



## GRANITE ENGINEERING, LLC

civil engineering • land planning • municipal services

### Waivers

**The applicant requests the following waivers in accordance with Article 26.19.13:**

**1. Which Requirement:**

Article 25.3.6 – Toxic or Acid Forming Materials – When the proposed operation includes the excavation of bedrock materials, the applicant shall demonstrate that excavation activities will not adversely impact surface or ground water quality through the unearthing of toxic or acid forming elements or compounds resident in the bedrock or soils. Such demonstration shall be made by obtaining the opinion of a NH licensed engineer or professional geologist. Excavation of bedrock shall not be permitted where bedrock contains toxic or acid forming elements or compounds.

**Why the waiver is needed:**

Professionally engineered plans, a Hydrogeologic Investigation Report, Acid Mine Drainage Potential Report, and an Acid Mine Drainage Detection Initial Response Action Plan prepared by a professional geologist were submitted in conjunction with the subject excavation permit. As demonstrated in the submitted material, excavation activities will not adversely impact surface or ground water quality through the unearthing of toxic or acid forming elements or compounds resident in the bedrock or soils.

Our initial site testing, involving eight overburden wells, revealed bedrock at depths ranging from less than 5 feet to 14 feet. Subsequent testing of the bedrock, combined with an acid-producing potential analysis, helped us evaluate the risk of Acid Mine Drainage (AMD). AMD can occur when low pH waters at an excavation site contain elevated levels of certain minerals.

Given that bedrock was encountered and has the potential to contain minerals that could lead to AMD, a waiver is required to proceed with bedrock excavation. This waiver is necessary to adequately excavate the material on-site. While AMD is uncommon in active New England quarries, our proactive approach includes initial testing, early detection protocols, and action plans, which are crucial for managing any potential adverse effects. These supporting documents have been included with this waiver request for your review.

**Alternative Standard:**

The alternative to the proposed would result in no bedrock excavation activities on-site. Due to the shallow depth of bedrock found throughout the property, excavation with avoiding bedrock is not a practical option. Bedrock, or granite, is common in New Hampshire and is regularly excavated for various purposes. While AMD testing isn't typical in New England, it's a potential factor in many quarrying operations.

Considering the makeup of the granite bedrock in Keene and the areas where bedrock excavation is permitted, there's a possibility that any bedrock extraction in Keene might lead to the same waiver requirement.

**Not in Violation:**

Granting this waiver would not violate NH RSA 155:E, as the State of New Hampshire does not have specific regulations for AMD. Because AMD is uncommon in the state, testing and mitigation for it are not typically required. However, note that the applicant will monitor groundwater and surface water compounds, which will be compared to the relevant NHDES regulatory standards.

**Adverse Impacts:**

A proactive approach to AMD will allow the excavation of the bedrock and prevent any adverse impact on surface and groundwater:

*Sampling*

Initial testing and analysis have indicated that AMD may potentially occur on Site. Due to this potential, it is proposed that strategically placed wells will be monitored on a bi-annual basis in the months of April and October. Additionally, samples will be collected from surface water basins constructed throughout the project. The basins collect all surface water conveyed from the proposed excavation and discharge to one common infiltration pond. Baseline, pre-excavation monitoring will consist of the collection of two (2) rounds of samples collected a minimum of 14 calendar days apart. Results will be reviewed in comparison to the New Hampshire Department of Environmental Services (NHDES) Ambient Groundwater Quality Standards (AGQS). All results will be forwarded to the City of Keene Community Development Department within 45 days of sample collection.

*Prevention*

AMD occurs when surface water interacts with heavy metals, resulting in a low pH level. Our strategy focuses on minimizing the contact between surface water and bedrock.

The bedrock at our site has limited exposure to groundwater. To assess groundwater potential, we installed eight bedrock wells. Only two of these encountered groundwater, and both were located outside the planned excavation area. While one existing well found groundwater close to the surface, another nearby well and test pit did not, indicating a general lack of groundwater within the bedrock intended for mining. This limited groundwater significantly reduces the potential for water to interact with the bedrock.

Furthermore, all stormwater from excavation activities will be collected, contained, and infiltrated back into the ground. We anticipate zero runoff leaving the site, effectively protecting surface waters from potential AMD.

Research indicates a link between abandoned quarries and AMD due to prolonged water contact with minerals. To avoid this, any stockpiled material will be moved off-site promptly. We also plan to refrain from blasting and processing bedrock unless there is a clear economic demand.

Finally, all exposed bedrock, with the exception of the vertical ledge face, will be reclaimed with suitable loam and seed. This will prevent long-term contact between surface water and the minerals.

#### *Pre-mitigation*

All stormwater associated with the excavation activities is collected, detained, and infiltrated back into the ground via infiltration ponds. Zero runoff is expected to leave the site. In addition of reintroducing surface water to the ground, the proposed lining the two infiltration ponds with 12 inches of crushed limestone gravel as a precautionary measure will help neutralize any potential for acid mine drainage.

#### *Mitigation*

Although unlikely, if a surface and/or groundwater sampling location presents results that are indicative of the formation of acid mine drainage, NHDES and the City of Keene will be notified immediately. Furthermore, the following immediate initial response actions will be implemented:

1. All active quarrying/mining operations occurring in the affected area will cease and exposed bedrock surfaces shall be expeditiously restored to have a minimum thickness of 3-feet of cover material. The cover material shall consist of a minimum of 30% clay content. The intent of the clay content and compaction is to limit air and surface water contact with the source of the acid mine drainage.
2. Any affected drainages which may be contributing/conveying acid mine drainage shall be armored with 1-foot of 2-inch minus, crushed, limestone gravel.
3. The frequency of surface water and groundwater monitoring for acid mine drainage will be increased to a quarterly basis.
4. All surface water within ½-mile downgradient of the detected acid mine drainage shall be sampled within 2-weeks of the initial detection and be included in the surface water monitoring program.
5. Sampling of all domestic water supply wells within ½-mile of the affected area for acid mine drainage parameters will occur within 2-weeks of the initial detection and continue to be sampled on a quarterly basis.
  - a. If acid mine drainage is detected in a domestic water supply well the homeowner shall be offered to have a “point-of-use” water treatment system installed and maintained while a new, unimpacted, domestic water supply is made available at no cost to the homeowner.

6. A groundwater quality assessment in the areas adjected to the detected acid mine drainage will be initiated.
  - a. The Groundwater Quality Assessment shall include the installation of a minimum of three (3) monitoring wells; one upgradient of the affected surface water, and two down-gradient of the affected surface water. Additional monitoring wells may be required to determine the horizontal and vertical distribution of the groundwater impacts.
  - b. Groundwater samples will be collected within 2 weeks of installation and analyzed for acid mine drainage parameters listed above. A second, confirmatory round of sampling will occur 2-weeks after the initial sampling round. Monitoring wells will be sampled on a quarterly basis if acid mine drainage impacts are detected. If results indicate acid mine drainage may have traveled further downgradient additional monitoring wells may be required.

#### **Purpose and Intent:**

The purpose of this regulation is to protect surface waters AMD. AMD occurs when water reacts with sulfur bearing minerals creating sulfuric acid. The overall result of AMD is lower levels of pH of the surface water, and the potential for high levels of toxic materials. The regulation requires the applicant to prove that the proposed bedrock extraction will not negatively impact surface waters and wetlands. While the purpose of the regulation is clear, the submitted material and detection plans, thoroughly address the lack of impact this project will have on the surrounding environment.

#### **Not Unduly Injurious:**

Granting this waiver is not expected to negatively affect public or environmental welfare. Our project incorporates a proactive AMD detection plan, overseen by our professional geologist and detailed previously, which will ensure no adverse environmental or public impact.

We will conduct preemptive monitoring to gather the necessary data for early risk detection. Furthermore, our design and operational practices are specifically chosen to prevent long-term exposure of bedrock and surface water. We will also implement pre-mitigation steps to encourage a balanced pH level in the surface water. In the event that risk is detected, a comprehensive mitigation plan is in place to allow for a swift and coordinated response from both the applicant and the City to prevent any potential impact.

#### **Unique Site Characteristics :**

While we do not believe the site possesses a particularly unique character, the City's requirement for Acid Mine Drainage (AMD) testing is. The state does not mandate this testing, and to our knowledge, no other municipality in New Hampshire requires it.

Although the site's bedrock *may* exhibit *potential* acid-generating properties, this characteristic alone does not inherently make it unique. If AMD testing was standard practice across all rock excavation sites in New England, we would have a clearer understanding of how prevalent these properties actually are.

## **2. Which Requirement:**

Article 25.3.3 – Excavation below the water table – Excavation shall not be permitted lower than 6-ft above the seasonal high-water table, as indicated by borings or test pits, without the issuance of an exception. An exception to this standard shall be granted if the applicant demonstrates that such excavation will not adversely affect water quality or quantity, provided, however, that written notice of such exception shall be recorded in the County Registry of Deeds as part of the decision, and 1-copy filed with the NH Department of Environmental Services.

### **Why the waiver is needed:**

A groundwater monitoring well (SLR-12), installed by SLR International Corporation, observed a groundwater fracture within 18 inches of the existing ground surface. It is the project's intent to refrain from excavating this area. While there is no evidence that the fracture in which SLR-12 is located extends into the proposed excavation area, we are respectfully requesting this waiver to ensure continued compliance with Article 25.3.3.

### **Alternative Standard:**

The groundwater monitoring well which encountered high groundwater is an anomaly. This particular well, drilled by a different company for another firm, unexpectedly encountered a high level of groundwater. The applicant noted during drilling that surface water was present nearby and appeared to be flowing into the well. It's important to note that a nearby well and test pit, located close to SLR-12, did not encounter any groundwater. Furthermore, all overburden and bedrock wells within the planned excavation area have also shown no groundwater.

While we believe the high groundwater reading in the anomalous well is likely inaccurate due to the observed surface water influence, we have taken care to avoid disturbing the adjacent grade. However, completely avoiding the adjacent area would unfortunately prevent the construction of a critical sedimentation pond. These sedimentation ponds are essential for effective site runoff control. They function by capturing and holding water, allowing sediment to settle out. This process is vital in preventing sediment from entering downstream water bodies and safeguarding water quality during the construction phase. If groundwater is actually encountered in the adjacent area, blasting operations will cease as MSHA, the protective protocols governing blasting, does not allow the blasting within groundwater.

**Not in Violation:**

We do not anticipate encountering groundwater during the proposed excavation activities. The site is underlain by crystalline bedrock, which is non-porous and transmits groundwater primarily through fractures. Our investigation of bedrock wells within the excavation area did not reveal any groundwater-bearing zones or fractures. It's important to note that the only well where groundwater was observed (SLR-12) is situated outside the proposed excavation footprint.

Furthermore, nearby wells SLR-4 and test pit 6, both located in close proximity to SLR-12, did not show any signs of groundwater. Our extensive investigation also included overburden wells MW-1 through MW-8 and bedrock wells BRW-1 through BRW-6, none of which encountered groundwater.

As a precautionary measure, all blast hole drilling will be meticulously logged to identify any potential fractures or groundwater-bearing zones. Blasting operations will not proceed in any areas where such zones are identified.

Finally, it's critical to understand that if groundwater is encountered in the vicinity, all blasting activities will immediately cease. This is in strict adherence to MSHA's protective protocols, which explicitly prohibit blasting within groundwater.

**Adverse Impacts:**

Excavation will not adversely affect water quality or quantity. It is not anticipated that any work within the groundwater will be conducted therefore there will be no effect on groundwater quantity or quality. Based on our initial assessment, we do not anticipate any adverse effects on water quality or quantity. Our initial site testing, which included eight overburden wells, indicated bedrock at depths between less than 5 feet and 14 feet. Further testing confirmed that the groundwater level is below our planned excavation depths. In the event that groundwater is unexpectedly encountered near the well with a higher level (which we believe is an isolated case), construction in that specific area will cease.

To further safeguard water resources, we will conduct on-site testing of surface water quality before it infiltrates the ground. We are proposing a bi-annual monitoring program involving strategically positioned wells, with sampling occurring in April and October. Additionally, we will collect samples from surface water basins designed to capture all surface water runoff from the excavation area. These basins will discharge into a central infiltration pond for surface water treatment.

Prior to commencing excavation, we will establish a baseline water quality profile by collecting two rounds of samples, separated by a minimum of 14 calendar days. The results will be compared against the New Hampshire Department of Environmental Services (NHDES) Ambient Groundwater Quality Standards (AGQS). All monitoring

data will be submitted to the City of Keene Community Development Department within 45 days of each sample collection.

**Purpose and Intent:**

This regulation aims to preserve both water quality and quantity. Water quantity will be maintained by capturing all runoff on-site for infiltration. The water quality monitoring program will include testing drinking water supplies and comparing results to NHDES Ambient Groundwater Quality Standards (AGQS).

**Not Unduly Injurious:**

Granting this waiver will not be unduly injurious to public or environmental welfare. A robust monitoring program has been established, including the monitoring of bedrock wells, six surface water locations, and all drinking water wells within a half-mile radius of the site. Practices and measures are put in place to help safeguard the environment including a surface water treatment system, groundwater excavation prevention measures, AMD action plans, and MSHA oversight. MSHA's regulations regarding explosives and blasting are focused on ensuring the safety of miners and the mine environment during blasting operations. The emphasis on safe practices and the use of permissible materials and equipment helps to minimize potential risks that could lead to groundwater contamination.

**Unique Site Characteristics:**

A groundwater monitoring well (SLR-12), installed by SLR International Corporation, observed a groundwater fracture within 18 inches of the existing ground surface. We intend to avoid excavation in this immediate area. We believe the high groundwater encountered in this well is an isolated occurrence. Our findings during drilling suggest that surface water was present nearby and may have flowed into the well, potentially influencing the results. It's important to note that a nearby well and test pit, situated close to SLR-12, did not encounter any groundwater. Additionally, all other overburden and bedrock wells within the planned excavation footprint have also remained dry. This suggests that the condition at SLR-12 is a unique characteristic of that specific location and not representative of the broader area.

To ensure the protection of this localized area, we will refrain from excavating directly at the SLR-12 location, though work will continue in the adjacent areas. Should the findings from this well indicate a broader groundwater impact beyond this localized point source, we will immediately halt excavation and blasting activities to prevent any potential disruption to groundwater resources.



Sincerely,

A handwritten signature in black ink, appearing to read "Justin Daigneault", with a long horizontal flourish extending to the right.

Justin Daigneault  
*Project Manager*