

UPPER HE CREEK WATER BALANCE

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Sequatchie Valley Coal Corporation



Background

- Surface coal mine reclamation site
- Sequatchie Valley Coal Corporation
- 1,000+ acre area mining with dragline
- Combined passive and active treatment
- Discharges to Big He Creek and He Creek

Water Balance Evaluation Goals

- Define source and quantity of water exposed to contact with acid bearing minerals
- Determine how water moves through the site
- Provide insight regarding how to manage water to meet goals
 - reducing water infiltration
 - improved treatment efficiency
- Provide a tool to measure costs versus benefits

Watershed Drainage Areas

• Big He Creek (1,310 acres)

- 640 acres from permit areas
- 670 acres from other areas
- Little He Creek (1,050 acres)
 - 400 acres from permit areas
 - 650 acres from other areas
- He Creek (2,750 acres)
 - 1085 acres from permit areas (40%)
 - 1665 acres from other areas

He Creek on USGS Map

He Creek and Dry Creek Watersheds



Watershed Drainage Areas to He Creek







Water Balance Parameters

- Precipitation
- Surface Runoff
- Evapotranspiration (ET)
- Infiltration
- Pumping Withdrawals
- Change in Groundwater Storage
- Groundwater Inflow

Monitoring Stations

- 1 Weather Station (Precipitation)
- 7 Surface Water Flow Stations
 - 3 stream flow stations
 - 3 pump flow stations
 - 1 gravity flow discharge station
- 5 Groundwater Level Stations
- 1 Evapotranspiration Lysimeter
- Monitored 3/15/12 10/11/12 (10 min intervals)

Monitoring Locations







Weather Station







AVERAGE PRECIPITATION (Source: University of Tennessee, Institute of Agriculture)







PRECIPITATION SUMMARY







Big He Creek Monitoring Station







Little He Creek Monitoring Station



Flow Depth

Flow Rate – Big He Creek

Flow Rate – Little He Creek

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Flow Rate – He Creek

Stream Flow Rates

Stream Flow Cross Check

Stream Runoff %

TABLE 3 PRECIPITATION AND RUNOFF FROM ALL DRAINAGE SHEDS DURING THE STUDY PERIOD IN INCHES

	STUDY PERIOD (210 DAYS MID-MARCH THROUGH MID-OCTOBER)			
	BIG HE CREEK (SW-13)	LITTLE HE CREEK (SW-14)	HE CREEK (SW-4)	
Precipitation [in (cm)]	31.1 (79.0)	31.1 (79.0)	31.1 (79.0)	
Runoff [in (cm)]	6.5 (16.5)	8.3 (21.0)	8.5 (21.5)	
Recharge + ET [in (cm)]	24.6 (62.6)	22.8 (58.0)	22.7 (57.6)	
Runoff (%)	20.8%	26.6%	27.2%	
Recharge + ET (%)	79.2%	73.4%	72.8%	

Evapotranspiration

ET AVERAGE ANNUAL RATES (FROM SANFORD AND SELNICK)

ESTIMATED MEAN ANNUAL ACTUAL EVAPOTRANSPIRATION RATES 1971-2000

PRECIPITATION AND ET

INFILTRATION

TABLE 6AVERAGE ANNUAL ESTIMATED INFILTRATION(Recharge + ET) – ET = Infiltration Recharge

	BIG HE CREEK (SW-13)	LITTLE HE CREEK (SW-14)	HE CREEK (SW-4)
Recharge + ET [in (cm)]	48.3 (122.7)	44.8 (113.7)	44.4 (112.8)
ET [in (cm)]	28.0 (71.1)	28.0 (71.1)	28.0 (71.1)
Infiltration Recharge [in (cm)]	20.3 (51.5)	16.8 (42.6)	16.4 (41.7)

Goundwater Monitoring

WATER BALANCE

TABLE 8 ANNUAL WATER BALANCE RESULTS

	PRECIPITATION	RUNOFF	ET	INFILTRATION
	GPM (M ³ /min)			
BIG HE CREEK	4,128 (15,624)	860 (3.26)	1,895 (7.17)	1,373 (5.20)
LITTLE HE CREEK	3,309 (12,525)	880 (3.33	1,519 (5.75)	910 (3.45)
HE CREEK	8,667 (32,805)	2,356 (8.92)	3,978 (15.06)	2,332 (8.83)
	IN (CM)	IN (CM)	IN (CM)	IN (CM)
BIG HE CREEK	61.0 (154.9)	12.7 (32.3)	28.0 (71.1)	20.3 (51.5)
LITTLE HE CREEK	61.0 (154.9)	16.2 (41.2)	28.0 (71.1)	16.8 (42.6)
HE CREEK	61.0 (154.9)	16.6 (42.1)	28.0 (71.1)	16.4 (41.7)

WATER BALANCE

HE CREEK (SW-4) ESTIMATED ANNUAL WATER BALANCE

NORTHERN AREA WATER BALANCE

- Largest contiguous portion of mined area
- Pumping used to control seepage
- Chemical added prior to treatment basin
- 2-3 days retention time in treatment system

Pump System Discharge

Pump Flow After Chemical Addition

Wetland Station

Wetland Flow Measurement

Basin D Station

Basin D Station

Northern Area Data

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Northern Area Infiltration

- Pump Rate 1,000 GPM +/-
- Pump water losses 300 GPM +/-
- Infiltration from water balance 700 GPM +/-

Northern Area

Basin Reclamation Projects

- Basin 2-2-006 (Completed 2013/2014)
- Basin 2-2-001A (Potential)
- Basin 2-2-001D and E Reclamation (Potential)
- Basin 2-001 (Completed 2014)
- Basin 2-002C (Completed 2014)

2-2-006 REMOVAL (129 acres)

Basin 2-2-006

Basin 2-002C

Proposed or Possible Projects

- AML Reclamation
- Pump discharge piping
- Storm Water Bypass (62 acres)
- Storm Water Bypass (181 acres)
- Additional treatment system piping (seasonal)
- Big He Creek Relocation (treatment relocation)

2409-DIVERSIONS (>250 acres)

AML Reclamation

AML Reclamation Planning

Sequatchie Valley Coal Corporation QUESTIONS?