The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

LARGE GROUNDWATER WITHDRAWAL PERMIT

NO. LGWP-2018-0002

to the permittee

TOWN OF RAYMOND PUBLIC WORKS
4 EPPING STREET
RAYMOND, NH 03077
(603-895-4735)

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

Production Well RBW-6K: 360,000 gallons over any 24-hour period

Date of Issuance: May 10, 2018
Date of Expiration: May 10, 2028

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 Production Well RBW-6K 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 and maintain compliance with the approved Water Conservation Plan, dated April 25, 2018, in accordance with Env-Wq 2101 and NHDES' approval dated May 8, 2018.

3. Metering Requirements: Withdrawals from the well 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. 7 of this permit:

   a) The 24-hour peak day volume withdrawn from the well during each month and the date the water use occurred; and

   b) The cumulative total volume withdrawn from the well during each month.

4. Groundwater Level Monitoring and Reporting Requirements: The permittee shall establish and maintain the monitoring and reporting program as described below:

   a) Production well: The permittee shall install a pressure transducer and data logger and measure water levels at a frequency of at least once every four hours in production well RBW-6K. Water level monitoring shall commence upon initiating a withdrawal from the well and shall continue indefinitely as a condition of this permit.

   b) On-site monitoring wells: The permittee shall install pressure transducers and data logger and measure water levels at a frequency of at least once every four hours in monitoring well RBW-6G and piezometer 6P1. Water level monitoring shall commence upon initiating a withdrawal from the well and shall continue indefinitely as a condition of this permit.

   All water level monitoring shall be completed by a person who can demonstrate, by education or experience, competency in collecting and reporting hydrogeologic measurements.

   Monitoring well locations and frequencies may be added or changed if the data obtained contradict the information provided in the permittee's application, or if additional data points are required to assess the potential for adverse impacts to occur.

   An annual monitoring report and all monitoring data shall be submitted to NHDES by January 31 of each year. The annual monitoring report shall provide text, tables or figures that present a summary of all previously collected data and note any relevant observations that may affect the measurements made from the preceding year inclusive of pertinent field notes or observations that document the annual monitoring activities undertaken to comply with this permit.

   The annual monitoring report shall be submitted in an electronic format and hard copy format. All water level monitoring data collected shall be submitted in an electronic format only.

5. Wetland Assessment Requirement: The permittee shall coordinate completion of the following assessment.

    a) The permittee shall conduct a Functions and Values wetlands assessment in the wetland area east-northeast of RBW-6K, within the wetland in which piezometers 6P1 and 6P2 are installed.

    b) The assessment above shall be completed by a NH-certified wetlands scientist prior to initiation of groundwater withdrawal from production well RBW-6K.

    c) The assessment report shall be submitted with the first annual monitoring report for the withdrawal's water level monitoring program referenced in Condition No. 4. above.

6. 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) Prior to initiating a withdrawal from the RBW-6K well field, the permittee shall notify in writing via certified mail the owners of all properties shown that are served by private wells or public wells not owned by the permittee within the area estimated to be the influence area of the well, as illustrated on Figure 14, titled "Projected Pumping-Induced Groundwater Levels after 180 Days of Pumping Proposed Production Well RBW-6K at 250 GPM" prepared by Emery & Garrett Groundwater Investigations, Inc. (EGGI), dated December 8, 2015. The permittee shall provide a copy of the notification letter and copies of the certified return mail receipts to NHDES. The notification letter shall explain to property owners with wells in the identified area that their well may be influenced by the withdrawal at RBW-6K, and provide the property owners with contact information for both the permittee and NHDES in the event they believe they may be adversely impacted by the withdrawal.

    c) 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 about a reported impact. A verified adverse impact shall be mitigated in accordance with Env-Wq 403.

    d) NHDES will routinely review the results of all monitoring data, and if water level monitoring data indicates that groundwater is being extracted at a rate that exceeds natural recharge on average, then NHDES will modify the permit in accordance with Env-Wq 403 in order to prevent adverse impacts from occurring.

7. 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.

8. 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.

for Eugene J. Forbes, P.E.,
Director Water Division

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PROJECT NARRATIVE

Large Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2018-0002
Raymond Water Department, PWS ID 1971010
Production Well RBW-6K
Raymond, New Hampshire

May 10, 2018

BACKGROUND

The Town of Raymond Water Department (Raymond) has submitted an application to the New Hampshire Department of Environmental Services (NHDES) requesting approval of one new large community production well and issuance of a large groundwater withdrawal permit for the withdrawal of up to 360,000 gallons per day (gpd) or 250 gallons per minute (gpm) over a 24-hour period for the purposes of municipal water supply.

The purpose of developing the new community production well, designated RBW-6K, is to: 1) provide source redundancy and diversification for the water system; and 2) accommodate potential increases in water demand based on historic water use trends and projected future growth in areas served by the water system.

Production well RBW-6K is located in the northeast portion of the town of Raymond, about one and half miles from the town boundary with Nottingham. The well site is on the edge of an athletic field complex owned by Raymond High School, to the immediate north and east is a small stream with interconnected riparian areas that are distributed throughout non-disturbed wooded hills within conserved lands that abut the Flint Hill area in Raymond. To the south of the well site are residential areas and mixed/light commercial areas along NH Route 27, farther to the south resides the Lamprey River and areas having more subdued topography within the river valley corridor. Much of the immediate area surrounding the well site (and athletic field complex) is within a small subwatershed of a southerly draining unnamed tributary to the Lamprey River. This southwest-northeast trending drainage is relatively steep sloped for the surrounding topography with many perched and stranded wetlands that intermingle with the primary thread of the tributary itself. The wellhead protection area (WHPA) for the withdrawal encompasses much of the subwatershed that drains to this tributary and its embedded wetlands, covering a little over 0.7 square miles of the surrounding area.

Drilling results indicate that bedrock at the RBW-6K well is comprised of calcium rich, highly foliated schists (metasedimentary) rocks of the Berwick Formation. Based on the drilling logs of RBW-6K and other test wells nearby, the production well is located within a southwest-to-northeast trending, oversteepened 'trough' in the bedrock surface, where the depth of competent bedrock ranges from about 90 to 130 feet below ground. The presence of the weathered bedrock trough and the logging of a substantially high degree of fracturing during drilling in this part of the Berwick formation is likely related to the northeasterly trending/steeply dipping fracture network proximate to the Flint Hill Fault Zone mapped approximately 1,500 feet east of the well. The density of fracturing and thick overburden in the well's location imply a favorable hydrogeologic setting for a high yield production well. The surficial material at the well site (within the trough) is recorded as a mix of glacial till with distinct bands of silt and clay. The transition zone (contact) between overburden and bedrock at the site tends to be comprised of clay and weathered-broken rock ranging in thickness from about 10 to 20 feet. Well RBW-6K was finished as an 8-inch bedrock well drilled to a depth of 380 feet, and is observed to have produced most of it groundwater from a fracture (fracturing) present at a depth of about 300 feet.

WITHDRAWAL TESTING AND CONCLUSIONS

A withdrawal testing program was conducted by Emery & Garrett Groundwater Investigations LLC (EGGI) from July 1st through approximately August 1st, 2015. The purpose of withdrawal testing is to provide data to estimate

long-term sustainable water quantity and quality of the well; 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 RBW-6K was pumped at approximately 250 gpm between July 14 and 21, 2015. Discharge from the well was metered during the withdrawal testing program to maintain a near-constant pumping rate, and water quality samples were collected during the pumping period to characterize the quality of the groundwater derived from the proposed production well.

Water Level Monitoring and Observations

During the withdrawal testing program, water level measurements were collected at:

- The proposed new production well RBW-6K;
- The Raymond High School water supply well;
- Seven bedrock monitoring wells;
- Two overburden monitoring wells;
- Nine offsite bedrock private water supply wells;
- Three shallow groundwater piezometers; and,
- Two stream gauges.

The private water supply wells monitored during the pumping test range in distance from the production well between about 1,300 to 5,500 feet generally to the south, west, north and northeast. Groundwater levels at deeper onsite groundwater monitoring wells (bedrock) were recorded in order to observe the zone of influence of the production well, while shallow groundwater and surface water level measurements were recorded to assess the degree of hydraulic connection between the bedrock and the shallow (overburden) water table, and surrounding wetlands and streams. Based on static (pre-pumping) water levels observed from the site and surrounding area, deeper (bedrock) groundwater flow in the area is largely convergent on the middle of the drainage of the subwatershed just east of the proposed production well, with primary flow direction to the southwest to lower elevatiosn near the Lamprey River valley. Shallow groundwater flow through overburden appears convergent on the stream that drains the area.

The pumping test water level measurements indicate that four on-site bedrock monitoring wells, three off-site water supply wells, and one shallow piezometer responded to pumping of RBW-6K, with drawdowns ranging from about 1 to 196 feet. Water level influences were observed up to a distance of about 1,500 feet from the production wells, with bedrock wells closest to the production responding the greatest to pumping. Generally, the hydraulic effects predominantly observed during the test occurred in a northeast/southwest orientation, roughly coincident with the strike of the Flint Hill Fault zone located east of the production well site. A secondary, lesser, drawdown effect was also observed in a northwest, southeast orientation out to shorter distances. With the exception of shallow overburden just north of the production well, shallow water table impacts (vertical flow) appears to be limited by fine-grained/restrictive soils in the overburden at the site. Drawdown in production well RBW-6K at the end of the test was 209 feet. Based on a distance-drawdown analysis of water level responses assuming 180 days of continuous pumping of RBW-6K, effects from the withdrawal with no net recharge from precipitation to the aquifer are projected to extend on the order of 2,000 feet from the well site.

Water Quality Monitoring and Observations

Results of water quality sampling conducted during the withdrawal testing program indicate acceptable water quality, with all drinking water parameters below applicable Maximum Contaminant Levels (MCLs) and secondary MCLs.

PUBLIC NOTIFICATION AND 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) were sent (via certified mail) to municipalities and public water suppliers in the potential impact area of the withdrawal. No public hearings were requested by notified parties following submittal of the preliminary application or final report.

LARGE GROUNDWATER WITHDRAWAL PERMIT MONITORING, REPORTING AND WITHDRAWAL REQUIREMENTS

The large groundwater withdrawal permit issued to Raymond allows the withdrawal of up to 360,000 gpd (250 gpm) from RBW-6K. The large groundwater withdrawal permit also requires Raymond to conduct a groundwater level monitoring program that includes the production well and monitoring wells. General monitoring requirements are summarized as follows:

- The permit requires that water levels in RBW-6K be monitored continuously so that water level fluctuations in nearby wells can be compared to the operation of the production well;
- The permit requires that water levels in one on-site monitoring well (bedrock) and one shallow piezometer be monitored continuously to infer the extent of potential water level effects on nearby wells and shallow overburden proximate to neighboring wetlands; and
- The permit requires a pre-startup Functions and Values assessment be conducted on a wetland area north of the production well.

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 expanding (or 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. 6.

Raymond is required to submit an annual monitoring report in hard copy and electronic format to NHDES by January 31st of each year. As stipulated in the permit, the annual report shall include a summary of trends and variability observed in the monitoring data, all monitoring data and records required by the permit, and an assessment of the potential impacts associated with the withdrawal from RBW-6K. The annual report will be available to the public for review. A complete description of monitoring and reporting requirements is presented in more detail in the large groundwater withdrawal permit under condition Nos. 4 and 5.

Permit monitoring points in NHDES'
Environmental Monitoring Database

Station_Name	Station_ID
MONITORING WELL 6P1	20180002MW6P1
MONITORING WELL RBW-6G	20180002MWRBW6G
PRODUCTION WELL RBW-6K	20180002PWRBW6K