

## AIR EMISSION SOURCES

**During Construction there are the following sources of emissions** (source: Report on possible impacts for the working project "Construction of a bypass railway line bypassing the railway junction of Almaty Station. Adjustment", 593 p. 2023)

<b>Zhetygen LPG Storage Park No3</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of materials
Source No6008	Mechanical section
Source No6009	Bulk material transfer
Source: No0001	Compressor with internal combustion engine
Source No0002	Bitumen boiler

<b><u>Reclamation of quarries on the stretch of Kazymbek Bek Station - Sorbulak Station</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b><u>Reclamation of quarries on the stretch of Sorbulak Station - Moyinkum</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b><u>Reclamation of quarries on the stretch of Zhana Arna Station - Zhetygen Station</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b><u>Stretch Station Zhana Arna - Station Zhetygen</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling

Source No6007	Mechanical section
Source No6008	Reception and storage of materials
Source No6009	Waterproofing
Source No6009	Asphalt paving
Source: No0001	Compressor with internal combustion engine
Source No0002	Bitumen boiler
Source No0003	Welding unit (diesel)

**Stretch from Kazybek Bek to Sorbulak**

Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Reception and storage of inert materials
Source No6004	Asphalt paving
Source No6005	Mechanical section

**Stretch from Sorbulak Station to Moyinkum Station**

Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Reception and storage of inert materials
Source No6004	Asphalt paving

Source No6005	Mechanical section
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**Stretch of Moyinkum Station – Zhana Arna Station**

Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of materials
Source No6008	Bulk material transfer
Source No6009	Waterproofing
Source No6009	Asphalt paving
Source: No0001	Compressor with internal combustion engine
Source No0002	Bitumen boiler
Source No0003	Welding unit (diesel)

**Reclamation of quarries on the stretch of Zhana-Arna Station - Moyinkum Station**

Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b>St. Zhetigen. LPG storage parkNo1</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of inert materials
Source No6008	Mechanical section
Source No6009	Bulk material transfer
Source: No0001	Compressor with internal combustion engine
Source No0002	Mobile Diesel Power Plant

<b>St. Zhetgen LPG Storage Park No2</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of inert materials
Source No6008	Mechanical section
Source No6009	Bulk material transfer
Source: No0001	Bitumen boiler
Source No0002	Compressor with internal combustion engine
Source No0003	Mobile Diesel Power Plant

<b>Alma 500 kV subStation</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of inert materials
Source No6008	Asphalt paving
Source No6009	Mechanical section
Source No6010	Bulk material transfer
Source: No0001	Bitumen boiler
Source No0002	Compressor with internal combustion engine
Source No0003	Welding unit (diesel)

<b>St.Zhana Arna</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding

Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of inert materials
Source No6008	Waterproofing
Source No6009	Mechanical section
Source No6010	Bulk material transfer
Source No6011	Concrete production
Source No6012	Rotational camp. Laundry room.
Source No6013	Rotational camp. Kitchen
Source No6014	Rotational camp. Bath.
Source: No0001	Bitumen boiler
Source No0002	Welding unit (diesel)
Source No0003	Compressor with internal combustion engine
Source No0004	Mobile Diesel Power Plant
Source No0005	Rotational camp. Boiler room
Source No0006	Rotational camp. Emissions from fuel discharge into the tank
Source No0007	Rotational camp. Diesel generator
Source No0008	Rotational camp. Tank for diesel generators.

<b>St.Zhetygen</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling

Source No6007	Reception and storage of inert materials
Source No6008	Waterproofing
Source No6009	Asphalt paving
Source No6010	Mechanical section
Source No6011	Bulk material transfer
Source No6012	Concrete Mixing Plant
Source: No0001	Welding unit (diesel)
Source No0002	Bitumen boiler
Source No0003	Compressor with internal combustion engine

<b><u>Reclamation of quarries at Moyinkum Station</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b><u>Reclamation of quarries at Kazybek Bek Station</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b>St.Kazybek Bek</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Mechanical section
Source No6006	Bulk material transfer
Source No6007	Waterproofing
Source No6008	Excavation
Source No6009	Backfilling
Source No6010	Reception and storage of inert materials
Source No6011	Asphalt paving
Source No6012	Concrete Mixing Plant
Source: No0001	Compressor with internal combustion engine
Source No0002	Mobile Diesel Power Plant
Source No0003	Bitumen boiler
Source No0004	Welding unit (diesel)

<b>Moyinkum</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding
Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of inert materials
Source No6008	Waterproofing
Source No6009	Asphalt paving
Source No6010	Mechanical section
Source No6011	Bulk material transfer
Source: No0001	Welding unit (diesel)
Source No0002	Bitumen boiler
Source No0003	Compressor with internal combustion engine
Source No6012	Concrete production

<b>Sorbulak</b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Welding

Source No6004	Painting works
Source No6005	Excavation
Source No6006	Backfilling
Source No6007	Reception and storage of inert materials
Source No6008	Waterproofing
Source No6009	Asphalt paving
Source No6010	Mechanical section
Source No6011	Bulk material transfer
Source: No0001	Welding unit (diesel)
Source No0002	Bitumen boiler
Source No0003	Compressor with internal combustion engine
Source No6012	Concrete production
Source No0004	Rotational camp. Boiler room
Source No0005	Rotational camp. Emissions from fuel discharge into the tank
Source No0006	Rotational camp. Diesel generator
Source No0007	Rotational camp. Tank for diesel generators.
Source No6013	Rotational camp. Laundry room.
Source No6014	Rotational camp. Kitchen
Source No6015	Rotational camp. Bath.

<b><u>Reclamation of quarries at Zhana Arna Station</u></b>	
Source No6001	Emissions from vehicles
Source No6002	Dust emissions from motor transport
Source No6003	Excavation

<b><u>Bleed section of line "A" (section No1)</u></b> <b><u>Bleed section of line "B" (section No1)</u></b> <b><u>Bleed section of line "C" (section No1)</u></b>	
Source: No0001	Bleed Candle

<b><u>Bleed section of line "A" (section No2)</u></b> <b><u>Bleed section of line "B" (section No2)</u></b> <b><u>Bleed section of line "C" (section No1)</u></b>	
Source: No0001	Bleed Candle

The key pollutant emission sources and assumptions for construction are summarised below.

## POLLUTANT EMISSIONS DURING CONSTRUCTION AND CALCULATION ASSUMPTIONS

No.	Key pollution sources	Key calculations assumptions
1.	Heavy vehicles and motor vehicles running on diesel fuel	<ul style="list-style-type: none"> <li>• In accordance to Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 18 April 2008 No 100-p, maximum one-time emissions of hot water from engines of mobile sources (g/s) are taken into account.</li> <li>• Gross emissions from mobile source engines (t/year) are not standardized</li> </ul>
2.	Dust emissions from motor vehicles	<ul style="list-style-type: none"> <li>• The amount of dust emitted by vehicles within the construction site is calculated according to the methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials (Appendix No 8 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 12. 06. 2014 No221)</li> <li>• 2 vehicles round trips within the construction site per hour and 6 vehicles on site</li> <li>• Dust emission per 1km of transport is 1,450g</li> </ul>
3.	Excavation	<ul style="list-style-type: none"> <li>• The calculation of pollutant emissions was made according to the methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials (Appendix No 8 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 12.04.2014 No 221), 24</li> <li>• Amount of rock processed by the excavator - 45 t/h</li> </ul>
4.	Backfilling	<ul style="list-style-type: none"> <li>• The calculation of pollutant emissions was made according to the methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials (Appendix No8 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 12.04.2014 No221-ø), 24</li> <li>• Amount of rock processed by the excavator - 45 t/h</li> </ul>
5.	Compressor with internal combustion engine	<ul style="list-style-type: none"> <li>• A mobile compressor will be used at the site, operating time in kg/year, with a maximum operating power of 29 kW.</li> </ul>
6.	Bitumen boiler operating on diesel fuel	<ul style="list-style-type: none"> <li>• In accordance with the "Methodology for calculating emissions of harmful substances from enterprises of the road construction industry, including asphalt concrete plants (Appendix No 3 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated April 18, 2008 No 100-p).</li> <li>• Combustion products are removed through a chimney with a height of 3 m and a diameter of 0.1 m.</li> <li>• Diesel fuel consumption is assumed to be in g/sec with fuel characteristics in Kcal/kg or MJ/kg</li> <li>• Temperature of flue gas at pipe outlet 300 °C</li> </ul>
7.	Asphalt paving	<ul style="list-style-type: none"> <li>• According to the methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials (Appendix No11 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 18.04.2008 No100-p).</li> </ul>
8.	Diesel welding units	<ul style="list-style-type: none"> <li>• Operating time in kg/hours with a maximum operating power of 29 kW.</li> </ul>
9.	Welding works	<ul style="list-style-type: none"> <li>• Electrode type and consumption tons were estimated.</li> </ul>

No.	Key pollution sources	Key calculations assumptions
		<ul style="list-style-type: none"> <li>The calculation of pollutant emissions was made according to the methodology for determining gross emissions of harmful substances into the atmosphere by the main technological equipment of machine-building enterprises (Appendix No4 to the Order of the Minister of Environmental Protection and Water Resources of the Republic of Kazakhstan dated 12.06.2014 No221-ø), 24.</li> </ul>
10.	Gas welding works using propane-butane mixture	<ul style="list-style-type: none"> <li>The calculation of pollutant emissions was made according to the methodology for determining gross emissions of harmful substances into the atmosphere by the main technological equipment of machine-building enterprises (Appendix No4 to the Order of the Minister of Environmental Protection and Water Resources of the Republic of Kazakhstan dated 12.06.2014 No221), 24.</li> <li>Gas usage was assumed to be 1.5 kg/period, however the period of usage as undetermined.</li> </ul>
11.	Painting works	<ul style="list-style-type: none"> <li>Enamel consumption in kg/h, solvent consumption in kg/h, bitumen varnish in t/period (period was unspecified), white spirit consumption in g/s and oil paint consumption in g/s were estimated.</li> <li>The calculation was carried out according to the "Methodology for calculating emissions of pollutants into the atmosphere during the application of paints and varnishes (by the values of specific emissions)", Astana, 2004.</li> </ul>
12.	Waterproofing works	<ul style="list-style-type: none"> <li>According to the methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials (Appendix No11 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 18.04.2008 No100-p).</li> </ul>
13.	Bulk material transfer	<ul style="list-style-type: none"> <li>Calculations consider the weight fraction of dust in the material; the fraction of dust (0-50µm) that becomes aerosol; the coefficient for local weather conditions; the coefficient for local conditions and protection from external influences; the coefficient for moisture content; the coefficient for material size; the coefficient for height of pouring; the capacity of the transfer unit; and the total amount of material processed per period.</li> </ul>
14.	Unloading and storage of construction materials	<ul style="list-style-type: none"> <li>The cargo turnover of crushed stone in tons per hour were estimated.</li> <li>Dust calculated as from fugitive emission sources, according to the "Methodology for calculating emission standards from fugitive sources, Appendix No8 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 12 June 2014 No221".</li> </ul>
15.	Mechanical works	<ul style="list-style-type: none"> <li>The calculation of emissions was made in accordance with the "Methodology for calculating emissions of pollutants into the atmosphere during mechanical processing of metals (by the values of specific emissions). RND 211.2.02.06-2004".</li> <li>Mechanical works include works related to a drilling machine, a cutting machine, a grinding machine, and a milling cutter.</li> <li>In accordance with the "Methodology for calculating emissions of pollutants into the atmosphere during mechanical processing of metals (by the values of specific emissions). RND 211.2.02.06-2004".</li> </ul>

No.	Key pollution sources	Key calculations assumptions
16.	Mobile diesel generator	<ul style="list-style-type: none"> <li>• Maximum operating power of 4kW with fuel consumption in L/h, exhaust gas pipe of 2.5m and diameter of 0.1 m</li> <li>• In accordance with the "Methodology for calculating emissions of pollutants into the atmosphere from Stationary diesel installations. RND 211.2.02.04-2004".</li> </ul>
17.	Concrete production at an existing concrete plant	<ul style="list-style-type: none"> <li>• Crushed stone turnover rate in tons per hour, concrete mixing plant cement consumption and working time were considered.</li> <li>• calculate dust as from fugitive emission sources, according to the "Methodology for calculating emission standards from fugitive sources, Appendix No8 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 12 June 2014 No221".</li> <li>• calculation was carried out in accordance with the "Methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials, Appendix No11 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 18. 04 2008 No100 -p".</li> </ul>
18.	Construction labour camp boiler room	<p>Running on LPG with flue gas discharged from a chimney of 12m in height and 0.377 m in diameter.</p> <p>Consumption of LPG was calculated for heating during winter.</p>

**For the period of operation, there are the following sources of pollutant emissions:**

<b>St.Zhana Arna</b>	
Source: No0001	Boiler room
Source No0002	Fuel storage tank
Source No0003	Gas storage. Emissions from fuel discharge into the tank
Source No0004	Gas storage. Tank blowdown emissions
Source No6005	Manoeuvring a diesel locomotive

<b>St.Kazybek Bek</b>	
Source: No0001	Boiler room
Source No0002	Fuel storage tank
Source No0003	Gas storage. Emissions from fuel discharge into the tank
Source No0004	Gas storage. Tank blowdown emissions
Source No6005	Manoeuvring a diesel locomotive

<b>St.Zhetygen</b>	
Source: No0001	Boiler Room 1
Source No0002	Fuel Storage Tank 1
Source No0003	Gas storage 1. Emissions from fuel unloading in reservoir
Source No0004	Gas storage 1. Tank blowdown emissions
Source No0005	Boiler Room 2
Source No0006	Fuel Storage Tank 2
Source No0007	Gas storage 2. Emissions from fuel unloading in reservoir
Source No0008	Gas storage 2. Tank blowdown emissions
Source No0009	Boiler room 3
Source No0010	Fuel Storage Tank 3
Source No0011	Gas storage 3. Emissions from fuel unloading in reservoir
Source No0012	Gas storage 3. Tank blowdown emissions
Source No0013	Diesel generator
Source No0014	Compressor Station 1
Source No0015	Compressor Station 2
Source No0016	Administrative building
Source No0017	Wagon control and technical inspection point
Source No0018	Rest house for locomotive crews
Source No0019	Locomotive Equipment and Inspection Depot
Source No0020	Drying oven
Source No0021	Sand storage facilities (pneumatic transport)
Source No0022	Sand storage facilities (pneumatic transport)
Source No0023	Sand storage facilities (pneumatic transport)
Source No0024	Sand storage facilities (pneumatic transport)
Source No0025	Pouring sand into locomotives
Source No6001	Manoeuvring a diesel locomotive

<b>St.Sorbulak</b>	
Source No6001	Manoeuvring a diesel locomotive

<b>St.Moyinkum</b>	
Source No6001	Manoeuvring a diesel locomotive

The pollutant emission sources for operations are summarised below.

### POLLUTANT EMISSIONS DURING OPERATIONS AND CALCULATION ASSUMPTIONS

No.	Key pollution sources	Key calculation assumptions
1.	Bleed candle emissions from railway line	<ul style="list-style-type: none"> <li>Design temperature, pressure, volume and rate of gas released were considered.</li> </ul>
2.	Boiler room	<ul style="list-style-type: none"> <li>Modular boiler type, boiler capacity, chimney height and diameter were considered.</li> <li>LPG usage duration during winter for heating and hot water was considered.</li> <li>Diesel as a backup fuel for heating and hot water was considered.</li> <li>According to the "Collection of Methods for Determining the Concentrations of Pollutants in Industrial Emissions", Almaty, 1996</li> <li>When determining the volume of gross emissions of harmful substances, the "Collection of Methods for Calculating Emissions of Harmful Substances into the Atmosphere by Various Industries", Almaty, 1996, was used.</li> </ul>
3.	Diesel fuel storage tank	<ul style="list-style-type: none"> <li>Fuel tank capacity, breathing valve height and diameter, tons of diesel per year consumption and maximum ejection of fuel were considered.</li> <li>Fuel composition, fuel content in liquid phase and liquid density were considered.</li> <li>Emissions are calculated in accordance with the "Industry Methodology for Determining Emissions of Pollutants during Technological Processes in Production Associations of the Ministry of Gas and Gas of the Kazakh Republic".</li> </ul>
4.	Emissions from LPG fuel unloading into fuel tank	<ul style="list-style-type: none"> <li>Volume of fuel tank, fuel consumption rate, % of tank filled, number of refuelling per year, volume of fuel loading hose and rate of tank filling were considered.</li> </ul>
5.	Emissions from LPG fuel tank blowdown	<ul style="list-style-type: none"> <li>In accordance with the "Safety Rules in the Gas Industry", underground tanks must be inspected once every 5 years. After internal inspections, repairs, and before commissioning, the tanks are purged with gas to remove air from them and prevent the formation of an explosive mixture.</li> <li>Tank volume, vapour density under normal conditions and frequency and duration of purging were considered.</li> <li>In accordance with the "Safety Rules in the Gas Industry", safety valves on tanks must be checked for actuation once a year.</li> <li>Capacity of the safety valve, valve flow rate and duration of valve being open were considered.</li> </ul>
6.	Shunting diesel locomotives	<ul style="list-style-type: none"> <li>Shunting diesel locomotives running on diesel fuel emissions are calculated for cold and warm conditions from duration for warming</li> </ul>

No.	Key pollution sources	Key calculation assumptions
		up, route distance, locomotive speed and annual fuel consumption rate.
7.	Diesel generators	<ul style="list-style-type: none"> <li>Capacity in kW, fuel consumption rate in L per hour, flue gas discharge chimney height and diameter, maximum operating power in kW and maximum operating time per year were considered.</li> <li>In accordance with the "Methodology for calculating emissions of pollutants into the atmosphere from Stationary diesel installations. RND 211.2.02.04-2004"</li> </ul>
8.	Compressor Stations	<ul style="list-style-type: none"> <li>Compressor Station model and operating duration per year were considered</li> </ul>
9.	Sand drying oven with diesel-fired burner	<ul style="list-style-type: none"> <li>Chimney height and diameter, operation duration and fuel consumption rate were considered</li> <li>Calculations were in accordance with "The collection Methods along Definition concentrations of pollutants in industrial emissions", Almaty, 1996</li> </ul>
10.	Unloading of sand into silos	<ul style="list-style-type: none"> <li>Volume of silos, number of silos and annual sand consumption were considered.</li> <li>In accordance with the "Methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials, Appendix No11 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 18 April 2008 No100 -p".</li> </ul>
11.	Pouring sand into locomotives	<ul style="list-style-type: none"> <li>Sand consumption rate was considered.</li> <li>In accordance with the "Methodology for calculating emissions of pollutants into the atmosphere from enterprises producing building materials, Appendix No11 to the Order of the Minister of Environmental Protection of the Republic of Kazakhstan dated 18 April 2008 No100 -p".</li> </ul>