

Module 8: Hydrology [§§77.405/77.406/77.407]

8.1 Chemical Analysis.

Provide the following data, in accordance with 8.2 for each point in the background sampling and monitoring program and report on Module 8.1(A).

- a) pH (field & laboratory) See Attachment 8.1(A)
- b) Total Suspended Solids (mg/l) See Attachment 8.1(A)
- c) Total Dissolved Solids (mg/l) or Specific Conductance ($\mu\text{S}/\text{cm}$ at 25°C) See Attachment 8.1(A)
- d) Field temperature at sample source (°C).
See Attachment 8.1(A)
- e) Provide the following in addition to a) through d) above, if requested by the Department. *

Total Alkalinity (mg/l)
Total Acidity (mg/l)
Total Iron (Fe) (mg/l)
Total Manganese (Mn) (mg/l)
Sulfates (SO_4) (mg/l)

*If the proposed noncoal minerals to be mined are located within the coal fields or other known acid producing areas or a watershed sensitive to mining impacts, additional parameters may be required by the Department. Contact the appropriate District Mining Office prior to beginning sampling to determine if these parameters are needed.

Additional sampling has been completed in support of the Anti-degradation Supplement prepared for the site. Please refer to the Water Quality Assessment Report included with Module 2.

- f) Flows of perennial streams above and below the operation and surface and underground mine discharges must be measured by approved methods. In addition, other flows from springs, streams, seeps or other discharge points in the representative monitoring program should be measured to reflect seasonal variations. (The Department may waive sampling points if there is a representative sampling of the requested points.) The elevations and flows of springs, seeps, and mine discharges are required.

See Attachment 8.1(A) (Note, additional flow data is provided in the Water Quality Assessment Report included with Module 2)

- g) Provide a description of the type of sample point (e.g. well, spring, etc.) and its relationship to the mine site (e.g. up-gradient, perched aquifer, down-gradient).

See Attachment 8.1(A)

- h) Provide the name(s), address(es) and telephone number(s) of the individual(s) responsible for the collection and analysis of this data.

EarthRes Group, Inc.
6912 Old Easton Road
Pipersville, PA 18947
(215) 766 - 1211

Test America Laboratories, Inc.
1010 W. Ninth Avenue, Suite 50
King of Prussia, PA 198406
(484) 685 - 0871

- i) Provide a description of the methodology used to collect and analyze this data.

Disposable bailers were used to collect samples from monitoring wells, MW-1, MW-2, and MW-3. Residential well samples were collected by running an internal faucet or external spigot until the sample was visibly clear. If possible, sample locations installed before any filtration or treatment equipment were chosen. The static depth to water was measured using an electronic water level meter prior to sampling. The static water level of MW-4 was monitored with a sonic water level meter.

Stream samples SW-1, SW-2, SW-3, and SW-4 were collected directly as grab samples. Surface water flows were measured using a Global Flow Probe to record flow velocity and flow depth at several stations across the channel using the USGS "6 tens method". In instances where the flow was too low to register on the probe, flow was estimated.

Field parameters consisting of temperature, pH, total dissolved solids, specific conductivity, and oxidation reduction potential were measured during sampling using a calibrated Myron II ultrameter.

Water samples were packed on ice and transported under chain of custody to Test America Laboratories, Inc. for water quality analysis.

8.2 Background Sampling and Monitoring.

a) Background Sampling

Provide the results of the chemical analyses, as required by the Department, that characterize the water quality of sample points listed in 1) through 8). Background sampling points must have at least two (2) complete chemical analyses, at monthly intervals. All sampling points must be keyed to Exhibit 6.2 and identified in Module 8.1(A).

Note: Include sample(s) from a low flow period.

- 1) each stream that receives discharge, runoff or drainage from the operation.
**Three Mile Run: SW-1 and SW-2; and
Unnamed Tributary to Tohickon Creek: SW-3 and SW-4**
- 2) streams, springs or wetlands that are representative of the surface and groundwater system of the general area.
**Three Mile Run: SW-1 and SW-2; and
Unnamed Tributary to Tohickon Creek: SW-3 and SW-4
Upstream Surface Water Point (Data included in Water Quality Assessment Report included in Module 2)**
- 3) springs, seeps and wetlands within the permit area and springs, seeps and wetlands within 1,000 feet of the permit area.
N/A
- 4) impoundments within the permit area and impoundments within 1000 feet of the permit area.
Sump
- 5) impoundments, impoundment discharges, and discharges from backfilled areas associated with previous or current underground or surface coal mines within the permit area and within 1,000 feet of the permit area.
NPDES 001, 002, 003, 004 – Data are included within the Water Quality Assessment Report included in Module 2.
- 6) discharges within the permit area resulting from underground mines and discharges resulting from underground mines that are within the permit area but discharge outside the permit area.
N/A
- 7) any monitoring wells developed to determine the characteristics of the groundwater. (The Department may require additional monitoring wells.)
Monitoring Wells MW-1, MW-2, and MW-3 were installed during this investigation to determine the characteristics of groundwater. Monitoring well MW-4 has been in existence at the Site previous to the permit update and was used to collect groundwater levels during this monitoring period. Additional information regarding groundwater is found in the Groundwater Pumping Evaluation dated July, 2018 and the Groundwater Pumping Evaluation Addendum dated September 2024.
- 8) private water supplies and water supplies abandoned because of degradation or pollution from mining, within the permit area and within 1,000 feet of the permit area. For each water supply sampled, provide the data required on the Private Water Supply Information Exhibit 8.2(A)(8) and indicate the source of the information (e.g. owner interview, survey by operator, P.E. etc.). (Provide driller logs if available.) (The Department may require additional water supply information on a case-by-case basis.)
MP-1, MP-2, MP-3, MP-5, MP-6, MP-7, MP-8, MP-10, MP-11, MP-12, MP-13, MP-16, and MP-17.

b) Monitoring Program

Describe the proposed surface and groundwater monitoring plan that will be conducted. The monitoring plan shall include quantity and quality measurements of discharges from the operation; points that will show any effect of the discharge on the receiving stream; and points that will show any effect on the groundwater system. Unless otherwise approved by the District Mining Office prior to permit application submittal, monitoring points must have a minimum series of six (6) complete chemical analyses collected at monthly intervals and should include the month of August, September or October to reflect low flow conditions.

Points to be included in the Monitoring Program are provided in the tables below. Static water elevations in monitoring wells (MW-1, MW-2, MW-3, and MW-4) will be recorded monthly. Surface water sampling of NPDES 001, 002, 003, & 004 will be conducted as required by the NPDES permit.

All monitoring points must be keyed to Exhibit 6.2. Monitoring plans must provide for collection and monitoring on a quarterly basis unless otherwise specified by the Department. All monitoring data must be compiled on Module 8.1(A) or equivalent facsimile. All monitoring points should be identified in the field with durable markers that can be maintained (wooden stakes, metal or plastic tags, etc.; not just plastic flagging).

If monitoring Points are added during the pre-application field meeting, the Department will accept the application with three (3) months of sampling results for those points only.

The following monitoring locations should be included in the monitoring program:

The permanent monitoring point locations for the Quarry are shown on Exhibit 6.2. Monitoring locations are summarized below and discussed in further detail in the Groundwater Pumping Evaluation.

	Monitoring Points (Key to Exhibit 6.2)
1) receiving streams above proposed discharge points	<u>N/A</u>
2) receiving streams below proposed discharge points	<u>N/A</u>
3) abandoned underground or surface mine discharges that are hydrologically connected and may be impacted by the proposed mining	<u>N/A</u>
4) representative springs and seeps within the permit area and within 1,000 feet of the permit area	<u>N/A</u>
5) representative wetlands with defined discharge points within the permit area and wetlands within 1,000 feet of the permit area that may be impacted by the proposed mining,	<u>N/A</u>
6) water supplies	<u>N/A</u>
7) cased boreholes/piezometers	<u>N/A</u>
8) point source discharges	<u>001</u> <u>(Downgradient</u> <u>Permit Boundary)</u>
9) treatment pond discharges	<u>004 (Clarifying</u> <u>Pond)</u>
10) sedimentation pond discharges	<u>002, 003</u> <u>(Stormwater only)</u>
11) pit water during active mining (identify by mineral being mined)	<u>N/A</u>
12) each monitoring well developed to determine the characteristics of the groundwater	<u>MW-1, MW-2,</u> <u>MW-3,</u> <u>MW-4 (Water Level</u> <u>Only)</u>

Note: In cases where cased boreholes/ piezometers or monitoring wells are not necessary, insert NA above and provide an explanation.

Module 8.1(A)
BACKGROUND (check appropriate block)

Operator: _____ Monitoring Point I.D.: _____ Description of Sample Point**: _____
 Operation Name: _____ Latitude: _____° _____' _____"N and _____
 Permit No.: _____ Longitude: _____° _____' _____"W _____
 Township: _____ Surface Elevation (MSL): _____
 County: _____

Instructions: Use a separate sheet for each sample point and list results consecutively by date.

Date Sampled	Method of Flow Measurement	Flow (GPM) or Static Water Elevation	Field pH	Laboratory pH	Suspended Solids mg/l	Total Dissolved Solids mg/l or Specific Conductance $\mu\text{S}/\text{cm}$ @25°C	Field Temp. °C	Alkalinity mg/l	Acidity mg/l	Iron Mg/l	Manganese mg/l	Aluminum mg/l	Sulfate mg/l		Laboratory and Name of Sampler
								Submit above as requested by the Department							

Signature of Permittee or Responsible Official or Authorized Representative _____

Date _____

**Description should include type of sample point, relation to mine site, treatment and other comments (such as odor, color, etc.)

8.2(A)(8) PRIVATE WATER SUPPLY INFORMATION (key to Module 6.2)

Sample Point No	Owner	Type of Supply (Dug or Drilled Well, Spring)	Use	Surface Elevation (MSL)	Depth of Casing	Diameter of Well	Static Water Elevation (MSL) or Flow, Date of Measurement	Depth of Well	Type of Treatment If Any (iron filter, etc.)
MP-1	Salvatore and Janice Galluppi	Drilled	Domestic	543	Unknown	6"	535.08	150'	None
MP-2	Michael Wilder and Eileen Koolpe	Drilled	Domestic	592	Unknown	6"	580.58	400'	Filtered
MP-3	Robert Silber	Drilled	Domestic	511	Unknown	Unknown	469.50	Unknown	No
MP-4	Donald G. Thomas Sr.	Drilled	Domestic	548	Unknown	Unknown	Unknown	Unknown	No
MP-5	Steven and Deborah Conolly	Drilled	Domestic	585	65'	Unknown	535.70'	200'	No
MP-6	Terry DeGroot	Drilled	Domestic	538	Unknown	Unknown	Unknown	Unknown	No
MP-7	Bruce Costa	Drilled	Domestic	556	Unknown	Unknown	Unknown	Unknown	No
MP-8	David S. Fitzgerald	Drilled	Domestic	542	Unknown	Unknown	526.8'	Unknown	Unknown
MP-9	Howard F. Bryan Jr.	Drilled	Domestic	556	Unknown	Unknown	Unknown	79'	Filtered
MP-10	Ryan and Kimberly Gottshall	Drilled	Domestic	534	100'	6"	526.17	500'	No

8.2(A)(8) PRIVATE WATER SUPPLY INFORMATION (key to Module 6.2)

Sample Point No	Owner	Type of Supply (Dug or Drilled Well, Spring)	Use	Surface Elevation (MSL)	Depth of Casing	Diameter of Well	Static Water Elevation (MSL) or Flow, Date of Measurement	Depth of Well	Type of Treatment If Any (iron filter, etc.)
MP-11	Steven Benner	Drilled	Domestic	534	Unknown	Unknown	510.6	180'	Filtered
MP-12	Michael Maier	Dug	Domestic	544	Unknown	Unknown	531.6	Unknown	Filtered
MP-13	Gene and Donna Herdon	Drilled	Domestic	560	45'	6"	542.2	420'	Filtered
MP-14	M. Arthur Hallett	Drilled	Domestic	Unknown	Unknown	Unknown	Unknown	Unknown	Filtered
MP-15	William S. Seachrist	Drilled	Domestic	Unknown	40' 4"	6"	Unknown	140'	No
MP-16	Andrew Wright and Sandra Lehrman	Drilled	Domestic	Unknown	Unknown	Unknown	Unknown	Unknown	No
MP-17	Gary and Beth Gotwals	Drilled	Domestic	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown

8.3 Groundwater Information.

- a) State if and when groundwater will be intercepted (e.g., mining below the water table, installation of a production well for support or processing facilities) and describe the groundwater system that exists within the permit and adjacent area. If pumping of groundwater is planned, indicate the estimated gallons/day to be pumped. Include the depth to groundwater and the water table conditions present (artesian, regional, perched, etc.), the relationship to the mineral to be mined, known groundwater problems, and the data and references used to establish the description. Groundwater modeling may be required if the pumping has the potential to adversely impact water supplies, wetlands and other water resources and their affiliated uses. (Key groundwater elevations to cross-sections in 7.1 (c).)

Groundwater conditions at Rock Hill Quarry (Quarry) are described in detail within the Groundwater Pumping Evaluation (GPE) and Groundwater Pumping Evaluation Addendum (GPE Addendum) submitted as a supplement to this application in Attachment 8.6 (d). The groundwater potentiometric surface ranges from a high of 598.05 feet above mean sea level (amsl) on the east side of the quarry (MW-1) to a low of 524.5 feet amsl (MW-3). The water in the quarry sump is at a level of approximately 590 feet amsl. Some areas of the quarry are located above the water table and will not require dewatering for mining. Pit dewatering will require approval and authorization from PADEP prior to being initiated.

A numerical groundwater model was developed to evaluate future mining below the water table. The calibrated numerical model for the Quarry indicated an average groundwater inflow of 0.039 MGD at the maximum extent of mining (See GPE Addendum Section 1). Precipitation that falls over the permit area is estimated to collect an additional 0.035 MGD. At the proposed final depth of 464 feet amsl, the total steady-state pumping rate is projected to be 0.074 MGD (refer to the GPE Addendum). During wet weather and periods of above average recharge, quarry discharge will exceed steady state predictions. The proposed NPDES discharge rate of 0.238 MGD at Outfall 004 accounts for these variable seasonal and climatic conditions.

The data collected for the GPE and GPE Addendum indicates that potential hydrologic impacts due to the continued mining of the Quarry are minimal. The hydrologic balance will continue to be assessed through the implementation of the monitoring plan in conjunction with the Quarry's pumping records.

- b) Describe the groundwater movement of the area and the conditions that control and influence the movement and infiltration. Include the influence of any underground mines, cave systems or other karst features.

Groundwater movement in the area is described within the GPE and GPE Addendum. Most groundwater movement in the local area occurs in the interconnected fracture network that includes joints and faults. Fracture networks within the diabase are often discontinuous over moderate to large distances, resulting in development of local groundwater flow systems. The water table is generally a subdued reflection of topography, and groundwater typically flows downhill discharging to local streams. A simulated groundwater map for the current unconfined aquifer is included as Figure 2 of the GPE. No underground mines or cave systems were identified in or adjacent to the quarry.

- c) Identify all aquifers above the lowest mineral to be mined and the first aquifer below the lowest mineral to be mined and the presence of any underground mine or cave system. Include stratigraphic units, depths, and any current use.

The Quarry is located within the Haycock/Rockhill Diabase. The diabase intrudes into native sedimentary rock of the Brunswick and Locketong Formations (See Greenman, D., 1955 Plate 1). The Brunswick Formation is a sequence of sedimentary rock from shale to siltstone with interbedded sandstone. The Locketong Formation is also a sedimentary sequence with laminated beds of siltstone and shale or argillite. The intrusion of diabase has created a metamorphosed zone of baked Brunswick Formation surrounding the diabase. Mining will occur solely within the diabase. Groundwater within the diabase is stored exclusively in fractures because the crystalline rock has no primary porosity (see GPE for additional information).

There are no known underground mines or cave systems in the vicinity of the Quarry.

- d) Identify the effects which any previous mining has had on the quantity and quality of the groundwater in the area, including impacts from increased turbidity, suspended solids or settleable solids. Include the source, rock unit involved and the reasons for the effect.

There are no known effects from previous mining on the quantity or quality of groundwater in the vicinity of the Quarry.

- e) Identify any other (i.e. non-mining) existing effects on the quantity and quality of the groundwater in the area. Include the source, involved and the reasons for the effect.

☒ Not Applicable

8.4 Surface Water Information.

- a) Identify each stream receiving drainage from the proposed operation and the 25 Pa Code Chapter 93 projected water use classification.

Stream

Unnamed Tributary to Tohickon Creek

Classification

TSF, MF (Per §93.9e Drainage List E)

EV, MF (Per Existing Use Table, PA DEP)

- b) Identify the effects which previous mining has had on the quantity and quality of the surface waters in this area, including impacts from increased turbidity, suspended solids or settleable solids. Include the source, rock unit involved, and reasons for the effect.

There are no known effects from previous mining on the quantity or quality of groundwater in the vicinity of the Quarry.

8.5 Public Water Supply Information.

Provide the name, type, and location of all current public (community and non-community) surface water supplies that have intakes on the receiving stream within 10 miles downstream of the proposed permit area; public (community and non-community) water supplies (wells or springs) in or within one half mile of the proposed permit area; and public water supply wells for which any part of the permit area is within the Wellhead Protection Zone. Show the location of these supplies on Exhibit 6.1 or 6.2.

Based on the information obtained from Hydrogeologic Analysis of Perkasio Water Supply Wells and Consultants Report for the Year 2017, prepared by Mercuri and Associates, Inc. June 2018, there are two wells (PBA-5 and PBA-9) within ½ mile of the Quarry. Three additional wells (PBA-6, PBA-7, and PBA-8) are located just outside of the ½ mile boundary. See additional information in Attachment 8.5. All of these wells are keyed to Exhibit 6.2.

There are no known surface water intakes for a Public Water Supply ("PWS") within 10 miles downstream of the Quarry discharge. Two (2) groundwater withdrawals within one half mile of the permit area were located through a search of the Department's eMapPA website, and the results are provided in Attachment 8.5.

8.6 Hydrologic Assessment

- a) Describe the groundwater hydrology in relation to the proposed mining operation (at maximum depth and lateral development) - i.e. - intercept regional water table, above regional water table, intercept perched water table, etc.

The Quarry has already intercepted the water table within the diabase rock. Progressive dewatering of the Quarry will result in a limited cone of depression surrounding the Quarry.

8.6 Hydrologic Assessment (continued)

Identify water supply sources that may be contaminated, diminished or interrupted by the mining operation and the means to restore or replace the affected supply. Include a demonstration that the quantity of the water supply will be sufficient to meet the needs of the water supply use. Note why other water supplies will not be affected. Provide a specific capacity, step-drawdown, or other approved yield test for all water supplies that may be impacted by mining and for each proposed replacement supply source. Yield tests on other wells are at the discretion of the applicant or as requested by the Department. Provide specific capacity data on Module 8.6(A). Please refer to the guidance document, "Procedures for Establishing the Quantity of Water in Low-Yield Wells" for methods.

There are no water supply sources that are anticipated to be contaminated, diminished or interrupted by the mining operation. A numerical groundwater model of the continued mining of the Quarry was developed and the results are provided in the Groundwater Pumping Evaluation (GPE) and Groundwater Pumping Evaluation Addendum (GPE Addendum) (Attachment 8.6d). The results of the model indicate that the aquifer has low hydraulic conductivity, resulting in a steep cone of depression with limited aerial extent. There are no wells located within the modeled 10-foot drawdown contour zone of influence for the quarry area at the proposed final depth and areal extent of mining.

- 1) Provide the existing operation and maintenance costs for each water supply that may be contaminated, diminished or interrupted by the mining operation and the projected operation and maintenance costs for the proposed replacement supply.

N/A - there are no water supplies that are anticipated to be affected by mining.

- aa) If the operation and maintenance costs for the proposed replacement water supply will be more than for the existing water supply, identify the provisions for compensating the water supply owner for the increased costs or provide the consent to Lesser Water Supply Agreement Form 5600-FM-BMP0110 for the increased operation/maintenance costs.

N/A - there are no water supplies that are anticipated to be affected by mining.

- b) Describe the probable hydrologic consequences of the proposed noncoal surface mining activities on the hydrologic system of the permit area and adjacent area both during and after the operation. Describe the impact, during and after mining, on existing quantity and quality of the surface and groundwater.

A numerical groundwater model of the Quarry was developed to assess mining below the water table and the results are provided in the Groundwater Pumping Evaluation and Groundwater Pumping Evaluation Addendum (Attachment 8.6d). The investigation results indicate that the aquifer has low hydraulic conductivity, which will result in a steep cone of depression with limited aerial extent. No private or public water supplies are located within the predicted zone of influence. During mining, minor drawdown may occur as a result of groundwater discharge to the quarry. The volumetric discharge and drawdown are expected to be minimal. The zone of influence extends a limited distance beyond the property boundary as shown on Figure 1 of the GPE Addendum and Exhibit 6.2. Based on the background sampling conducted for Module 8 and sampling completed for the Water Quality Assessment Report included with Module 2, the water quality is not expected to be impacted as a result of quarry development. After conclusion of mining activities the water levels in the pit will recover to an approximate level of 590 amsl and the water table will return to pre-pumping levels.

There are no anticipated impacts to the quantity or quality of surface water in the vicinity of the Quarry.

- c) Is there evidence of sinkhole or cavern development in or within 1,000 feet of the proposed permit area? ☐ Yes ☒ No

If "yes" is checked, describe the effects mining will have on sinkhole or cavern development and the steps that will be taken to repair or alleviate sinkholes.

N/A

- d) Has groundwater modeling been conducted? ☒ Yes ☐ No

If "yes" is checked provide documentation for the modeling and the results.

See Groundwater Pumping Evaluation provided as Attachment 8.6d.

References for Module 8 are provided in the Groundwater Pumping Evaluation and Groundwater Pumping Evaluation Addendum.