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# NETL Life Cycle Inventory Data

## Process Documentation File

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auto_calc_wtr	<i>[dimensionless] Variable to determine if fresh and saline ground water are automatically calculated. If 0, user is responsible for ensuring fractions add up to 1.</i>
water_pct_total	<i>[dimensionless] Sum of water fractions (for user verification of water fractions)</i>
Water_Produced	<i>[L/kg coal] L of water produced during mining per kg coal produced</i>
EF_w_Al	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_arsenic	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_barium	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_BOD	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Boron	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Cadmium	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Calcium	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_C_TOC	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_COD	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Cr	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Cu	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Cn	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_F	<i>[kg/L water] kg of water quality constituent per L of water produced</i>



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EF_w_Iron	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Lead	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Mg	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Mn	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Hg	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Ni	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_nitrxtc	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_N_amm	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_N_total	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_P	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Selenium	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Na	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_TDS	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_TSS	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Stront	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_sulfate	<i>[kg/L water] kg of water quality constituent per L of water produced</i>
EF_w_Zinc	<i>[kg/L water] kg of water quality constituent per L of water produced</i>

### Tracked Input Flows:



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none

### Tracked Output Flows:

Coal, water

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

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## Section II: Process Description

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### Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS\_Stage1\_O\_Surface\_Coal\_Mine\_Water\_2013.01.xlsx*, which provides additional details regarding calculations, data quality, and references as relevant.

### Goal and Scope

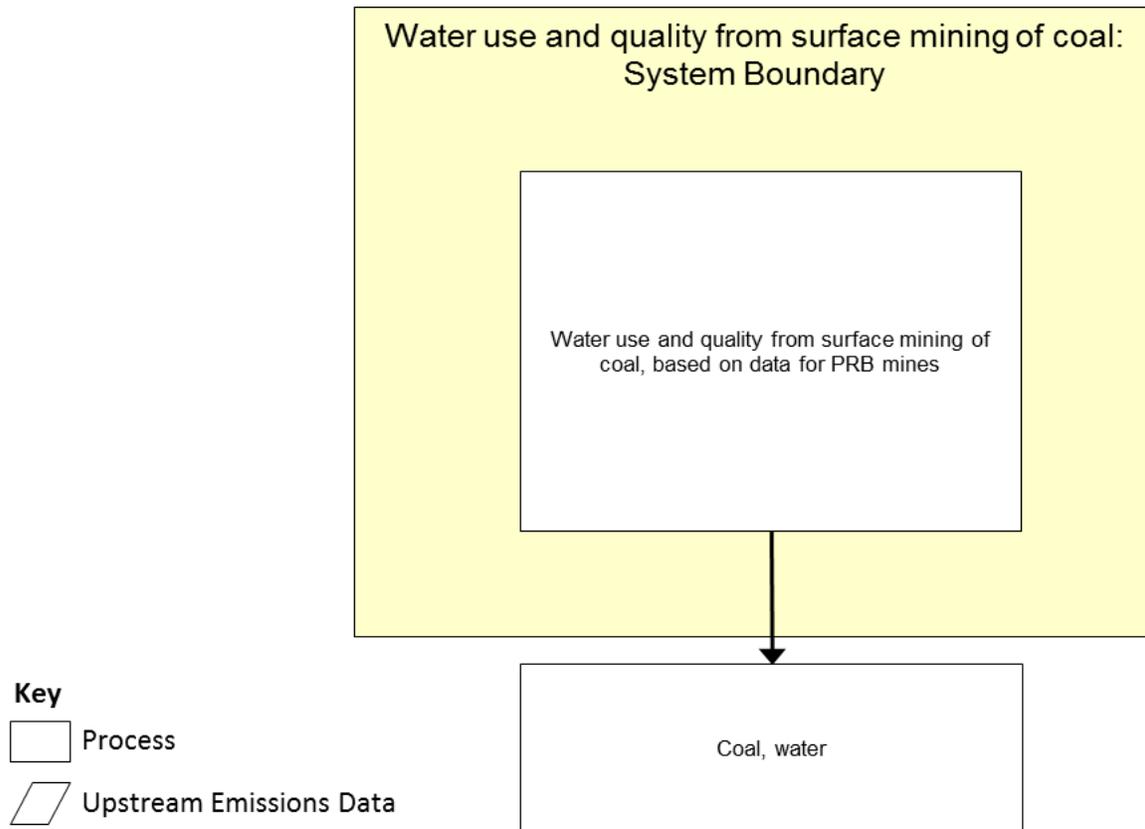
The scope of this process covers the water use and water quality for surface mining of coal. The process is based on the reference flow of 1 kg of cleaned, crushed coal, as shown in **Figure 1**. Water flows include water required for mining and cleaning operations and wastewater flows. Storm water is included in the inventory for wastewater flows.

### Boundary and Description

This unit process is based on water data for the surface mining of coal in the Powder River Basin. It is assumed that all surface 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 based on an environmental impact study completed on West Antelope II mine located in the Powder River Basin of Wyoming (BLM 2008). Water emissions, including flows and concentrations of relevant inorganic constituents and solids entering the waterstream, were taken from available National Pollutant Discharge Elimination System permit reporting documentation (NPDES 2009).

**Table 1** shows the input and output flows of this unit process. 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)
<b>Inputs</b>		
Water (ground water, fresh) [Water]	1.44E-02	L
Water (ground water, saline) [Water]	1.09E-02	L
Water (surface water, fresh) [Water]	5.08E-03	L
<b>Outputs</b>		
<b>Coal, surface, water [Intermediate product]</b>	<b>1.00</b>	<b>kg</b>
Aluminium [Heavy metals to fresh water]	2.51E-10	kg
Arsenic (+V) [Heavy metals to fresh water]	3.53E-11	kg
Barium [Inorganic emissions to fresh water]	8.88E-10	kg
Biological oxygen demand (BOD) [Analytical measures to fresh water]	7.97E-08	kg
Boron [Inorganic emissions to fresh water]	4.86E-09	kg
Cadmium (+II) [Heavy metals to fresh water]	1.59E-12	kg
Calcium (+II) [Inorganic emissions to fresh water]	1.14E-06	kg
Total organic carbon, TOC (Ecoinvent) [ecoinvent long-term to fresh water]	9.65E-08	kg
Chemical oxygen demand (COD) [Analytical measures to fresh water]	2.69E-07	kg
Chromium (unspecified) [Heavy metals to fresh water]	1.59E-10	kg
Copper (+II) [Heavy metals to fresh water]	7.81E-11	kg
Cyanide [Inorganic emissions to fresh water]	1.13E-10	kg
Fluoride [Inorganic emissions to fresh water]	1.79E-10	kg
Iron [Heavy metals to fresh water]	1.36E-08	kg
Lead (+II) [Heavy metals to fresh water]	1.61E-09	kg
Magnesium (+III) [Inorganic emissions to fresh water]	1.62E-11	kg
Manganese (+II) [Heavy metals to fresh water]	1.40E-06	kg
Mercury (+II) [Heavy metals to fresh water]	2.51E-09	kg
Nickel (+II) [Heavy metals to fresh water]	1.59E-13	kg
Nitrate (as total N) [Inorganic emissions to fresh water]	1.59E-10	kg
Ammonia, as N [Inorganic emissions to fresh water]	9.20E-09	kg
Nitrogen (as total N) [Inorganic emissions to fresh water]	4.77E-09	kg
Phosphorus [Inorganic emissions to fresh water]	1.52E-08	kg
Selenium [Heavy metals to fresh water]	2.39E-08	kg
Sodium (+I) [Inorganic emissions to fresh water]	2.49E-08	kg
Total Dissolved Solids [Analytical measures to fresh water]	2.96E-10	kg
Total Suspended Solids [Analytical measures to fresh water]	2.93E-11	kg
Strontium [Heavy metals to fresh water]	3.46E-06	kg
Sulfates [Inorganic emissions to fresh water]	2.38E-05	kg
Zinc (+II) [Heavy metals to fresh water]	1.62E-07	kg
Water (wastewater) [Water]	1.59E-02	L

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



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**Section III: Document Control Information**

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**Point of Contact:** Timothy Skone (NETL), Timothy.Skone@NETL.DOE.GOV

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**Section IV: Disclaimer**

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