NETL Life Cycle Inventory Data
Process Documentation File

Process Name: Illinois No. 6 Coal, Extraction and Transport

Reference Flow: 1 kg of Illinois No. 6 Coal

Brief Description: This process includes all inputs for the raw material acquisition and raw material transportation for 1 kg of delivered Illinois No. 6 bituminous coal.

Section I: Meta Data

Geographical Coverage: US **Region:** N/A

Year Data Best Represents: 2006

Process Type: Extraction Process (EP)

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

Allocation Applied: No

Completeness: Individual Relevant Flows Captured

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:

Train_dist	*The distance the train travels from the mine to the energy conversion facility*
Coal_mine_methane	*The amount of methane in the coal which is released during extraction*
Loss_rate	*Amount of coal lost during transit*

Tracked Input Flows:

I6 Commissioning	*The energy required for the commissioning and decommissioning of the mine*
Hard Coal (Illinois No. 6)	*Coal, including mine operations, energy, and water requirements*

Coal Preparation Facility	*Construction of a coal preparation facility*
Underground coal mine	*Construction of the underground coal mine*
Coal Unit Train Assembly, 100 Railcars, per kg Coal Transported	*Assembly process for constructed locomotive and railcars, used for the transport of coal*
Energy Resources	*Energy required for RMA and RMT of Illinois No. 6 coal*

Tracked Output Flows:

Illinois No. 6 Coal	*Delivered coal at the energy conversion facility*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_CTG_IllinoisNo.6_2011.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

The scope of this unit process covers all aspects of raw material acquisition (RMA) and raw material transportation (RMT) to the energy conversion facility as shown in **Figure 1**. At the downstream boundary for RMA and RMT, one kilogram of coal is delivered to the life cycle (LC) Stage #3 boundary. The RMA and RMT are discussed separately below.

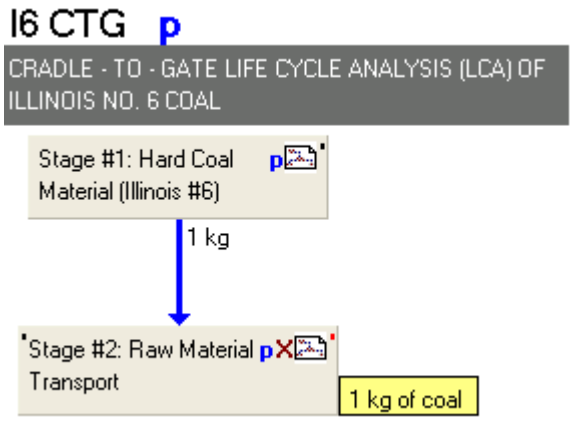


Figure 1: Plan for RMA and RMT of Illinois No. 6 Coal

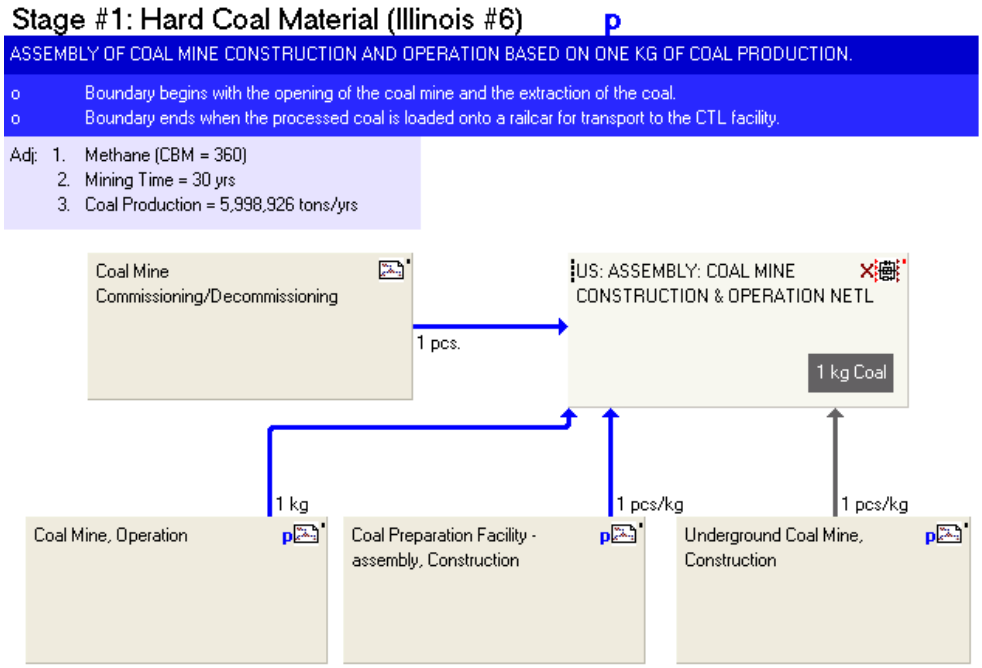
Boundary and Description

LC stage #1, RMA for bituminous coal, includes the construction of an Illinois No. 6 (I-6) coal mine and required operation equipment, the operation of the coal mine, and the commissioning and decommissioning of the mine. The mine was modeled based on the Galatia Mine in Galatia, Illinois, an underground mine producing I-6 bituminous coal.

Each of the processes included in RMA for I-6 coal include upstream processes (for example, diesel fuel or steel). Coal mine construction includes individual construction unit processes for key equipment, which are aggregated within the model as described below. The plan for RMA of I-6 coal is provided in **Figure 2**.

Coal mine commissioning and decommissioning integrates diesel and gasoline use during commissioning and decommissioning of the I-6 mine. Due to lack of available data, coal mine decommissioning was assumed to require 10% of the commissioning inputs. The coal mine operation includes energy from the power grid and diesel use for the operation of the mine and mine equipment. Coal mine methane emission rate is an adjustable parameter in this process.

Figure 2: Plan for RMA of Illinois No. 6 Coal, including Operation, Construction, and Commissioning/Decommissioning Profiles



The construction process is broken down into two main sub-processes: the construction of the coal preparation facility, which consists of the above ground processing and sizing components of the mine, and the construction of the underground mine and

extraction machinery. The coal preparation facility process includes the following construction unit processes:

- Coal cleaning facility
  (DS/DF_Stage1_C_Coal_Cleaning_Facility_2010.01)
- Coal crusher facility
  (DS/DF_Stage1_C_Coal_Crusher_Facility_2010.01)
- Coal loading silo
  (DS/DF_Stage1_C_Steel_Coal_Loading_Silo_325_Tons_2010.01)
- Coal mine wastewater treatment plant
  (DS/DF_Stage1_C_Wastewater_Treatment_Plant_Underground_Coal_Mine_2010.01)
- Stacker reclaimer
  (DS/DF_Stage1_C_Coal_Stockpile_Stacker_2010.01)
- All site work
  (DS/DF_Stage1_C_CoalMineSite_I6_2010.01)

The underground mine includes the following construction unit processes:

- Continuous miner
  (DS/DF_Stage1_C_Continuous_Miner_755_HP_2010.01)
- Conveyor system
  (DS/DF_Stage1_C_Conveyor_System_48_Inch_2010.01)
- Longwall miner system
  (DS/DF_Stage1_C_Assembly_Longwall_Mining_System_2010.01)
- Shuttle car
  (DS/DF_Stage1_C_Shuttle_Car_2010.01)

Each piece of equipment is scaled to the production of coal mine production accounting for the lifetime of each piece of equipment, as relevant. The profiles and processes included in RMA are provided in **Table 1**. Those shown in bold face were developed by NETL.

Table 1: Profiles and Processes Included in RMA for Illinois No. 6 Coal

Stage #1: Hard Coal Material (Illinois #6)
- Coal Mine Commissioning/Decommissioning
  - US: Commissioning and Decommissioning of Illinois No. 6 Coal Mine NETL <u-so>
  - US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>
  - US: GASOLINE, NATIONAL AVERAGE, 2009 nETL <u-so>
- Coal Mine, Operation
  - North American Average Electricity Mix, 2007 NETL
  - US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>

US: Underground Mine, Illinois No. 6 Bituminous Coal, Operation <u-so>

Coal Preparation Facility - assembly, Construction

Coal Cleaning Facility, Construction

DE: Stainless steel cold roll PE

DE: Zinc redistilled mix PE

North American Average Electricity Mix, 2007 NETL

US: Coal Cleaning Facility, Construction NETL

US: Concrete, ready mixed, R-5-0 (100% Portland Cement) NETL <u-so>

WOR: Rebar Wire Rod, BF Manufactures NETL

Coal Crusher Facility, Construction

North American Average Electricity Mix, 2007 NETL

US: Coal Crusher Facility, Construction NETL

US: Concrete, ready mixed, R-5-0 (100% Portland Cement) NETL <u-so>

WOR: Rebar Wire Rod, BF Manufactures NETL

WOR: Steel Plate, BF, Manufacture NETL <u-so>

Coal Loading Silo, Construction

DE: Steel cold rolled PE

US: Steel Coal-Loading Silo, 325 Tons, Construction NETL <u-so>

Coal Mine Wastewater Treatment Plant, Construction

BF: Hot-dip Galvanized NETL

DE: Cast iron part PE <p-agg>

DE: Copper mix PE

North American Average Electricity Mix, 2007 NETL

RER: Polyvinylchloride pipe (PVC) PlasticsEurope

US: Concrete, ready mixed, R-5-0 (100% Portland Cement) NETL <u-so>

US: Thermal energy from heavy fuel oil PE

US: Wastewater Treatment Plant, Underground Coal Mine, Construction NETL <u-so>

WOR: Steel, Stainless, 316 2B, 80% Recycled NETL <u-so>

Stacker Reclaimer, Construction

US: Coal Stockpile Stacker, 450 Tonnes, Construction NETL <u-so>

WOR: Steel Plate, BF, Manufacture NETL <u-so>

US: Illinois No. 6 Coal Preparation Facility Assembly, Construction NETL <u-so>

Underground Coal Mine, Construction

Continuous Miner, Construction

US: Continuous Miner, 755 Horsepower, Construction NETL <u-so>

WOR: Steel Plate, BF, Manufacture NETL <u-so>

Conveyor System, Construction

BF: Hot-dip Galvanized NETL

DE: Steel cold rolled PE

DE: Styrene-butadiene rubber mix (SBR) PE

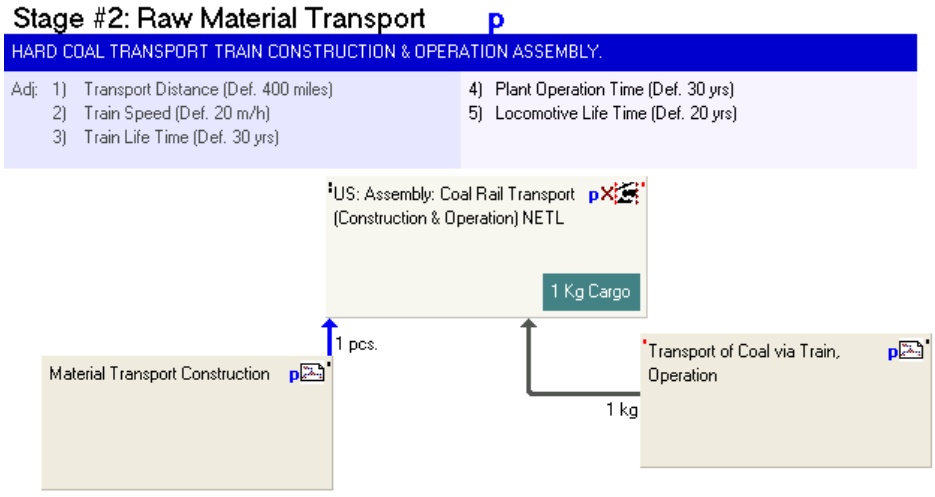
US: Conveyor System, 48 Inches, Construction <u-so>

Longwall Miner System, Construction

US: Longwall Miner System, Construction NETL
WOR: Steel Plate, BF, Manufacture NETL <u-so>
Shuttle Car, Construction
DE: Steel cold rolled PE
US: Shuttle Car, Construction NETL
Site Paving, Construction
GAB II, ASPHALT (Medium water content)
DK: GAB II, ASPHALT (Medium water content)
DK: Gravel round: at mine/CH S NETL
EU-15: Bitumen at refinery PE
North American Average Electricity Mix, 2007 NETL
US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>
US: Natural Gas RMA/RMT, Mix Nominal, 060911 NETL
North American Average Electricity Mix, 2007 NETL
US: Concrete, ready mixed, R-5-0 (100% Portland Cement) NETL <u-so>
US: Illinois No. 6 Underground Bituminous Coal Mine Site, Construction NETL <u-so>
US: Underground Coal Mine, Construction NETL
US: ASSEMBLY: COAL MINE CONSTRUCTION & OPERATION NETL

LC Stage #2 (RMT) includes the transport of the mined and processed I-6 bituminous coal from the underground coal mine site to the energy conversion facility (LC Stage #3). The construction of equipment used to transport mined coal and the operation of that equipment considered in two unit processes within RMT. Coal transport takes place via a train, which is suitable for the transport of coal, and which is powered by diesel. The transport distance is an adjustable parameter for RMT. The modeling plan for RMT of I-6 coal is provided in **Figure 3.**

Figure 3: Plan for RMT of I-6 Coal, including Construction and Operation of Profiles for Transport



Construction of the train for RMT includes the materials required to construct the following pieces of equipment for transport:

- Coal railcar
  (DS/DF_Stage2_C_Railcar_244000_lbs_Net_Capacity_2009.01)
- Diesel locomotive
  (4,400 horsepower) (DS/DF_Stage2_C_Locomotive_2009.01)
- Coal unit train (100 railcars and the required number of locomotives)
  (DS/DF_Stage2_C_Assembly_Coal_Unit_Train_100_Cars_2010.01)

The profiles and processes included in RMT are provided in **Table 2**. Those shown in bold face were developed by NETL.

Table 2: Profiles and Processes Included in RMT for Illinois No. 6 Coal

Stage #2: Raw Material Transport
Material Transport Construction
RER: Aluminum sheet mix PE
US: Coal Railcar, 244000 lbs Net Capacity, Construction NETL <u-so>
US: Coal Unit Train Assembly, 100 Railcars, Construction NETL <u-so>
US: Diesel Locomotive, 4400 Horsepower, Construction NETL <u-so>
WOR: Steel Plate, BF, Manufacture NETL <u-so>
WOR: Steel, Stainless, 316 2B, 80% Recycled NETL <u-so>
Transport of Coal via Train, Operation
US: Coal, Train Transport NETL <u-so>
US: DIESEL, NATIONAL AVERAGE, 2009 NETL <u-so>
US: Assembly: Coal Rail Transport (Construction & Operation) NETL

Parameters and Balances

The parameters for the highest level modeling plans for RMA and RMT of I-6 bituminous coal are shown in **Table 3**. These parameters may or may not include the adjustable parameters shown previously, based on how the model was created. **Table 4** presents the input and output balances for resources and emissions of interest for the cradle-to-gate plan as well as each of the RMA and RMT plans.

Table 3: Adjustable Parameters for RMA and RMT of Illinois No. 6 Coal

Plan	Parameter	Value	Comment
LC Stage #1			
Stage #1: Hard Coal Material (Illinois #6)	S1_CBM	360	[scf/ton coal] Average methane emissions from Galatia mine
Stage #1: Hard Coal Material (Illinois #6)	S1_COAL_PRO_YR	6E+09	[kg/yrs] coal production from Galatia Mine, See coal mine operation sheet.
Stage #1: Hard Coal Material (Illinois #6)	S1_MINE_OP_TIME	30	[years] coal mine will be operated for X years.
LC Stage #2			
Stage #2: Raw Material Transport	CONS_MAT	1	[pcs/Kg] Pieces per kg of construction material.
Stage #2: Raw Material Transport	S2_OPER_TIME	30	[yrs] Adjustable. Assumed life of the power plant
Stage #2: Raw Material Transport	S2_TRAIN_DISNZ	400	[miles] User Defined parameter, default value is 200 miles one way
Stage #2: Raw Material Transport	S2_TRAIN_SPEED	20	[mph] Estimated average speed of coal unit trains for six railroads in US from reference [8]

Table 4: Inputs and Output Balances for Cradle-to-Gate, RMA, and RMT of Illinois No. 6 Coal (kg/kg delivered)

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Inputs			
Flows	2.187E+00	1.169E+00	1.018E+00
Resources	2.187E+00	1.169E+00	1.018E+00
Energy resources	1.019E+00	1.791E-02	1.002E+00
Non renewable energy resources	1.019E+00	1.791E-02	1.002E+00
Crude oil (resource)	1.490E-03	3.968E-04	1.093E-03
Hard coal (resource)	1.015E+00	1.474E-02	1.000E+00
Lignite (resource)	8.288E-05	7.753E-06	7.512E-05
Natural gas (resource)	2.957E-03	2.761E-03	1.958E-04
Uranium (resource)	5.112E-09	6.281E-10	4.484E-09
Renewable energy resources	5.835E-08	4.203E-08	1.632E-08
Biomass	4.520E-09	3.525E-09	9.948E-10
Renewable fuels	9.536E-13	8.402E-13	1.134E-13
Wood	5.383E-08	3.851E-08	1.533E-08
Unspecified	0.000E+00	0.000E+00	0.000E+00
Land use	0.000E+00	0.000E+00	0.000E+00
Material resources	1.167E+00	1.151E+00	1.617E-02
Non renewable elements	6.351E-06	6.081E-06	2.705E-07
Aluminum	1.934E-10	1.923E-10	1.122E-12

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Chromium	4.461E-13	3.717E-13	7.442E-14
Copper	9.731E-12	9.725E-12	5.819E-15
Iron	6.316E-06	6.047E-06	2.689E-07
Lead	3.786E-13	3.327E-13	4.589E-14
Magnesium	2.018E-16	1.139E-16	8.789E-17
Mercury	3.272E-13	3.053E-13	2.189E-14
Nickel	4.870E-15	4.595E-15	2.756E-16
Phosphorus	2.021E-11	1.143E-11	8.783E-12
Sulphur	9.638E-11	1.234E-11	8.404E-11
Zinc	3.516E-08	3.366E-08	1.497E-09
Non renewable resources	4.676E-03	2.763E-03	1.912E-03
Barium sulphate	2.347E-16	5.914E-18	2.288E-16
Basalt	3.408E-06	1.075E-07	3.300E-06
Bauxite	2.048E-04	1.880E-06	2.029E-04
Bentonite	6.127E-06	1.239E-06	4.888E-06
Calcium carbonate (CaCO3)	1.259E-06	1.251E-06	7.301E-09
Calcium chloride	2.403E-14	6.055E-16	2.342E-14
Chalk (Calciumcarbonate)	2.807E-38	2.799E-38	8.158E-41
Chromium ore (39%)	1.628E-06	1.622E-06	5.660E-09
Clay	8.135E-07	4.267E-07	3.868E-07
Colemanite ore	8.662E-09	7.386E-09	1.275E-09
Copper - Gold - Silver - ore (1,0% Cu; 0,4 g/t Au; 66 g/t Ag)	8.814E-07	8.642E-07	1.721E-08
Copper - Gold - Silver - ore (1,1% Cu; 0,01 g/t Au; 2,86 g/t Ag)	5.370E-07	5.265E-07	1.049E-08
Copper - Gold - Silver - ore (1,16% Cu; 0,002 g/t Au; 1,06 g/t Ag)	3.031E-07	2.972E-07	5.919E-09
Copper - Molybdenum - Gold - Silver - ore (1,13% Cu; 0,02% Mo; 0,01 g/t Au; 2,86 g/t Ag)	1.132E-07	9.874E-08	1.442E-08
Copper ore (0.14%)	1.412E-06	1.382E-06	3.008E-08
Copper ore (1.2%)	9.141E-08	8.962E-08	1.785E-09
Copper ore (4%)	9.313E-18	6.029E-18	3.284E-18
Copper ore (sulphidic, 1.1%)	8.631E-08	8.581E-08	5.006E-10
Dolomite	7.226E-06	7.160E-06	6.646E-08
Feldspar (aluminum silicates)	1.419E-11	7.992E-12	6.194E-12
Ferro manganese	1.763E-13	1.628E-13	1.355E-14
Fluorspar (calcium fluoride; fluorite)	1.539E-06	1.413E-08	1.525E-06
Granite	2.459E-20	2.291E-20	1.678E-21
Gravel	1.065E-03	1.065E-03	0.000E+00
Gypsum (natural gypsum)	4.775E-07	2.668E-07	2.108E-07
Heavy spar (BaSO4)	1.479E-05	2.969E-06	1.182E-05
Ilmenite (titanium ore)	1.868E-11	1.868E-11	1.380E-16

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Inert rock	2.434E-03	7.973E-04	1.637E-03
Iron ore (56,86%)	6.624E-04	6.538E-04	8.636E-06
Iron ore (65%)	1.589E-07	1.541E-07	4.837E-09
Kaolin ore	1.555E-08	1.326E-08	2.288E-09
Lead - zinc ore (4.6%-0.6%)	1.301E-06	3.003E-07	1.000E-06
Limestone (calcium carbonate)	1.889E-04	1.642E-04	2.465E-05
Magnesit (Magnesium carbonate)	1.280E-11	7.933E-12	4.867E-12
Magnesium chloride leach (40%)	3.251E-07	4.161E-08	2.835E-07
Manganese ore	1.177E-08	1.049E-08	1.275E-09
Manganese ore (R.O.M.)	1.006E-06	9.450E-07	6.048E-08
Molybdenite (Mo 0,24%)	6.919E-08	6.029E-08	8.895E-09
Molybdenum ore (0.1%)	3.413E-09	2.321E-09	1.092E-09
Natural Aggregate	5.217E-05	4.454E-05	7.625E-06
Nickel ore (1,5%)	9.624E-07	9.616E-07	7.745E-10
Nickel ore (1.6%)	4.184E-06	4.032E-06	1.527E-07
Olivine	1.824E-12	1.683E-12	1.412E-13
Peat	1.546E-07	9.757E-09	1.448E-07
Phosphate ore	1.161E-11	5.101E-12	6.512E-12
Phosphorus minerals	3.197E-08	3.117E-08	8.056E-10
Phosphorus ore (29% P2O5)	4.020E-13	3.273E-13	7.472E-14
Potassium chloride	5.536E-10	4.395E-10	1.141E-10
Precious metal ore (R.O.M)	1.315E-08	1.270E-08	4.427E-10
Quartz sand (silica sand; silicon dioxide)	2.135E-06	1.938E-06	1.967E-07
Raw pumice	1.311E-09	1.286E-09	2.508E-11
Rutile (titanium ore)	2.940E-12	2.416E-13	2.698E-12
sand	1.031E-10	8.224E-11	2.087E-11
Slate	1.370E-12	1.062E-12	3.082E-13
Sodium chloride (rock salt)	7.941E-06	3.162E-06	4.779E-06
Sodium nitrate	1.435E-18	1.431E-18	4.679E-21
Sodium sulphate	1.561E-10	2.164E-12	1.539E-10
Soil	1.196E-05	9.448E-06	2.511E-06
Sulphur (bonded)	2.285E-13	1.454E-13	8.313E-14
Talc	2.299E-10	2.236E-10	6.369E-12
Tin ore	2.035E-17	5.129E-19	1.984E-17
Titanium ore	3.984E-08	2.428E-08	1.556E-08
Zinc - copper ore (4.07%-2.59%)	4.857E-07	3.198E-07	1.659E-07
Zinc - lead - copper ore (12%-3%-2%)	2.922E-07	2.157E-07	7.646E-08
Zinc - lead ore (4.21%-4.96%)	3.180E-18	2.059E-18	1.121E-18

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Zinc ore (4%)	-3.703E-06	-3.671E-06	-3.199E-08
Zinc ore (sulphidic, 4%)	3.662E-17	3.019E-17	6.428E-18
Renewable resources	1.163E+00	1.148E+00	1.426E-02
Water	1.156E+00	1.145E+00	1.134E-02
Water	6.747E-03	5.385E-04	6.208E-03
Water (feed water)	0.000E+00	0.000E+00	1.938E-06
Water (ground water)	3.861E-01	3.853E-01	8.198E-04
Water (lake water)	6.287E-06	6.287E-06	0.000E+00
Water (municipal)	5.602E-06	5.602E-06	0.000E+00
Water (sea water)	1.591E-05	5.507E-06	1.040E-05
Water (surface water)	7.603E-01	7.560E-01	4.304E-03
Water (well water)	2.269E-07	1.648E-07	6.205E-08
Water (well-produced water)	2.788E-03	2.788E-03	0.000E+00
Water (with river silt)	1.377E-16	1.539E-17	1.223E-16
Air	6.654E-03	3.743E-03	2.911E-03
Carbon dioxide	8.012E-06	2.942E-06	5.071E-06
Nitrogen	1.084E-08	9.647E-09	1.195E-09
Oxygen	0.000E+00	0.000E+00	0.000E+00
Unspecified	5.549E-08	5.517E-08	3.219E-10
Unspecified minerals	1.262E-08	1.255E-08	7.323E-11
Unspecified resources	4.287E-08	4.262E-08	2.487E-10
Area of Production Land	0.000E+00	0.000E+00	0.000E+00
Output			
Flows	1.785E+00	1.765E+00	2.024E-02
Resources	1.728E+00	1.724E+00	3.753E-03
Energy resources	0.000E+00	0.000E+00	0.000E+00
Land use	0.000E+00	0.000E+00	0.000E+00
Material resources	1.728E+00	1.724E+00	3.753E-03
Renewable resources	1.728E+00	1.724E+00	3.753E-03
Water	1.728E+00	1.724E+00	3.750E-03
Water (feed water)	1.042E-05	1.236E-05	0.000E+00
Water (river water)	1.712E+00	1.709E+00	3.712E-03
Water (wastewater)	2.830E-03	2.791E-03	3.836E-05
Water (wastewater)	1.234E-02	1.234E-02	0.000E+00
Nitrogen	0.000E+00	0.000E+00	0.000E+00
Oxygen	4.617E-06	1.689E-06	2.928E-06

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Ecoinvent	2.282E-03	2.282E-03	1.330E-14
Long-term emission	2.282E-03	2.282E-03	1.330E-14
Fresh water	2.282E-03	2.282E-03	1.330E-14
Chloride	2.282E-03	2.282E-03	0.000E+00
Dissolved organic carbon, DOC (Ecoinvent)	2.293E-12	2.280E-12	1.330E-14
Production residues in life cycle	8.336E-04	7.678E-04	6.582E-05
Hazardous waste for disposal	5.923E-05	6.242E-07	5.861E-05
Chromium containing slag	9.926E-08	9.926E-08	0.000E+00
Dross (Fines)	3.932E-07	3.455E-09	3.898E-07
Natrium oxide	6.683E-07	5.874E-09	6.625E-07
Red mud (dry)	5.807E-05	5.104E-07	5.756E-05
Soil and sand containing heavy metals	4.352E-09	4.327E-09	2.525E-11
Toxic chemicals (unspecified)	1.293E-09	8.884E-10	4.047E-10
Hazardous waste for recovery	2.287E-07	6.752E-08	1.611E-07
Used oil	1.057E-07	9.294E-10	1.048E-07
Waste water processing residue	1.229E-07	6.660E-08	5.634E-08
Waste for disposal	7.559E-04	7.494E-04	6.484E-06
Incineration good	9.248E-10	7.040E-10	2.208E-10
Sludge from water works (6% dry matter-content)	1.945E-11	6.731E-12	1.272E-11
Waste (solid)	1.823E-06	9.177E-07	9.048E-07
Waste for disposal (unspecified)	2.097E-07	2.097E-07	0.000E+00
Waste from steel works	7.539E-04	7.483E-04	5.578E-06
Waste for recovery	1.820E-05	1.764E-05	5.620E-07
Aluminum scrap	5.956E-12	5.951E-12	5.071E-15
Chemicals (unspecified)	7.175E-10	5.962E-10	1.213E-10
Cooling water	1.504E-05	1.466E-05	3.760E-07
Cryolite	1.833E-07	1.611E-09	1.817E-07
Dross	9.067E-10	1.488E-10	7.579E-10
Filter dust	1.576E-08	1.576E-08	0.000E+00
Furnace clinker	3.939E-09	3.939E-09	0.000E+00
Gypsum (contaminated)	6.283E-13	6.283E-13	0.000E+00
Gypsum (FDI)	4.854E-10	4.854E-10	1.173E-16
Plastic (unspecified)	1.010E-09	7.824E-10	2.279E-10
Production residues (unspecified)	6.980E-11	6.812E-11	1.681E-12
Rolling gravel	2.428E-07	2.428E-07	0.000E+00
Rolling tinder	2.206E-09	2.206E-09	2.063E-23
Slag	2.152E-06	2.149E-06	3.261E-09
Slag (containing precious metal)	1.457E-09	1.457E-09	0.000E+00

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Slag (Iron plate production)	8.341E-08	8.341E-08	0.000E+00
Slag (Mn 6,5%)	4.739E-07	4.739E-07	0.000E+00
Waste paper	9.347E-11	9.344E-11	3.349E-14
Wood	9.386E-11	9.374E-11	1.272E-13
Wooden pallet (EURO)	6.391E-18	5.714E-18	6.769E-19
Mixed Waste (Hazardous or Radioactive)	7.067E-08	7.067E-08	0.000E+00
Neutralized residues	3.009E-12	3.009E-12	2.222E-17
Emissions to air	5.418E-02	3.782E-02	1.636E-02
Heavy metals to air	3.131E-08	2.867E-08	2.636E-09
Antimony	6.935E-12	1.751E-12	5.184E-12
Arsenic (+V)	1.483E-10	7.858E-11	6.976E-11
Arsenic trioxide	8.595E-16	2.029E-16	6.565E-16
Cadmium (+II)	8.736E-11	8.302E-11	4.340E-12
Chromium (+III)	6.322E-13	4.684E-13	1.637E-13
Chromium (+VI)	7.686E-15	5.236E-15	2.449E-15
Chromium (unspecified)	1.203E-09	1.171E-09	3.171E-11
Cobalt	2.163E-11	1.256E-11	9.067E-12
Copper (+II)	5.373E-11	3.413E-11	1.960E-11
Heavy metals to air (unspecified)	3.120E-12	3.057E-12	6.284E-14
Hydrogen arsenic (arsine)	7.134E-14	1.684E-14	5.450E-14
Iron	3.804E-11	2.472E-11	1.331E-11
Lanthanides	4.023E-15	1.003E-15	3.021E-15
Lead (+II)	3.584E-09	3.456E-09	1.283E-10
Manganese (+II)	1.485E-10	9.789E-11	5.066E-11
Mercury (+II)	6.259E-10	6.150E-10	1.093E-11
Molybdenum	4.296E-12	3.022E-12	1.274E-12
Nickel (+II)	6.326E-10	2.703E-10	3.624E-10
Palladium	6.651E-19	1.676E-20	6.484E-19
Rhodium	6.421E-19	1.618E-20	6.259E-19
Selenium	1.554E-10	4.799E-11	1.074E-10
Silver	5.375E-17	5.365E-17	1.029E-19
Tellurium	4.930E-14	2.747E-14	2.183E-14
Thallium	1.303E-12	1.136E-12	1.672E-13
Tin (+IV)	7.943E-11	1.823E-11	6.120E-11
Titanium	2.581E-13	6.685E-14	1.913E-13
Vanadium (+III)	3.787E-09	2.333E-09	1.454E-09
Zinc (+II)	2.073E-08	2.042E-08	3.064E-10
Inorganic emissions to air	4.104E-02	2.711E-02	1.393E-02

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Ammonia	4.982E-07	5.313E-08	4.451E-07
Ammonium	5.615E-11	5.615E-11	3.579E-15
Ammonium nitrate	1.283E-15	8.075E-16	4.756E-16
Argon	3.786E-12	3.786E-12	0.000E+00
Barium	9.485E-09	1.903E-09	7.582E-09
Beryllium	3.399E-12	1.888E-12	1.511E-12
Boron compounds (unspecified)	1.462E-09	3.402E-10	1.121E-09
Bromine	5.310E-10	1.385E-10	3.926E-10
Carbon dioxide	3.816E-02	2.551E-02	1.264E-02
Carbon dioxide (biotic)	4.146E-08	4.146E-08	0.000E+00
Carbon dioxide (biotic)	1.164E-06	5.614E-07	6.021E-07
Carbon disulphide	1.782E-13	3.457E-14	1.436E-13
Carbon monoxide	6.107E-05	2.339E-05	3.767E-05
Carbon monoxide (biotic)	2.527E-10	2.527E-10	0.000E+00
Chloride (unspecified)	6.965E-10	1.922E-10	5.043E-10
Chlorine	3.139E-11	1.774E-11	1.365E-11
Cyanide (unspecified)	1.756E-11	1.334E-11	4.225E-12
Fluoride	2.912E-08	3.199E-10	2.880E-08
Fluorides	5.876E-12	4.836E-13	5.393E-12
Fluorine	2.100E-13	1.887E-13	2.132E-14
Helium	1.587E-11	9.142E-12	6.724E-12
Hydrogen	7.307E-09	8.926E-10	6.415E-09
Hydrogen bromine (hydrobromic acid)	1.162E-12	1.379E-13	1.024E-12
Hydrogen chloride	2.151E-07	1.871E-07	2.798E-08
Hydrogen cyanide (prussic acid)	5.879E-12	1.264E-12	4.615E-12
Hydrogen fluoride	2.997E-08	7.613E-10	2.920E-08
Hydrogen iodide	1.104E-15	1.165E-16	9.875E-16
Hydrogen phosphorous	9.679E-13	1.276E-14	9.551E-13
Hydrogen sulphide	8.811E-08	4.891E-08	3.920E-08
Lead dioxide	2.815E-12	2.798E-12	1.704E-14
Nitrogen (atmospheric nitrogen)	6.055E-07	4.584E-07	1.472E-07
Nitrogen (N-compounds)	7.405E-13	7.405E-13	0.000E+00
Nitrogen dioxide	5.493E-07	4.229E-07	1.264E-07
Nitrogen monoxide	1.849E-10	1.802E-10	4.663E-12
Nitrogen oxides	7.378E-05	4.244E-05	3.134E-05
Nitrous oxide (laughing gas)	7.550E-07	4.491E-07	3.059E-07
Oxygen	1.166E-06	3.683E-07	7.979E-07
Scandium	2.021E-15	4.751E-16	1.546E-15

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Steam	2.659E-03	1.455E-03	1.203E-03
Strontium	7.622E-14	1.879E-14	5.743E-14
Sulphur dioxide	8.449E-05	7.669E-05	7.806E-06
Sulphur hexafluoride	4.741E-09	4.741E-09	5.208E-14
sulphur oxide	6.716E-08	6.716E-08	0.000E+00
Sulphuric acid	1.178E-11	1.840E-12	9.941E-12
Tin oxide	4.951E-16	4.302E-16	6.485E-17
Unspecified Particles	1.033E-07	1.027E-07	5.994E-10
Zinc oxide	9.901E-16	8.604E-16	1.297E-16
Zinc sulphate	1.794E-12	4.222E-13	1.372E-12
Organic emissions to air (group VOC)	7.678E-03	7.665E-03	1.273E-05
Group NMVOC to air	9.094E-06	6.585E-06	2.509E-06
Group PAH to air	2.979E-09	4.376E-10	2.542E-09
Anthracene	2.072E-13	3.346E-14	1.738E-13
Benzo{a}anthracene	1.043E-13	1.684E-14	8.744E-14
Benzo{a}pyrene	3.201E-10	2.760E-10	4.415E-11
Benzo{ghi}perylene	9.302E-14	1.502E-14	7.800E-14
Benzofluoranthene	1.861E-13	3.004E-14	1.560E-13
Chrysene	2.562E-13	4.136E-14	2.148E-13
Dibenz(a)anthracene	5.796E-14	9.360E-15	4.860E-14
Indeno[1,2,3-cd]pyrene	6.921E-14	1.118E-14	5.804E-14
Naphthalene	2.177E-11	3.514E-12	1.825E-11
Phenanthrene	6.837E-12	1.104E-12	5.733E-12
Polycyclic aromatic hydrocarbons (PAH)	2.630E-09	1.569E-10	2.473E-09
Halogenated organic emissions to air	7.273E-09	9.375E-11	7.179E-09
Dichloroethane (ethylene dichloride)	4.858E-12	4.858E-12	2.380E-17
Dichloromethane (methylene chloride)	3.359E-14	3.263E-14	9.611E-16
Dioxins (unspec.)	-3.059E-15	-3.033E-15	-2.613E-17
Halogenated hydrocarbons (unspecified)	1.751E-12	1.637E-12	1.138E-13
Polychlorinated biphenyls (PCB unspecified)	1.509E-13	3.117E-14	1.198E-13
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	6.932E-16	1.840E-16	5.092E-16
R 11 (trichlorofluoromethane)	3.728E-11	4.491E-12	3.279E-11
R 114 (dichlorotetrafluoroethane)	3.818E-11	4.599E-12	3.358E-11
R 116 (hexafluoroethane)	7.154E-10	6.285E-12	7.091E-10
R 12 (dichlorodifluoromethane)	8.015E-12	9.656E-13	7.050E-12
R 13 (chlorotrifluoromethane)	5.033E-12	6.063E-13	4.427E-12
R 22 (chlorodifluoromethane)	8.761E-12	1.055E-12	7.705E-12
Tetrafluoromethane	6.442E-09	5.997E-11	6.382E-09

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Vinyl chloride (VCM; chloroethene)	1.150E-11	9.220E-12	2.277E-12
Acetaldehyde (Ethanal)	1.112E-09	8.495E-10	2.627E-10
Acetic acid	4.421E-09	3.380E-09	1.040E-09
Acetone (dimethylcetone)	1.107E-09	8.480E-10	2.588E-10
Acrolein	1.462E-12	2.361E-13	1.226E-12
Aldehyde (unspecified)	2.432E-11	8.142E-12	1.618E-11
Alkane (unspecified)	6.575E-09	4.082E-09	2.493E-09
Alkene (unspecified)	2.495E-09	8.958E-10	1.599E-09
Aromatic hydrocarbons (unspecified)	4.333E-10	3.384E-10	9.498E-11
Benzene	1.113E-09	4.776E-10	6.351E-10
Butadiene	1.796E-13	1.761E-13	3.435E-15
Butane	1.180E-07	2.290E-08	9.507E-08
Butane (n-butane)	1.175E-09	2.783E-10	8.967E-10
Caprolactam	7.073E-14	5.809E-15	6.492E-14
Cumene (isopropylbenzene)	1.398E-16	1.398E-16	0.000E+00
Cyclohexane (hexahydro benzene)	3.281E-12	3.371E-13	2.944E-12
Diethylamine	5.614E-18	5.525E-18	8.948E-20
Ethane	3.242E-07	6.310E-08	2.611E-07
Ethanol	2.172E-09	1.680E-09	4.921E-10
Ethene (ethylene)	2.399E-11	1.627E-11	7.722E-12
Ethyl benzene	2.288E-09	7.306E-10	1.557E-09
Fluoranthene	6.750E-13	1.090E-13	5.660E-13
Fluorene	2.142E-12	3.458E-13	1.796E-12
Formaldehyde (methanal)	4.740E-09	2.907E-09	1.832E-09
Heptane (isomers)	3.892E-09	7.546E-10	3.138E-09
Hexamethylene diamine (HMDA)	1.056E-14	1.036E-14	2.021E-16
Hexane (isomers)	7.639E-09	2.925E-09	4.714E-09
Mercaptan (unspecified)	4.244E-11	1.238E-11	3.006E-11
Methanethiol	2.627E-09	2.612E-09	1.524E-11
Methanol	2.213E-09	1.742E-09	4.709E-10
NMVOC (unspecified)	7.967E-06	6.349E-06	1.618E-06
Octane	2.141E-09	4.151E-10	1.726E-09
Pentane (n-pentane)	4.322E-08	8.603E-09	3.462E-08
Phenol (hydroxy benzene)	9.858E-14	2.396E-14	7.462E-14
Propane	5.745E-07	1.122E-07	4.623E-07
Propene (propylene)	2.075E-10	6.631E-11	1.412E-10
Propionic acid (propane acid)	6.891E-14	9.492E-15	5.942E-14
Styrene	3.961E-15	4.311E-16	3.530E-15

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Toluene (methyl benzene)	1.102E-09	3.425E-10	7.596E-10
Trimethylbenzene	4.822E-15	4.191E-15	6.317E-16
Xylene (dimethyl benzene)	9.584E-09	3.054E-09	6.531E-09
Hydrocarbons (unspecified)	1.017E-08	1.006E-08	1.067E-10
Methane	7.665E-03	7.658E-03	6.884E-06
Methane (biotic)	4.589E-10	4.589E-10	0.000E+00
Organic chlorine compounds	1.362E-12	1.220E-12	1.419E-13
Unspecified Organic Compounds	7.182E-14	7.140E-14	4.166E-16
VOC (unspecified)	3.893E-06	5.586E-07	3.335E-06
Other emissions to air	5.419E-03	3.039E-03	2.380E-03
Aldehydes, unspecified	3.591E-14	3.570E-14	2.083E-16
Exhaust	5.355E-03	2.979E-03	2.376E-03
Particulate Matter, unspecified	6.760E-08	2.947E-08	3.813E-08
Sand (Silica) (SiO2)	6.846E-10	6.806E-10	3.971E-12
Used air	6.341E-05	5.985E-05	3.559E-06
Particles to air	4.447E-05	3.219E-06	4.125E-05
Dust (PM10)	1.547E-07	1.349E-07	1.978E-08
Dust (PM2,5 - PM10)	1.892E-12	1.892E-12	0.000E+00
Dust (PM2.5)	1.415E-07	5.567E-08	8.588E-08
Dust (Portland cement kiln)	2.845E-07	2.845E-07	0.000E+00
Dust (unspecified)	4.389E-05	2.743E-06	4.115E-05
Metals (unspecified)	2.811E-12	2.698E-12	1.124E-13
Unspecified Organic Chlorine Compounds	4.738E-13	4.711E-13	2.749E-15
Wood (dust)	1.827E-13	1.588E-13	2.393E-14
Radioactive emissions to air	4.483E-11	6.301E-12	3.853E-11
Uranium (total)	4.483E-11	6.301E-12	3.853E-11
Unspecified Heavy Metals	3.700E-17	3.679E-17	2.147E-19
Emissions to fresh water	4.246E-04	3.813E-04	4.331E-05
Analytical measures to fresh water	1.032E-04	1.029E-04	2.928E-07
Adsorbable organic halogen compounds (AOX)	7.071E-10	3.597E-10	3.474E-10
Biological oxygen demand (BOD)	3.613E-07	3.515E-07	9.775E-09
Chemical oxygen demand (COD)	8.112E-07	5.459E-07	2.653E-07
Nitrogenous Matter (unspecified, as N)	7.785E-08	7.726E-08	5.926E-10
Solids (dissolved)	8.325E-05	8.325E-05	5.746E-09
Total dissolved organic bounded carbon	1.995E-07	1.995E-07	2.197E-11
Total Dissolved Solids	1.849E-05	1.849E-05	0.000E+00
Total organic bounded carbon	1.668E-08	5.697E-09	1.098E-08
Heavy metals to fresh water	1.706E-05	8.432E-06	8.623E-06

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Aluminium	1.680E-06	1.381E-07	1.542E-06
Antimony	1.488E-08	1.224E-09	1.366E-08
Arsenic (+V)	8.199E-08	3.821E-08	4.378E-08
Cadmium (+II)	4.755E-09	4.420E-10	4.313E-09
Chromium (+III)	1.172E-09	1.161E-09	1.133E-11
Chromium (+VI)	1.400E-12	9.664E-13	4.331E-13
Chromium (unspecified)	1.067E-07	3.106E-08	7.563E-08
Cobalt	1.560E-12	4.155E-13	1.144E-12
Copper (+II)	1.101E-07	4.644E-08	6.363E-08
Heavy metals to water (unspecified)	1.146E-09	1.145E-09	1.633E-12
Iron	4.595E-06	1.086E-06	3.509E-06
Lead (+II)	1.619E-07	1.399E-08	1.479E-07
Manganese (+II)	5.215E-08	5.170E-08	4.455E-10
Mercury (+II)	8.125E-10	6.797E-11	7.446E-10
Molybdenum	1.164E-10	2.247E-11	9.391E-11
Nickel (+II)	2.856E-06	1.685E-06	1.172E-06
Selenium	1.315E-10	1.150E-10	1.647E-11
Silver	1.453E-08	1.196E-09	1.334E-08
Strontium	5.407E-09	1.787E-09	3.620E-09
Thallium	3.024E-14	7.220E-15	2.302E-14
Tin (+IV)	5.487E-12	1.470E-12	4.018E-12
Titanium	1.277E-11	2.132E-12	1.064E-11
Unspecified Substance	3.201E-13	3.182E-13	1.857E-15
Uranium	4.731E-06	4.731E-06	0.000E+00
Vanadium (+III)	4.332E-11	1.165E-11	3.167E-11
Zinc (+II)	2.637E-06	6.043E-07	2.033E-06
Inorganic emissions to fresh water	2.695E-04	2.427E-04	2.675E-05
Acid (calculated as H+)	4.108E-08	7.502E-10	4.033E-08
Aluminum (+III)	1.438E-08	1.134E-08	3.037E-09
Ammonia	5.381E-08	5.305E-08	7.686E-10
Ammonia, as N	5.267E-10	5.267E-10	0.000E+00
Ammonium (total N)	1.818E-05	1.495E-06	1.669E-05
Ammonium / ammonia	3.685E-06	3.682E-06	3.578E-09
Barium	7.759E-07	7.750E-07	8.558E-10
Beryllium	1.314E-13	1.609E-14	1.153E-13
Boron	3.060E-09	2.139E-09	9.204E-10
Bromate	4.461E-14	4.335E-14	1.264E-15
Bromine	1.267E-13	3.233E-14	9.435E-14

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Calcium (+II)	1.150E-06	8.615E-07	2.881E-07
Carbonate	5.543E-06	5.490E-06	5.348E-08
Chlorate	2.694E-11	2.573E-11	1.211E-12
Chloride	1.474E-05	8.466E-06	6.269E-06
Chlorine (dissolved)	8.713E-08	8.296E-08	4.171E-09
Copper ion (+II/+III)	6.316E-14	5.311E-14	1.005E-14
Cyanide	1.352E-07	1.112E-08	1.241E-07
Fluoride	6.114E-07	2.889E-07	3.225E-07
Fluorine	2.153E-11	1.316E-11	8.376E-12
Hydrogen chloride	4.551E-13	2.883E-13	1.668E-13
Hydrogen fluoride (hydrofluoric acid)	2.254E-13	1.293E-13	9.612E-14
Hydrogen Ions (H+)	7.146E-11	7.104E-11	4.145E-13
Hydroxide	1.255E-07	1.125E-09	1.243E-07
Inorganic salts and acids (unspecified)	3.276E-20	2.601E-20	6.746E-21
Iron ion (+II/+III)	1.489E-09	1.484E-09	4.506E-12
Magnesium (+III)	1.253E-07	9.609E-08	2.922E-08
Magnesium chloride	1.809E-13	4.559E-15	1.764E-13
Metal ions (unspecific)	2.293E-09	2.235E-09	5.733E-11
Neutral salts	2.572E-13	9.624E-14	1.610E-13
Nickel ion (+III)	8.906E-13	6.057E-13	2.849E-13
Nitrate	4.087E-08	2.888E-08	1.198E-08
Nitrate (as total N)	1.148E-12	1.141E-12	6.658E-15
Nitrogen	1.142E-07	1.141E-07	7.944E-11
Nitrogen (as total N)	1.461E-08	1.461E-08	0.000E+00
Nitrogen organic bounded	2.581E-09	1.671E-09	9.101E-10
Phosphate	4.206E-10	2.858E-10	1.348E-10
Phosphorus	1.619E-06	1.459E-07	1.473E-06
Potassium	2.073E-10	1.493E-10	5.808E-11
Silicate particles	8.919E-10	8.918E-10	4.546E-14
Sodium (+I)	3.462E-06	2.868E-06	5.937E-07
Sodium chloride (rock salt)	1.540E-05	1.540E-05	3.455E-13
Sodium hypochlorite	1.384E-12	1.458E-13	1.239E-12
Sulfates	1.155E-06	1.155E-06	0.000E+00
Sulphate	2.024E-04	2.017E-04	7.123E-07
Sulphide	1.233E-08	2.568E-09	9.765E-09
Sulphite	4.070E-10	1.922E-10	2.147E-10
Sulphur	1.545E-10	4.092E-11	1.135E-10
Sulphuric acid	5.867E-11	3.717E-11	2.151E-11

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Unspecified Iron Oxides	8.196E-13	8.149E-13	4.755E-15
Unspecified Oil	2.904E-12	2.887E-12	1.684E-14
Unspecified Organic Chlorine compounds	6.581E-15	6.543E-15	3.817E-17
Unspecified Salt	2.633E-11	2.618E-11	1.527E-13
Unspecified Solids (Suspended)	1.022E-10	1.016E-10	5.929E-13
Organic emissions to fresh water	5.595E-06	5.576E-06	1.865E-08
Halogenated organic emissions to fresh water	2.295E-12	1.923E-12	3.715E-13
1,2-Dibromoethane	7.706E-16	7.920E-17	6.914E-16
Chlorinated hydrocarbons (unspecified)	3.969E-13	3.969E-13	2.053E-19
Chloromethane (methyl chloride)	7.283E-13	3.580E-13	3.703E-13
Dichloroethane (ethylene dichloride)	2.035E-13	2.035E-13	6.383E-20
Dichloropropane	8.479E-18	8.316E-18	1.622E-19
Polychlorinated dibenzo-p-dioxins (2,3,7,8 - TCDD)	6.625E-16	6.625E-16	3.031E-21
Vinyl chloride (VCM; chloroethene)	9.646E-13	9.641E-13	5.185E-16
Hydrocarbons to fresh water	5.574E-06	5.570E-06	3.769E-09
Acenaphthene	2.084E-13	4.561E-14	1.628E-13
Acenaphthylene	8.652E-14	1.876E-14	6.776E-14
Acetic acid	6.033E-11	3.898E-11	2.134E-11
Acrylonitrile	6.200E-13	6.082E-13	1.186E-14
Anthracene	2.938E-13	5.820E-14	2.356E-13
Aromatic hydrocarbons (unspecified)	1.377E-10	3.915E-11	9.851E-11
Benzene	4.144E-10	8.724E-11	3.272E-10
Benzo{a}anthracene	3.035E-14	7.062E-15	2.329E-14
Benzofluoranthene	1.694E-14	4.595E-15	1.234E-14
Chrysene	1.378E-13	3.339E-14	1.044E-13
Cresol (methyl phenol)	4.001E-12	1.060E-12	2.941E-12
Ethyl benzene	2.080E-11	4.409E-12	1.639E-11
Fluoranthene	3.554E-14	8.235E-15	2.730E-14
Hexane (isomers)	4.371E-13	1.160E-13	3.211E-13
Hydrocarbons (unspecified)	2.029E-08	2.024E-08	4.961E-11
Methanol	4.965E-09	4.505E-09	4.601E-10
Oil (unspecified)	5.546E-06	5.544E-06	2.003E-09
Phenol (hydroxy benzene)	3.897E-10	8.927E-11	3.004E-10
Polycyclic aromatic hydrocarbons (PAH, unspec.)	1.555E-09	1.350E-09	2.050E-10
Toluene (methyl benzene)	2.669E-10	5.701E-11	2.099E-10
Xylene (isomers; dimethyl benzene)	1.032E-10	2.921E-11	7.399E-11
Carbon, organically bound	1.855E-08	3.702E-09	1.485E-08
Naphthalene	1.315E-11	2.742E-12	1.041E-11

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
N-unspecified (N)	2.273E-12	2.259E-12	1.318E-14
Organic chlorine compounds (unspecified)	1.102E-13	8.874E-14	2.150E-14
Organic compounds (dissolved)	1.427E-11	5.131E-12	9.141E-12
Organic compounds (unspecified)	2.168E-11	1.912E-11	2.558E-12
Unspecified wastewater	1.718E-09	1.708E-09	9.968E-12
Other emissions to fresh water	0.000E+00	0.000E+00	0.000E+00
Particles to fresh water	2.926E-05	2.165E-05	7.616E-06
Metals (unspecified)	1.749E-11	1.669E-11	8.007E-13
Silicon dioxide (silica)	4.720E-11	3.210E-11	1.510E-11
Soil loss by erosion into water	1.771E-11	1.596E-11	1.756E-12
Solids (suspended)	2.911E-05	2.150E-05	7.615E-06
Suspended solids, unspecified	1.509E-07	1.499E-07	1.014E-09
Unspecified Oxides	6.814E-13	6.774E-13	3.953E-15
Radioactive emissions to fresh water	0.000E+00	0.000E+00	0.000E+00
Bromide	0.000E+00	0.000E+00	0.000E+00
Radionuclide	0.000E+00	0.000E+00	0.000E+00
Sulfite	0.000E+00	0.000E+00	0.000E+00
Unspecified Solids (Dissolved)	1.970E-10	1.959E-10	1.143E-12
Uranium (total)	4.395E-13	4.395E-13	0.000E+00
Emissions to sea water	2.388E-05	6.298E-06	1.758E-05
Analytical measures to sea water	9.380E-08	1.499E-08	7.880E-08
Adsorbable organic halogen compounds (AOX)	5.774E-15	7.312E-16	5.043E-15
Biological oxygen demand (BOD)	6.369E-09	8.065E-10	5.563E-09
Chemical oxygen demand (COD)	8.106E-08	1.338E-08	6.768E-08
Total organic bounded carbon	6.369E-09	8.065E-10	5.563E-09
Heavy metals to sea water	1.998E-08	3.235E-09	1.675E-08
Arsenic (+V)	2.256E-10	4.551E-11	1.801E-10
Cadmium (+II)	1.160E-10	2.507E-11	9.093E-11
Chromium (unspecified)	3.626E-10	7.253E-11	2.901E-10
Cobalt	3.868E-11	1.994E-11	1.874E-11
Copper (+II)	6.735E-10	1.096E-10	5.639E-10
Iron	1.313E-09	3.416E-10	9.718E-10
Lead (+II)	1.781E-10	2.694E-11	1.511E-10
Manganese (+II)	1.321E-10	3.513E-11	9.698E-11
Mercury (+II)	2.521E-12	4.372E-13	2.083E-12
Molybdenum	3.029E-10	2.971E-10	5.765E-12
Nickel (+II)	2.281E-10	4.395E-11	1.841E-10
Silver	1.933E-11	2.228E-12	1.710E-11

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Strontium	1.559E-08	1.802E-09	1.379E-08
Tin (+IV)	2.316E-11	2.669E-12	2.049E-11
Titanium	2.359E-12	2.718E-13	2.087E-12
Vanadium (+III)	2.948E-11	1.401E-11	1.546E-11
Zinc (+II)	7.387E-10	3.955E-10	3.432E-10
Inorganic emissions to sea water	1.869E-05	5.634E-06	1.305E-05
Aluminum (+III)	7.593E-11	8.751E-12	6.718E-11
Ammonia	2.256E-09	2.600E-10	1.996E-09
Barium	3.597E-09	1.101E-09	2.496E-09
Beryllium	1.851E-12	1.098E-12	7.526E-13
Boron	1.228E-09	1.415E-10	1.086E-09
Calcium (+II)	1.341E-07	1.545E-08	1.186E-07
Carbonate	2.262E-07	6.923E-08	1.570E-07
Chloride	1.802E-05	5.486E-06	1.253E-05
Magnesium	3.348E-08	3.871E-09	2.961E-08
Nitrate	2.933E-10	8.975E-11	2.035E-10
Sodium (+I)	1.272E-07	1.611E-08	1.111E-07
Sulphate	9.553E-08	2.921E-08	6.632E-08
Sulphide	4.117E-08	1.260E-08	2.857E-08
Sulphur	6.570E-10	7.572E-11	5.813E-10
Organic emissions to sea water	1.117E-08	3.298E-09	7.869E-09
Hydrocarbons to sea water	1.109E-08	3.266E-09	7.824E-09
Acenaphthene	1.963E-12	9.130E-13	1.050E-12
Acenaphthylene	7.609E-13	3.498E-13	4.110E-13
Acetic acid	2.869E-12	1.897E-12	9.711E-13
Anthracene	9.392E-13	3.035E-13	6.357E-13
Aromatic hydrocarbons (unspecified)	6.369E-11	8.065E-12	5.563E-11
Benzene	1.178E-09	2.874E-10	8.902E-10
Benzo{a}anthracene	4.112E-13	2.004E-13	2.109E-13
Benzofluoranthene	4.267E-13	2.179E-13	2.088E-13
Chrysene	2.263E-12	1.123E-12	1.140E-12
Cresol (methyl phenol)	1.702E-11	1.961E-12	1.506E-11
Ethyl benzene	7.213E-11	2.445E-11	4.768E-11
Fluoranthene	4.793E-13	2.335E-13	2.458E-13
Hexane (isomers)	1.858E-12	2.141E-13	1.644E-12
Oil (unspecified)	7.399E-09	2.195E-09	5.204E-09
Phenol (hydroxy benzene)	1.264E-09	4.487E-10	8.156E-10
Toluene (methyl benzene)	7.640E-10	1.736E-10	5.904E-10

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Xylene (isomers; dimethyl benzene)	3.203E-10	1.220E-10	1.983E-10
Naphthalene	7.681E-11	3.184E-11	4.496E-11
Particles to sea water	5.069E-06	6.419E-07	4.427E-06
Solids (suspended)	5.069E-06	6.419E-07	4.427E-06
Emissions to agricultural soil	0.000E+00	0.000E+00	0.000E+00
Emissions to industrial soil	1.493E-04	1.492E-04	5.777E-08
Heavy metals to industrial soil	1.492E-04	1.492E-04	1.452E-08
Antimony	1.930E-16	1.930E-16	0.000E+00
Arsenic (+V)	8.268E-08	8.268E-08	1.736E-14
Cadmium (+II)	9.330E-13	7.512E-13	1.818E-13
Chromium (+III)	2.710E-12	2.641E-12	6.852E-14
Chromium (+VI)	6.992E-16	6.992E-16	0.000E+00
Chromium (unspecified)	6.358E-11	2.286E-11	4.071E-11
Cobalt	1.142E-12	4.361E-13	7.054E-13
Copper (+II)	3.445E-12	2.989E-12	4.562E-13
Iron	1.480E-04	1.480E-04	5.691E-11
Lead (+II)	5.912E-07	5.912E-07	1.131E-13
Manganese (+II)	2.512E-11	1.516E-11	9.956E-12
Mercury (+II)	1.529E-09	1.529E-09	1.446E-15
Nickel (+II)	6.305E-11	4.612E-11	1.693E-11
Selenium	9.822E-09	9.822E-09	0.000E+00
Strontium	1.961E-08	5.230E-09	1.439E-08
Thallium	7.149E-08	7.149E-08	0.000E+00
Vanadium (+III)	4.513E-07	4.513E-07	0.000E+00
Zinc (+II)	1.881E-11	1.400E-11	4.813E-12
Inorganic emissions to industrial soil	6.819E-08	2.522E-08	4.297E-08
Aluminum (+III)	8.128E-11	3.542E-11	4.587E-11
Ammonia	3.067E-08	8.318E-09	2.235E-08
Bromide	8.329E-12	2.283E-12	6.046E-12
Calcium (+II)	5.850E-09	5.084E-09	7.664E-10
Chloride	1.006E-08	2.958E-09	7.098E-09
Chlorine	1.631E-13	1.631E-13	0.000E+00
Fluoride	2.777E-10	7.612E-11	2.015E-10
Magnesium (+III)	8.085E-10	7.025E-10	1.060E-10
Phosphorus	3.194E-09	8.536E-10	2.340E-09
Potassium (+I)	8.417E-09	3.352E-09	5.065E-09
Sodium (+I)	5.117E-10	4.447E-10	6.703E-11
Sulphate	1.187E-09	4.840E-10	7.032E-10

Process or Category	Cradle to Gate	Cradle to Gate (RMA)	Gate to Gate (RMT)
Sulphide	7.124E-09	2.904E-09	4.219E-09
Organic emissions to industrial soil	4.785E-10	1.919E-10	2.867E-10
Oil (unspecified)	4.785E-10	1.919E-10	2.867E-10
Radioactive emissions to industrial soil	0.000E+00	0.000E+00	0.000E+00
Calcium Fluoride	1.129E-08	1.129E-08	0.000E+00
Radionuclide	0.000E+00	0.000E+00	0.000E+00

Embedded Unit Processes

NETL (2010). *NETL Life Cycle Inventory Data – Process Data Sheet File: Illinois No. 6 Underground Coal Mine Assembly, Construction*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: January 2010 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

NETL (2010). *NETL Life Cycle Inventory Data – Process Data Sheet File: Illinois No. 6 Coal Preparation Facility Assembly, Construction*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: February 2010 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

NETL (2010). *NETL Life Cycle Inventory Data – Process Data Sheet File: Commissioning and Decommissioning of Illinois No. 6 Coal Mine*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: January 2010 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

NETL (2009). *NETL Life Cycle Inventory Data – Unit Process: Underground Mine, Illinois No. 6 Bituminous Coal, Operation*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: December 2009 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

NETL (2010). *NETL Life Cycle Inventory Data – Unit Process: Coal Unit Train Assembly, 100 Railcars, Construction*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: January 2010 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

NETL (2010). *NETL Life Cycle Inventory Data – Process Data Sheet File: Coal - Train Transport, Operations*. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: October 2010 (version 01). www.netl.doe.gov/energy-analyses (http://www.netl.doe.gov/energy-analyses)

References

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

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