NETL Life Cycle Inventory Data
Process Documentation File

Process Name:	Vibroseis Truck Seismic Survey, Operation
Reference Flow:	1 square km of Seismic Truck Survey
Brief Description:	Using vibroseis truck for seismic survey. Includes diesel consumption.

Section I: Meta Data

Geographical Coverage:	US	**Region:** N/A
Year Data Best Represents:	2012	
Process Type:	Transport Process	
Process Scope:	Gate-to-Gate Process (GG)	
Allocation Applied:	No	
Completeness:	All 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:

Num_Trucks	*[trucks] Number of vibroseis trucks needed for seismic survey*
mpg_Seismic	*[km/liter] Vibroseis truck (diesel engine) seismic survey average fuel consumption*

Spacing   *[routes/km] Adjustable Parameter, number of seismic survey routes across one km length*

Survey_Area   *[square km] Adjustable Parameter, The survey area*

Tracked Input Flows:

Diesel [Crude oil]   *[Technosphere] Quantity of diesel fuel for transport*

Tracked Output Flows:

Seismic Truck Survey [Other]   *Reference Flow*
Carbon dioxide [Inorganic emissions to air]   *Emission output to atmosphere*
Methane [Organic emissions to air (group VOC)]   *Emission output to atmosphere*
Nitrous oxide (laughing gas) [Inorganic emissions to air]   *Emission output to atmosphere*
Sulphur oxide [Inorganic emissions to air]   *Emission output to atmosphere*
Particulate matter, unspecified [Other emissions to air]   *Emission output to atmosphere*
Nitrogen oxides [Inorganic emissions to air]   *Emission output to atmosphere*
Carbon monoxide [Inorganic emissions to air]   *Emission output to atmosphere*

Section II: Process Description

Associated Documentation

This unit process is composed of this document and the data sheet (DS) *DS_Stage3_O_Vibroseis Truck_2012.01.xls*, which provides additional details regarding relevant calculations, data quality, and references.

Goal and Scope

This unit process provides a summary of the input and output flows associated with the seismic survey using vibroseis trucks. These include diesel input for combustion, and fugitive emissions. This process is based on the assumptions that the survey site is relatively flat and suitable for vibroseis truck utilization. For additional documentation, please see the associated DS sheet for this unit process. The reference flow of this unit process is: 1 square km of Seismic Truck Survey.

Boundary and Description

This unit process accounts for the seismic survey using vibroseis trucks in the planned survey sites. The only tracked input is diesel fuel, and the key outputs are diesel combustion emissions.

A seismic survey project in California provided emission estimates, which were used in the development of this unit process (Lands Commission, CA. 2012). The project used a team of four, synchronously timed, vibroseis trucks for the survey. Vibroseis trucks vibrate the ground and use seismic equipment to measure the geological characteristics of a site. The peak force of the vibroseis trucks is 275 kN (61,800 lb) with the frequency limit 5 Hz to 250 Hz.

The survey duration is 12 hours per day for seven days. The estimated survey length from the southern area site map is around 26 miles (42 km) by georeferencing the information in a Geographic Information System. The information is used in converting units from time to distance and area. This unit process assumed the survey area is relatively flat and suitable for utilizing vibroseis trucks without any additional seismic sources.

To be able to consider both 2D and 3D seismic surveys in the unit process, the spacing between survey routes is estimated so that the area can be converted into equivalent length. A 3D seismic survey report published by BLM (2008) showed that the spacing is around 1/5 mile (i.e., 6 survey routes within a mile).

DF_Stage3_O_Vibroseis Truck_2012.01.doc

Figure 1: Unit Process Scope and Boundary
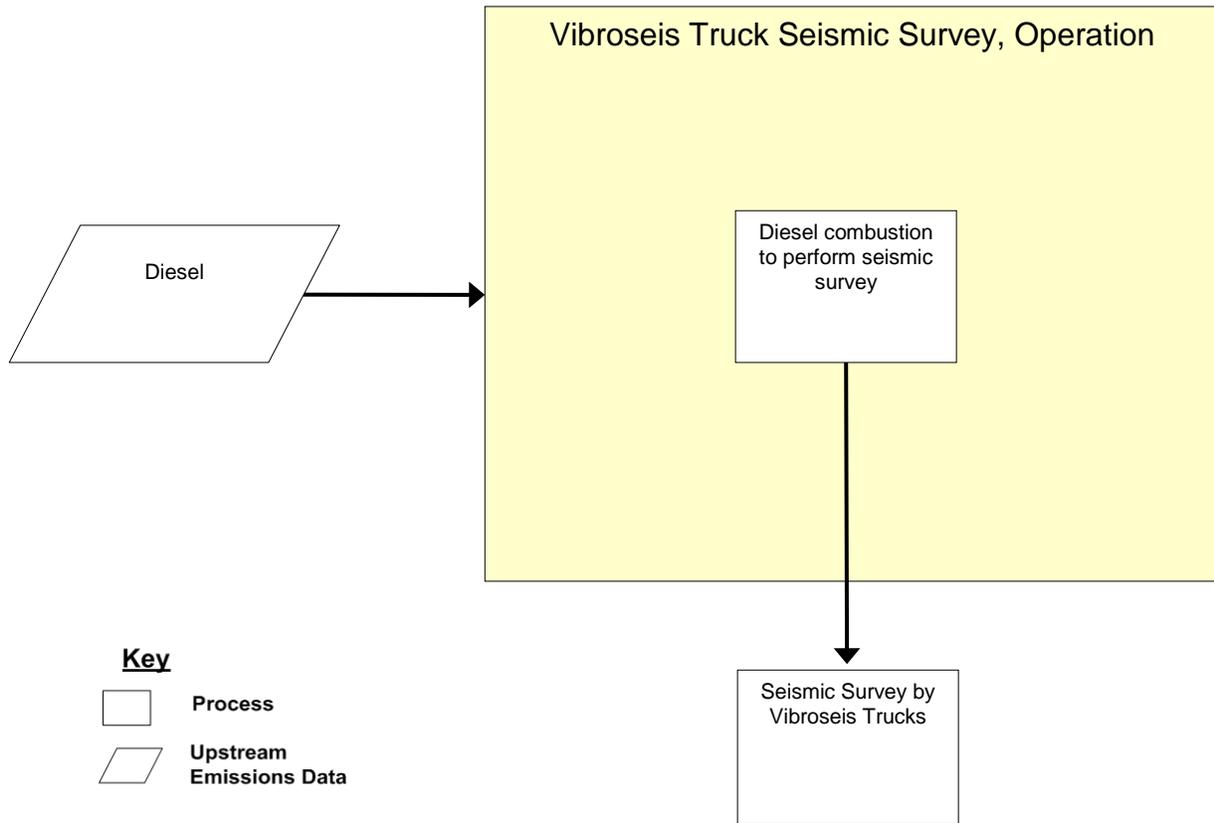
Table 1: Relevant Parameters

Parameters	Value	Units
Number of trucks (Num_Trucks)	4	trucks
Survey fuel efficiency (mpg_Seismic)	0.01	km/liter
Spacing (Spacing)	3.73	survey routes in a km
Survey Area (Survey_Area)	11.19	km2
Diesel Density (Diesel_Density)	0.84	kg/liter

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Table 2: Unit Process Input and Output Flows

Flow Name	Value	Units (Per Reference Flow)
Inputs		
Diesel [Crude oil]	**1.158E+03**	**kg**
Outputs		
Seismic Truck Survey [Other]	**1.00**	**km^2**
Carbon monoxide [Inorganic emissions to air]	9.076E+00	kg
Nitrogen oxides [Inorganic emissions to air]	2.652E+01	kg
Sulphur dioxide [Inorganic emissions to air]	3.642E-02	kg
Particulate matter, unspecified [Other emissions to air]	9.612E-01	kg
Carbon dioxide [Inorganic emissions to air]	3.711E+03	kg
Methane [Organic emissions to air (group VOC)]	2.782E-01	kg
Nitrous oxide (laughing gas) [Inorganic emissions to air]	1.252E-01	kg

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

Embedded Unit Processes

None.

References

Lands Commission, CA. 2012   Carlifornia State Lands Commission. 2012. Central Coastal California Seismic Imaging Project. Carlifornia State Lands Commission. http://www.slc.ca.gov/Division_Pages/DEPM/DEPM_Programs_and_Reports/CCCSIP/CCCSIP.html (accessed July 31, 2012).

EIA. 2012   EIA. 2012. Voluntary Reporting of Greenhouse Gases Program Fuel Carbon Dioxide Emission Coefficients. Energy Information Administration, U.S. Department of Energy. http://www.eia.gov/oiaf/1605/coefficients.html#tbl2 (accessed July 30, 2012).

BLM. 2012   BLM. 2008. Piceance Creek 3D Seismic Survey Project. Bureau of Land Management, U.S. Department of the Interior. http://www.blm.gov/pgdata/etc/medialib/blm/co/information/nepa/white_river_field/Completed_2011_Documents.Par.35034.File.dat/co11008036ea.pdf (accessed July 27, 2012).

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Section III: Document Control Information

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