Report #293

Red River Coal Company
Benthic Macroinvertebrate Survey
Fall 2014 SC-1

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EXECUTIVE SUMMARY

Biological Monitoring, Inc. (BMI) performed a stream survey in the South Fork Pound River Watershed for Red River Coal Company. The purpose of this survey was to conduct instream assessments as outlined in Red River's permits. One instream monitoring station was sampled.

The Virginia Stream Condition Index (VASCI) protocol was used for instream biological surveys. All biological sampling was performed in accordance with the Virginia Department of Game and Inland Fisheries' scientific collection permit requirements.

Samples were collected on September 29, 2014. Benthic samples were collected based on BMI's QAPP. All organisms were identified to the lowest practicable level and collapsed to the family level for VASCI calculation. The US EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers was used for sampling macroinvertebrate populations and performing habitat assessments.

The analysis of the Fall 2014 survey data yielded a VASCI score of 51.66 for station SC-1. Using the Virginia Department of Environmental Quality devised scale, this station was classified in the "Stress" Aquatic Life Use (ALU) Tier. The habitat assessment score was 149 falling into the "Suboptimal" category of habitat. Physicochemical and chemical analyses seem typical for mining influenced streams in the region.

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1.0 INTRODUCTION

Biological Monitoring, Inc. (BMI) performed a stream survey for Red River Coal Company in the South Fork Pound River Watershed located in Wise County, Virginia. The purpose of this survey was to conduct instream assessments in fulfillment of permit requirements. The present report provides the methods utilized and the results obtained from the October 29, 2014 sampling event.

BMI is a Tier III (VA) bio-monitoring facility as well as a National Environmental Laboratory Accreditation Program (NELAP) accredited Whole Effluent Toxicity Laboratory. BMI specializes in issues of water quality. Since 1980, BMI has been providing expertise in aquatic toxicology and risk assessment. Highly motivated and academically trained scientists at BMI work closely with clients to create practical solutions to environmental problems. BMI has maintained a commitment to the research and development of aquatic biomonitoring and toxicological concepts resulting in leading edge technologies and applications.

BMI interacts with regulatory agencies on behalf of its clients to solve specific environmental problems associated with water quality and toxicological regulations and permit compliance. With its main facilities located in Blacksburg, Virginia, BMI focuses on the development and application of procedures to create feasible solutions that balance the need for environmental protection and continued economic development.

2.0 METHODS AND MATERIALS

2.1 General

Instream stations are generally sampled for analytical and physicochemistry as well as benthic macroinvertebrates. On September 29, 2014, samples were collected from instream stations in the South Fork Pound River Watershed.

Grab samples were used for analytical and physicochemistry. Macroinvertebrate samples were collected following BMI's Biological Monitoring Program Quality Assurance Project Plan for Wadeable Streams and Rivers (BMI 2012). The Virginia Stream Condition Index (VASCI) protocol was used for this instream biological survey (Tetra Tech 2003). The US EPA's Rapid Bioassessment Protocols for use in Wadeable Streams and Rivers (RBP) was used for sampling macroinvertebrate populations and performing habitat assessments (USEPA 1999). Qualitative habitat assessments were conducted at each bioassessment site by trained and experienced individuals.

2.2 Station Location

One instream monitoring station was specified for this project. Station location was provided by the permittee. These stations were located in Wise County, Virginia and in the South Fork Pound River Watershed. Latitude and longitude coordinates were recorded at the downstream extent of the station using a Garmin® Global Positioning System portable unit (GPSMAP 60 CSX). Table 1 summarizes the monitoring station attributes. Figure 1 provides a map of the area and the location of the monitoring stations. Figure 2 presents an orthophoto of study area. Station photographs are presented as Appendix A.

Table 1. Monitoring Station Attributes.

Station ID	Location Summary	Latitude	Longitude
SC-1	Mouth of Short Creek	37° 04 36.9”	82° 39’ 29.4”

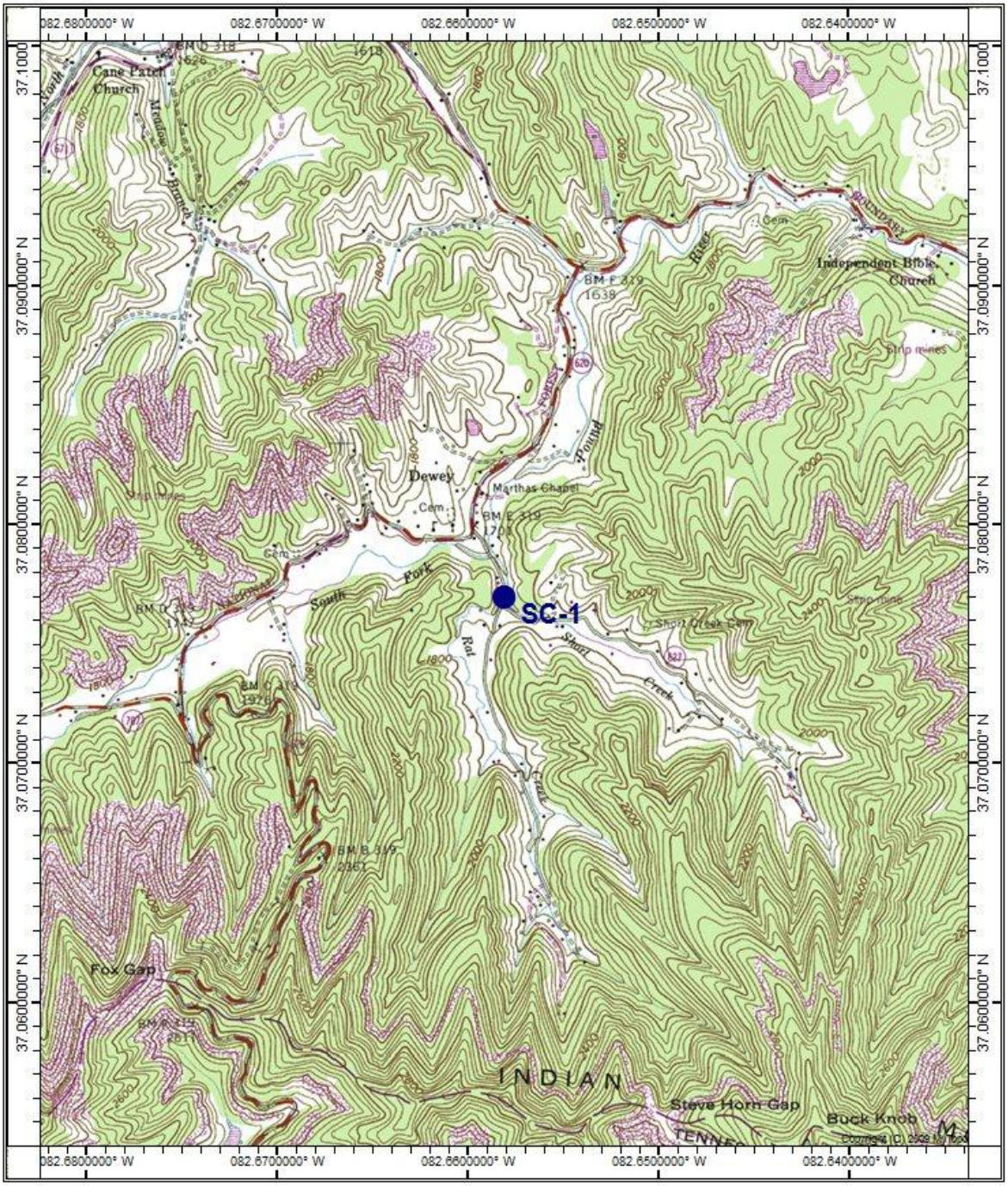

Figure 1. Map of the Monitoring Stations.

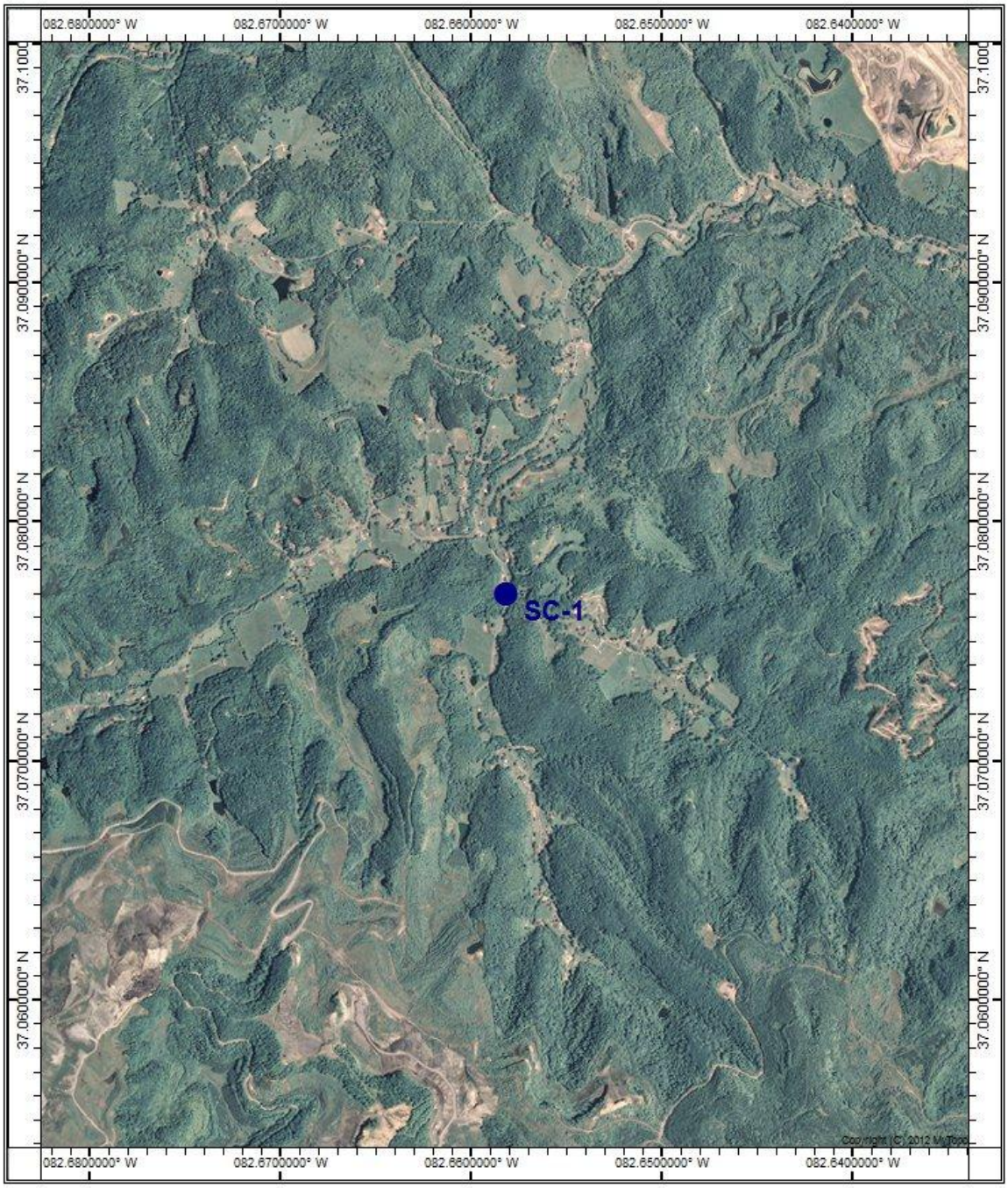

Figure 2. Orthophoto of the Study Area

2.3 Macroinvertebrate Sampling & Assessment

2.3.1 Sampling & Identification

All biological sampling was performed in accordance with the Virginia Department of Game and Inland Fisheries' scientific collection permit requirements. Macroinvertebrates were collected at each benthic station following the single habitat approach (riffle-run) as presented in the QAPP (BMI 2012). Samples were collected using a semi-quantitative approach.

Four samples were collected at each station using a 0.50 m wide rectangular kick-net having a 500 µm mesh size. Each sample was collected by first placing the net on the bottom downstream of the 0.50 m^2 area to be sampled. Where appropriate, large rocks and debris were brushed off into the net and removed. The area to be sampled was then vigorously kicked for approximately 30 to 90 seconds or the Best Professional Judgment of the scientist. For each monitoring station, the four samples were rinsed, composited, placed in a labeled container, and preserved in 70% ethanol. Sample information was recorded on a BMI Sample Chain of Custody Form and returned to BMI's laboratory for enumeration and identification.

Organisms were separated from the debris in the laboratory. Subsampling was performed on each sample to a standard count of 110 ± 10%. All organisms were identified to the lowest practicable level. Organism identification utilized the appropriate taxonomic keys (Merritt and Cummins 2008). All data analysis was performed at the family level in order to use the Virginia Stream Condition Index (VASCI). All organisms from this study will be retained for a period of at least five years.

2.3.2 Macroinvertebrate Data Assessment

Macroinvertebrate data were analyzed using *A Stream Condition Index for Virginia Non-Coastal Streams* (Tetra Tech 2003). This VASCI was developed from an analysis of data collected by the Virginia DEQ from 1994 to 1998 and 1999 to 2002. Using these data, VASCI designated statewide reference values were determined for each of the following eight metrics of community structure:

- **Total Number of Taxa** measures the total number of distinct taxa and, therefore, is representative of the diversity within a sample. High diversity is a strong indicator of stream health and ability to sustain populations. This metric value is expected to decrease in response to increased perturbation.
- **Total Number of EPT Taxa** is a measure of the total number of distinct taxa within the Orders Ephemeroptera, Plecoptera, and Trichoptera. These orders include the mayflies, stoneflies, and caddis flies, respectively. Organisms in these three orders have low tolerances to perturbation. As a result, the value of the metric is expected to decrease in response to increasing perturbation.
- **Percent Ephemeroptera** is the percentage of individual Ephemeroptera (mayflies) within a sample. This metric is calculated by dividing the number of Ephemeroptera by the total number of sample organisms. This metric indicates the relative abundance of this sensitive order within the stream community. The value of this metric is expected to decrease in response to increasing perturbation.
- **Percent P T Less Hydropsychidae** is the percentage of individuals from the orders Plecoptera and Trichoptera "less" the individuals from the family Hydropsychidae. This metric is calculated by dividing the number

of organisms from the orders Plecoptera and Trichoptera (less Hydropsychidae) by the total number of sample organisms. This metric indicates the relative abundance of these sensitive orders within the stream community. The value of this metric is expected to decrease in response to increasing perturbation.

- **Percent Scrapers** is percent abundance of individuals in the sample whose primary functional mechanism for obtaining food is to graze on substrate or periphyton, attached algae and associated material within a sample. This metric is calculated by dividing the number of organisms from the functional feeding group "scrapers" by the total number of sample organisms. The value of this metric is expected to decrease in response to increasing perturbation.

- **Percent Chironomidae** is the percent individual organisms of the Family Chironomidae within a sample. The metric is calculated by dividing the number of Chironomidae organisms by the total number of sample organisms. Family Chironomidae, the midges, are tolerant to perturbation and their relative abundance tends to increase in impacted streams. As a result, the value of this metric is expected to increase in response to increasing perturbation.

- **Percent Two Dominant Taxa** is the percentage of total individuals in the two taxa with the greatest number of organisms. The metric is calculated by adding the number of organisms present in the two largest taxa. Dividing this sum by the total number of organisms yields the relative abundance of the two dominant taxa. Samples with populations concentrated into a few taxa may be an indication of impact. This metric is expected to increase in response to increasing perturbation.

- **Hilsenhoff Biotic Index** (HBI) was originally designed to evaluate organic pollution by utilizing tolerance values to weight taxa abundance. The

resulting HBI value is an estimation of overall pollution level. The metric is expected to increase in response to increasing perturbation.

The VASCI metrics and their expected response to perturbation are summarized in Table 2.

Table 2. VASCI Metrics and Expected Responses.

Metric	Expected Response
Total Number of Taxa	Decrease
Total Number of EPT Taxa	Decrease
Percent Ephemeroptera	Decrease
Percent PT Less Hydropsychidae	Decrease
Percent Scrapers	Decrease
Percent Chironomidae	Increase
Percent Two Dominant Taxa	Increase
Hilsenhoff Biotic Index	Increase

VASCI scores for each of the monitoring stations were calculated by dividing each station's metric values by the corresponding VASCI statewide reference values. This yielded a percentage score for each metric relative to the statewide reference condition. If the percentage score of any individual metric was greater than 100, the score was truncated to 100. The eight resulting values were then averaged to arrive at the VASCI score for each station.

2.4 Habitat Assessment

Habitat assessments were performed at each benthic station where macroinvertebrates were collected. These assessments were performed as per the RBP (USEPA 1999). Ten

habitat parameters were assessed, each receiving a score of 0 – 20. A description of each of the habitat parameters follows:

- **Epifaunal Substrate / Available Cover** rate the availability of structures in the stream that can be utilized as refuge, spawning, and feeding sites by macroinvertebrates. Examples of such structures would include boulders, cobble, undercut banks, roots, logs and branches. The availability of cover can be a limiting factor on stream diversity and abundance.

- **Embeddedness** rate the degree to which coarse substrate such as gravel; cobble and boulders are sunken into the sand, silt and mud substrate of the stream bottom. Embeddedness is the result of sediment movement and deposition. Increased embeddedness reduces the available refuge, feeding and spawning sites available to macroinvertebrates resulting in lower diversity and abundance.

- **Velocity / Depth Regimes** gauge the presence or absence of four velocity-depth patterns. These patterns are slow-deep, slow-shallow, fast-deep, and fast-shallow. Ideally, all four patterns should be present to best provide a stable diverse stream community.

- **Sediment Deposition** rates the degree to which new sediment has accumulated in pools, point bars and islands. Sediment deposition may be an indicator of an unstable environment and lowered diversity.

- **Channel Flow Status** rates the degree to which water fills the stream channel. Channel flow status may be affected by obstructions, diversions or widening of the stream channel. As less of the channel is filled by water, the amount of suitable substrate is also reduced.

- **Channel Alteration** rate the degree to which the shape of the stream channel has been altered. Alterations may include bridges, roads, diversion channels, channel straightening, artificial embankments, riprap,

dams, weirs, and other instream structures. Channel alteration often results in scouring and loss of available habitat.

- **Frequency of Riffles (or Bends)** rates the presence of quality riffle or sinuous habitat. Riffles and sinuous streams provide quality habitat for stable, diverse communities.

- **Bank Stability** indicates the degree to which banks have eroded or may erode. Eroded banks are a sign of sediment movement and deposition, which leads to reduced epifaunal habitat. Unstable banks may also point to poor vegetative cover.

- **Bank Vegetative Protection** gauges the extent of vegetative protection at the stream bank and the nearby riparian zone. Bank vegetation plays a vital role in erosion control, nutrient uptake, stream shading, and food supply.

- **Riparian Vegetative Zone Width** measures the extent of natural vegetation from the stream through the riparian zone. Wide vegetative zones provide pollution buffering, erosion control, habitat, nutrient uptake and nutrient input. These beneficial contributions can be impaired by commercial and residential development, roads, pastures, actively worked fields, etc.

Table 3 identifies each of the ten Habitat Assessment Parameters and their range of scores. Scores for each parameter were recorded on Habitat Assessment Field Log Sheets (USEPA 1999). The habitat assessment score for each station was calculated by adding the score for each parameter yielding a station total. The highest attainable score was 200. The actual habitat assessment process involves rating the ten parameters as optimal (>153), suboptimal (101-153), marginal (46-100), or poor (<45).

Table 3. Habitat Assessment Parameters

Parameter	Description	Scoring
1	Epifaunal Substrate / Available Cover	0-20
2	Embeddedness	0-20
3	Velocity / Depth Regime	0-20
4	Sediment Deposition	0-20
5	Channel Flow Status	0-20
6	Channel Alteration	0-20
7	Frequency of Riffles or Bends	0-20
8	Bank Stability	Left 0-10
		Right 0-10
9	Vegetative Protection	Left 0-10
		Right 0-10
10	Riparian Vegetative Zone Width	Left 0-10
		Right 0-10

2.5 Physicochemical Assessment

Prior to any field data collections, all handheld meters were calibrated. Conductivity (µS), Dissolved Oxygen (mg/L), pH (SU) and temperature (°C) were recorded at each of the sample stations, where appropriate. Conductivity, Dissolved Oxygen, pH and Temperature were all recorded using calibrated field meters. Field meters included an Oakton PCTestr 35 combination pH/EC/TDS/Temperature Meter and a Hanna model HI 9142 Dissolved Oxygen Meter.

2.6 Chemical Monitoring

Samples for analytical chemistry were collected by BMI and analyzed by Environmental Monitoring, Inc.

3.0 RESULTS

3.1 Station Location

Station attributes, including latitudes and longitudes are presented in Table 1 and depicted in Figures 1 and 2. Station photographs are presented in Appendix A. Flow was adequate for sampling at all stations.

3.2 Macroinvertebrate Monitoring Data

3.2.1 Virginia Stream Condition Index Metrics

The 110 ± 10% subsample is summarized in Table 4. The VASCI metric values for the monitoring stations sampled are summarized in Table 5. Raw data are presented in Appendix B.

Table 4. Identification / Enumeration Data

Order	**Family**	**SC1**
Coleoptera	Psephenidae	1
Diptera	Chironomidae	9
Diptera	Simuliidae	2
Diptera	Tipulidae	21
Ephemeroptera	Ephemerellidae	5
Ephemeroptera	Heptageniidae	23
Odonata	Gomphidae	3
Plecoptera	Leuctridae	1
Trichoptera	Hydropsychidae	33
Trichoptera	Philopotamidae	4
Trichoptera	Rhyacophilidae	1
Other Taxa	Asellidae	5
Other Taxa	Collembola	2

Table 5. VASCI Metrics.

	SC-1
Total Taxa	13.00
EPT Taxa	6.00
%Ephemeroptera	0.25
%Plec+Tric less Hydropsych.	5.45
%Scrapers	21.82
%Chironomidae	8.18
% Top 2 Dominant	50.91
HBI (Family)	4.64

3.2.2 Virginia Stream Condition Index Scores

Table 6 presents a summary of the VASCI scoring. Raw data are presented in Appendix B. Each metric score represents a percentage of the statewide reference condition. The VASCI score calculated for SC-1 was 51.66.

Table 6. VASCI Scoring.

	SC-1
Total Taxa	59.09
EPT Taxa	54.55
%Ephemeroptera	0.42
%Plec+Tric less Hydropsych.	15.32
%Scrapers	42.28
%Chironomidae	91.82
% Top 2 Dominant	70.94
HBI (Family)	78.88
VASCI	51.66

Figure 3 is a graphical representation of the VASCI score(s) along with the Aquatic Life Use Tiers. It should be noted that four tiers exist in the VASCI, whereas, a score of 60 or higher is considered "unimpaired" and a score of < 60 is considered "impaired".

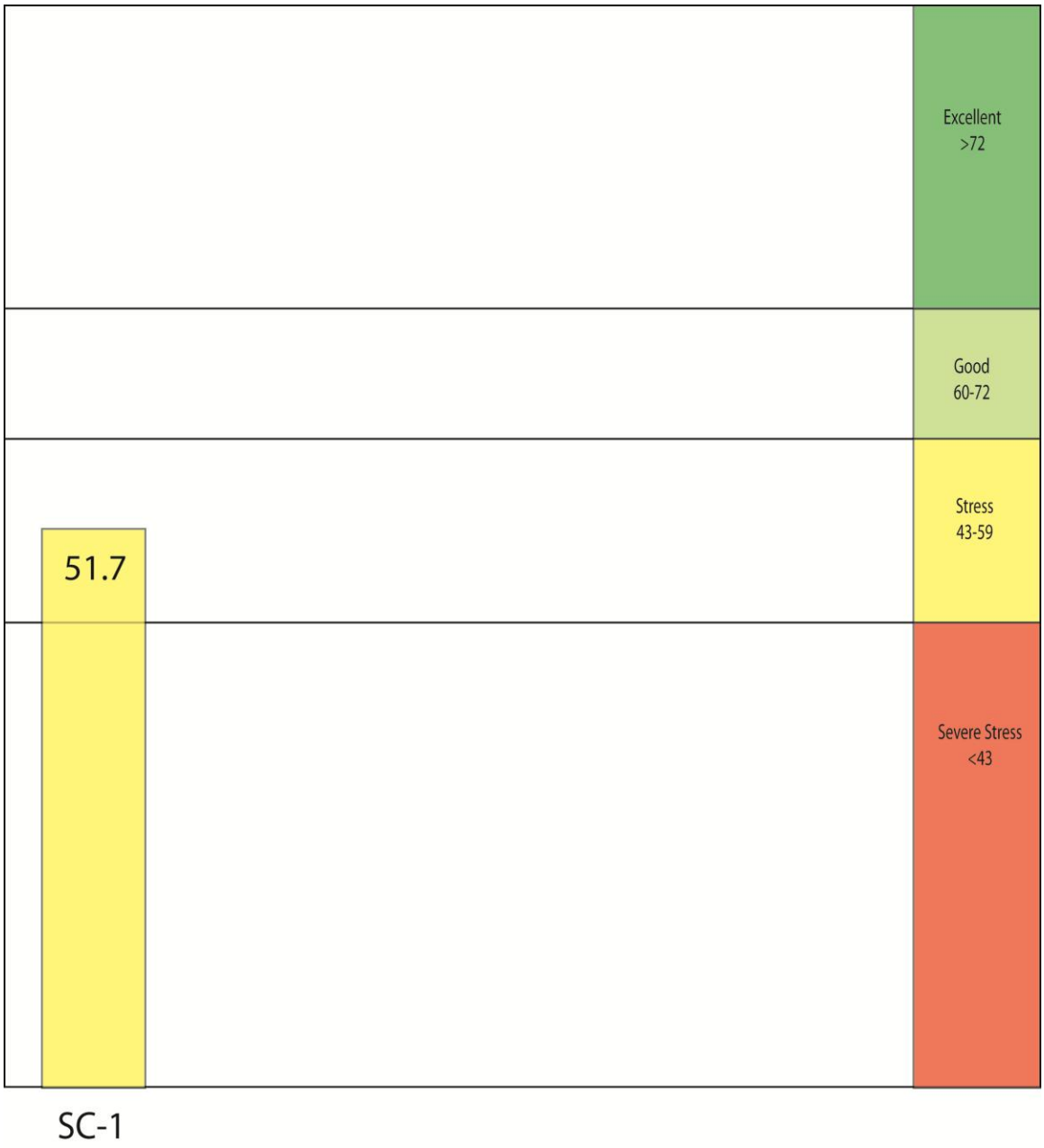

Figure 3. VASCI Scoring Summary

3.3 Habitat Assessment

Table 7 presents a summary of the habitat assessment score for the monitoring stations. Raw data are presented in Appendix B. The habitat assessment score was 149 for SC-1 falling into the "Suboptimal" category of habitat.

Table 7. RBP Habitat Scoring.

Parameter	SC-1
Subst./Cover	19
Embeddedness	15
Velocity	17
Sediment Dep.	16
Channel Flow	16
Channel Alt.	13
Freq of Riffles	19
Bank Stab L	9
Bank Stab R	8
Veg. Prot. L	7
Veg. Prot. R	9
Rip. Zone L	0
Rip. Zone R	1
Total	**149**

Figure 4 is a visual representation of the habitat score(s) obtained for this permit along with the different tiers.

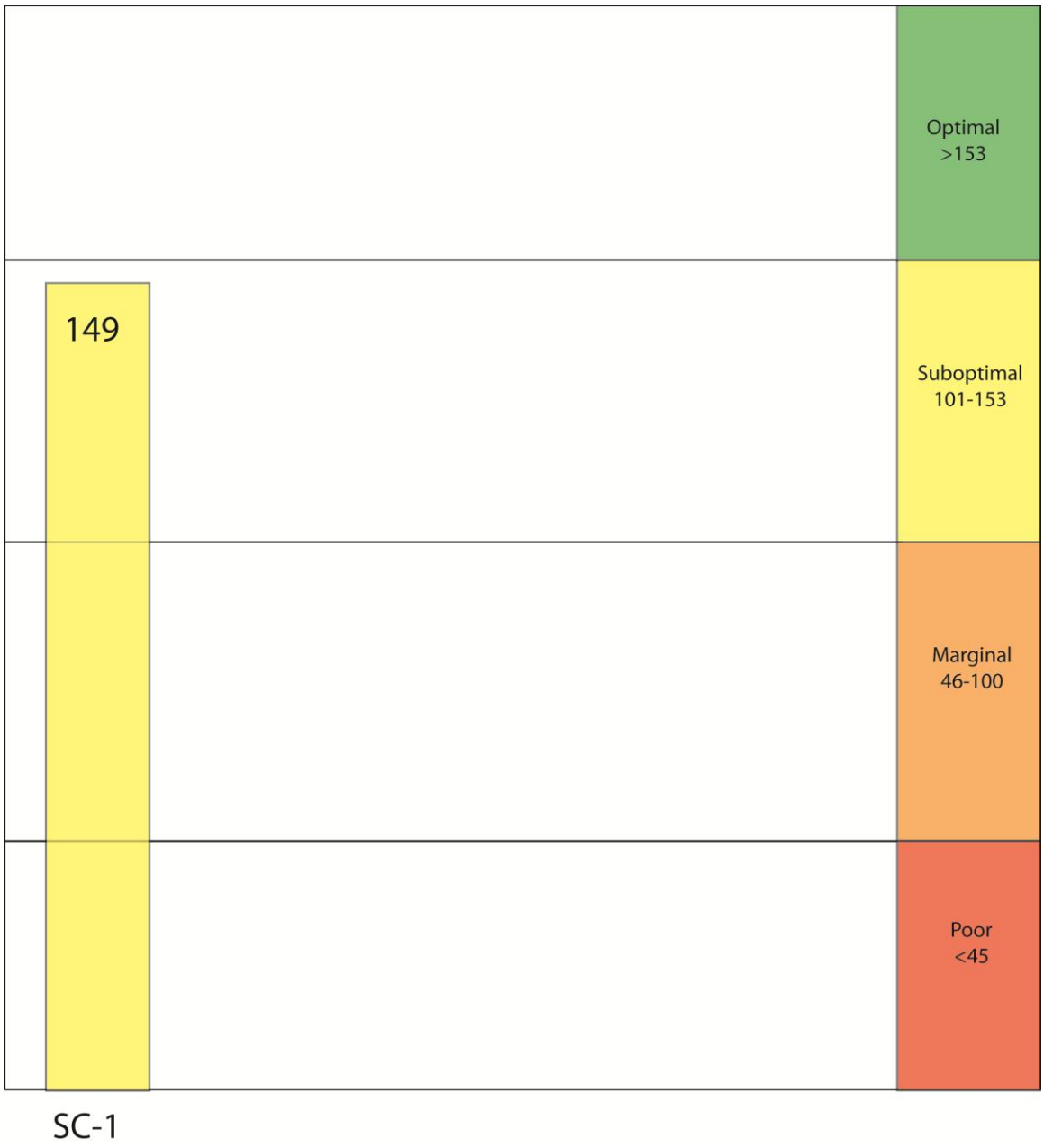

Figure 4. Habitat Scoring Sumary

3.4 Water Quality Assessment

Table 8 presents the water quality assessments.

Table 8. Water Quality Analyses.

	SC-1
Conductivity (µS/cm)	367
Dissolved Oxygen (mg/L)	8.7
pH (SU)	8.0
Temperature (°C)	18.0
Flow (cfs)	0.19

3.5 Chemical Monitoring

Results from the chemical monitoring are included as Appendix C.

4.0 DISCUSSION

Water quality and both instream and riparian habitat are important determinants of the composition, structure, and function of biotic communities. The instream water quality assessments and the RBP Habitat Assessment techniques used in this study do not provide adequate discriminatory power to differentiate cause and effect. A systematic assessment of instream and riparian habitat quality is necessary to fully assess water quality conditions in streams and rivers (USEPA 1999).

4.1 Station Location

Since the sampling locations were presumably specified in the permit, it is assumed that they are representative of the permit in question. Furthermore, this study represents a significant component of the holistic watershed management approach.

4.2 Macroinvertebrate Data

The VASCI values in this study should be considered a relative ranking, indicating the comparability of the studied stream to the statewide reference for least disturbed streams. As such, these values should not be considered an absolute rating.

The VASCI validation document recommends Aquatic Life Use tiers based on the VASCI scores (VADEQ 2006). These tiers and their respective scores are as follows:

- "Severe Stress indicates scores below 43;
- "Stress" indicates scores from 43 to 59;
- "Good" conditions indicate scores from 60 to 72; and
- "Excellent" stream quality is represented by scores above 72.

The VASCI score calculated was 51.66 for station SC-1. This score falls into the "Stress" Aquatic Life Use tier.

4.3 Habitat Assessment

Habitat plays an important role in species composition, various assemblages and numbers of organisms found in aquatic environments. To make meaningful impact analyses, one must consider habitat data as a possible limiting factor. The habitat assessment score was 149 for station SC-1 falling into the "Suboptimal" category of habitat.

RBP habitat assessment techniques are qualitative in nature and designed to determine comparability and ranking amongst stations. Traditionally, this approach assumes the presence of a reference station for the data set. To further explore the role habitat may be playing on the benthic score; additional data will have to be collected.

4.4 Water Quality Assessment

The water chemistry parameters examined, conductivity, pH, temperature and flow, were typical for streams influenced by urban environments and mining in the region.

5.0 LITERATURE CITED

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APPENDIX A:

STATION PHOTOGRAPHS

SC-1

APPENDIX B:

RAW DATA

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NELAC ACCREDITED LAB # 460015

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

STREAM NAME Short Creek	LOCATION Mouth of Short Creek	
STATION # SC-1 RIVERMILE_____	STREAM CLASS	
LAT _____ LONG _____	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS JR, WB		
FORM COMPLETED BY WB	DATE 9-29-14 TIME 1500 AM PM	REASON FOR SURVEY

WEATHER CONDITIONS

Now		Past 24 hours
•	storm (heavy rain)	•
•	rain (steady rain)	•
•	showers (intermittent)	•
15 %•	%cloud cover	• ____%
•	clear/sunny	•

Has there been a heavy rain in the last 7 days? • Yes • No

Air Temperature 25 °C

Other_____

SITE LOCATION/MAP

Draw a map of the site and indicate the areas sampled (or attach a photograph)

PICS → 1277-1282

Flow

	D	V
LC		
C	0.46	0.34
RC		

Width 1.2'

0.19 cfs

pH 8.0

DO 8.7

Cond 367

TEMP 18.0

STREAM CHARACTERIZATION

Stream Subsystem
• Perennial • Intermittent • Tidal

Stream Type
• Coldwater • Warmwater

Stream Origin
• Glacial • Spring-fed
• Non-glacial montane • Mixture of origins
• Swamp and bog • Other_____

Catchment Area_____km^2

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	**Predominant Surrounding Landuse** • Forest • Commercial • Field/Pasture • Industrial • Agricultural • Other _____ • Residential **Local Watershed NPS Pollution** • No evidence • Some potential sources • Obvious sources **Local Watershed Erosion** • None • Moderate • Heavy
RIPARIAN VEGETATION (18 meter buffer)	**Indicate the dominant type and record the dominant species present** • Trees • Shrubs • Grasses • Herbaceous **dominant species present** _____
INSTREAM FEATURES	**Estimated Reach Length** 100 m **Estimated Stream Width** _____ m **Sampling Reach Area** _____ m^2 **Area in km^2 (m^2x1000)** _____ km^2 **Estimated Stream Depth** _____ m **Surface Velocity (at thalweg)** _____ m/sec **Canopy Cover** • Partly open • Partly shaded • Shaded **High Water Mark** 0.1 m **Proportion of Reach Represented by Stream Morphology Types** • Riffle 50 % • Run 20 % • Pool 30 % **Channelized** • Yes • No **Dam Present** • Yes • No
LARGE WOODY DEBRIS	**LWD** _____ m^2 **Density of LWD** _____ m^2/km^2 **(LWD/ reach area)**
AQUATIC VEGETATION	**Indicate the dominant type and record the dominant species present** • Rooted emergent • Rooted submergent • Rooted floating • Free floating • Floating Algae • Attached Algae **dominant species present** _____ **Portion of the reach with aquatic vegetation** 70 %
WATER QUALITY	**Temperature** _____ °C **Specific Conductance** _____ **Dissolved Oxygen** _____ **pH** _____ **Turbidity** _____ **WQ Instrument Used** _____ **Water Odors** • Normal/None • Sewage • Petroleum • Chemical • Fishy • Other _____ **Water Surface Oils** • Slick • Sheen • Globs • Flecks • None • Other _____ **Turbidity (if not measured)** • Clear • Slightly turbid • Turbid • Opaque • Stained • Other _____
SEDIMENT/ SUBSTRATE	**Odors** • Normal • Sewage • Petroleum • Chemical • Anaerobic • None • Other _____ **Oils** • Absent • Slight • Moderate • Profuse **Deposits** • Sludge • Sawdust • Paper fiber • Sand • Relict shells • Other silt **Looking at stones which are not deeply embedded, are the undersides black in color?** • Yes • No

RDB Road
LDB Road

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	**Diameter**	**% Composition in Sampling Reach**	**Substrate Type**	**Characteristic**	**% Composition in Sampling Area**
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	5
Boulder	> 256 mm (10")	10			
Cobble	64-256 mm (2.5"-10")	35	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	40			
Sand	0.06-2mm (gritty)	10	Marl	grey, shell fragments	
Silt	0.004-0.06 mm	5			
Clay	< 0.004 mm (slick)				

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NELAC ACCREDITED LAB # 460015

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME Short Creek	LOCATION	
STATION # SC-1 RIVERMILE	STREAM CLASS	
LAT LONG	RIVER BASIN	
STORET #	AGENCY	
INVESTIGATORS JR, WB		
FORM COMPLETED BY WB	DATE 9-29-14 TIME 1500 AM (PM)	REASON FOR SURVEY

+4 crayfish

Parameters to be evaluated in sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/ depth regime (usually slow-deep).
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Parameters to be evaluated broader than sampling reach

Habitat Parameter	Condition Category: Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters: little or no riparian vegetation due to human activities.
SCORE ___ (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE ___ (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

RDB Road
LDB Road

Total Score _____

Benthic Macroinvertebrate Laboratory Bench Sheet

Station ID:		Sample Subsorted by:	JM	Date Subsorted:	10/09/14
StationName:	SC-1	# of Grids subsorted:			
Date Sampled:	09/29/14 1500	Total # of Subsorted Insects:			
Sampling Method:		Sample Identified by:		Date Identified:	

	TAXON	# of larvae	Total # of Organisms	# to Ref.Coll.
1	Heptageniidae Maccaffertium	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ III		
2	Ephemerellidae eurylophela	~~IIII~~		
3	Tipulidae tipula	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ I		
4	Psephenidae psephenus	I		
5	Philopotamidae chimarra	IIII		
6	Gomphidae gomphus	III		
7	Chironomidae	~~IIII~~ IIII		
8	Simuliidae simulium	II		
9	Leuctridae leuctra	I		
10	Rhyacophilidae rhyacophila	I		
11	Colembola	II		
12	Asellidae asellus	~~IIII~~ I		
13	Hydropsychidae hydropsyche	III		
14	cheumatopsyche	~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~ ~~IIII~~		
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
	TOTALS			

Sub-sample and Sample Reduction

(per SOP)

Sub-sample and Sample Reduction Sheet

Organisms found in first grid = 20 (Grid # 10)

If <30 organisms found, continue to table below.
If >30 organisms found, discard 1st grid, enter # of grids for sample reduction and continue to table below.

Sample Reduction? Y___ N ____ Number of Grids selected for reduction =_____

Grid I.D. #	# of Organisms		Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms	Grid I.D. #	# of Organisms
30	16	36						
12	21	57						
2	27	84						
5	33	117						

Total organisms = _____ Total grids = _____

For sample reduction: _____ x _____ = _____
(# of grids after reduction) (correction multiplier) (corrected # of grids from orig. sample) {A}

IF after picking, there are >121 organisms, then return picked sample to 15-30 grid tray and remove grids (per SOP) to reduce sample to 121 organisms or less. Record data below.

Total # of organisms retained = _____
Grids removed to reduce sample to 121 organisms or fewer = _____
Percentage of grids retained for sample (to total grids) = _____

_____ x _____ = _____
(# of grids from original sample {A}) (% of grids retained) (final corrected # of grids from original sample)

APPENDIX C:

CHEMISTRY DATA

ENVIRONMENTAL MONITORING, INCORPORATED
ENVIRONMENTAL CONSULTANTS ▲ ANALYTICAL LABORATORIES
5730 INDUSTRIAL PARK RD. ▲ NORTON, VIRGINIA 24273 ▲ 276/679-6544

Certificate of Analysis

Client Name: RED RIVER COAL COMPANY
Address: P.O. BOX 668
NORTON, VA 24273

Report Date: 10/23/14
Lab Sample No.: **1464444**
Client No.: 95
EMI Project No.: 71

Sample Identification: SC-1
Site Description: RED RIVER

Date Collected: 09/29/14
Time Collected: 1500
Sample Matrix: AQ
Collected By: CLIENT

Parameter		Sample Result	Units	MDL	RL	Method	Date Analyzed	Time Analyzed	Analyst
Acidity, Hot		BDL	mg/l CaCO3	4.00	4.00	SM 2310B-2011	9/30/2014	1902	MCF
Alkalinity		62.5	mg/l CaCO3	4.00	4.00	SM 2320B-2011	9/30/2014	1352	MCF
Alkalinity, CO3	Not NELAP	0.583	mg/l CaCO3	0.100		SM 4500-CO2-D-2011	10/1/2014	1255	SAS
Alkalinity, HC03	Not NELAP	62.0	mg/l CaCO3	0.100		SM 4500-CO2-D-2011	10/1/2014	1255	SAS
Bromide		BDL	mg/l	0.144	0.600	EPA 300.0	10/7/2014	423	JLW
Chloride		11.7	mg/l	0.667	5.00	EPA 300.0	10/14/2014	148	THR
Conductivity		355	umhos/cm	10.0	10.0	SM 2510B-2011	10/1/2014	1250	KMC
Flow, Measured	Not NELAP	85.0	gpm				9/29/2014	1500	FLD
Hardness, Total		184	mg/l CaCO3	4.00	4.00	SM 2340 C-2011	10/6/2014	1442	SAS
Nitrate		0.900 HE MSF	mg/l	0.317	0.600	EPA 300.0	10/7/2014	423	JLW
Nitrite		BDL HE	mg/l	0.100	0.400	EPA 300.0	10/7/2014	423	JLW
pH	Not NELAP	8.00	STD			SM 4500-H+B-2011	9/29/2014	1500	FLD
Sulfate		95.8	mg/l	0.517	5.00	EPA 300.0	10/14/2014	148	THR
Total Dissolved Solids		222	mg/l	1.00	1.00	SM 2540 C-2011	9/30/2014	1037	JRS
Total Suspended Solids		23.1	mg/l	1.00	1.00	SM 2540 D-2011	9/29/2014	2257	MLS

To the best of our knowledge and belief, the collection, preservation, and analysis of all parameters represented by this report have been determined to comply the requirements as specified in 40 CFR, Part 136.
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VA Laboratory ID#: 460038
WV Laboratory ID#: 105
KY Laboratory ID#: 98012
EPA Laboratory ID#: VA00010

The release of this report is authorized by:_____
R. J. Porter
Technical Director

Flow if Avaliable (GPM): 85.0
Temp. if Available (C): 18.0
Depth if Available (Ft):
Analysis Package Code: EPA0902R

PSCN
Rev-09-11-14

Type of Sample: Grab
BDL = Below Detection Limit
FLD = Field Technician
MR = Multiple analytical runs were used for this result
IV = Flag indicates Insufficient Sample Volume
SV = Sample volume indicated by method not used
AB = Analyte found in Method Blank
MSF = Matirx Spike Failure - Method in Control
EV = Estimated Value: Outside of calibration range

J = Flag indicates estimated value below Report Limit
T = Results indicate possible toxicity which is expected to influence reported value.
NA = A result for this analyte is not available.
MI = Matrix Interference - Final result may not be representative.
BQ = Batch QC Outside Acceptable Range
HE = Parameter Hold Time Exceeded
FC = Failure to Comply Current SOP
R = Sample results rejected because of gross deficiencies in QC or method performance .
DC = Duplicate did not meet method criteria, method process in control
P = Sample was not properly preserved for this parameter.

ENVIRONMENTAL MONITORING, INCORPORATED
ENVIRONMENTAL CONSULTANTS ▲ ANALYTICAL LABORATORIES
5730 INDUSTRIAL PARK RD. ▲ NORTON, VIRGINIA 24273 ▲ 276/679-6544

Certificate of Analysis

Client Name: RED RIVER COAL COMPANY
Address: P.O. BOX 668
NORTON, VA 24273

Report Date: 10/23/14
Lab Sample No.: **1464444**
Client No.: 95
EMI Project No.: 71

Sample Identification: SC-1
Site Description: RED RIVER

Date Collected: 09/29/14
Time Collected: 1500
Sample Matrix: AQ
Collected By: CLIENT

Parameter	Sample Result	Units	MDL	RL	Method	Date Analyzed	Time Analyzed	Analyst
Aluminum, Total	0.382	mg/l	0.0095	0.050	200.7	9/30/2014	2025	AWM
Antimony, Total	BDL	ug/l	0.248	2.00	200.8	10/17/2014	1953	CLS
Arsenic, Total	0.405 J	ug/l	0.072	2.00	200.8	10/17/2014	23	CLS
Barium, Total	40.9	ug/l	0.134	2.00	200.8	10/17/2014	1953	CLS
Beryllium, Total	0.094 J	ug/l	0.020	2.00	200.8	10/17/2014	1953	CLS
Boron, Total	0.015 J	mg/l	0.0056	0.030	200.7	9/30/2014	1523	AWM
Cadmium, Total	0.026 J	ug/l	0.017	2.00	200.8	10/17/2014	23	CLS
Chromium, Total	0.344 J	ug/l	0.079	2.00	200.8	10/17/2014	1953	CLS
Cobalt, Total	0.722 J	ug/l	0.068	2.00	200.8	10/17/2014	1953	CLS
Copper, Total	1.11	ug/l	0.296	0.200	200.8	10/17/2014	23	CLS
Iron, Total	0.836	mg/l	0.0076	0.050	200.7	9/30/2014	2025	AWM
Lead, Total	0.575 J	ug/l	0.088	2.00	200.8	10/17/2014	23	CLS
Magnesium, Total	15.6	mg/l	0.0081	0.500	200.7	9/30/2014	1222	AWM
Manganese, Total	0.120	mg/l	0.0009	0.050	200.7	9/30/2014	2025	AWM
Mercury, Total	BDL	ug/l	0.067	0.500	EPA 245.1-REV.3	10/3/2014	1209	SAS
Nickel, Total	2.86	ug/l	0.093	2.00	200.8	10/17/2014	23	CLS
Selenium, Total	BDL	ug/l	0.516	2.00	200.8	10/16/2014	23	CLS

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Client No.: 95
EMI Project No.: 71

Sample Identification: SC-1
Site Description: RED RIVER

Date Collected: 09/29/14
Time Collected: 1500
Sample Matrix: AQ
Collected By: CLIENT

Parameter	Sample Result	Units	MDL	RL	Method	Date Analyzed	Time Analyzed	Analyst
Silver, Total	BDL	ug/l	0.039	2.00	200.8	10/17/2014	23	CLS
Thallium, Total	BDL	ug/l	0.111	2.00	200.8	10/17/2014	23	CLS
Zinc, Total	9.34	ug/l	1.02	5.00	200.8	10/17/2014	1953	CLS

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Savannah
5102 LaRoche Avenue
Savannah, GA 31404
Tel: (912)354-7858

TestAmerica Job ID: 680-105819-1
Client Project/Site: 95.71

For:
Environmental Monitoring, Inc.
5730 Industrial Park Avenue
Norton, Virginia 24273

Attn: Donna Phillips

Authorized for release by:
10/8/2014 4:18:19 PM

Sheila Hoffman, Project Manager II
(912)354-7858 e.3004
sheila.hoffman@testamericainc.com

LINKS

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Certification Summary 15

Job ID: 680-105819-1

Laboratory: TestAmerica Savannah

Narrative

CASE NARRATIVE

Client: Environmental Monitoring, Inc.

Project: 95.71

Report Number: 680-105819-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In the event of interference or analytes present at high concentrations, samples may be diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

RECEIPT
The samples were received on 10/01/2014; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 5.4 C.

TOTAL CYANIDE
Samples 1464442-GF-1 (680-105819-1), 1464443-SFP-2 (680-105819-2), 1464444-SC-1 (680-105819-3), 1464445-RC-1 (680-105819-4) and 1464454-SFP-1 (680-105819-6) were analyzed for total cyanide in accordance with EPA Method 335.4. The samples were prepared and analyzed on 10/02/2014.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

PHENOLS
Samples 1464442-GF-1 (680-105819-1), 1464443-SFP-2 (680-105819-2), 1464444-SC-1 (680-105819-3), 1464445-RC-1 (680-105819-4) and 1464446-SFP-1 (680-105819-5) were analyzed for phenols in accordance with EPA Method 420.1. The samples were prepared and analyzed on 10/03/2014 and 10/07/2014.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

DISSOLVED ORGANIC CARBON
Samples 1464442-GF-1 (680-105819-1), 1464443-SFP-2 (680-105819-2), 1464444-SC-1 (680-105819-3), 1464445-RC-1 (680-105819-4) and 1464446-SFP-1 (680-105819-5) were analyzed for dissolved organic carbon in accordance with SM 5310B. The samples were analyzed on 10/03/2014 and 10/04/2014.

No analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Sample Summary

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
680-105819-1	1464442-GF-1	Water	09/29/14 13:00	10/01/14 09:52
680-105819-2	1464443-SFP-2	Water	09/29/14 14:15	10/01/14 09:52
680-105819-3	1464444-SC-1	Water	09/29/14 15:00	10/01/14 09:52
680-105819-4	1464445-RC-1	Water	09/29/14 15:30	10/01/14 09:52
680-105819-5	1464446-SFP-1	Water	09/29/14 16:30	10/01/14 09:52
680-105819-6	1464454-SFP-1	Water	09/30/14 07:15	10/01/14 09:52

Method Summary

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Method	Method Description	Protocol	Laboratory
335.4	Cyanide, Total	MCAWW	TAL SAV
420.1	Phenolics, Total Recoverable	MCAWW	TAL SAV
SM 5310B	Organic Carbon, Dissolved (DOC)	SM	TAL SAV

Protocol References:

MCAWW = "Methods For Chemical Analysis Of Water And Wastes", EPA-600/4-79-020, March 1983 And Subsequent Revisions.

SM = "Standard Methods For The Examination Of Water And Wastewater",

Laboratory References:

TAL SAV = TestAmerica Savannah, 5102 LaRoche Avenue, Savannah, GA 31404, TEL (912)354-7858

Definitions/Glossary

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Qualifiers

General Chemistry

Qualifier	Qualifier Description
U	Indicates the analyte was analyzed for but not detected.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Client Sample ID: 1464442-GF-1

Lab Sample ID: 680-105819-1
Date Collected: 09/29/14 13:00
Matrix: Water
Date Received: 10/01/14 09:52

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.0025	U	0.010	0.0025	mg/L		10/02/14 08:21	10/02/14 12:54	1
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/03/14 08:16	10/03/14 14:01	1

General Chemistry - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	3.1		1.0	0.50	mg/L			10/03/14 22:58	1

Client Sample ID: 1464443-SFP-2

Lab Sample ID: 680-105819-2
Date Collected: 09/29/14 14:15
Matrix: Water
Date Received: 10/01/14 09:52

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.0025	U	0.010	0.0025	mg/L		10/02/14 08:21	10/02/14 12:55	1
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/07/14 08:29	10/07/14 13:02	1

General Chemistry - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	3.1		1.0	0.50	mg/L			10/03/14 23:40	1

Client Sample ID: 1464444-SC-1

Lab Sample ID: 680-105819-3
Date Collected: 09/29/14 15:00
Matrix: Water
Date Received: 10/01/14 09:52

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.0039	J	0.010	0.0025	mg/L		10/02/14 08:21	10/02/14 12:56	1
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/03/14 08:16	10/03/14 14:01	1

General Chemistry - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	2.7		1.0	0.50	mg/L			10/03/14 23:54	1

Client Sample ID: 1464445-RC-1

Lab Sample ID: 680-105819-4
Date Collected: 09/29/14 15:30
Matrix: Water
Date Received: 10/01/14 09:52

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.0025	U	0.010	0.0025	mg/L		10/02/14 08:21	10/02/14 12:57	1
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/03/14 08:16	10/03/14 14:06	1

General Chemistry - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	2.7		1.0	0.50	mg/L			10/04/14 00:11	1

Client Sample Results

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Client Sample ID: 1464446-SFP-1

Lab Sample ID: 680-105819-5

Date Collected: 09/29/14 16:30

Matrix: Water

Date Received: 10/01/14 09:52

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/07/14 08:29	10/07/14 13:02	1

General Chemistry - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	1.7		1.0	0.50	mg/L			10/04/14 00:25	1

Client Sample ID: 1464454-SFP-1

Lab Sample ID: 680-105819-6

Date Collected: 09/30/14 07:15

Matrix: Water

Date Received: 10/01/14 09:52

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.0025	U	0.010	0.0025	mg/L		10/02/14 08:21	10/02/14 12:58	1

QC Sample Results

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Method: 335.4 - Cyanide, Total

Lab Sample ID: MB 680-351673/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 351782 — **Prep Batch: 351673**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cyanide, Total	0.0025	U	0.010	0.0025	mg/L		10/02/14 08:21	10/02/14 12:41	1

Lab Sample ID: LCS 680-351673/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 351782 — **Prep Batch: 351673**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cyanide, Total	0.0500	0.0532		mg/L		106	90 - 110

Method: 420.1 - Phenolics, Total Recoverable

Lab Sample ID: MB 680-351908/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 351979 — **Prep Batch: 351908**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/03/14 08:16	10/03/14 13:47	1

Lab Sample ID: LCS 680-351908/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 351979 — **Prep Batch: 351908**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Phenolics, Total Recoverable	0.100	0.103		mg/L		103	75 - 125

Lab Sample ID: MB 680-352311/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 352442 — **Prep Batch: 352311**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Phenolics, Total Recoverable	0.025	U	0.050	0.025	mg/L		10/07/14 08:29	10/07/14 12:49	1

Lab Sample ID: LCS 680-352311/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 352442 — **Prep Batch: 352311**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Phenolics, Total Recoverable	0.100	0.0946		mg/L		95	75 - 125

Method: SM 5310B - Organic Carbon, Dissolved (DOC)

Lab Sample ID: MB 680-352329/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 352315

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Dissolved Organic Carbon	0.50	U	1.0	0.50	mg/L			10/03/14 22:15	1

QC Sample Results

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Method: SM 5310B - Organic Carbon, Dissolved (DOC) (Continued)

Lab Sample ID: LCS 680-352329/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 352315

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Dissolved Organic Carbon			20.0	19.0		mg/L		95	80 - 120		

Lab Sample ID: LCSD 680-352329/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 352315

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Dissolved Organic Carbon			20.0	18.9		mg/L		94	80 - 120	1	20

Lab Sample ID: 680-105819-1 MS — **Client Sample ID: 1464442-GF-1**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 352315

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Dissolved Organic Carbon	3.1		20.0	22.3		mg/L		96	80 - 120		

Lab Sample ID: 680-105819-1 MSD — **Client Sample ID: 1464442-GF-1**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 352315

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Dissolved Organic Carbon	3.1		20.0	22.1		mg/L		95	80 - 120	1	20

QC Association Summary

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

General Chemistry

Prep Batch: 351673

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-1	1464442-GF-1	Total/NA	Water	Distill/CN	
680-105819-2	1464443-SFP-2	Total/NA	Water	Distill/CN	
680-105819-3	1464444-SC-1	Total/NA	Water	Distill/CN	
680-105819-4	1464445-RC-1	Total/NA	Water	Distill/CN	
680-105819-6	1464454-SFP-1	Total/NA	Water	Distill/CN	
LCS 680-351673/2-A	Lab Control Sample	Total/NA	Water	Distill/CN	
MB 680-351673/1-A	Method Blank	Total/NA	Water	Distill/CN	

Analysis Batch: 351782

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-1	1464442-GF-1	Total/NA	Water	335.4	351673
680-105819-2	1464443-SFP-2	Total/NA	Water	335.4	351673
680-105819-3	1464444-SC-1	Total/NA	Water	335.4	351673
680-105819-4	1464445-RC-1	Total/NA	Water	335.4	351673
680-105819-6	1464454-SFP-1	Total/NA	Water	335.4	351673
LCS 680-351673/2-A	Lab Control Sample	Total/NA	Water	335.4	351673
MB 680-351673/1-A	Method Blank	Total/NA	Water	335.4	351673

Prep Batch: 351908

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-1	1464442-GF-1	Total/NA	Water	Distill/Phenol	
680-105819-3	1464444-SC-1	Total/NA	Water	Distill/Phenol	
680-105819-4	1464445-RC-1	Total/NA	Water	Distill/Phenol	
LCS 680-351908/2-A	Lab Control Sample	Total/NA	Water	Distill/Phenol	
MB 680-351908/1-A	Method Blank	Total/NA	Water	Distill/Phenol	

Analysis Batch: 351979

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-1	1464442-GF-1	Total/NA	Water	420.1	351908
680-105819-3	1464444-SC-1	Total/NA	Water	420.1	351908
680-105819-4	1464445-RC-1	Total/NA	Water	420.1	351908
LCS 680-351908/2-A	Lab Control Sample	Total/NA	Water	420.1	351908
MB 680-351908/1-A	Method Blank	Total/NA	Water	420.1	351908

Prep Batch: 352311

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-2	1464443-SFP-2	Total/NA	Water	Distill/Phenol	
680-105819-5	1464446-SFP-1	Total/NA	Water	Distill/Phenol	
LCS 680-352311/2-A	Lab Control Sample	Total/NA	Water	Distill/Phenol	
MB 680-352311/1-A	Method Blank	Total/NA	Water	Distill/Phenol	

Analysis Batch: 352315

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-1	1464442-GF-1	Dissolved	Water	SM 5310B	
680-105819-1 MS	1464442-GF-1	Dissolved	Water	SM 5310B	
680-105819-1 MSD	1464442-GF-1	Dissolved	Water	SM 5310B	
680-105819-2	1464443-SFP-2	Dissolved	Water	SM 5310B	
680-105819-3	1464444-SC-1	Dissolved	Water	SM 5310B	
680-105819-4	1464445-RC-1	Dissolved	Water	SM 5310B	
680-105819-5	1464446-SFP-1	Dissolved	Water	SM 5310B	
LCS 680-352329/2-A	Lab Control Sample	Dissolved	Water	SM 5310B	352329

QC Association Summary

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

General Chemistry (Continued)

Analysis Batch: 352315 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCSD 680-352329/3-A	Lab Control Sample Dup	Dissolved	Water	SM 5310B	352329
MB 680-352329/1-A	Method Blank	Dissolved	Water	SM 5310B	352329

Filtration Batch: 352329

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 680-352329/2-A	Lab Control Sample	Dissolved	Water	FILTRATION	
LCSD 680-352329/3-A	Lab Control Sample Dup	Dissolved	Water	FILTRATION	
MB 680-352329/1-A	Method Blank	Dissolved	Water	FILTRATION	

Analysis Batch: 352442

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
680-105819-2	1464443-SFP-2	Total/NA	Water	420.1	352311
680-105819-5	1464446-SFP-1	Total/NA	Water	420.1	352311
LCS 680-352311/2-A	Lab Control Sample	Total/NA	Water	420.1	352311
MB 680-352311/1-A	Method Blank	Total/NA	Water	420.1	352311

EPA/RPA PROJECTS CHAIN OF CUSTODY

SUB-WORK REQUIRED
COPY TO CLIENT

C028817

ENVIRONMENTAL MONITORING, INC
P.O. BOX 1190 * NORTON VA 24273 * 276-679-6544

Proj. Description: Red River	EPA Sampling
EMI Project #: 95,71	Emi Project Manager: RJP
COLLECTED BY: BMI / JR, WB	

EMI NO.	EMI SAMPLE #	CUSTOMER SAMPLE IDENTIFICATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	NO. OF CONT.	EPA 0902R BROMIDE	TOTAL METALS, HARDNESS	DISSOLVED ORGANIC CARBON	PHENOLS	CYANIDE	DISSOLVED METALS	PH	TEMP	FLOW (cfs)	Flows REMARKS
							PRESERVATIVE USED:									
							COOL < 6°C	HNO_3	FILT. HCL	H_2SO_4	NaOH	FILT. HNO_3				
	146442	GF-1	9-29-14	1300	W	7	1	2	2	1	1		7.8	17.5	0.454	203
	443	SFP-2	"	1415	W	7	1	2	2	1	1		8.4	17.5	7.82	3503
	444	SC-1	"	1500	W	7	1	2	2	1	1		8.0	18.0	0.19	85
	445	RC-1	"	1530	W	7	1	2	2	1	1		8.1	18.0	0.82	367
	446	SFP-1	"	1630	W	6 ~~7~~ (1)	1	2	2	1			7.6	17.1	4.23	1895

(1) JR 9/29/14

BIN # _____ EMI pH Meter # _____

COOLER TEMP 15.9°C ON ICE CHECKED BY: RDD Number of Containers this Page: 34

Relinquished by: [signature] Date: 9/29/14 Time: 1850 Received by: [signature]

Relinquished by: Cooler Date: 9/29/14 Time: 2025 Received by: [signature]

Updated 09/16/13

All samples requiring pH preservation were verified to be as indicated on COC by: RD
Date: 9/29/14 Time: 2025

EPA/RPA PROJECTS CHAIN OF CUSTODY

ENVIRONMENTAL MONITORING, INC

P.O. BOX 1190 * NORTON VA 24273 * 276-679-6544

C029114

Proj. Description: Red River	**EPA Sampling**
EMI Project #: 95.71	**Emi Project Manager: RJP**
COLLECTED BY: BMI / JR, WB	

EMI NO.	EMI SAMPLE #	CUSTOMER SAMPLE IDENTIFICATION	DATE COLLECTED	TIME COLLECTED	SAMPLE MATRIX	NO. OF CONT.	COOL v 6°C (EPA 0902R BROMIDE)	HNO_3 (TOTAL METALS, HARDNESS)	FILT. HCL (DISSOLVED ORGANIC CARBON)	H_2SO_4 (PHENOLS)	NaOH (CYANIDE)	FILT. HNO_3 (DISSOLVED METALS)	PH	TEMP	FLOW	REMARKS
	1464454	SFP-1	9-30-14	0715	W	1					1		7.9	17.0		See previous logsheet

PRESERVATIVE USED:

All samples requiring pH preservation were verified to be as indicated on COC by: [illegible]
Date: 9-30-14 Time: 9:10

BIN # _____ **EMI pH Meter #** _____

COOLER TEMP 4.2°C (260 on ice) **CHECKED BY:** [illegible] **Number of Containers this Page:** _____

Relinquished by: Wendel R Boylan Date: 9 / 30 / 14 Time: 0908 Received by: [illegible]

Relinquished by: _____ Date: ___/___/___ Time: _____ Received by: _____

Updated 09/16/1

Certification Summary

Client: Environmental Monitoring, Inc.
Project/Site: 95.71

TestAmerica Job ID: 680-105819-1

Laboratory: TestAmerica Savannah

The certifications listed below are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Virginia	NELAP	3	460161	06-14-15