

## ATTACHMENT II-G

### SURFACE WATER HYDROLOGY

## **SURFACE WATER HYDROLOGY (880-X-8E-.06(1))**

### **General Description of Surface Water Hydrology**

The proposed surface mine permit site is located in the Mulberry Fork River Basin and is drained by the Mulberry Fork of the Warrior River. Immediate surface runoff drains into Little Spring Creek or unnamed tributaries of Little Spring Creek. Little Spring Creek drains into Spring Creek which in turn drains into Blackwater Creek which drains into the Mulberry Fork of the Black Warrior River. Stream flows vary with rainfall with low flows historically in the summer months and high flows historically during January/February. The site is bounded on the west by the 100' setback from Little Spring Creek and consists of varying contours with unnamed tributaries and woodland up-slopes up to Bird Farm Road (County Road 1549). There are three (3) distinct primary unnamed tributaries and at least five (5) secondary unnamed tributaries that will convey drainage from the proposed mine site to Little Spring Creek. The three (3) primary unnamed tributaries are intermittent and the five (5) secondary tributaries are classified as wet-weather and are generally dry but convey storm drainage. Bird Farm Road has been constructed generally along the drainage divide on the upland ridge along the eastern boundary of the proposed mine and acts as a divide to convey all surface drainage to the east and to the west.

The proposed mine site lies in USGS Hydrologic Unit Code and SCS Sub-watershed Number for the immediate drainage area of this proposed mine is 03160109-130 as defined by the USDA Soil Conservation Service. Surface water flowing into and from the proposed permit area will consist predominately of overland flow and six (6) sediment control structures are proposed to control exit flows from this facility (See [NPDES Permit Map](#) for basins identification and

location.) There are no perennial streams or springs located within the proposed permit boundary. (See [Spectrum Environmental Inc. Streams Classification](#) on drainage ways at the proposed mine site.)

Prior to any mining disturbance, sediment basins will be constructed in the corresponding sub-watersheds to contain and treat all surface water flows before being discharged into state waters. The Alabama Department of Environmental Management designation of streams within the surrounding area are as follows: Spring Creek - Fish and Wildlife, Little Spring Creek - Fish and Wildlife and Blackwater Creek - Fish and Wildlife.

Three (3) surface water monitoring stations, designated SW-1 (downstream), SW-2 (upstream) and SW-3 (upstream) have been established to monitor baseline surface water quality, and quantity.

NOTE: SW-3 monitoring station was established after the January 4, 2011 recommendations of the participants at the Interagency Coordination meeting when the mining site was reduced from 1173 acres to 589 acres. SW-3 will provide more localized and accurate baseline data for Little Spring Creek - East. At this time (4-26-2011) four (4) baseline samples have been taken.

Performance monitoring for this proposed mine site will be characterized by data taken from SW-1, the downstream monitoring site, and will be used in the water quality projections. The upstream surface water monitoring stations (SW-2 & SW-3) will be monitored for baseline data. See [Hydro-Geo Map](#) for the location of the surface water monitoring stations.

### **Surface-Water Bodies**

Other than the previously described intermittent and wet weather streams as previously described there are no other surface-water bodies. The proposed sediment basins on this site will be temporary and will be removed in the reclamation process.

### **Surface Water Uses**

The known uses of surface water on Little Spring Creek and/or any unnamed tributaries and wet-weather streams at this site are considered fish and wildlife.

### **Surface Water Quality**

See attached Surface Water Baseline Analyses. Samples taken from surface water monitoring stations SW-1, SW-2 and SW-3 indicate the water is of good quality. Samples have been taken over adequate monthly intervals to identify seasonal flow characteristics.

### **Surface Water Quantity**

Stream Flow (overland flow) water quantity in cubic feet per second (cfs) is determined at each sampling interval of baseline data. Flow rate measurement of surface water samples were performed in accordance with ASTM D3858-95 (Reapproved 2008) pages 1-9, "Standard Test Method for Open-Channel Flow Measurement of Water by Velocity-Area Method" and utilizing a "FP211 Flow Probe" digital water velocity meter.

## **Surface Water Sampling and Analytical Methods**

All surface water samples were collected by the grab method and analyzed by TASK Engineering Management Inc. Flow rates were determined as outline in the previous "Surface Water Quantity" section. Flow velocity, pH and Specific Conductivity of all samples were measured in the field at the time said samples were taken. Samples are immediately stored in new, clean plastic sample bottles. After all field measurements are completed, the time, date, mine identification and surface monitoring site identification are recorded on the sample bottle and on a chain of custody form to maintain documentation and sample integrity. Samples are then deposited in a field cooler with ice to refrigerate to near 4°C for delivery to the TASK Engineering Management Inc. offices for further chemical testing.

See following for description and documentation of methodology of analyses:

- 1) Analysis of pH was a direct reading and performed in accordance with the standard operating procedures of the Hach Company's sensION1 Portable pH meter.
- 2) Analysis of Conductivity, SpC, was a direct reading and performed in accordance with the standard operating procedures of the Hach Company's DR3 Spectrophotometer which is equipped with a conductivity meter.
- 3) Analysis of Total Iron, Fe, was utilizing a Hach DR/890 Colorimeter and performed in accordance with the Hach DR/820-DR/850-DR/890 Datalogging Colorimeter Handbook, "FerroVer Method", pp.227 through 233 (USEPA approved).

- 4) Analysis of Total Manganese, Mn, was performed in accordance with the Hach DR/820-DR/850-DR/890 Datalogging Colorimeter Handbook, "Periodate Oxidation Method", pp.253 through 261 (USEPA approved).
  
- 5) Analysis of Sulfate, SO<sub>4</sub>, was performed in accordance with the Hach DR/820-DR/850-DR/890 Datalogging Colorimeter Handbook, "SulfaVer 4 Method", pp.539 through 545 (USEPA approved).
  
- 6) Analysis of Acidity was performed by digital titration in accordance with the Hach Water Analysis Handbook , "Methyl Orange Method" pp.2-3 through 2-5.
  
- 7) Analysis of Alkalinity was performed by digital titration in accordance with the Hach Water Analysis Handbook, "Titration Method" pp.2-9 through 2-12.
  
- 8) Analysis of Suspended solids was performed by gravimetric methods and/or Photometric methods as required.

NOTE: Any chemical analyses parameters outside the ability of TASK Engineering Management Inc. will be sent to ESC LAB SCIENCES for processing. Samples not analyzed by TASK Engineering Management Inc. will be so noted by correspondence to the Regulatory Authority.

### **Precipitation Modeling**

No modeling and/or simulation methods are employed at this time.

### **Surface Water Monitoring Station Location(s)**

For locations of surface water monitoring stations, see [Hydro-Geo Map](#).

### **Results of Surface Water Sampling and Analytical Data for Each Sample**

See attached Surface Water Baseline Tables. All surface water samples were analyzed for Quantity of Flow, pH, Conductivity, Total Suspended Solids, Total Iron, Total Manganese, Sulfates, Acidity, and Alkalinity.

**SURFACE WATER BASELINE ANALYSIS**

SAMPLE I.D.: SW-1

MONITORING SOURCE: LITTLE SPRING CREEK

DRAINAGE AREA: 5.442 SQ. MI.

LOCATION FROM MINE: DOWNSTREAM

DATE	DISH. cfs	pH s.u.	SpC u-mhos/cm	TSS Mg/l	Fe Mg/l	Mn Mg/l	SO4 Mg/l	ACID Mg/l	ALKA Mg/l
04/23/09	10.04	6.87	90	5	0.62	BDL	43	22	41
05/20/09	20.55	7.21	227	11	0.66	0.31	75	18	36
06/25/09	13.59	7.25	146	7	0.75	0.29	60	8	27
07/24/09	27.60	6.70	357	13	0.61	0.11	36	6	23
08/25/09	15.33	6.90	115	9	0.55	0.15	27	26	39
09/30/09	4.48	7.13	138	12	0.69	0.25	39	11	29
10/21/09	12.60	6.63	195	9	0.73	0.17	55	9	34
11/24/09	12.95	6.79	275	7	0.86	0.05	52	13	19
12/21/09	19.36	6.59	142	11	0.75	0.14	46	23	31
01/26/10	21.46	7.11	207	9	0.47	0.17	48	11	27
02/25/10	9.75	6.87	155	11	0.59	0.12	49	15	36
03/24/10	10.35	7.04	109	7	0.52	0.21	52	24	35
04/22/10	12.67	7.11	145	5	0.66	0.37	67	19	31
05/27/10	18.65	7.46	390	27	0.42	0.10	11	11	46

**SURFACE WATER BASELINE ANALYSIS**

SAMPLE I.D.: SW-2

MONITORING SOURCE: LITTLE SPRING CREEK

DRAINAGE AREA: 2.032 SQ. MI.

LOCATION FROM MINE: UPSTREAM

DATE	DISH. cfs	pH s.u.	SpC u-mhos/cm	TSS Mg/l	Fe Mg/l	Mn Mg/l	SO4 Mg/l	ACID Mg/l	ALKA Mg/l
04/23/09	5.14	7.03	75	3	0.71	0.20	38	20	36
05/20/09	10.32	7.11	195	13	0.70	0.25	83	15	33
06/25/09	7.30	7.06	113	4	0.79	0.15	67	11	33
07/24/09	17.49	6.58	290	11	0.51	0.11	51	11	20
08/25/09	9.93	6.41	156	5	0.63	0.22	15	19	31
09/30/09	3.44	7.25	109	16	0.77	0.19	59	21	40
10/21/09	7.45	7.04	177	9	0.79	0.09	29	15	29
11/24/09	7.01	7.11	103	6	0.57	0.26	55	21	39
12/21/09	10.05	6.92	159	14	0.68	0.18	26	17	32
01/26/10	12.78	6.86	239	5	0.62	0.23	40	16	31
02/25/10	6.07	7.11	210	16	0.61	0.27	52	16	39
03/24/10	5.67	6.90	96	4	0.41	0.20	70	21	39
04/22/10	6.52	7.00	110	5	0.59	0.41	121	11	26
05/27/10	10.10	7.89	326	19	0.29	0.21	29	19	52

**SURFACE WATER BASELINE ANALYSIS**

SAMPLE I.D.: SW-3  
MONITORING SOURCE: LITTLE SPRING CREEK  
DRAINAGE AREA: 3.930 SQ. MI.  
LOCATION FROM MINE: UPSTREAM

DATE	DISH. cfs	pH s.u.	SpC u-mhos/cm	TSS Mg/l	Fe Mg/l	Mn Mg/l	SO4 Mg/l	ACID Mg/l	ALKA Mg/l
01/26/11	22.14	7.44	224	4	0.55	0.17	75	12	27
02/18/11	6.79	7.01	295	7	0.32	0.21	105	21	23
03/21/11	4.22	6.68	313	2	0.44	0.15	98	23	23
04/25/11	11.55	6.88	295	4	0.41	0.21	111	17	22
05/25/11	3.15	6.92	412	1	0.21	0.11	125	18	21
06/14/11	0.00*								
07/22/11	3.36	7.05	268	3	0.19	0.18	89	14	25
08/08/11	3.19	6.98	302	4	0.20	0.22	142	18	25
09/15/11	0.89	6.22	458	3	0.23	0.19	119	19	24
10/06/11	0.00*								

\*NO FLOW

**SEASONAL BASELINE DATA**

SAMPLE I.D. SW-1  
 MONITORING SOURCE: LITTLE SPRING CREEK  
 DRAINAGE AREA: 5.442 SQ. MI.  
 LOCATION FROM MINE: DOWNSTREAM

SEASON	DISH. cfs	pH s.u.	SpC u-mhos/cm	TSS Mg/l	Fe Mg/l	Mn Mg/l	SO4 Mg/l	ACID Mg/l	ALKA Mg/l
SUMMER	24.47	6.88	203.33	11.33	0.62	0.17	34.00	14.33	30.33
FALL	14.97	6.66	204.00	9.00	0.78	0.12	51.00	15.00	28.00
WINTER	13.85	6.99	157.00	9.00	0.53	0.17	49.67	16.67	32.67
SPRING	15.10	7.14	199.60	11.00	0.62	0.21	51.20	15.60	36.20
AVERAGE	17.10	6.92	190.98	10.08	0.64	0.17	46.47	15.40	31.80

SAMPLE I.D. SW-2  
 MONITORING SOURCE: LITTLE SPRING CREEK  
 DRAINAGE AREA: 2.032 SQ. MI.  
 LOCATION: UPSTREAM

SEASON	DISH. cfs	pH s.u.	SpC u-mhos/cm	TSS Mg/l	Fe Mg/l	Mn Mg/l	SO4 Mg/l	ACID Mg/l	ALKA Mg/l
SUMMER	9.01	5.80	194.00	10.67	0.63	1.17	28.33	27.67	51.33
FALL	9.07	5.74	93.67	9.67	0.56	0.88	23.67	24.33	38.67
WINTER	11.70	5.54	134.00	8.33	0.79	1.29	12.33	26.33	45.33
SPRING	12.21	5.57	189.60	8.80	0.76	1.11	15.40	25.60	33.20
AVERAGE	10.50	5.66	152.82	9.37	0.69	1.11	19.93	25.98	42.13

SAMPLE I.D.: SW-3  
 MONITORING SOURCE: LITTLE SPRING CREEK  
 DRAINAGE AREA: 3.930 SQ. MI.  
 LOCATION FROM MINE: UPSTREAM

SEASON	DISH. cfs	pH s.u.	SpC u-mhos/cm	TSS Mg/l	Fe Mg/l	Mn Mg/l	SO4 Mg/l	ACID Mg/l	ALKA Mg/l
SUMMER	2.48	6.58	342.67	3.33	0.21	0.20	116.67	17	24.67
FALL	N/A								
WINTER	11.05	6.94	277.33	4.33	0.44	0.18	92.67	18.67	24.33
SPRING	7.35	6.90	353.50	2.50	0.31	0.16	118.00	17.50	21.50
AVERAGE	6.96	6.81	324.50	3.39	0.32	0.18	109.11	17.72	23.50