NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Water use and quality from underground mining of coal

Reference Flow: 1 kg of coal

Brief Description: Water use and quality from underground mining of coal, based on data for Illinois No. 6 coal.

Section I: Meta Data

Geographical Coverage: US   **Region:**   US

Year Data Best Represents: 2004

Process Type: Extraction Process (EP)

Process Scope: Cradle-to-Gate Process (CG)

Allocation Applied: No

Completeness: All Relevant Flows Recorded

Flows Aggregated in Data Set:

☒ Process   ☐ Energy Use   ☐ Energy P&D   ☐ Material P&D

Relevant Output Flows Included in Data Set:

Releases to Air: ☐ Greenhouse Gases   ☐ Criteria Air Pollutants   ☐ Other

Releases to Water: ☒ Inorganic Emissions   ☒ Organic Emissions   ☐ Other

Water Usage: ☒ Water Consumption   ☒ Water Demand (throughput)

Releases to Soil: ☐ Inorganic Releases   ☐ Organic Releases   ☐ Other

Adjustable Process Parameters:

gnd_water_f	*[l/kg coal] Fresh groundwater withdrawal*
gnd_water_s	*[l/kg coal] Saline groundwater withdrawal*
surf_water_f	*[l/kg coal] Fresh surface water withdrawal*
water_disch	*[l/kg coal] Water discharge from mine*
EF_water_alk	*[kg/l] Concentration of discharge water constituent*

EF_water_acid	*[kg/l] Concentration of discharge water constituent*
EF_water_chl	*[kg/l] Concentration of discharge water constituent*
EF_water_iron	*[kg/l] Concentration of discharge water constituent*
EF_water_sulf	*[kg/l] Concentration of discharge water constituent*
EF_water_bod	*[kg/l] Concentration of discharge water constituent*
EF_water_nitro	*[kg/l] Concentration of discharge water constituent*
EF_water_tss	*[kg/l] Concentration of discharge water constituent*

Tracked Input Flows:

Tracked Output Flows:

Coal, underground, water	*Reference flow of coal, used to scale water flows per unit of coal extracted*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage1_O_Underground_Coal_Mine_Water_2013.01.xls*, which provides additional details regarding calculations, data quality, and references as relevant.

Goal and Scope

The scope of this process covers the water use and water quality for surface mining of coal. The process is based on the reference flow of 1 kg of cleaned, crushed coal, as


DF_Stage1_O_Underground_Coal_Mine_Water_2013.01.docx

shown in **Figure 1.** Water flows include water required for mining and cleaning operations and wastewater flows. Storm water is included in the inventory for wastewater flows.

Boundary and Description

This unit process is based on water data for the underground mining of Illinois No. 6 coal. It is assumed that all underground mines have similar water use and quality profiles.

Figure 1 provides an overview of the boundary of this unit process.

Figure 1: Unit Process Scope and Boundary
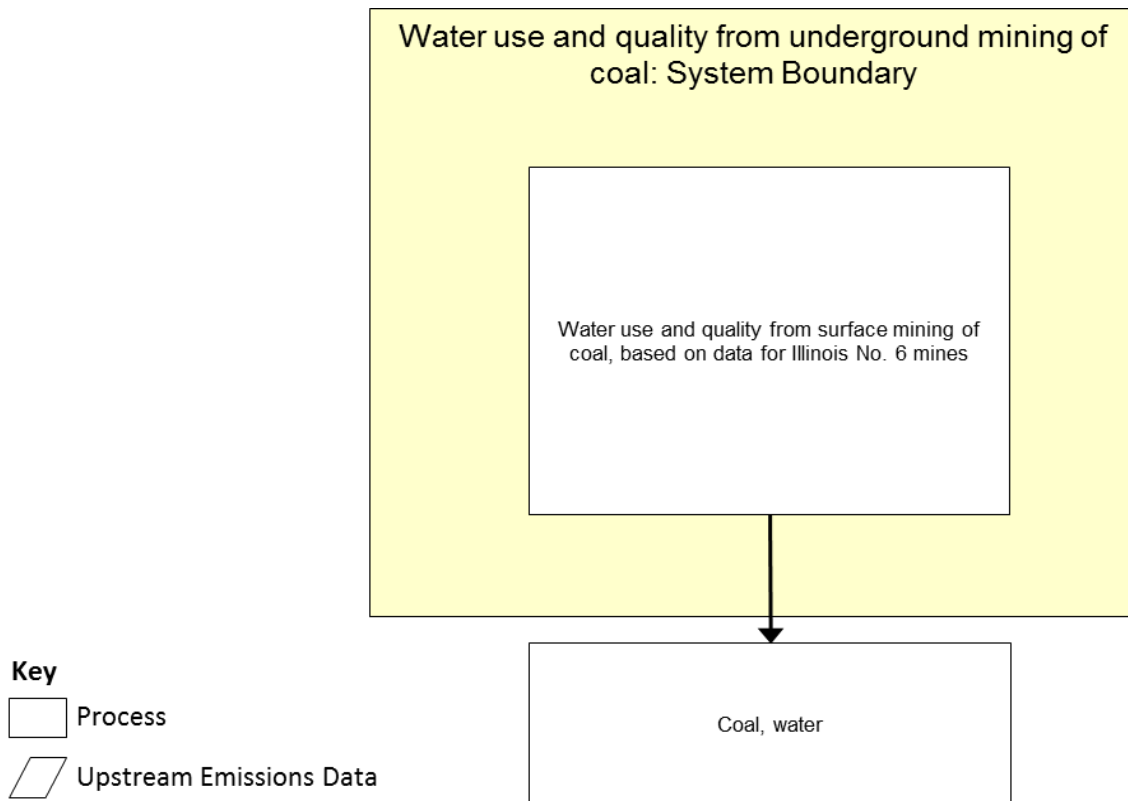
Water use was estimated by dividing USGS 2005 county-level water use (U.S. Geological Survey, 2005) by the 2005 Galatia Mine coal production (EIA 2013), which correlates well with an estimate provided by Galatia Mine staff (Personal Communication 2009). Water use for other counties with coal mines is provided to provide a bound for uncertainty. Water emissions data, including flows and concentrations of relevant inorganic constituents and biological oxygen demand, were taken from available National Pollutant Discharge Elimination System permit reporting documentation for Galatia Mine from 2009-2011 (EPA 2013).

Table 1 provides a summary of modeled input and output flows. Additional details regarding input and output flows, including calculation methods, are contained in the associated DS sheet.

Table 1: Unit Process Input and Output Flows

Flow Name*	Value	Units (Per Reference Flow)
Inputs		
Water (ground water, fresh) [Water]	1.34E-01	L
Water (ground water, saline) [Water]	5.17E-02	L
Water (surface water, fresh) [Water]	1.18E-01	L
Outputs		
Coal, underground, water [Reference flow]	**1.00E+00**	**kg**
Water (storm runoff) [Water]	3.78E-01	L
Total suspended solids [Particles to fresh water]	5.32E-06	kg
Iron [Heavy metals to fresh water]	9.22E-08	kg
Alkalinity [Inorganic emissions to fresh water]	6.10E-05	kg
Acidity [Inorganic emissions to fresh water]	-2.97E-05	kg
Chloride [Fresh water]	2.44E-03	kg
Sulphate [Inorganic emissions to fresh water]	3.80E-04	kg
Biological oxygen demand (BOD) [Analytical measures to fresh water]	7.49E-06	kg
Ammonia, as N [Inorganic emissions to fresh water]	1.88E-06	kg

* **Bold face** clarifies that the value shown *does not* include upstream environmental flows.

Embedded Unit Processes

None.

References

EPA 2013	CWA Effluent Report: Permit ID IL0061727. Environmental Protection Agency: Washington, DC. http://www.epa-echo.gov (Accessed April 1, 2013).
Personal Communication 2009	Personal communication with Galatia Mine chief engineer, March 13, 2009.
U.S. Geological Survey. 2005.	*Estimated Use of Water in the United States: County-Level Data for 2005*. United States Geological Survey. http://water.usgs.gov/watuse/data/2005/ilco2005.xls (accessed April 1, 2013).
EIA 2013	*Historical Detailed Coal Production Data (1983-2011)*. US Energy Information Agency: Washington, DC. (accessed 04/01/2013)

Section III: Document Control Information

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