



The

NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES

hereby issues

LARGE GROUNDWATER WITHDRAWAL PERMIT

NO. LGWP-2013-0002

to the permittee

TOWN OF NEWMARKET PUBLIC WORKS DEPARTMENT  
186 MAIN STREET  
NEWMARKET, NH 03857  
(603-659-3093)

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

Well NGE-2B                      432,000 gallons over any 24-hour period

Date of Issuance: November 15, 2013

Date of Expiration (if the withdrawal is not activated): November 15, 2018

Date of Expiration (if the withdrawal is activated): November 15, 2023

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 Well NGE-2B subject to the following conditions:

1. The permittee shall comply with the requirements of Env-Wq 403 (formerly Env-Ws 388) and RSA 485-C at all times.
2. Water Conservation: The permittee shall implement the approved Water Conservation Plan, dated April 14, 2008, in accordance with Env-Wq 2101 (formerly Env-Ws 390) and NHDES' approval dated May 23, 2008.
3. Metering Requirements: Withdrawals from Well NGE-2B must be metered at all times. All meters must be selected, installed, tested, and maintained in accordance with the AWWA M6 manual as referenced in Env-Wq 2101. The permittee shall provide NHDES with a certificate of calibration and performance specifications for each meter. The permittee shall document and maintain records of all meter maintenance and calibration activities and submit this information to NHDES in an annual report by January 31 of each year. The permittee shall read source water meters to adequately report the following volumes to the reporting program referenced in condition No. 6 of this permit:
  - a) The 24-hour peak day volume withdrawn from the source during each month and the date the water use occurred; and
  - b) The cumulative total volume withdrawn from the source during each month.
4. Monitoring and Reporting Requirements: The permittee shall establish and maintain the monitoring and reporting program as described below:
  - a) Groundwater Level Monitoring
    - i. Off-site Private Bedrock 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 the private bedrock well serving the following property. Water level monitoring shall commence at least six months prior to initiating a withdrawal from Well NGE-2B and shall continue indefinitely as a condition of this permit.

Tax Map/Tax Block-Tax Lot	Property Address
20130002DW01	

- ii. On-site 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 Well NGE-2B. Water level monitoring shall commence upon initiating a withdrawal from Well NGE-2B and shall continue indefinitely as a condition of this permit. 20130002PWNGE2B

Private wells that supply drinking water shall be sampled for coliform bacteria [in accordance with Env-Wq 403.14(e)(5) and Env-Wq 403.14(g)] prior to and after the installation of any monitoring equipment.

If a private well owner denies permission to monitor water levels or if the identified well cannot be monitored due to a structural limitation, then the permittee shall propose an alternative monitoring location to NHDES for approval. Upon receiving approval from NHDES, the permittee shall install the monitoring well, if a suitable alternative residential well or monitoring well is not

already available, and monitor water levels at the alternative location at the same frequency required at the original monitoring well.

- b) Surface Water Monitoring: The permittee shall implement the surface water monitoring program of the Piscassic River as described in the Final Report titled "Final Hydrogeologic Investigation for Newmarket Production Wells #3 (NGE-2B) and #4 (NGE-1A), Newmarket Department of Public Works, Newmarket, New Hampshire" prepared for the permittee by Emery & Garrett Groundwater, Inc. (EGGI), dated August 27, 2010, incorporated herein by reference, subject to the following conditions:
  - i. Monitoring shall occur using the methods described, and at the frequency described, at the Ash Swamp Road and Grant Road surface water monitoring stations established by EGGI, described in a report titled "Long-Term Streamflow and Water Level Monitoring Program, Results for May through November 2011, Public Water Supply Wells NGE-1A and NGE-2B, Newmarket, New Hampshire" prepared for the permittee by EGGI, dated March 13, 2012. Ash Swamp Road = 20130002SWPISC1  
Grant Road = 20130002SWPISC2
  - ii. On an annual basis, the permittee shall perform manual stream gauging at each surface water monitoring station at least three times between August 1 and September 30. Stream gauging shall be conducted during periods of low flow, preferably when stream discharge is less than 1,000 gallons per minute (2.23 cubic feet per second). The permittee shall update the rating curve created for each monitoring station using this data.
- c) All monitoring shall be completed by a person who can demonstrate, by education or experience, competency in collecting and reporting hydrogeologic measurements.

Monitoring 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 annually by January 31 of each year. The annual monitoring report shall note any relevant observations that may affect the measurements and include all field notes documenting the monitoring activities for the preceding year.

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

## 5. 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 Well NGE-2B, the permittee shall notify in writing via certified mail the owners of all properties served by private wells or

public wells not owned by the permittee within the area estimated to be the influence area of Well NGE-2B, as illustrated on Figure 1, titled "180-day Zone of Influence Based on the NGE-1A and NGE-2B Production Well Eight-Day Combined Pumping Test, Town of Newmarket Groundwater Investigation, Newmarket, New Hampshire" included in Appendix B of the Final Report Addendum titled "Final Hydrogeologic Investigation for Newmarket Production Wells #3 (NGE-2B) and #4 (NGE-1A), Newmarket Department of Public Works, Newmarket, New Hampshire" prepared by EGGI, dated April 28, 2011. The permittee shall provide the following to NHDES: 1) a map illustrating the 180-day zone of influence of Well NGE-2B overlain on a current tax map with the notified properties labeled with their tax map and lot number; 2) a table listing the ownership information for the notified properties; 3) one copy of the notification letter; and 4) copies of the certified mail return receipts. The notification letter shall: a) explain to property owners with wells in the identified area that their well may be influenced by the withdrawal at Well NGE-2B; b) 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; and c) explain that a Source Replacement Plan is available and that a copy could be provided to them at their request. The Source Replacement Plan, titled "Groundwater Development for the Town of Newmarket and the Town of Newmarket Public Works Department, Production Well NGE-2B, Source Replacement Plan," dated October 17, 2013, was prepared by EGGI, and submitted to NHDES in response to NHDES' review letter dated May 31, 2011.

- 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. 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 indicate 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. In addition, the permittee shall operate Well NGE-2B in accordance with the management procedures described below. To determine whether a water level monitoring trigger is met or exceeded, the permittee shall obtain and review the water level monitoring data collected per condition No. 4 of this permit twice yearly during the last week of May and July.

#### STAGE I MANAGEMENT PROCEDURES

In the event that the following monitoring trigger is met or exceeded, production from Well NGE-2B shall be reduced to 75% of the permitted withdrawal volume such that output from the well does not exceed 324,000 gallons over any 24-hour period.

*Trigger:* A 10 foot drawdown below the "Projected 180-day No-Recharge Water Level Elevation" at the location listed in Table 1, unless it is determined by NHDES that the drop in water levels is erroneous.

As part of Stage I management procedures, the permittee shall increase the frequency of reporting of all on-site and off-site water level measurements to NHDES, and submit all measurements electronically to NHDES by the 15<sup>th</sup> and 30<sup>th</sup> day of each calendar month.

#### STAGE II MANAGEMENT PROCEDURES

In the event that the following monitoring trigger is met or exceeded, production from Well NGE-2B shall be reduced to 50% of the permitted withdrawal volume such that output from the well does not exceed 216,000 gallons over any 24-hour period.

*Trigger:* A 20 foot drawdown below the "Projected 180-day No-Recharge Water Level Elevation" at the location listed in Table 1, unless it is determined by NHDES that the drop in water levels is erroneous.

As part of Stage II management procedures, the permittee shall increase the frequency of reporting of all on-site and off-site water level measurements to NHDES, and submit all measurements electronically to NHDES by the 15<sup>th</sup> and 30<sup>th</sup> day of each calendar month.

#### STAGE III MANAGEMENT PROCEDURES

In the event that the following monitoring trigger is met or exceeded, production from Well NGE-2B shall be reduced to 25% of the permitted withdrawal volume such that output from the well does not exceed 108,000 gallons over any 24-hour period.

*Trigger:* A 30 foot drawdown below the "Projected 180-day No-Recharge Water Level Elevation" at the location listed in Table 1, unless it is determined by NHDES that the drop in water levels is erroneous.

As part of Stage III management procedures, the permittee shall increase the frequency of reporting of all on-site and off-site water level measurements to NHDES, and submit all measurements electronically to NHDES by the 15<sup>th</sup> and 30<sup>th</sup> day of each calendar month.

#### STAGE IV MANAGEMENT PROCEDURES

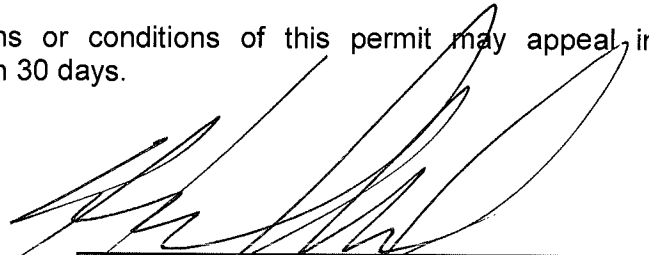
In the event that the following monitoring trigger is met or exceeded, production from Well NGE-2B shall be reduced to less than 57,600 gallons over any 24-hour period

*Trigger:* A 40 foot drawdown below the "Projected 180-day No-Recharge Water Level Elevation" at the location listed in Table 1, unless it is determined by NHDES that the drop in water levels is erroneous.

As part of Stage IV management procedures, the permittee shall increase the frequency of reporting of all on-site and off-site water level measurements to NHDES, and submit all measurements electronically to NHDES by the 15<sup>th</sup> and 30<sup>th</sup> day of each calendar month.

6. 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.
7. 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.



Harry T. Stewart, P.E.,  
Director Water Division

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**Table 1. Trigger Water Level Elevations for the Town of Newmarket Public Works Department's  
Large Groundwater Withdrawal Permit LGWP-2013-0002.**

<b>Tax Map / Tax Block-Tax Lot</b>	<b>Property Address</b>	<b>NHDES-Assigned Station ID*</b>	<b>Projected 180-day No-Recharge Water Level Elevation (feet AMSL)</b>	<b>Stage I Trigger Water Level Elevation (feet AMSL)</b>	<b>Stage II Trigger Water Level Elevation (feet AMSL)</b>	<b>Stage III Trigger Water Level Elevation (feet AMSL)</b>	<b>Stage IV Trigger Water Level Elevation (feet AMSL)</b>
		20130002DW01	47	37	27	17	7

\* See enclosed Electronic Data Reporting Program Letter and Guidelines Document

## **PROJECT NARRATIVE**

**Large Well Siting Approval/Large Groundwater Withdrawal Permit LGWP-2013-0002  
Town of Newmarket Public Works Department, Newmarket Water Works, PWS ID 1731010  
Well NGE-2B  
Newmarket, New Hampshire**

**November 15, 2013**

### **BACKGROUND**

The Town of Newmarket Public Works Department (Newmarket) has submitted an application to the New Hampshire Department of Environmental Services (NHDES) requesting approval of a large community production well and issuance of a large groundwater withdrawal permit for the withdrawal of up to 432,000 gallons per day (gpd) or 300 gallons per minute (gpm) over a 24-hour period. Newmarket 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 Well NGE-2B) is to: 1) provide additional water supply capacity to meet current average and maximum day demand; 2) provide source diversity and redundancy for the system; and 3) accommodate potential increases in water demand based on historic water use trends and projected future growth in areas served by the system.

Newmarket is currently served by two gravel packed wells, designated the Bennett Well and Sewell Well, which have an estimated, combined total pumping capacity of 461,000 gpd. Both of these sources are vulnerable due to depletion of groundwater storage in the Newmarket Plains Aquifer, drought susceptibility, and nearby contamination threats. In a letter to Newmarket dated May 7, 2012, summarizing a sanitary survey performed on November 15, 2011, NHDES notified Newmarket of a significant deficiency for inadequate water supply capacity and the need to address the deficiency. Inadequate source capacity from Newmarket's existing wells serves as the basis for development of NGE-2B.

Well NGE-2B is located approximately 1.5 miles southwest of Newmarket Center, south of the Piscassic River. The potential impact area for the withdrawal from NGE-2B encompasses approximately 4.5 square miles of the Piscassic River watershed above the confluence of the Piscassic River and Lamprey River approximately two miles downgradient of the well site. The potential impact area is bounded on the north and south by regional watershed divides. The upgradient limit of the potential impact area is defined by a drainage divide, which marks the terminus of the contributing area to a point on the Piscassic River approximately 4,000 feet upstream of NGE-2B. The potential impact area also includes a small area located northeast of NGE-2B that is outside of the Piscassic River watershed.

Drilling results indicate that bedrock beneath the well site is comprised of the Exeter Diorite and occurs at depths ranging from approximately 30 to 40 feet beneath the ground surface. Surficial materials at the site consist primarily of marine clay of the Presumpscot Formation. It is reported that NGE-2B encountered 28 feet of clay, and was completed in bedrock to a depth of 430 feet; three major water-bearing fracture zones were reportedly intercepted at depths of approximately 340, 370, and 410 feet.



## WITHDRAWAL TESTING AND CONCLUSIONS

A withdrawal testing program was conducted by Emery & Garrett Groundwater, Inc. (EGGI) from October 19, 2009 through November 12, 2009. 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 NGE-2B was pumped at approximately 300 gpm between October 28, 2009 and November 4, 2009. Well NGE-2B was tested in combination with Well NGE-1A, a second proposed production well located approximately 4,800 feet southwest of NGE-2B; NGE-1A was pumped at approximately 275 gpm between October 27, 2009 and November 4, 2009.<sup>1</sup>

Discharge from NGE-2B 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. EGGI also conducted an extended pumping program of NGE-2B between February 25, 2010 and April 22, 2010 to evaluate water quality trends under prolonged pumping conditions.

During the withdrawal testing program, water level measurements were collected at: Wells NGE-1A and NGE-2B; 2 bedrock exploration wells; 13 piezometers; 11 surface water staff gauges; and 30 private water supply wells (2 overburden wells and 28 bedrock wells). The 30 private water supply wells are located at distances ranging from approximately 1,120 to 6,860 feet from NGE-2B in residential neighborhoods to the north and southwest of NGE-2B. Shallow groundwater and surface water level measurements were recorded to assess the degree of hydraulic connection between the bedrock aquifer, overburden, the Piscassic River, and surrounding wetlands.

Water level measurements collected during the withdrawal testing program indicate that 1 bedrock exploration well (closest to NGE-2B) and 10 of the private bedrock water supply wells responded to pumping of NGE-2B. Water levels in the private overburden water supply well closest to NGE-2B, piezometers, and at the surface water staff gauges did not respond to pumping of NGE-2B. The water level in NGE-2B itself did not respond to pumping of NGE-1A.

Pumping-induced drawdown of water levels in the private bedrock water supply wells that responded to the pumping of NGE-2B ranged from approximately 0.3 to 16.5 feet and was greatest in a well located approximately 1,440 feet north of NGE-2B.

Based on a distance-drawdown analysis of graphical projections of water level responses in the monitored bedrock wells that assume 180 days of continuous combined pumping of NGE-1A and NGE-2B at 575 gpm with no net recharge from precipitation to the aquifer, and inference from the refined conceptual hydrologic model of the withdrawal, pumping-induced drawdown is estimated to extend on the order of 1 mile to the northeast, 2 miles to the southwest, and 0.75 miles to the northwest and southeast of NGE-2B. Overall, based on monitoring results presented in the final report, a production rate of 432,000 gpd (300 gpm) is a production rate that NGE-2B and the geologic formation can sustain.

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<sup>1</sup> Newmarket's development of Well NGE-1A as a public water supply source has been deferred until such time that Newmarket can secure rights to, ownership of, or control of the well site and the well's sanitary protective area, as required by NHDES' community well siting regulations.

Results of the water quality sampling conducted during the withdrawal testing program indicate that each parameter, with the exception of arsenic, chloride, and manganese was below the applicable Maximum Contaminant Level (MCL) or Secondary Maximum Contaminant Level (SMCL). Sodium and specific conductance, which do not have established MCLs or SMCLs, were also elevated. Additional water quality samples were collected during the extended pumping program of NGE-2B to evaluate trends in concentrations of arsenic, chloride, iron, manganese, sodium, and specific conductance. Arsenic concentrations in samples collected during the withdrawal testing program and the extended pumping program ranged from 0.006 mg/l to 0.011 mg/l; no systematic trends in arsenic concentrations were observed under either pumping scenario. As such, water derived from NGE-2B may require treatment for arsenic depending on future compliance sampling results. Water derived from NGE-2B may also require treatment for aesthetic water quality issues due to elevated levels of chloride, manganese, sodium, and total dissolved solids.

## **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) were sent (via certified mail) to municipalities and public water suppliers in the potential impact area of the withdrawal. Copies of the above-referenced materials were sent to the towns of Newfields and Newmarket. No public water suppliers, other than the permittee, are located within the potential impact area. No public hearings were requested, and no public meetings were held regarding the application for this large groundwater withdrawal permit.

## **LARGE GROUNDWATER WITHDRAWAL PERMIT PUBLIC NOTIFICATION, MONITORING, REPORTING AND WITHDRAWAL REQUIREMENTS**

To provide a means for notification in the event of an unforeseen impact, the large groundwater withdrawal permit requires Newmarket to notify any property owner with a private well within the estimated zone of influence of NGE-2B prior to initiating a withdrawal from the well. As part of the notification, Newmarket must explain to each property owner that their well may be influenced by the withdrawal at the production well and provide them with contact information at Newmarket and NHDES in the event they believe their well may be impacted by the withdrawal. More information concerning this requirement is provided in the large groundwater withdrawal permit under condition No. 5.

The large groundwater withdrawal permit requires Newmarket to conduct a groundwater level monitoring program that includes monitoring of the production well and an off-site private bedrock water supply well. General monitoring requirements are summarized as follows:

- On-site well – The permit requires that water levels in NGE-2B be monitored so that water level fluctuations in the off-site monitored well can be compared to the operation of the production well.
- Off-site well – The permit requires that water levels in one private bedrock water supply well be monitored to assess the potential for or detect the occurrence of an adverse impact.

The large groundwater withdrawal permit also requires Newmarket to perform stream flow monitoring in the Piscassic River at sites upgradient and downgradient of NGE-2B to assess the potential for an adverse impact to surface water levels or flows.

The large groundwater withdrawal permit requires a reduction in the withdrawal from NGE-2B if:

- Trigger water levels are met or exceeded in the off-site monitored well; or
- NHDES determines that the withdrawal is not sustainable based on a review of the monitoring data.

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. 5.

Newmarket is required to submit an annual monitoring report in hard copy and electronic format to NHDES by January 31<sup>st</sup> 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 NGE-2B. 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 No. 4.