



The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

LARGE GROUNDWATER WITHDRAWAL PERMIT

NO. LGWP-2015-0001

to the permittee

TOWN OF CHARLESTOWN WATER WORKS

P.O. BOX 385

CHARLESTOWN, NH 03603

(603-826-4400)

for the withdrawal of the following volumes of groundwater from the following wells for the purpose of community water supply:

Bull Run Well #2 1,008,000 gallons over any 24-hour period

Bull Run Wells #1 and #2 a combined total of 1,008,000 gallons over any 24-hour period

Date of Issuance: October 9, 2015

Date of Expiration (if the withdrawal is not activated): October 9, 2020

Date of Expiration (if the withdrawal is activated): October 9, 2025

Pursuant to authority in N.H. RSA 485-C:21, the New Hampshire Department of Environmental Services (NHDES), hereby grants this permit to withdraw groundwater from Bull Run Well #2 subject to the following conditions:

1. The permittee shall comply with the requirements of Env-Wq 403 and RSA 485-C at all times.
2. Water Conservation: The permittee shall implement the approved Water Conservation Plan, signed May 20, 2015, in accordance with Env-Wq 2101 and NHDES' approval dated July 10, 2015.
3. Metering Requirements: Withdrawals from the wells must be metered at all times. All meters must be selected, installed, tested, and maintained in accordance with Env-Wq 2101. The permittee shall read source water meters to adequately report the following volumes to the reporting program referenced in condition No. 5 of this permit:
 - a) The 24-hour peak day volume withdrawn from each source during each month and the date the water use occurred; and
 - b) The cumulative total volume withdrawn from each source during each month.
4. Mitigation Requirements
 - a) In the event that an adverse impact occurs, the permittee shall comply with all of the requirements below and with the impact mitigation and source replacement requirements of Env-Wq 403.
 - b) Where the status of an unanticipated impact is not clear, the permittee shall gather information needed to quantify the impact and determine its status relative to the adverse impact criteria defined under RSA 485-C:21, V-c and provide this information to NHDES within 48 hours of being notified by NHDES. A verified adverse impact shall be mitigated in accordance with Env-Wq 403.
5. The permittee shall register its new source of water with the NHDES Water Use Registration and Reporting Program and maintain the water use reporting requirements established by RSA 488, Env-Wq 2102 and this permit.
6. The permittee shall apply for renewal of this permit at least 365 days prior to its expiration date in accordance with Env-Wq 403. The permittee shall continue to comply with all conditions in this permit until the permit is renewed or the facility is closed in accordance with all applicable requirements, regardless of whether a renewal application is filed.

Any person aggrieved by any terms or conditions of this permit may appeal in accordance with RSA 21-O:7, IV within 30 days.



Eugène J. Forbes, P.E.,
Director Water Division

PROJECT NARRATIVE

**Large Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2015-0001
Town of Charlestown Water Works, PWS ID 0411010
Bull Run Well #2
Charlestown, New Hampshire**

October 9, 2015

BACKGROUND

The Town of Charlestown Water Works (CWW) has submitted an application to the New Hampshire Department of Environmental Services (NHDES) requesting approval of one large community production well and issuance of a large groundwater withdrawal permit for the withdrawal of up to 1,008,000 gallons per day (gpd) or 700 gallons per minute (gpm) over a 24-hour period. CWW is requesting approval for this new well to be used in combination with its existing sources for the purposes of municipal water supply.

The purpose of developing the new community production well (designated Bull Run Well #2) is to: 1) improve the reliability of the water system; 2) support potential increases in water demand based on historic water use trends and projected future growth in areas served by the water system; and 3) accommodate the potential future interconnection of CWW and the North Charlestown Water Department water systems.

CWW is currently served by two overburden wells, Bull Run Well #1 and the Clay Brook Well. Bull Run Well #1, located approximately 50 feet south of Bull Run Well #2, has limited production capacity due to the construction and design of the well. The Clay Brook Well is a shallow, gravel packed well located approximately 1.5 miles southeast of Bull Run Well #2. Although the Clay Brook Well is located in a separate overburden aquifer and drainage basin, which is favorable from a source diversification standpoint, its production capacity is susceptible to drought effects. These issues, in addition to the potential future interconnection of the town's two municipal water systems, serve as the basis for development of Bull Run Well #2.

Bull Run Well #2 is located west of Route 12/Claremont Road within an extensive sand and gravel deposit on the eastern bank of Connecticut River. The deposit, comprised of interlayered sands and gravels, is mapped as a stream terrace/glacial outwash deposit. The sand and gravel deposit thins eastward from the well site where it eventually terminates against glacial till. The aquifer is unconfined and is on the order of 100 feet thick with a saturated thickness of approximately 40 feet. Bull Run Well #2 is screened from a depth of 80 feet to 90 feet below ground surface. The sand and gravel deposits are underlain by approximately 40 feet of till, which in turn is underlain by slate and schist of the Partridge Formation.

The potential impact area of the withdrawal from Bull Run Well #2 encompasses approximately 1.6 square miles of the Beaver Brook watershed between the Connecticut River, Hubbard Hill to the east, and Oak Hill to the south.

WITHDRAWAL TESTING AND CONCLUSIONS

A withdrawal testing program was conducted by Vanasse Hangen Brustlin, Inc. (VHB) from November 5, 2014 through November 24, 2014. The purpose of withdrawal testing is to provide data to estimate long-term sustainable water quantity and quality; observe the response of the aquifer to pumping; evaluate

the degree of hydraulic connection with overlying deposits; and assess the potential for adverse impacts to water resources and users that may result from the proposed withdrawal. The withdrawal testing program included monitoring during pre-pumping, pumping, and water level recovery periods, where Bull Run Well #2 was pumped at approximately 700 gpm between November 14, 2014 and November 19, 2014. Bull Run Well #1 was not operated during the withdrawal testing program.

Discharge from Bull Run Well #2 was measured using an orifice weir during the withdrawal testing program to maintain a constant pumping rate, and water quality samples were collected during the pumping period to characterize the quality of the water derived from the well.

During the withdrawal testing program, water level measurements were collected at: Bull Run Wells #1 and #2; 7 overburden monitoring wells; 3 surface water/wetland monitoring stations each comprised of a shallow and deep piezometer and staff gauge; and 1 surface water level monitoring station in the Connecticut River. Groundwater and surface water measurements were recorded to assess the degree of hydraulic connection between the overburden aquifer, surrounding streams and wetlands, and the Connecticut River.

Properties within the potential impact area of the withdrawal are served by CWW; as such, no private wells were included in the monitoring network. The nearest known private water supply well is a bedrock well approximately 3,500 feet east of the well site.

Groundwater level measurements collected during the pumping of Bull Run Well #2 indicate that Bull Run Well #1 and 4 on-site monitoring wells responded to pumping. Pumping-induced drawdown of water levels in the monitoring wells ranged from approximately 0.5 feet to 1.2 feet and was greatest in wells located closest to Bull Run Well #2. Effects of pumping Bull Run Well #2 were not observed at the surface water/wetland monitoring stations or in the Connecticut River.

Based on the conceptual hydrologic model of the withdrawal, the cone of depression of Bull Run Well #2 is likely asymmetrical, elongated in the northeast-southwest direction (parallel to the Connecticut River) within the most transmissive portion of the sand and gravel deposits; however, insufficient data exists to estimate its areal extent to the east (upgradient). Based on an analysis of graphical projections of water level responses in the monitored wells that assume 180 days of continuous pumping of Bull Run Well #2 at 700 gpm with no net recharge to the aquifer, pumping-induced drawdown is estimated to extend on the order of 600 feet from the well.

Water level measurements collected during the withdrawal testing program support that the Connecticut River acts as a hydraulic (recharge) boundary. In comparison of the proposed withdrawal volume to the typical flow regime expected in the Connecticut River, NHDES concurred with VHB that the withdrawal will not have a significant effect on flow in the Connecticut River. Water level measurements also confirmed that the river establishes the local hydraulic base level and that management of impoundments along the river affects groundwater levels in the aquifer from which Bull Run Wells #1 and #2 derive groundwater; as such, NHDES is recommending that CWW reexamine their use of the wells if impoundment management practices should change in the future.

Results of the water quality sampling conducted during the withdrawal testing program indicate that each parameter, with the exception of sulfide, was below the applicable Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL) in water derived from Bull Run Well #2. Results of the water quality sampling program also indicated that the concentration of radon is elevated in water derived from the well.

Due to detections of chlorinated and gasoline-related volatile organic compounds (VOCs) in groundwater derived from Bull Run Well #1 in the mid- to late-1990s, and the detection of 1,4-dioxane in a sample collected from an on-site monitoring well in 2013, NHDES required the collection of additional water quality samples from Bull Run Wells #1 and #2 and selected monitoring wells prior to and during the withdrawal testing program. Based on the results of these sampling efforts, NHDES concurred with VHB that contamination does not appear to be persistent in the aquifer from which Bull Run Wells #1 and #2 derive groundwater and that the proposed withdrawal will not result in an violation of, or trigger the need for mitigation under, the adverse impact criterion specified in RSA 485-C:21, V-c (j).

PUBLIC INVOLVEMENT

Pursuant to RSA 485-C:21, II through V-a, materials submitted in support of the large groundwater withdrawal permit (the preliminary application, final report, and supplemental materials) are required to be sent (via certified mail) to municipalities and public water suppliers in the potential impact area of the withdrawal. In the case of this application, the Town of Charlestown is the only municipality and public water supplier in the potential impact area of the withdrawal. No public hearings were requested, and no public meetings were held regarding the application for this large groundwater withdrawal permit.

LARGE GROUNDWATER WITHDRAWAL PERMIT MONITORING, REPORTING AND WITHDRAWAL REQUIREMENTS

No initial monitoring of water users or water-related natural resources is incorporated into the permit due to the lack of substantial influence of Bull Run Well #2 on these entities. In the event that an adverse impact is reported and verified, an impact mitigation program would be implemented in accordance with conditions of the large groundwater withdrawal permit and Env-Wq 403. The program would implement actions necessary to mitigate the impact including reducing the withdrawal volume, establishing water use restrictions for customers of the water system, modifying or replacing an impacted source at no initial capital cost to the user, and establishing a monitoring network to assess the effectiveness of the mitigation program. More information concerning these requirements is provided in the large groundwater withdrawal permit under condition No. 4.