

**Module 8: Hydrology**  
**[§§77.405~~77.406~~77.407, 77.457, 77.521]**

**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)
- b) Total Suspended Solids (mg/l)
- c) Total Dissolved Solids (mg/l) or Specific Conductance ( $\mu\text{S}/\text{cm}$  at 25°C)
- d) Field temperature at sample source (°C).
- 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<sub>4</sub>) (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.

- 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.
- 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).
- h) Provide the name(s), address(es) and telephone number(s) of the individual(s) responsible for the collection and analysis of this data.
- i) Provide a description of the methodology used to collect and analyze this data.

**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.
- 2) streams, springs or wetlands that are representative of the surface and groundwater system of the general area.
- 3) springs, seeps and wetlands within the permit area and springs, seeps and wetlands within 1000 feet of the permit area.
- 4) impoundments within the permit area and impoundments within 1000 feet of the permit area.
- 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 1000 feet of the permit area.
- 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.
- 7) any monitoring wells developed to determine the characteristics of the groundwater. (The Department may require additional monitoring wells.)
- 8) private water supplies and water supplies abandoned because of degradation or pollution from mining, within the permit area and within 1000 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.)

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. A minimum of six (6) monthly samples should be submitted with the application and any additional samples while the application is in process.

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).

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

	Monitoring Points (Key to Exhibit 6.2)
1) receiving streams above proposed discharge points	_____
2) receiving streams below proposed discharge points	_____
3) abandoned underground or surface mine discharges that are hydrologically connected and may be impacted by the proposed mining	_____
4) representative springs and seeps within the permit area and within 1000 feet of the permit area	_____
5) representative wetlands with <b>defined discharge points</b> within the permit area and wetlands within 1000 feet of the permit area that may be impacted by the proposed mining,	_____
6) water supplies	_____
7) cased boreholes/piezometers	_____
8) point source discharges	_____
9) treatment pond discharges	_____
10) sedimentation pond discharges	_____
11) pit water during active mining (identify by mineral being mined)	_____
12) each monitoring well developed to determine the characteristics of the groundwater	_____

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.)

8.3 Characterization of Groundwater Information. [ §§ 77.405, 77.457 and 77.521 ]

~~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).)~~

~~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.~~

~~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.~~

~~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.~~

~~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

Characterize the existing hydrologic balance of the permit and adjacent areas  
Cite all references and sources of information.

~~a) Identify all aquifers above the lowest mineral to be mined and the first aquifer below the lowest mineral to be mined. Include stratigraphic units, depths, and any current use. Discuss the general uses of these aquifers in the area and known quality or quantity issues with these aquifers in relation to their uses.~~

~~b) Describe the groundwater movement of the area and the conditions that control and influence the groundwater system. Include the influence on quantity and quality from underground mines, industrial or municipal effects, fracture zones, faults, karst features and cave systems. Provide a groundwater contour map, if suitable.~~

~~c) Identify the effects which any current or previous mining (including previous mining at this site) has had on the quantity and quality of the groundwater in the area, including impacts from diminution, increased turbidity, suspended solids or settleable solids. Include description of the source, rock unit involved and the reasons for the effect.~~

**8.4 Characterization of Surface Water Information. [§§ 77.406 77.457 and 77.521]**

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

Stream

Classification

- b) Identify the effects which current or previous mining (including previous mining at this site) 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.

- c) Identify the effects from other current or previous land uses on stream quantity and quality.

**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.

**8.6 Hydrologic Impact Assessment [§ 77.457 and 77.521]**

- 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. 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). Include the depth to groundwater and the water table conditions present (artesian, regional, perched, etc.), the relationship to the mineral to be mined.

- b) Describe the probable hydrologic consequences of the proposed mining activities on the hydrologic system of the permit area and adjacent area both during the stages of and after the conclusion of operations. Describe the impact, during and after mining, on existing quantity and quality of the surface and groundwater as described in Sections 8.3 and 8.4.

- c) Is pumping of groundwater planned within the life of the operation.  Yes  No.

If yes, indicate the estimated gallons/day to be pumped for each stage of mining. Submit a science-based estimate of the zone of influence for each proposed stage of the operation. This will-may require a groundwater model to be developed using existing aquifer data as well as collecting new data, tracer tests or fracture trace analysis. Provide all documentation for the modeling. Use of groundwater modeling may be required to support the discussion of potential effects of groundwater withdrawal if the withdrawal has the potential to adversely impact water supplies, wetlands and other water resources and their affiliated uses, or if the withdrawal has the potential to cause or exacerbate sinkhole formation (See section 8.7). (Key groundwater elevations to cross-sections in 7.1 (c).)

NOTE: Operations in karst geology areas may be required to complete the *Karst Permitting Supplement* in addition to supplying this information.

**8.7. Water Supply Replacement [§§ 77.407 and 77.533]**

- a) 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.
- b) 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" (TGD # 563-2112-606) for methods.
- c) 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.
- d) 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.

**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.~~

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- ~~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.~~

\_\_\_\_\_

- ~~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-MR-0110 for the increased operation/maintenance costs.~~

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5600-PM-BMP0315-8 Rev. ~~12/2014~~12/2018

~~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.~~

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~~e) Is there evidence of sinkhole or cavern development in or within 1000 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.~~

\_\_\_\_\_

~~d) Has groundwater modeling been conducted?  Yes  No~~

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

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