from the prior plan, and range from moderate to high in both DWSMAs. At moderate locations, the aquifer used by the PPU wells has some geologic protection and water and contaminants may travel from the land surface to the city's aquifer within a time span of years to decades. Moderately vulnerable aquifers are prone to several types of contaminant threats, including chemical storage tanks and abandoned wells which can provide conduits for contaminants to quickly reach the city's aquifer.

The high vulnerability rating is assigned to areas where well records indicate that the protective clay-rich till layer overlying the aquifer is relatively thin. At these locations, the aquifer vulnerability is considered high because the clay layer is less than 10 feet thick. This suggests that water and contaminants may travel more quickly from the land surface to the aquifer compared to the moderate vulnerability setting. The high vulnerability area of the north DWSMA remains the same as the prior plan. However, for this amendment, the boundaries of the high vulnerability area for the south DWSMA was revised using new information from the *Sherburne County Geologic Atlas* (Berg, 2017). To be consistent with current practice, the boundaries of the high vulnerability areas were also refined using geographic features, such as parcel boundaries, public land survey data, and streets for this amendment. Highly vulnerable aquifers are prone to a wide variety of contaminants and activities occurring on the land that can pose a threat to the aquifer. The remainder of the city's wellhead protection plan will outline strategies for effectively managing potential contaminant sources within the DWSMA.

Table 2 - Isotope and Water Quality Results (Date Sampled: 03/08/2019)

Well Name (Unique Number)	Tritium[1]	Nitrate (mg/L)	Chloride/ Bromide Ratio	Chloride (mg/L)	Bromide (mg/L)	Arsenic (µg/L)
Well #7 (578949)	6.9 (Modern Age)	< 0.05	709	13.4	0.0189	3.09
Well #8 (751504)	3.9 (Modern Age)	< 0.05	715	13.8	0.0193	3.24
Well #9 (749848)	3.6 (Modern Age)	< 0.05	363	6.03	0.0166	1.5

Note: 1. Modern age reference: Lindsey et. al, 2019.

Water Quality Concerns - At present, none of the human-caused contaminants for which the Safe Drinking Water Act has established health-based standards is found above maximum allowable levels in the city's water supply, nor are any present at one-half of those levels.

Documentation

MDH rule criteria and guidelines were used to assess the adequacy of the existing delineations and vulnerability assessments and evaluate the impact of newer data. The results of this assessment showed that a full update of the Part 1 plan is not necessary and instead this brief synopsis is adequate to amend the Part 1 plan. The documentation of this assessment is available from MDH upon request.

1. **Confirm Boundaries of the High Vulnerability Areas:** The high vulnerability area of the north DWSMA was mapped using geologic information from only a couple of wells. In addition, the 80 acre area east of U.S. Hwy 169 of the south DWSMA was also mapped as high vulnerability, even though this area is located beyond the high pollution sensitivity area mapped by the MN DNR (Berg, 2017). To be conservative, the high vulnerability designations of the prior WHP Plan were maintained at these locations of the north and south DWSMAs because of limited existing subsurface information in these areas.

   Pending available resources, it is recommended that the PPU strive to locate other wells that may have geologic information, and possibly drill test borings in these high vulnerability areas to confirm the boundaries and extent. The MDH hydrologist can assist with interpreting existing well records, identifying proposed locations, and depths of test borings. In addition, surface geophysics can sometimes be useful for identifying the presence or absence of protective clay layers (i.e., aquifer confining units) overlying buried sand aquifers. The city may want to contact the MN DNR (geophysics staff, Ecological and Water Resources Division) to request their assistance with assessing whether surface geophysical survey tools would be useful in the Princeton hydrogeologic setting. In the past and pending available resources, DNR staff have had capacity to assist source water protection efforts by conducting geophysical surveys in settings where subsurface information is limited. If the city includes measures regarding this work in their amended plan, then the investigations may be eligible for funding by a Source Water Protection (SWP) grant.

2. **Water Quality Monitoring**: The standard assessment monitoring package should be analyzed during year six at any primary wells that exist at the time. MDH can provide sample bottles and cover analytical costs, pending available resources. The PPU may need to collect the samples and ship them to MDH.

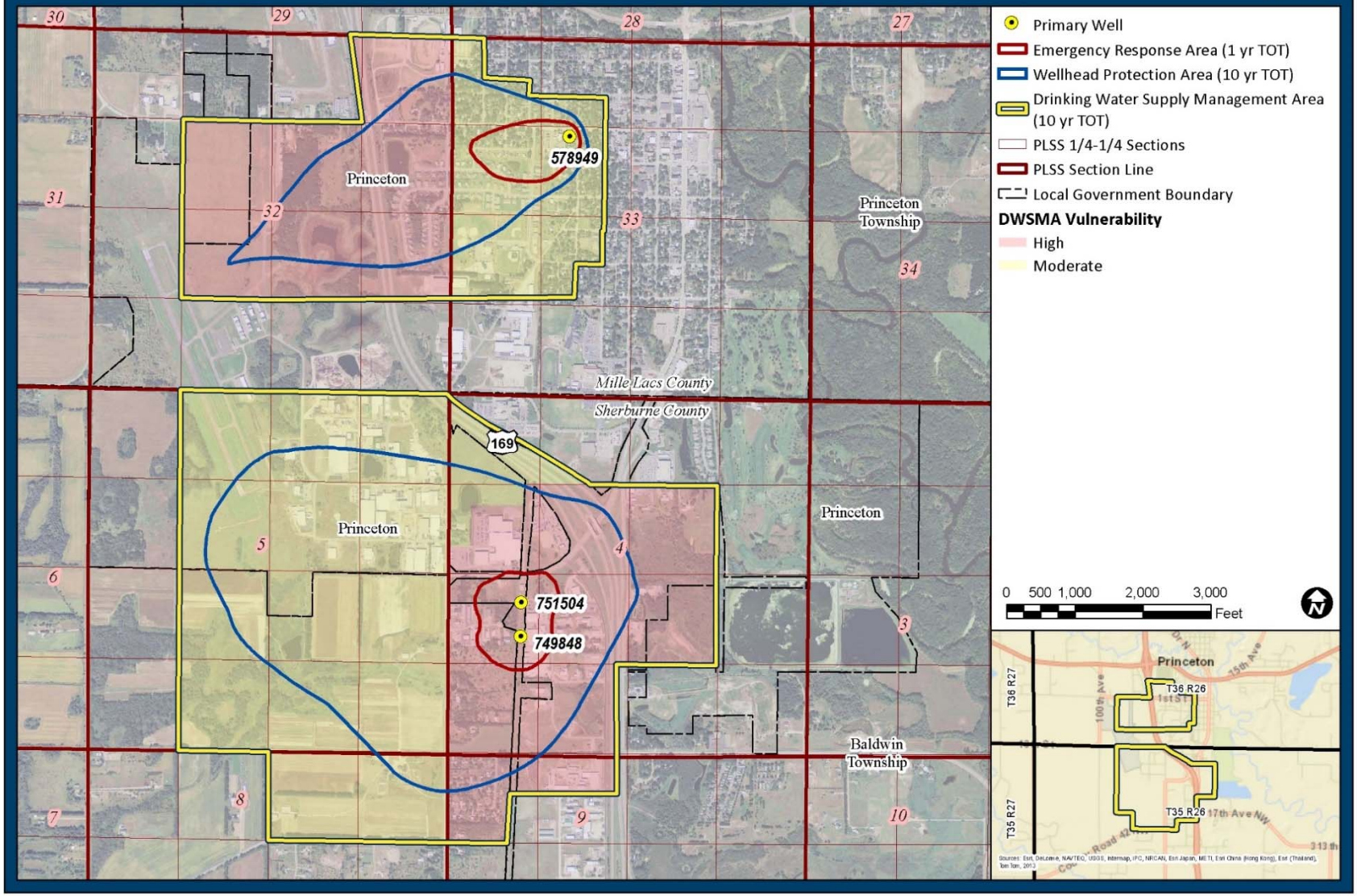
Selected References

Berg, J.A. (2017), *Geologic atlas of Sherburne County, Minnesota*, Minnesota Department of Natural Resources, Division of Waters, County Atlas Series, C-32, Part B, St. Paul, Minn., 56 p., 2 plates, scale 1:100,000.

Lindsey, B.D., Jurgens, B.C., and Belitz, K., (2019), *Tritium as an indicator of modern, mixed, and premodern groundwater age*, U.S. Geological Survey Scientific Investigations Report 2019–5090, 18 p.

Mille Lacs & Sherburne Counties
Minnesota

Figure 1
Drinking Water Supply Management Area and Vulnerability
City of Princeton



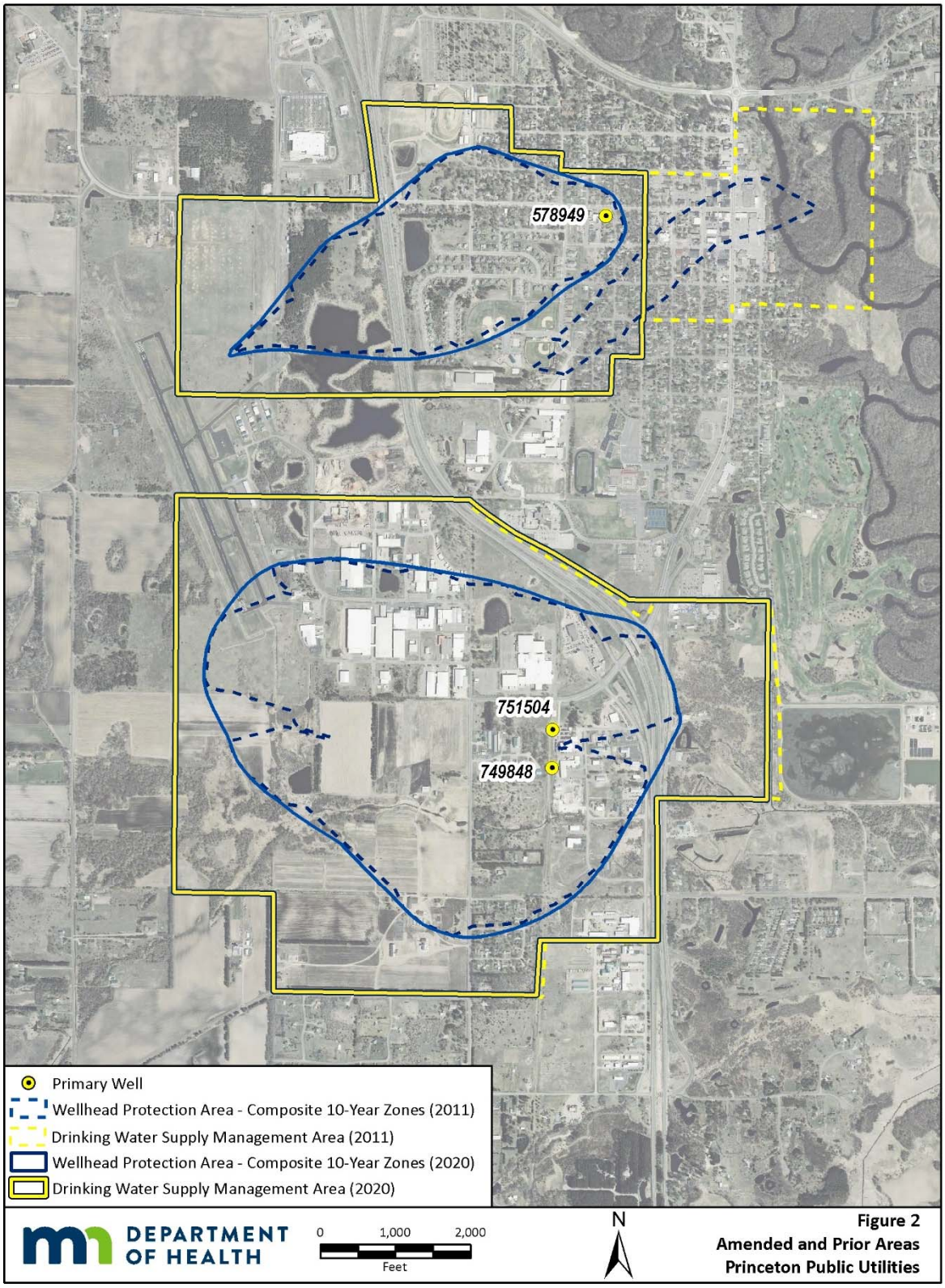


Figure 2
Amended and Prior Areas
Princeton Public Utilities