

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**

**Bureau of Mining Programs**

**DOCUMENT NUMBER:** NEW NUMBER NEEDED

**TITLE:** Implementation of Remining Regulations

**EFFECTIVE DATE:** Upon publication as Final in *PA Bulletin*

**AUTHORITY:** Subchapter F of 25 Pa. Code Chapter 87  
Subchapter G of 25 Pa. Code Chapter 88  
Subchapter F of 25 Pa. Code Chapter 90  
Coal Refuse Disposal Control Act (CRDCA)  
Surface Mining Conservation and Reclamation Act (SMCRA)

**POLICY:** The regulations provide protection for surface coal mine operators to remine lands previously affected by mining activities that have pre-existing polluttional discharges. For a permit to be issued, the proposed mining and reclamation activities must exhibit a significant potential to abate or reduce the polluttional load from the pre-existing discharges. The permittee is held to standards that verify the remining activity is not further degrading the surface and/or groundwater.

**PURPOSE:** The purpose of this guidance is to identify and explain conditions that must be met to qualify for Subchapter F/G authorizations as well as the obligations of a mine operator during the mining activity under permit. This guidance will also address procedures to be followed to modify the permit to account for changes in groundwater flow patterns and/or new discharges and to qualify for bond release. This guidance also reflects the current Subchapter F/G regulations.

**APPLICABILITY:** This remining policy shall apply to the permitting of pre-existing polluttional discharges which are hydrologically connected to the permit area and pollution abatement area. The policy shall not apply to pre-existing discharges which have the water quality characteristics of natural background conditions or to polluttional discharges that must be treated by an obligated party.

**DISCLAIMER:** The policies and procedures outlined in this guidance document

are intended to supplement existing requirements. Nothing in the policies or procedures will affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of the DEP to give these rules that weight or deference. This document establishes the framework, within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

**PAGE LENGTH:**

21 pages

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## **TECHNICAL GUIDANCE:**

### **BACKGROUND**

Act 158 of 1984 amended the Surface Mining Conservation and Reclamation Act (SMCRA) establishing requirements for remining previously mined areas with pre-existing polluttional discharges. The regulations concerning the permitting of pre-existing polluttional discharges are found in Subchapter F of 25 Pa. Code Chapter 87, Subchapter G of 25 Pa. Code Chapter 88, and Subchapter F of 25 Pa. Code Chapter 90. In this document, we use the term “Subchapter F/G” to reference the remining regulations comprehensively.

The Subchapter F and G regulations of Chapters 87 and 88, respectively, were originally published as final rulemaking in the June 29, 1985 *Pennsylvania Bulletin* (15 Pa. B. 2377). The preamble to this rulemaking provides a detailed background regarding the coordination of OSM and EPA. The purpose of the remining program is to improve the quality of the waters of the Commonwealth by providing protection for operators to enter, mine, and reclaim areas that were previously affected by mining with pre-existing polluttional discharges.

Act 114 of 1994 added section 6.2 to the Coal Refuse Disposal Control Act (CRDCA) relating to coal refuse disposal activities on previously affected areas. The Subchapter F regulations of Chapter 90 were published as final in the July 14, 2001 *Pennsylvania Bulletin* (31 Pa. B. 3735).

In the October 22, 2016 *Pennsylvania Bulletin* (46 Pa. B. 6780), the Environmental Quality Board published as final the updated Subchapter F/G regulations which incorporated the requirements of the Federal remining rules found in 40 CFR Part 434 Subpart B and Appendix B. This rulemaking incorporated many requirements which were previously included in each remining permit.

This guidance replaces three technical guidance documents written for the previous remining procedures: Determining Eligibility of Pre-existing Polluttional Discharges under Subchapter F or G Permits (563-2112-610); Permitting Pre-existing Polluttional Discharges under Subchapter F & Subchapter G (563-2112-611); and Monitoring, Compliance & Bond Release for Subchapter F or G Permits (563-2504-612). Because the rules for Subchapter F/G were not detailed in the regulations prior to 2016, these guidance documents and the individual permit documents included extensive conditions and clarifications. After 2016, the now-rescinded guidance documents no longer applied comprehensively, and the permit templates and conditions were simplified. This new guidance retains and reorganizes the pertinent information from those now archived versions, eliminating what is now codified in regulation, and adds additional technical information relating to the final regulations of 2016.

### **ELIGIBILITY AND APPLICATION FOR REMINING PROTECTION**

#### **Determining Eligibility**

Remining protection (Subchapters F/G, as applicable to permit type) apply to active surface coal mining, coal refuse reprocessing, and coal refuse disposal activities on areas that have been

previously affected by mining that have been abandoned and have resulted in continuing water pollution from mining-related discharges. These options do not apply to proposed underground mining permits. Restrictions for authorizing a permit under Subchapter F/G are detailed under *Applicability* in the appropriate mining regulations (§§87.203, 88.503, and 90.303).

Determining which sites and discharges are eligible to qualify for Subchapter F/G protection requires consideration of four factors: Legal Responsibility, Water Quality, Origination, and Hydrologic Connection.

### Legal Responsibility

The applicant or related party applying for Subchapter F/G protection must have no existing legal responsibility for treatment of the discharge(s) or for reclaiming the proposed pollution abatement area.<sup>1</sup>

Subchapter F/G protection may not be granted for remining where another party has a legal obligation for the discharges or pollution abatement areas.<sup>2</sup> The applicant for a remining permit under Subchapter F/G must demonstrate that there is no prior legal responsibility for these discharges or areas to be reclaimed.

If an applicant decides not to pursue Subchapter F/G authorization for eligible pre-existing pollution discharge within the permit area, or the sites are ineligible, they will be liable for treatment of the discharge to the standards in §§87.102, 88.92, and 90.102 once mining activity begins.

### Water Quality

The pre-existing discharges proposed to be covered under Subchapter F/G protection must exhibit water quality indicative of mine drainage pollution. To make this determination, the conductivity, acidity, alkalinity, iron, manganese, aluminum and sulfate values of each pre-existing discharge should be compared to the values of these parameters in unaffected springs, wells and surface waters from the surrounding area. As a general guideline, the primary indicator of coal mining-related pollution in Pennsylvania is typically sulfates greater than background values because sulfate is a conservative parameter unaffected by treatment or precipitation. Background sulfate concentrations of unpolluted surface waters and ground waters are generally several milligrams per liter to several tens of milligrams per liter, and rarely in excess of 100 milligrams per liter.

Subchapter F/G authorizations can be applied to discharges that exhibit water quality indicative of mine drainage that would fail to meet the water quality limits of §§87.102, 88.92, and 90.102. In addition, the discharge must have the chemical characteristics that would otherwise require the permittee to treat to meet these standards. This means that if the discharge were not authorized under Subchapter F/G, treatment would be required either upon permit issuance or upon the

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<sup>1</sup> 25 Pa. Code §§87.205(a)(1), 88.505(a)(1), 90.305(a)(1)

<sup>2</sup> 25 Pa. Code §§87.205(b), 88.505(b), 90.305(b)

permittee affecting the recharge area for the discharge.

Any pre-existing discharges having the water quality characteristics of natural background conditions rather than acid mine drainage are not eligible for Subchapter F/G authorization. These discharges located on or hydrologically-connected to the permit area will be held to standard effluent requirements upon permit issuance.

Aluminum does not have a “best available technology” (BAT) limit and is not a standard parameter to include in Subchapter F/G effluent limits. Separate water-quality-based effluent limits for aluminum can be part of the permit or can be included as part of the baseline calculations only as applicable. Substitution of BAT values (see Substitution in Baseline section), however, is not allowed.

Use of Subchapter F/G provisions is complicated by TMDL wasteload requirement for impaired streams. These cases must be handled individually dependent upon whether the pre-existing discharges were addressed in the existing wasteload allocations.

### Origination

The discharge(s) must be pre-existing and resulting from mining activities that have been abandoned prior to the time of the reminging permit application.<sup>3</sup> Discharge(s) can be on or off the permit area but the pollution abatement area (as defined in Section 3 of SMCRA and §§87.202, 88.502, and 90.302) must be included within the permit area. The pollution abatement area is the area causing or contributing to the baseline pollution load and that which, when reaffected, will likely reduce this load.

If there are no abandoned mining activities on a designated permit site, but pollution abatement activities within the permit area are expected to significantly improve pre-existing discharges hydrologically connected to the pollution abatement area, the Subchapter F/G provisions can be applied. Examples of this include rerouting a discharge that flowed onto the permit or designing wetlands to passively treat a discharge leaving the permit area. Neither of these involve reclaiming land but will result in improving the baseline pollution load.

Case law has consistently reaffirmed a permittee’s responsibility for meeting effluent limits for any discharge of mine drainage leaving the permit area. In most cases, pre-existing discharges within the permit boundary should be included under Subchapter F/G with baseline pollution load limits. An exception to this is if a discharge leaving the permit meets the criteria for bond release using §§87.102/88.92/90.102 effluent limits. Establishing protection under Subchapter F/G may not be a benefit to the operator.

Non-Subchapter F/G discharges within the SMP boundary are required to be treated to applicable effluent limits upon permit issuance.

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<sup>3</sup> 25 Pa. Code §§87.202, 88.502, 90.302, *Definitions*

## Hydrologic Connection

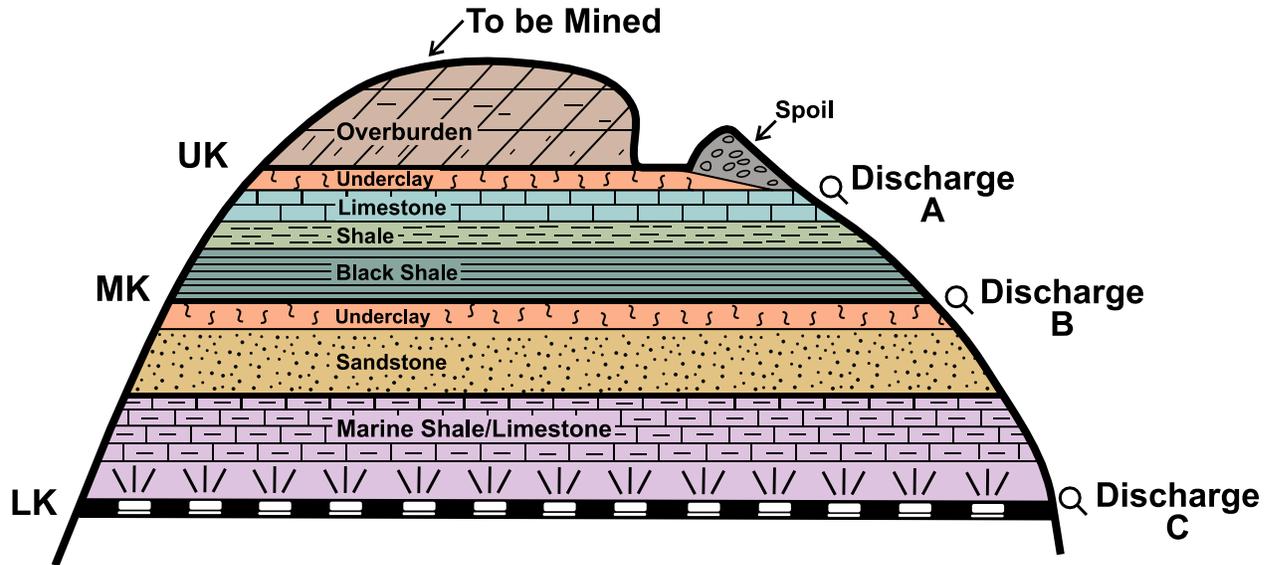
As part of the application, the applicant demonstrates that the discharge is hydrologically-connected to the permit area and to the proposed pollution abatement area intended to reduce the pollution load. If the applicant cannot demonstrate a likelihood that the pollution load from, or hydrologically-connected to, pre-existing discharges will be abated or significantly reduced via the pollution abatement plan, the proposed Subchapter F/G protection will be disallowed.<sup>4</sup>

If the proposed remining operation contributes recharge to an off-permit discharge of mine drainage, Subchapter F/G authorization is appropriate, subject to other eligibility requirements. Without Subchapter F/G authorization, if remining is determined to have adversely affected the off-permit discharge, treatment of the discharge to the standards of §§87.102, 88.92, and 90.102 is required.

Figure 1 shows several possible remining/discharge scenarios which illustrate varying degrees of “hydrologic connection”. Discharge A, which emanates from the same coal that is being mined, is clearly hydrologically connected to the mine site. Discharges B and C, on underlying coals or aquifers, are less clearly connected. While Discharges B and C are likely to receive some recharge from the mine due to downward vertical leakage, the significance of the hydrologic connection may diminish depending on the hydraulic characteristics of the mine site and intervening bedrock between the mine and the discharge. In general, sites which have no intervening discharge zones between the mine and an underlying discharge are likely to contribute a substantial amount of groundwater to the discharge. If Discharges A and B do not exist, Discharge C is more likely to be connected to the proposed mine. Conversely, if groundwater discharge zones exist between the mine site and the discharge in question, the significance of the connection may be much less. For example, the connection between the mine site and Discharge C is not as strong considering that most of the recharge is captured by the aquifers supplying Discharge A or B before the recharge can reach the aquifer or mine supplying Discharge C.

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<sup>4</sup> 25 Pa. Code §§87.205(a)(2), 88.505(a)(2), 90.305(a)(2)



**Figure 1.** Unreclaimed Upper Kittanning spoil will be reaffected by remining operations on the UK coal seam. The MK and LK coal seams will not to be affected. Discharge A is a toe-of-spoil discharge, Discharge B is a cropline seepage zone, and Discharge C is a large deep mine discharge.

In some cases, the potential impact of the remining activities on the discharge may be deemed insignificant or impossible to detect. An example is a mine pool/discharge complex receiving recharge from a remining site situated above the mine pool elevation. Anthracite remining projects commonly cover such a small portion of the recharge area for a large underground mine complex that it may not be possible to detect any change in water quality as a result of remining. As a general rule-of-thumb, the permitted mine site should comprise at least 5 to 10 percent of the recharge area to the deep mine pool/discharge complex before it should be considered hydrologically-connected.

See the later section “Three-tier approach” regarding options for permitting sites with or without discrete discharges or with large recharge areas.

### Information for Authorization

Because of the complexity of these applications and decisions about monitoring programs, the applicant is encouraged to take advantage of the pre-application process. Any operator requesting Subchapter F/G authorization must complete a remining permit application (including information specific to remining of areas with pre-existing pollutional discharges).

Specific to a Subchapter F/G authorization, DEP does the following:

- Determines if the proposed operation qualifies for this protection
- Reviews submitted maps and hydrogeologic data to determine whether the pre-existing discharges identified are hydrologically connected to the permit area and the pollution abatement area

- Disqualifies any pre-existing discharges that are not hydrologically connected
- Suggests areas to be added to or deleted from the permit area to account for recharge areas to pre-existing discharges
- Suggest use of hydrologic units (see later section) or other revisions to the monitoring plan
- Reviews the pollution abatement plan
- Considers the appropriate “tier” approach (see later section)
- Reviews the baseline calculations

The remining map must show the location of all Subchapter F/G discharges as well as their respective monitoring locations and when possible, the boundaries of the hydrologic unit(s). It is not necessary for these discharges to be located within the boundaries of the mining permit. However, all monitoring point locations must lie within a property for which a Consent of Landowner form has been submitted. Alternatively, the applicant may submit notarized permission from the landowner confirming agreement for continued access for monitoring.

### **Encountered Discharges**

A Subchapter F/G point is “encountered” when it is physically intercepted in the course of active surface mining activities including overburden removal, coal extraction, and backfilling. A discharge is also encountered if it will occur in the pit, sedimentation or treatment pond, or in any mining-related conveyance except diversions constructed under §§87.105(b)-(g), 88.95(b)-(g), or 90.104(b)-(h). An “encountered” discharge must be treated to technology-based effluent limits of §§87.102, 88.92 or 90.102 until reclamation is complete and the discharge is re-established. After mining, if the discharge is re-established, it is no longer “encountered”, and the effluent limit is based on the baseline pollution load.

To clarify the distinction between discharges that are encountered and unencountered, the term non-encountered should be used to describe discharge sample points which will not be physically mined out or intercepted during the mining operation. The use of the terms encountered and unencountered should be limited to discharge sample points which will be physically mined out or intercepted during the life of the mining operation.

### **Pollution Abatement Plan**

Applications for authorization under Subchapter F/G must include a pollution abatement plan that represents best technology (under §§87.204(a)(3), 88.504(a)(3) and 90.304(a)(3)). The Remining portion of the application outlines the requirements for the pollution abatement plan, which must include one or more Best Management Practices (BMPs). The pollution abatement plan must describe the anticipated impact on the pre-existing pollutional discharges. This may include effects on infiltration, evapotranspiration, water quality improvements, and any other anticipated pollution reduction benefits resulting from implementation of the abatement plan. The permit applicant must demonstrate a right of entry in accordance with §86.64 for the entire pollution abatement area prior to permit approval – this cannot be included with mining phases.

Issuance of a Subchapter F/G authorization is contingent on the pollution abatement plan and the

expectation that it can be successfully completed. The permittee has an obligation to carry out the plan upon permit issuance. If the permittee decides not to affect certain areas within the original pollution abatement plan, these areas should be deleted from the permit. This may result in a revocation of the Subchapter F/G provisions if the deletion is substantial. Once the permittee affects the area, they are obligated to complete the entire pollution abatement plan to obtain bond release as this plan is in the permit as part of the effluent limits. The Department may not allow a permit revision to substantially revise the pollution abatement plan after mining begins.

### **Baseline and Triggers**

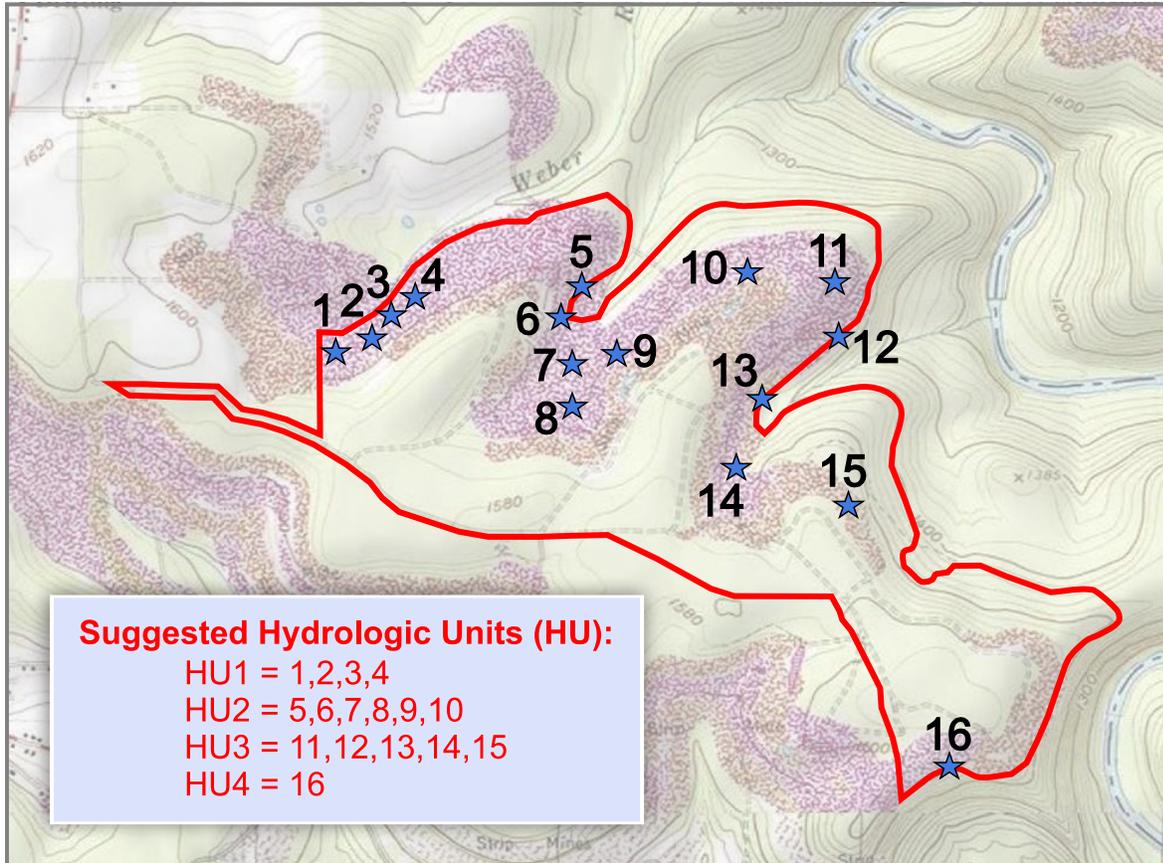
A typical remining permit includes a *baseline* established using pre-mining data and identifies the *triggers* for accelerated sampling and treatment. The concept of triggers as effluent limits is described in a later section.

The applicant calculates these triggers based on the instructions in the regulations using at least 12 monthly consecutive samples. At least a full year's worth of data must be submitted with the permit application. Partial sampling (6 months submitted with the remaining 6 months to be supplied while the application is in process) is no longer allowed.

The triggers represent a critical value that indicates the baseline behavior has been exceeded for that constituent. There are two kinds of triggers. The first is used for comparison to any one monitoring sample taken (the single-observation or monthly trigger – previously known as the “quick” trigger). The second is used for a comparison of the data set over a year (the annual or “subtle” trigger). The single-observation or monthly trigger is always established prior to permit issuance. Depending upon the statistical method used, the annual trigger may be established prior to permit issuance (see section: Method 1 vs Method 2). The monthly and annual triggers become effluent limits in the permit.

### **Hydrologic Units**

Pre-existing pollutional discharges may occur in the form of numerous discharge points, all of which emanate from a hydrologically discrete groundwater flow system. Groundwater flow paths may change during and following remining such that new discharge points appear, former discharge points disappear, and/or the distribution of flow rates between discharges changes. It is advantageous to designate hydrologic units to capture the entire related area. A “hydrologic unit” is the area where infiltrating waters will drain to a point or a series of related points. Each unit must be a hydrologically discrete area such that groundwater from one hydrologic unit does not flow to a different hydrologic unit. See Figure 2 for an example. To decide if a hydrologic unit is warranted, first establish hydrologic connection between points – determine if and how the geology (coal seams) and topography defines an area, and decide if a hydrologic unit is appropriate and draw its boundaries.



**Figure 2.** For sites that have multiple pre-existing discharges, hydrologic units can be defined to group these discharges to more accurately depict their anticipated interconnectedness. This map shows suggested hydrologic unit groupings.

Hydrologic unit boundaries should be shown on the remaining map. Establishing hydrologic units will eliminate the need for a permit revision should discharge locations change or new discharges develop within the previously designated unit. However, hydrologic unit boundaries should not be so expansive that they will include discharges to different stream segments or tributaries. For example, a single hilltop or ridge should not be considered one hydrologic unit if groundwater from opposite sides would drain to different streams or stream segments.

In many cases, it may be difficult to accurately identify hydrologic units at the permit application phase. Because of this, it may be necessary to revise how pre-existing discharges are grouped in a hydrologic unit after the mining has commenced. For this reason, it is important to retain the baseline data so that a more representative baseline pollution load based on hydrologic units can be calculated when necessary.

### Combining discharges

Discharges may be combined either naturally (where seeps have comingled) or by man-made controls to a single monitoring point, provided that the combination of discharges does not affect the pollution load measurement or that discharges from different hydrologic units are not combined. It is usually desirable both from the standpoint of cost to the operator and in terms of

permit writing and compliance monitoring, for the applicant to minimize the number of monitoring points needed. Combined discharge monitoring points cannot be too far away from their emanation point so that the flow is altered by precipitation runoff that will skew the results. When discharges are physically combined, sampling should not be taken during or immediately after storm events.<sup>5</sup>

### **Baseline data collection**

To be accurate, flow measurements must be made by directly measuring the actual volume (where appropriate) or by a permanently installed, properly constructed and maintained weir, flume, or other suitable flow-measuring device. The monitoring locations and any flow-measuring devices should be discussed during the pre-application field meeting or as early in the application review as possible to ensure efficient collection of reliable monthly measurements for the baseline collection period.

The applicant must perform the baseline pollution load statistical summary for each monitoring point. Where multi-discharge hydrologic units are defined, the baseline statistics should be calculated for the aggregate pollution load from each monitoring point, individually summed for each sample date. This requires sampling and analysis of each discharge on the same date with the same number of samples. The baseline pollution load is then reported for the combined pollution load from the hydrologic unit.

If the baseline monitoring period exceeds a year, the applicant can select the consecutive monitoring period to be used in establishing the baseline pollution load to ensure that seasonal low-flow or high-flow conditions are not over-represented or under-represented. More than 12 months can be used, but the results must be from consecutive months. For example, a baseline period of two high-flow seasons and one low-flow season would not be advantageous – extending the sampling period to obtain more typical values may be warranted. It is imperative that the application clearly documents which dataset was used to establish the baseline.

### **Calculating the Pollution Load**

Pollution load is the quantity of a specific pollutant being discharged, expressed in terms of mass/time. The loading rate in pounds per day can be obtained using the following formula:

$$\text{Pollution Load (lbs/day)} = \text{Concentration (mg/L)} \times \text{Flow (gals/min)} \times 0.01202^*$$

\* *A constant used for unit conversion.*

### **Substitution in Baseline Calculations**

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<sup>5</sup> To minimize runoff-influenced volume in streams, samples should be taken at least 2 days after a storm event. (Hittle, E., and Risser, D.W., 2019, Estimation of base flow on ungedged, periodically measured streams in small watersheds in western Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2018–5150, 42 p. <https://doi.org/10.3133/sir20185150>) The two-day window may not be applicable for tunnel discharges or large streams that drain extensive areas.

The updated remining regulations<sup>6</sup> allows for substitution of best available technology economically achievable (BAT) limits in calculating the baseline when the sample is below the daily maximum effluent limits established in §§87.102, 88.92, and 90.102. Therefore, the permittee would not be held to standards more stringent than a non-remining permit.

For example, if an applicant is calculating the baseline triggers for iron, but only 3 of 12 samples collected in the water year are above the 6 mg/L daily maximum limit (see Table 1), use of the sampled values would result in a calculated trigger that is more stringent than the BAT effluent standards.<sup>7</sup>

In this example for iron, the applicant should replace any baseline value that is below the daily maximum limit of 6 mg/L with this value. For manganese, any baseline value that is below the daily maximum limit of 4 mg/L should be replaced with this value. There is no baseline substitution for aluminum, as it has no BAT limit. For net acidity (acidity minus alkalinity), the technology-based limit is 0, so when the net acidity is negative, 0 should be used for the substitution.

**Table 1: Substitution Example: Iron**

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Original	1.52	0.35	0.27	0.43	0.54	0.55	2.63	6.3	7.6	6.0	2.36	3.66
Substitute	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.3	7.6	6.0	6.0	6.0

The substitution is applicable for new permit applications and can be applied to existing remining permits. An existing remining permit may have more stringent monthly and annual triggers as compared to a permit that would be issued under the new regulations. For this reason, an existing permittee may request to reestablish the baseline.<sup>8</sup> This is a permit correction as defined by §§87.203(a)(2), 88.503(b)(2), and 90.303(a)(2). (See section *Permit Revisions*.) This only applies if the original data used to establish the baseline is acceptable for use.

Substitution should not be applied in the following situations:

- the parameter does not have a BAT limit (*e.g.*, aluminum),
- for post-mining review calculations,
- when determining compliance with monthly and annual triggers,
- in calculating the interquartile range as required in the Method 1 annual trigger<sup>9</sup>
- in calculating the Method 2 monthly trigger<sup>10</sup>

<sup>6</sup> 25 Pa. Code §§87.211(e), 88.511(e), 90.311(e)

<sup>7</sup> 25 Pa. Code §§87.210, 88.510, 90.310

<sup>8</sup> 25 Pa. Code §§87.203(d), 88.503(d), 90.303(d)

<sup>9</sup> 25 Pa. Code §§87.213(b)(3), 88.513(b)(3), 90.313(b)(3)

<sup>10</sup> 25 Pa. Code §§87.212(d)(3), 88.512(d)(3), 90.312(d)(3)

If substitution is used repeatedly so that it results in many “ties” in ranking, Method 2 is unsuitable for that dataset and Method 1 should be used<sup>11</sup>.

## Method 1 vs Method 2

The remaining regulations allow for an applicant to select one of two methods to calculate the monthly and annual triggers - Method 1 or Method 2. Method 1 is what has been used in the past in Pennsylvania’s Remining Program. Method 2 has been added to Pennsylvania’s regulations to allow greater flexibility to a remining permit applicant. The Method 1 monthly trigger uses a statistical method that determines the tolerance interval of the 95th percentile above the median and compares that value with the sample under evaluation. The Method 2 monthly trigger is a nonparametric estimate of the 99th percentile of loadings. The monthly trigger in both methods is based upon progressively separating the dataset by the medians.

The Method 1 annual trigger compares the baseline with one year’s monitoring data for loading using the 95th percentile confidence interval for the median of each data set. The Method 2 annual trigger uses the Wilcoxon-Mann-Whitney test to compare the baseline and monitoring year being evaluated. The Wilcoxon-Mann-Whitney test uses ranking (from low to high) of all the data under evaluation. Therefore, it does not produce a value for the annual trigger beforehand as does the Method 1 approach because an entire year’s worth of data (each year after mining begins) is needed to calculate it. Method 2 compares the baseline sum of ranks to a critical value to determine exceedance. This comparison denotes if the data set passes or fails to meet the baseline values. The annual trigger value produced using Method 2 will be different every year and cannot be specified as a distinct number in the permit.

A common issue that applicants encounter is how to address zero flow that occurs during the baseline collection period. Zero flow represents zero load for that sample date and should be included with the baseline data. When the baseline sampling data has many “no flow” measurements, it produces many “ties” of rank. That makes Method 2 unsuitable for use with such data sets.

The EPA REMSTAT user manual provides a more detailed description of the statistical methods. The manual recommends the use of Method 1 in most cases but points out that Method 2 provides some protection against false positives and may be less capable of detecting an increase above the baseline. Method 2 is more suitable for baseline datasets with a high variability (that is, a high Coefficient of Variation ( $CV < 1.25$ )). The applicant is advised to try both methods on the baseline data set and compare the results prior to application submittal.

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<sup>11</sup> The Method 2 annual trigger uses the nonparametric Wilcoxon-Mann-Whitney (or rank sum) test as an alternative to the traditional two sample t-test which assumes that the variable in question is normally distributed in the two group. In the Wilcoxon-Mann-Whitney test, the baseline and monitoring groups are combined, ranked from lowest to highest, and assigned a numerical value from 1 to the total number of samples in the group. For instance, if your first few numbers are 4, 6, 8, and 10; they would be assigned the numbers 1, 2, 3, and 4 respectively. In the event of a tie, 4, 6, 6, and 10, the ranking would be 1, 2, 3, and 4, but you can’t have the same number be ranked higher or lower, in this case the 6. Instead the ranks of the tie are averaged, so in this example the assigned numbers would be 1, 2.5, 2.5, and 3 (since  $2 + 3 = 5$  and  $5/2 = 2.5$ ). Because the Wilcoxon test is based on ranks, the existence of so many ties makes it difficult to find a p-value.

Whichever method is selected, the same method must be used for both the monthly and annual triggers throughout the life of the permit.

## PERMITTING AND MONITORING

The critical component of all Subchapter F/G permits are the Best Management Practices (BMPs) that comprise the Pollution Abatement Plan. **The Pollution Abatement plan is incorporated into the permit as an effluent limit.** Because progression and completion of the pollution abatement plan must occur as approved for the permit to be in compliance, the permittee will be required to document the implementation of the BMPs, and these are also confirmed by the mine inspector. Documentation requirements are incorporated in the permit conditions and submitted by the permittee in an annual report.

As noted in the next sections describing the three-tier approach, emphasis on BMPs becomes more prominent when the utility of monitoring points is reduced.

### Three-tier Approach

Protection under Subchapter F/G can be applied in three ways in a tiered manner:

1. Individual points and hydrologic units
2. In-stream
3. BMP only

The applicant must justify why they cannot use option 1 in order to use option 2 – in-stream. Subsequently, to use option 3 – BMP only, they must have justified why they cannot use options 1 and 2. The following sections describe each tier and their sampling and reporting requirements.

#### Tier 1: Individual points and HU

The most common and “traditional” approach is to collect data to establish a baseline pollution load at the various pre-existing pollutorial discharges or hydrologic units. This approach is required unless the applicant demonstrates under the criteria in §§87.210(d)(4), 88.510(d)(4), and 90.310(d)(4), and DEP determines both of the following: a.) it is infeasible to collect samples of the discharges to establish a baseline and, b.) that remaining will result in significant improvement.

Upon issuance of the permit, the operator samples all points monthly and calculates loadings for individual points or hydrologic units as specified in the permit. A quarterly monitoring report is submitted (via email) to the DMO that includes sample results. An evaluation of whether degradation has occurred is determined each quarter using the monthly trigger applied to each sample. An annual report is submitted that includes 1.) an analysis of the years’ worth of data compared to the annual trigger, and, 2.) an operations progress report with details on mining activities and BMP implementation. The annual report can be submitted together with the

corresponding quarterly report. The annual report date should coincide with a year after permit issuance.

### Tier 2: In-stream

If it is infeasible to collect samples of the individual discharges (for example, there are multiple tiny seeps that appear in a general area or within the stream), then the applicant can establish an in-stream baseline concentration (mg/L) instead of loading (lbs/day) at a suitable point downstream of the remaining operation.<sup>12</sup> The applicant must demonstrate why Tier 1 is not feasible. If individual, discrete points can be monitored, the Tier 1 option is likely the appropriate option.

If Tier 2 is applicable, based on discussions with the DMO, the applicant collects twice-a-month samples for a year at the designated in-stream monitoring points and generates the baseline statistics for each point. One or more upstream monitoring points will also likely be required for comparison if the stream section being sampled is not the headwaters.

Upon issuance of the permit, the operator samples concentrations at least monthly (twice-monthly is recommended). A quarterly monitoring report is required. This quarterly report includes sample results, and an operations progress report including details on mining activities and BMP implementation. An evaluation of whether degradation has occurred at the downstream point is determined each quarter using the monthly trigger and on an annual basis applying the annual trigger. Graphing the data and looking for trends is an effective method of evaluating this data. The Tier 2 approach is unique to Pennsylvania and has not been widely applied as of this publication. The regulations do not specify the details on the implementation of this option. Therefore, the DMO and the operator should agree upon a suitable monitoring protocol and plan for assessing potential degradation depending on the specific circumstances of the site and other potential influences on stream quality. This may include an agreement to initiate weekly sampling if two consecutive samples exceed the established trigger. As with Tier 1, the operator is expected to pre-emptively acknowledge and address a result that indicates degradation has occurred. The operator will be provided the opportunity to demonstrate that their remaining was not the cause of the degradation through additional information regarding individual discharge sampling, precipitation data, or evidence of another stream impact to account for the change. If the operator cannot demonstrate this, pollution abatement measures must be undertaken.

The operator submits an annual analysis that includes calculations that compare the data from the previous water year to the established baseline and triggers for each point. This assessment is to ascertain if there has been a statistically significant change in in-stream water quality at each

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<sup>12</sup> This in-stream option is unique to Pennsylvania and is not offered under the federal requirements. It is intended to encourage additional remaining for complex sites but introduces unique challenges for establishing a viable baseline and for useful monitoring during mining activities. A test project, Project XL, conducted by the Department from 2000-2009, determined that this in-stream monitoring of concentration data, where applicable, was just as effective at indicating success or failure of pollution abatement as the individual discharge baseline pollution loadings process traditionally used for Subchapter F/G permits.

point or if there has been improvement or degradation based on the triggers from the established baseline.

A Tier 2 permit will have special conditions that detail the specific monitoring and reporting requirements.

### Tier 3: BMP only

Finally, if the applicant demonstrates that in-stream monitoring would not be indicative of the impact of the remining operation, DEP may waive the requirement based on the criteria in §§87.210(d)(5), 88.510(d)(5), and 90.310(d)(5). If the waiver is granted, the only effluent limitation is the pollution abatement plan established in the application in place of numerical effluent limits.

Without numerical effluent limits, it is particularly important that the applicant and DEP are confident in the efficacy of the proposed BMPs and that the pollution abatement plan is sufficiently robust to assure significant improvement following the remining operation. A useful reference for remining BMPs is the EPA Coal Remining – Best Management Practices Guidance Manual (EPA-821-B-01-010).

Sampling may not be required with the Tier 3 option. Quarterly and annual reporting will require detailed tracking of the progress of all BMPs for the permit. Failure to progress in BMP implementation on schedule will be a violation of the permit.

### **TMDL Watersheds**

Remining is part of the implementation strategy of most TMDL reports. The pollution from the pre-existing discharge is typically included in the load allocation (LA) of the TMDL. To accommodate a new remining permit, a TMDL may need to be revised. In a case where treatment is triggered, the discharge must be permitted with an assigned waste load allocation (WLA). Most TMDL reports require revision to re-assign LAs to WLAs.

### **Effluent Limits**

The effluent limits include narrative and numerical components. The BMPs that comprise the pollution abatement plan are the narrative limits. The permittee is required to follow this plan.

Numerical effluent limits are determined by the baseline dataset and are represented by the trigger values. The permittee cannot exceed baseline loadings in accordance with §§87.210(c)(1), 88.510(c)(1), and 90.310(c)(1).

The monthly trigger produces a meaningful number that can be used to quickly compare to monitoring sample results as opposed to the annual trigger that requires some calculations to compare. The monthly trigger is designated as the instantaneous maximum effluent limit - a daily maximum and a monthly average no longer apply. The monthly trigger also represents the limit the operator needs to treat to if treatment is triggered.

The annual trigger represents a more subtle exceedance of the baseline. It may indicate the quality trend will be getting worse.

Six consecutive exceedances of the monthly trigger (2 monthly samples followed by 4 weekly samples) requires treatment. Treatment liability ends when the water quality does not exceed either trigger.

### **Exceeding triggers and accelerated sampling**

If two consecutive monthly samples exceed the monthly trigger, the permittee commences weekly (accelerated) sampling for at least four weeks.<sup>13</sup> Accelerated sampling need only be done for the constituent exceeded. However, it is to the permittee's benefit to include all constituents to provide information that may prove useful in determining cause or treatment options.

There are three possible outcomes after the initial weekly sampling:

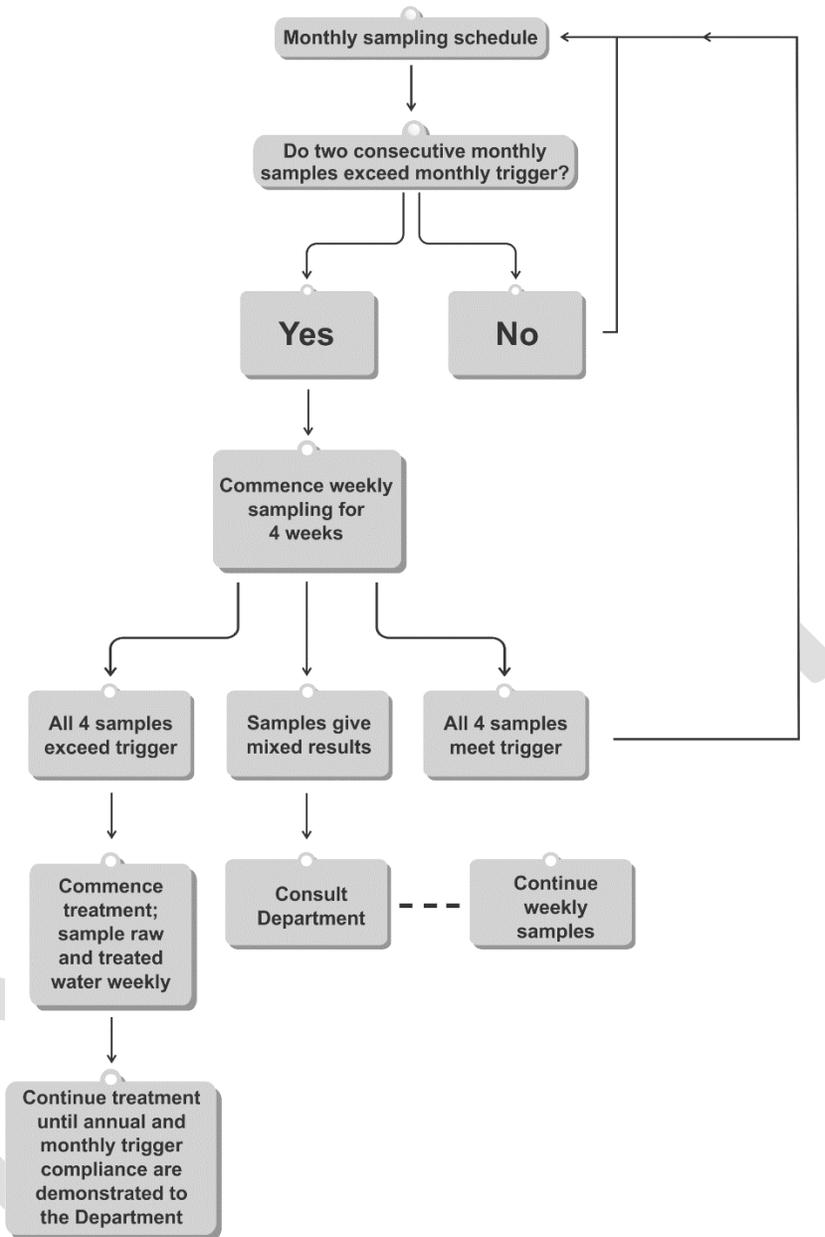
1. If all 4 weekly samples exceed the trigger, treatment must commence.<sup>14</sup>
2. If the sample results are mixed regarding meeting the trigger, weekly sampling likely continues to further discern the next step. See further details below.
3. If all samples are below the triggers (or if 3 out of 4 of the samples meet the trigger, with caveats, see below), the monthly sampling schedule resumes.

Refer to Figure 3 for a flowchart of the scenario of accelerated sampling.

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<sup>13</sup> 25 Pa. Code §§87.212(c)(1), 88.512(c)(1), 90.312(c)(1)

<sup>14</sup> 25 Pa. Code §§87.207(g) 88.507(g), 90.307(g)



**Figure 3.** A schematic of typical sampling scenario where the monthly sampling results are evaluated for exceedance of the single (monthly) trigger.

The section on *Operational requirements* (§§87.206, 88.506, 90.306) requires that weekly sampling continue until at least two consecutive weekly samples are below the trigger. However, the section on *Procedure for calculating and applying a single-observation (monthly) trigger* allows for resuming monthly monitoring if “three or fewer” of the 4 samples exceed the trigger.<sup>15</sup> This language originated in the federal regulations for remining, but the Department acknowledges it is not altogether consistent. It is not recommended to resume monthly monitoring if only 1 of the 4 weekly results meets the trigger because a reasonable conclusion

<sup>15</sup> 25 Pa. Code §§87.212(c), 88.512(c), 90.312(c)

would be that the baseline is still being exceeded. Therefore, the criteria to judge the set of weekly samples includes the following:

1. Two consecutive samples do not exceed the trigger.
2. If 2 or 3 of the 4 samples exceed the trigger, the operator must consider the degree of exceedance as well as when it occurred (early or late in the weekly cycle).
3. Consideration of conditions such as activity related to the pollution abatement plan or weather situations that may have contributed to the exceedances.

If the weekly samples are ambiguous about whether the baseline is being met, the operator should continue weekly samples and evaluate them on a rolling 4-week period. Two consecutive samples that meet the trigger may signal that the baseline is being met. The operator should consult the Department regarding the results.

Without exceeding the monthly trigger with any sample, it is possible for the annual trigger to be tripped. This may indicate a potential trend due to the remining and the operator must take action to address the exceedance. This may mean additional BMPs, a change in operations, or employing treatment for the exceeding parameter. The operator should prepare a plan in writing and discuss it with the DMO prior to the next quarterly submission after discovering the annual trigger is tripped. It is the operator's responsibility to determine if the annual trigger is tripped and bring this to the attention of the DMO as soon as it is discovered. The results are reported to the DMO in writing with the annual report. The permittee is required to review the sample results promptly upon receipt to determine if an exceedance of the baseline (effluent limits) has occurred. That is, if the Department determines that the baseline has been exceeded through the submission of a quarterly report, the permit is in violation. Under §§87.206, 88.506 and 90.306, it is a violation if the permittee fails to notify the Department when more frequent sampling is required due to an exceedance. It is also a violation if the permittee fails to conduct accelerated sampling when required.

## **Treatment**

When the monthly trigger is exceeded in the 4 weekly samples, the operator commences treatment and continues weekly sampling of the raw and treated water to gauge compliance. If the raw water samples show that the baseline is no longer being exceeded without treatment (in at least 2 consecutive weekly samples), the operator must consult with the Department, provide a reassessment of the progress in the pollution abatement plan, and provide a demonstration that the monthly and annual triggers are being met before the treatment obligations can be lifted. See §§87.207, 88.507 and 90.307.

If the annual trigger is tripped, treatment is likely required to address the exceedance, so the operator treats to achieve water quality to *at least* the monthly trigger value as the instantaneous maximum and re-calculates the annual trigger using a rolling year for each quarter (the previous 12 months of samples) to determine if the annual trigger is no longer tripped. However, treating just to this trigger may not be enough to regain compliance under the annual trigger and more

may need to be done. The operator should consult with the Department at least quarterly to manage an exceedance of the annual trigger.

The operator can discontinue treatment if they can demonstrate to the Department that they did not cause or allow the degradation by the remining activity.<sup>16</sup>

When a treatment facility is required, the permittee will be required to submit a treatment plan as a permit revision along with a revised NPDES permit to include the new treatment outfalls.

### **Permit revisions**

Remining permits establish site-specific limits prior to the start of mining. The baseline data cannot be revised after mining in the pollution abatement area has begun. However, statistical reevaluation of the pre-mining baseline may be justified. And, additional baseline data can be considered after permit issuance but prior to commencement of mining.

An existing permittee who does not have Subchapter F/G authorization may request a permit revision to add Subchapter F/G protection only if they can demonstrate they meet the requirements of applicability (§§87.203, 88.503, & 90.303). This would constitute a major permit revision and require public notice.

Because of the contingencies that are inherent in the authorization of a permit under Subchapter F/G, a permittee should discuss any potential permit revisions with the Department when these changes involve changes to the pre-existing discharges, their baseline calculations or the pollution abatement areas. The following are provided as examples of when a permit revision is or is not applicable.

New discharge appears (Major revision): A permittee has been issued a standard mining permit (without Subchapter F/G) and, while preparing to commence the mining operation, they notice a seep emanating from a hillside. After sampling the seep, it is determined to have an AMD-signature and does not meet the effluent limits of §§87.102, 88.92 and 90.102. The permittee could submit a major permit revision to the Department that must include the following: 1.) demonstration that the operator has not caused or contributed to a newly discovered pollutional discharge, 2.) the proposed pollution abatement area has not already been affected by surface mining activities, 3.) the proposed pollution abatement area is not hydrologically connected to an area where surface mining activities have been conducted, and 4.) mining approval has not already been granted for that area. Upon approval, the permit would be revised to grant Subchapter F/G protection.

Deleting unaffected area (Minor or Major revision): If a permittee has not affected area that is or is not part of the pollution abatement plan and wishes to delete this area, a minor permit revision may be recommended by the Department. Other changes may require a major revision dependent upon the extent of the proposal. Removal of remining areas from the permit may subsequently

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<sup>16</sup> 25 Pa. Code §§87.207(d)(4), 88.507(d)(4), 90.307(d)(4)

disqualify the permittee from Subchapter F/G coverage.

Corrections to the baseline calculations can be made to an issued Subchapter F/G permit under some circumstances. Recalculation of the baseline to reflect consideration of hydrologic units, to fix a calculation error, or to apply substitution to the original baseline data, is considered a permit correction, not a major revision under 25 Pa. Code § 86.52, as it does not fundamentally alter the authorization that was granted upon meeting the requirements of applicability.<sup>17</sup>

Recalculating baseline (Correction/Minor revision): If a permittee obtains a remining permit, but prior to commencing the remining activity, a monthly sample result exhibits an exceedance of the monthly trigger, then the permittee can decide to recalculate the baseline using the additional sampling period and establish new monthly and annual triggers. This correction is justified as the permittee is allowed to characterize the baseline prior to mining.

Re-establishing a hydro unit (Correction/Minor revision): If a permittee obtains a remining permit and after commencing the mining activity, two of the identified discharges go dry while the volume triples at a third identified discharge. The permittee determines that the three discharges are related and decides to treat these as a hydrologic unit. The permittee uses the data collected during the baseline to establish a hydrologic unit that comprises these three discharge points and submits it to the Department for approval.

Revising for substitution (Correction/Minor revision): If a permittee has an existing remining permit but did not utilize the substitution method when originally establishing the baseline as per §§87.211(e), 88.511(e) and 90.311(e), they can recalculate the baseline as long as the requirements of §§87.203(d), 88.503(d) and 90.303(d) can be met. The substitution method results in a fair set of effluent limits that ensures that the Subchapter F/G limits are no more stringent than those established in §§87.102, 88.92 and 90.102.

## **BOND RELEASE**

The specific criteria for bond release are included in §§87.209, 88.509 and 90.309. The operator must not have caused degradation of the baseline pollution load for a period of at least 12 months prior to the submittal of request for bond release (6 months for Stage 1). Because both triggers represent degradation of the baseline pollution load, this requirement necessitates a review of the annual and monthly triggers for this time period for the bond release request. The annual trigger test requires a year's worth of monthly samples. Therefore, all Subchapter F/G monitoring points must be sampled at least once a month when the site is in Active status and continuing until Stage 2 bond release is approved by the Department.

### Stage 1

The permittee must demonstrate implementation of each step of the pollution abatement plan and must not have tripped either trigger in the past 6 months. This is a two-pronged test: 1.) no sample in the last 6 months has tripped the monthly trigger, 2.) the annual trigger test with a year's worth of data

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<sup>17</sup> 25 Pa. Code §§87.203, 88.503, 90.303

must have been done within the past 6 months to show no degradation. The permittee must also demonstrate that the remaining has not caused or contributed to surface water pollution or groundwater degradation, in general.

## Stage 2

At this stage, the permittee must demonstrate the pollution load has improved from the original baseline or that it has not been made worse in the past 12 months. Practically, it may be difficult to determine if the discharges were made better or are essentially unchanged. But generally, bond release is approvable if triggers were never tripped (at least no trips within the last year), and the permittee has completed all the pollution abatement BMPs as described in the permit.

Once Stage 2 bond release for all portions of the pollution abatement area has been authorized, the DMO may approve a reduction in the frequency of monitoring on the Subchapter F/G monitoring points. A written request is required to change or modify the water monitoring plan in order to initiate a reduction in monitoring frequency. The DMO approves, in writing, any request to reduce the monitoring frequency. In order to comply with §§87.209(c)(3), 88.509(c)(3) or 90.309(c)(3), sampling must be resumed prior to the Stage 3 request so that there is a full water year of data available. A date flag should be noted for the permittee so that they resume sampling in time to avoid delay of applying for Stage 3 release.

## **Reduction in Monitoring Frequency**

Permittees have, in the past, requested a reduction in monitoring frequency from monthly to quarterly for Subchapter F/G points after mining is completed. The Department has determined that the regulatory requirements and the timing of the bond release schedule do not allow for an opportunity to reduce monitoring. For each stage of bond release, the permittee must demonstrate that they are in compliance with both triggers (note that the annual trigger always requires at least 12 months of data) to demonstrate they have not caused degradation of the baseline pollution load. For final bond release, the permittee must demonstrate they have not caused degradation from the time of Stage 2 release or, if treatment had subsequently been initiated, for 5 years after discontinuation of that treatment. See §§ 87.209 (c)(3), 88.509(c)(3) and 90.309(c)(3). In order to show compliance with the no degradation requirements, a reduction in monitoring frequency is not feasible. The Department may consider reduced monitoring frequency only in extenuating circumstances, such as a legal dispute, that delays bond release. Several factors will be considered for this exception including the consistency of the sample results, previous exceedances, and any trends of pollutional load. Permittees must always resume monthly sample for at least a year to make a valid demonstration of compliance with the annual trigger.

## Stage 3

In order to demonstrate compliance with baseline for final bond release, the permittee must submit a year's worth of data and run the test on both triggers.

Note that the permittee may not exceed the annual or monthly triggers in order to obtain bond

release. A change in flow following remining may cause the discharge to exceed the baseline pollution load and require treatment, even though the concentrations meet effluent limits and would otherwise be eligible for bond release.

If the permittee meets the monthly but not the annual trigger during these tests for Stage 3 release, the bond cannot be released. The operator can submit a plan to address the baseline exceedance and sampling must continue.

If treatment is triggered after a Stage 2 release, the five-year clock starts **after treatment is discontinued**.

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