Appendix C:

Hosensack Creek Macroinvertebrate Survey

ATTACHMENT 14.3(a)(3)

Hosensack Creek Macroinvertebrate Survey
Prepared by
Normandeau Associates, Inc.

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27 November 2006

John R. Ross, P.E.
EarthRes Group, Inc.
P.O. Box 468
Pipersville, PA 18947

VIA EMAIL: jross@earthres.com

SUBJECT: Hosensack Creek Macroinvertebrate Survey
Normandeau Project No. 20800.000

Dear John:

This letter reports the results of Normandeau's investigation of the of the benthic macroinvertebrate community in Hosensack Creek and two tributaries near the Geryville Materials (GM) site in order to determine if any of these streams are likely candidates for upgrade to High Quality (HQ) or Exceptional Value (EV) streams. One figure and 6 data tables are included in this report.

The Pennsylvania Department of Environmental Protection determines the suitability of streams for upgrade to HQ or EV status using macroinvertebrate community evaluation procedures currently applied in the Department's Antidegradation Program. These evaluation procedures are published in the Department's Water Quality Antidegradation Guidance, Document No. 391-0300-002, Effective Date 29 November 2003. Previously, the methodology, including modifications, was confirmed with Mr. Tony Shaw in the Department's Division of Water Quality Standards in Harrisburg. Normandeau followed the Department's evaluation procedures in its investigation.

Benthic macroinvertebrate samples were collected at three stations in Hosensack Creek and in two tributaries (Figure 1). A benthic macroinvertebrate sample also was collected at one station in a Department EV reference stream (Pine Creek) in Berks County, approximately 13 miles from the GM site. Location of the sample stations is as follows:

In Hosensack Creek and two tributaries:

Station 1 Immediately upstream of the PA Route 29 bridge. Latitude: N40° 25' 29.6"; Longitude: W 75° 31' 35.0"

Station 2 In Hosensack Creek approximately 0.41 mile downstream of the Hosensack Road bridge. Latitude: N40° 26' 1.1"; Longitude: W 75° 30' 57.5"

Station 3 In Hosensack Creek, approximately 0.13 mile upstream of the Hosensack Road bridge. Latitude: N40° 26' 25.6"; Longitude: W 75° 31' 01.2"

Station 4 In a tributary on the GM site, approximately 0.66 mile upstream of the confluence with Hosensack Creek. Latitude: N40° 26' 21.4"; Longitude: W 75° 30' 15.9"

Station 5 In a tributary flowing parallel to West Mill Hill Road, approximately 0.34 mile upstream of the confluence with Hosensack Creek. Latitude: N40° 26' 25.7"; Longitude: W 75° 30' 37.6"

In Pine Creek, immediately upstream of the abandoned Deysher Road bridge near Lobachsville, PA - Latitude: N 40° 24' 43.3"; Longitude: W 75° 44' 01.4"

Normandeau collected macroinvertebrate samples at all of the stations on 25 October 2006. The weather was partly cloudy to clear. With no rain in the past several days, water in the subject streams was clear and the level was considered normal.

Water quality at each station was measured using a Horiba field instrument. The results of measurements of temperature, dissolved oxygen, and specific conductance are shown in Table 1. In general, the measurements were similar, with the water well-oxygenated at all stations. However, specific conductance, a measure of the number of ions present, was reduced in Pine Creek, compared to Hosensack Creek and its tributaries.

Stream habitat at each station was characterized using assessment methods presented in the U.S. Environmental Protection Agency's *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish* (EPA 841-B-99-002). In short, 10 parameters describing the habitat were assessed on a scale from 0 to 20, where 20 is the best score.

The scoring results of the habitat assessment are shown in Table 2. Tributary Station 5 scored the least because of relatively poor quality substrate in the riffles and pools as well as pool variability and sediment deposition. The other stations clustered together with Hosensack Creek Station 1 at the low end due to lower scores for several habitat parameters.

Six 0.33-square meter macroinvertebrate kick samples were collected in riffle habitat at each station to yield one composite sample per station. A D-frame dipnet with 0.500 mm mesh was used in the sample collection effort and the individual samples were collected throughout each station. All samples were preserved in 70% isopropanol.

In Normandeau's laboratory, a 200-specimen subsample was sorted from each stream sample. The macroinvertebrates in each subsample were identified to genus in all cases, except for midges (Chironomidae) and worms (Oligochaeta).

The results of the laboratory analyses are shown in Table 3. Five metrics that describe the macroinvertebrate data obtained for each sample were computed and are shown in Table 4. These metrics are part of the data evaluation process used in determination of a stream's status as HQ, EV or non-HQ or EV. Computation of these metrics and use of them in stream status determination followed procedures presented in the Department's Antidegradation Implementation Guidance document.

In the data evaluation process, the metrics computed for each Hosensack Creek or tributary (the candidate stream) station's macroinvertebrate sample were compared to those computed for the Pine Creek (the reference stream) station's macroinvertebrate sample. The results of these candidate stream station to reference stream station comparisons were used to award a point score to the candidate stream station for each metric. The point scores were awarded according to a table entitled Biological Condition Scoring Criteria, which appears in Appendix A of the Department's Antidegradation Implementation Guidance document. The scores for all metrics were summed in order to obtain the candidate stream station's total score. In turn, this total score was divided by 40 (the maximum possible total score), in order to obtain the percent of reference. The metric scoring and associated computations are shown in Table 5.

At the end of the stream status data evaluation process, the computed percent of reference was compared to a series of threshold values in order to distinguish between HQ, EV, and non-HQ or EV status. The results of this effort are summarized in Table 6. The data indicate that none of the Hosensack Creek or tributary stations qualified for HQ or EV status, although tributary Station 4 came close to qualification as HQ. Most of the stations clustered relatively close together in the scoring, with tributary Station 5 scoring substantially less than the others.

Despite their failure to qualify for HQ or EV status, it should be noted that the Hosensack Creek stations and tributary Station 4 support substantial and taxonomically diverse macroinvertebrate communities. In fact, these stations failed only because a larger number of taxa, including EPT taxa, were collected in Pine Creek. EPT taxa are the mayflies (Ephemeroptera), stoneflies (Plecoptera), and caddisflies (Trichoptera) that are generally considered intolerant of poor water quality or habitat conditions.

Although not part of the present HQ/EV status investigation, it is noted that PADEP sampled macroinvertebrates on 9 December 1992 at two locations in Hosensack Creek between Normandeau's Stations 2 and 3 as part of an assessment of impact of an endosulfan spill earlier that year. These stations are shown in Figure 1. PADEP's samples contained more taxa, including more EPT taxa, than those collected in Normandeau's investigation. This disparity may be the result of a difference in sampling technique and/or in-stream changes over the 14-year period between sample dates. PADEP's report stated that "Hosensack Creek was judged to be nearly 100% recovered from the endosulfan spill".

PADEP also sampled fish by electrofishing at the two stations where macroinvertebrate samples were collected, and at a third Hosensack Creek location near its confluence with the Perkiomen Creek (Figure 1). A total of 15 warmwater species were captured at the three stations. In addition, a number of brown trout that were considered to be wild were captured at each station.

The PA Fish and Boat Commission also sampled fish at several locations in Hosensack Creek in 1983 and 2000 (Figure 1). Brown trout were captured at all of the stations. I have not received any information from the Commission concerning other Hosensack Creek fisheries investigations. I will notify you if other data are available.

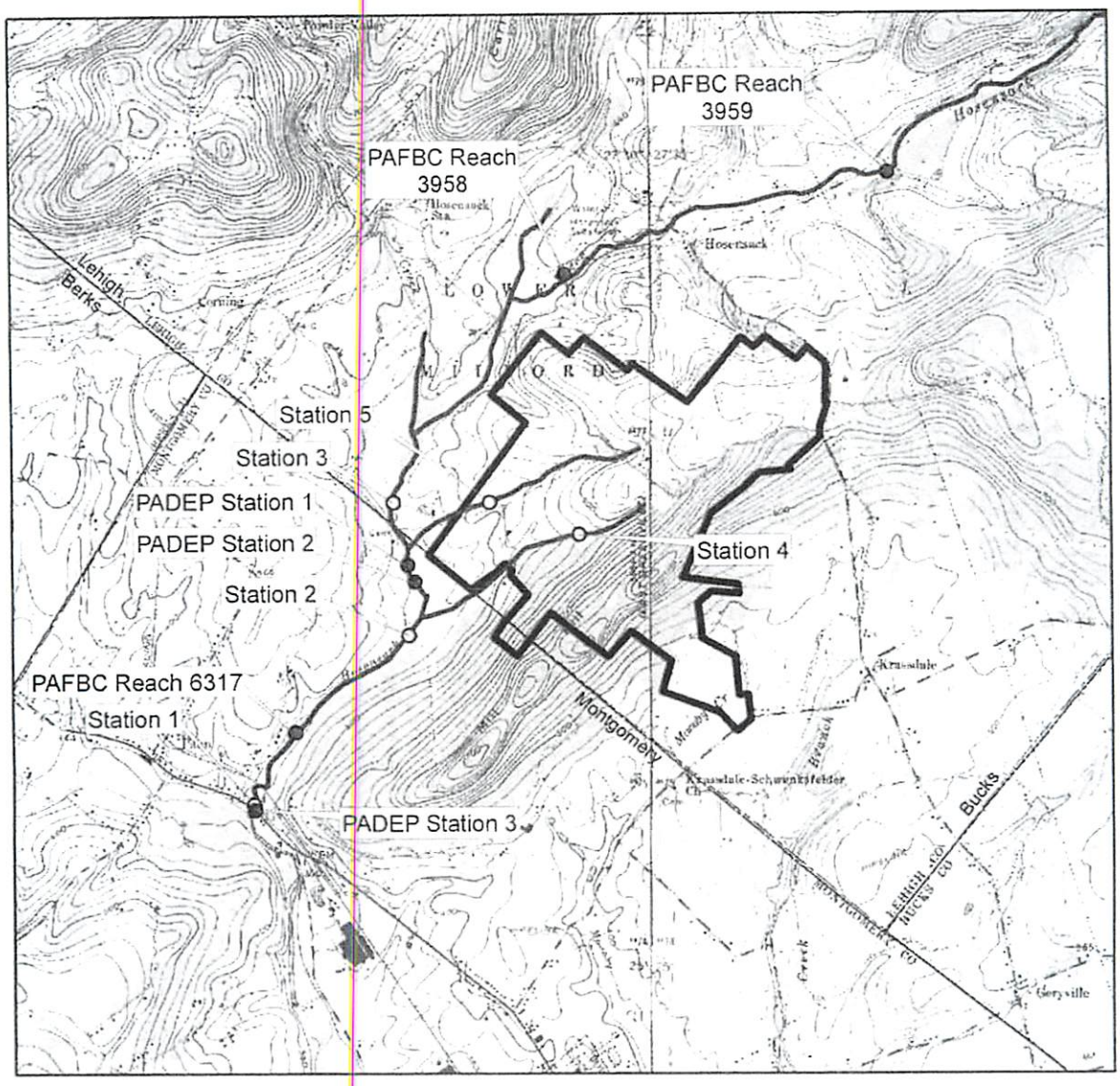
I trust that this letter report provides a good description of the effort. Please do not hesitate to call (302-945-3567) or email (wettinger@normandeau.com) me with any questions that you may have. I thank you for the opportunity to perform this work.

Sincerely,

William S. Ettinger
Principal Aquatic Ecologist

mke

Attachments: Figure 1 and Tables 1-6



Legend

Station 1 - Normandeau Associates sample stations (25 October 2006)

PADEP Station 1 - PA Department of Environmental Protection sample stations (9 December 1992)

PAFBC Reach 3959 - PA Fish and Boat Commission sample reaches 3958 and 3959 (28 July 1983) and 6317 (10 July 2000)

Source:
USGS East Greenville, PA Quad
USGS Milford Square, PA Quad

4 900 2 450 0 Feet

Figure 1.
Site Location Map
Geryville Materials
Lower Milford Township, Lehigh County

N

NORMANDEAU ASSOCIATES
ENVIRONMENTAL CONSULTANTS
400 Old Reading Pike Bldg A, Suite 101 Stowe, PA 19464

date 11/02/06
project 20800 000
prepared by: s sherman

rev date:
file name: 20800_sitelocation2
checked by: b ettinger

Table 1. Water quality measured at one reference station in Pine Creek and five candidate stations in Hosensack Creek and two tributaries on 25 October 2006.

Station	Temperature (°C)	Dissolved Oxygen (mg/l)	Specific Conductance (microsiemens/cm)
Pine Creek	9.5	12.0	117
Hosensack Creek and tributaries			
Station 1	7.6	12.3	247
2	9.4	14.4	245
3	9.3	14.0	247
4	8.7	11.2	273
5	9.7	10.6	288

Table 2. Habitat assessment[1] summary for one reference station in Pine Creek and five candidate stations in Hosensack Creek and two tributaries on 25 October 2006.

Habitat Parameter	Pine Creek	Hosensack Creek/Tributary Station				
		No. 1	No. 2	No. 3	No. 4	No. 5
Epifaunal Substrate/ Available Cover	19	18	19	19	19	12
Pool Substrate Characterization	19	15	17	17	19	12
Pool Variability	19	15	18	18	19	8
Sediment Deposition	19	16	18	18	19	8
Channel Flow Status	19	18	19	19	19	16
Channel Alteration	19	18	19	19	19	16
Channel Sinuosity	14	15	15	15	19	18
Bank Stability						
Left Bank	9	8	9	9	9	8
Right Bank	9	8	9	9	9	8
Vegetative Protection						
Left Bank	9	8	9	9	9	8
Right Bank	9	8	9	9	9	8
Riparian Vegetative Zone Width						
Left Bank	7	8	9	9	8	8
Right Bank	9	8	9	8	9	8
Total Score	180	163	179	178	186	138

[1] U.S. EPA. 1999. Rapid Biooassessment Protocols For Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish. Second Edition. EPA 841-B-99-002. (http://www.epa.gov/OWOW/monitoring/techmon.html)

Table 3 Macroinvertebrate data[1] collected at one reference station in Pine Creek and five candidate stations in Hosensack Creek and two tributaries on 25 October 2006

Taxon	Tolerance Value[2]	No Collected at Station: Pine Creek No	Pine Creek Percent	Hosensack Creek No 1 No	Hosensack Creek No 1 Percent	Hosensack Creek No 2 No.	Hosensack Creek No 2 Percent	Hosensack Creek No 3 No	Hosensack Creek No 3 Percent	Tributary No 4 No	Tributary No 4 Percent	Tributary No 5 No.	Tributary No 5 Percent
Amphipoda (scuds)													
Crangonyx	4											3	1.5
Coleoptera (beetles)													
Optioservus	4			14	6.4	8	3.0	5	2.0			1	0.5
Psephenus	4	7	3.3	14	6.4	3	1.1	3	1.2				
Stenelmis	5			5	2.3	10	3.7	1	0.4			1	0.5
Decapoda (crayfish)													
Cambarus	6									1	0.5		
Diptera (flies)													
Antocha	3	3	1.4	1	0.5	1	0.4						
Chironomidae	6	35	16.5	22	10.1	40	14.9	18	7.4	25	12.3	84	40.8
Dicranota	3	4	1.9							1	0.5		
Hexatoma	2	2	0.9							10	4.9		
Palponyia	6											1	0.5
Simulium	6			14	6.4	4	1.5	12	4.9	1	0.5	11	5.3
Tipula	4	1	0.5			1	0.4			4	2.0	3	1.5
Ephemeroptera (mayflies)													
Baetis	6			2	0.9					5	2.5		
Ephemerella	1	3	1.4	3	1.4	1	0.4	2	0.8				
Isonychia	3	10	4.7	35	16.1	10	3.7	15	6.1				
Paraleptophlebia	1	4	1.9							7	3.4		
Serratella	2			1	0.5								
Stenonema	3	5	2.4	2	0.9	7	2.6	7	2.9	2	1.0		
Isopoda (sow bugs)													
Lirceus	8											56	27.2
Megaloptera (fishflies)													
Corydalus	4					1	0.4						
Nigronia	2	1	0.5	1	0.5			2	0.8				
Odonata (dragonflies)													
Ophiogomphus	1	2	0.9										
Oligochaeta (worms)	10	42	19.8	1	0.5	5	1.9	2	0.8				
Plecoptera (stoneflies)													
Acroneuria	0	1	0.5					1	0.4	2	1.0		
Agnetina	2			2	0.9					1	0.5		
Allocapnia	3	5	2.4	1	0.5	45	16.7	50	20.5	57	27.9	4	1.9
Haploperla	0	3	1.4					1	0.4				

Table 3. Continued.

Taxon	Tolerance Value[2]	No. Collected at Station: Pine Creek No	Pine Creek Percent	Hosensack Creek No. 1 No	Hosensack Creek No. 1 Percent	Hosensack Creek No. 2 No	Hosensack Creek No. 2 Percent	Hosensack Creek No. 3 No	Hosensack Creek No. 3 Percent	Tributary No. 4 No	Tributary No. 4 Percent	Tributary No. 5 No	Tributary No. 5 Percent
Plecoptera (continued)													
Paracapnia	1									26	12.7		
Paragnetina	1	3	1.4	2	0.9								
Pteronarcys	0	1	0.5										
Sweltsa	0	8	3.8							22	10.8		
Taeniopteryx	2	1	0.5										
Tallaperla	0	1	0.5							2	1.0		
Trichoptera (caddisflies)													
Cheumatopsyche	6	11	5.2	23	10.6	20	7.4	33	13.5			1	0.5
Chimarra	4	1	0.5	51	23.4	56	20.8	75	30.7			38	18.4
Diplectrona	0									21	10.3		
Dolophilodes	0	39	18.4			1	0.4	1	0.4	13	6.4		
Glossosoma	0	1	0.5			3	1.1						
Hydropsyche	5	15	7.1	19	8.7	49	18.2	15	6.1	2	1.0	2	1.0
Polycentropus	6	1	0.5										
Psychomyia	2	2	0.9										
Rhyacophila	1							1	0.4	2	1.0		
Tricladida (flatworms)													
Dugesia	9			5	2.3	4	1.5					1	0.5
Total		212	100.0	218	100.0	269	100.0	244	100.0	204	100.0	206	100.0
Metrics[3]													
Taxa Richness		28		20		19		18		19		13	
Modified EPT Index		16		8		7		9		11		2	
Modified Hilsenhoff Index		4.3		4.5		4.6		4.2		2.2		6.0	
Percent Dominant Taxon		19.8		23.4		20.8		30.7		27.9		40.8	
Percent Modified Mayflies		10.4		18.9		6.7		9.8		4.4		0.0	

[1] 200-specimen subsample

[2] Modified Hilsenhoff Index tolerance values (PADEP)

[3] Source: PADEP's Water Quality Antidegradation Implementation Guidance (29 November 2003)

Table 4. Metrics data for one reference station in Pine Creek and five candidate stations in Hosensack Creek and two tributaries.

Metric	Pine Creek	Hosensack Creek No. 1	Hosensack Creek No. 2	Hosensack Creek No. 3	Tributary No. 4	Tributary No. 5
Taxa Richness	28	20	19	18	19	13
Modified EPT Index	16	8	7	9	11	2
Modified Hilsenhoff Index	4.3	4.5	4.6	4.2	2.2	6.0
Percent Dominant Taxon	19.8	23.4	20.8	30.7	27.9	40.8
Percent Modified Mayflies	10.4	18.9	6.7	9.8	4.4	0.0

Table 5. Metric Scoring: Five Hosensack Creek and tributary candidate stations versus the reference station in Pine Creek.

Metric	Candidate Station	Reference Station	Comparison	Candidate Station Score
a. Candidate Station: Hosensack Creek Station 1 versus Pine Creek				
Taxa Richness	20	28	71.4	4
Modified EPT Index	8	16	50.0	1
Modified Hilsenhoff Index	4.5	4.3	0.2	8
Percent Dominant Taxon	23.4	19.8	3.6	8
Percent Modified Mayflies	18.9	10.4	-8.5	8
Total Score				29
Percent of Reference				73
b. Candidate Station: Hosensack Creek Station 2 versus Pine Creek				
Taxa Richness	19	28	67.9	3
Modified EPT Index	7	16	43.8	0
Modified Hilsenhoff Index	4.6	4.3	0.3	8
Percent Dominant Taxon	20.8	19.8	1.0	8
Percent Modified Mayflies	6.7	10.4	3.7	8
Total Score				27
Percent of Reference				68
c. Candidate Station: Hosensack Creek Station 3 versus Pine Creek				
Taxa Richness	18	28	64.3	2
Modified EPT Index	9	16	56.3	2
Modified Hilsenhoff Index	4.2	4.3	-0.1	8
Percent Dominant Taxon	30.7	19.8	10.9	8
Percent Modified Mayflies	9.8	10.4	0.6	8
Total Score				28
Percent of Reference				70
d. Candidate Station: Tributary Station 4 versus Pine Creek				
Taxa Richness	19	28	67.9	3
Modified EPT Index	11	16	68.8	5
Modified Hilsenhoff Index	2.2	4.3	-2.1	8
Percent Dominant Taxon	27.9	19.8	8.1	8
Percent Modified Mayflies	4.4	10.4	6.0	8
Total Score				32
Percent of Reference				80

Table 5. Continued.

Metric	Candidate Station	Reference Station	Comparison	Candidate Station Score
e. Candidate Station: Tributary Station 5 versus Pine Creek				
Taxa Richness	13	28	46.4	0
Modified EPT Index	2	16	12.5	0
Modified Hilsenhoff Index	6.0	4.3	1.7	0
Percent Dominant Taxon	40.8	19.8	21.0	1
Percent Modified Mayflies	0.0	10.4	10.4	8
Total Score				9
Percent of Reference				23

Table 6. Summary of the metric scoring and the corresponding stream classification[1] resulting from the Hosensack Creek and tributaries (candidate) versus Pine Creek (reference) comparison.

Hosensack Creek or Tributary	Percent of Reference	Classification
1	73	Existing Use
2	68	Existing Use
3	70	Existing Use
4	80	Existing Use
5	23	Existing Use

[1] Comparison of Candidate Score to Reference Score (Percent of Reference)

- Exceptional Value (EV) $\geq$ 92%
- High Quality (HQ) 83-92%
- Existing use or designated use (Non-HQ or EV) < 83%

ATTACHMENT 14.3(c)(1)

Wetland and Stream Monitoring Program
GM-2

Wetland and Stream Monitoring Program –GM-2

This Monitoring Plan has been developed for the Geryville Materials Large Noncoal Surface Mine Permit Application, specifically, the mining area GM-2. Implementation of the plan will provide the following information:

1. A baseline wetland vegetation study at specific locations in the delineated wetland areas that lie within the permit boundary area associated with the GM-2 mining area. See Exhibit 6.2: Environmental Resources Map.

2. An ongoing assessment of the presence/absence and evaluation of changes in wetland vegetation at the monitoring locations, including the effects, if any, of quarry dewatering, effects of supplemental flow from the quarry, climatic change, and changes due to the natural evolution of each wetland's environment.

3. An ongoing assessment of potential flow reductions resulting from quarrying and assessment of stream/aquifer interaction

This program will assist in determining the perennial/intermittent or ephemeral status of the stream and characterizing the interrelationships between the monitored features both before and during mining activities. The proximity of these features to the quarry pit ensures that potential impacts from quarry dewatering will be promptly identified.

Characterization and Monitoring of Vegetation in Wetlands:

- A vegetation monitoring transect will be installed at a location designated on the attached Exhibit 6.2: Environmental Resources Map.

- The proposed transect (e.g. WTF-1) will be surveyed and staked at approximate 50-foot intervals within Wetland F (with allowances for points that may fall in the stream channel or unvegetated wetland water features). Interval points will be marked as a monitoring station (e.g. WTF-1A, WTF-1B, etc.). Approximate transect locations are shown on the enclosed plan, Exhibit 6.2: Environmental Resources Map, and exact placement will be based on field conditions.

- The vegetation at each monitoring station will be evaluated prior to disturbance of the site and at periodic intervals afterward, during the month of June, by a Certified Wetland Scientist. Trees, saplings, shrubs, herbs, and vines will be identified in terms of species and estimated percent coverage within each stratum within a 15-foot radius of each monitoring station. The wetland status of plant species will be determined through comparison with the U.S. Fish & Wildlife Service's Region 1 Wetland Indicator Status information (Reed, 1988).

- The first vegetation evaluation will occur within one year of the permit issuance. Information gathered from each evaluation will be compared to the baseline evaluation, stream/groundwater monitoring data, stream flow data and temporal climatic conditions. The information will be compiled in a report and submitted to the Department for review.

- Additional vegetation evaluations will occur annually, coinciding with the implementation of the infiltration system.

Characterization of Stream/Aquifer Interaction

- Monthly stream flow measurements will be completed at SW-2, SW-3, SW-7, SW-13, SW-15, SW-16, SW-20, and SW-23 to provide ongoing

  If mining were to impact surface waters, the stream/wetland complex proposed for monitoring would be the first surface feature to be impacted based on its proximity to the quarry pit. Also, this plan should be considered in conjunction with the groundwater monitoring plan

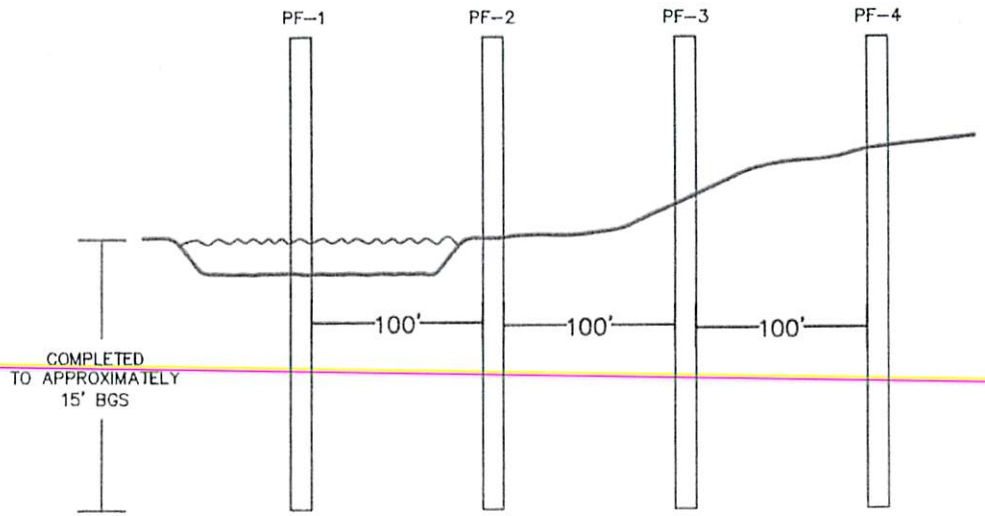
proposed in Module 8. The two plans provide adequate monitoring and characterization of the regional aquifer, perched aquifers, wetlands, stream flow through the permit area, and the interactions between quarry operations and those features.

In addition, Geryville Materials may opt to install continuous monitoring devices in on-site wells, transect piezometers and/or stream gauges to aid in further characterizing site hydrology.

ATTACHMENT 14.4(d)

Figure 14.4(d)(2)

Cross-Section of Typical Piezometer Transect



LEGEND

2" BOREHOLE W/ 1" SLOTTED SCH. 40 PVC SCREEN TO DEPTH (ALL PIEZOMETERS WILL BE COMPLETED TO THE SAME APPROXIMATE ELEVATION)

PF-1 TYPICAL TRANSECT PIEZOMETER

NOTES:

1. ALL SHALLOW TRANSECT WELLS TO BE COMPLETED TO SAME ELEVATION.
2. WELL CASING RISERS WILL BE BASED ON HEIGHT NEEDED TO AVOID INFILTRATION THROUGH WELL OPENING DURING FLOOD CONDITIONS.

TOP VIEW
OF TYPICAL TRANSECT

ERG
EARTHRES GROUP
ENVIRONMENTAL ENGINEERING and SCIENCE
EarthRes Group, Inc.
P.O. Box 468
7137 Old Easton Road
Pipersville, PA 18947 USA
www.earthres.com
215-766-1211

DRAWN BY: CME	CHECKED BY: JRR
DATE: 7/20/07	PROJECT NO: 051030.002
DRAWING SCALE: NTS	

FIGURE 14.4(d)2
TYPICAL PIEZOMETER TRANSECT CROSS-SECTION

SMP APPLICATION
GERRYVILLE MATERIALS, INC.
LOWER MILFORD TOWNSHIP, MONTGOMERY COUNTY, PA