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SKO [Southern Kazakhstan *Oblast'*] Department
Highways Committee
Ministry of Transport and Communications
Republic of Kazakhstan

Findings [conclusion]
of state environmental review [*expertiza*]
of the final project design [work project] *Reconstruction of highway from the Russian Federation border (Samara highway) to Shymkent.*
Construction of Temirlan bypass section, km 2217-2231

The final project design was prepared by Doris LLP (GSL licence No. 1007 of 17.03.2006). The section 'Environmental protection' was drafted by GradStroiEkoProekt LLP (Ministry for Environmental Protection licence No. 1347R of 22.04.10).

Developer – Highways Committee, Ministry of Transport and Communications, Republic of Kazakhstan.

The following material was presented for state environmental review:

- architectural planning assignment No. 190/48;
- explanatory note, vol. 1, vol. 9 and graphic materials for the final project design;
- findings of the SKO Department of the State Sanitary and Epidemiological Committee of the Ministry of Health of the Republic of Kazakhstan No. 17-6-1658 of 09.09.2010;
- findings of the Directorate for Sanitary and Epidemiological Inspection for the Ordabasy District, SKO No. 82 of 02.10.2010;
- copy of publication of application for the performance of an environmental review on the website чуут.уепсШо-кг.сот [*sic*] o*f* 23.08.2010;*
- newspapers *Iuzhnyi Kazakhstan* No. 128 of 06.10.2010 and *Otstuspk Kazakhstan* No. 151 of 07.10.2010 with publication of application for conduct of public hearings;
- minutes of public hearing of 29.07.2010;
- findings of Badam State Institution for Protection of Forests and Wildlife No. 413 of 11.10.2010;
- letter from the Aral-Syrdaria Basin Inspectorate No. 606 of 13.10.2010;
- findings of archaeological expert review by Nauchno-issledovatel'skii tsentr [Research Centre] LLP of 28.06.2010;
- Environmental Protection section;
- statement of environmental consequences.

The material was received for consideration on 29.10.2010, incoming ref. no. 08/647-3. *

General information

The planned section of road is located in the Ordabasy District of SKO between km 2216+50 and km 2230+700. The overall alignment of the road is from north to south-east. The start of this section has been set at km 2216+50 PK 0+00, and the end at km 2230+700 PK 148+43 on highway M-32. The overall length of the planned road is 14.843 km.

The section of road is located in a semi-desert zone. The local relief is undramatic and slightly undulating. In terms of its geology, the area of the road is of Upper Quaternary formation. From the surface down, the ground comprises loams. The climate

in the area is of the extreme continental category, with a dry, hot summer and a mild, short winter. The prevailing wind direction is east or south-east. The drainage network is dominated by the River Arys. Ground water on the site itself at a depth of 10 m from the surface has not been tapped. The natural cover is made up of ephemeral and wormwood-type vegetation. The local fauna consists of birds of various species, rodents and reptiles. No observations are being made of background concentrations of airborne pollutants.

The roadbed mainly runs on an embankment, and in some sections in a cutting. The soil used to lay the roadbed is to be mined in quarries located at PK 67+00 and PK 119+00, 150 m to the right of the planned road. The roadbed width is 27.5 m, and the shoulder width 3.75 m. The maximum height of the planned embankment is 8.67 m. The gradient of the banks is 1:4.0, 1:1.5 and 1:1.75. The traffic flows heading towards Shymkent and Kyzyl-Orda are separated by a central reservation. On the road as a whole the surface is cement concrete, while on bridge and overpass approaches it is asphalt concrete. On the section of the road in question here, two overpass junctions are planned: at PK7+16 there is a junction with highway M-32 of the “Pipe” type with left- and right-turn access roads, and at PK88+10 there is an individual-type junction at the intersection with the category IV highway from Temirlan to Kyzylsengir. The overpasses have been planned with a view to the load direction and the smallest unobstructed passage for transit transport.

The project design also includes construction of: an overpass over a field road at PK42 + 45; bridges: over canals (Naiman at PK84 + 14; Kaznaaryk at PK96 + 69; Kurtai at PK98 + 50; emergency discharge canal at PK103 + 20); over the R. Arys at PK106 + 67; culverts – 22 of these; lighting for road junctions and the bridge over the R. Arys; reconstruction of power lines, water pipe and telephone line; construction of junction with existing road from Temirlan to the Badam-Shubar road; and accessory structures.

The planned road is crossed at various angles by a 10 kV, a 0.4 kV and a 35 kV overhead power line, a KSPP-1x2x0.9 underground communications cable and an LSV (overhead telephone line).

The construction period for the section of road is 23 months, with 1 month of this for preparation work. Drinking water for the construction period is expected to be supplied from Temirlan. Process water will be drawn from the R. Arys and brought to the site in water tankers.

During the preparation period, the strip that is to be occupied by the road will be made ready, along with the communications that are to be re-laid. The area of the strip that is to be permanently set aside for the planned section is 103.762 ha. Extra land needs to be set aside for construction of the road, for both permanent and temporary use.

The project specifies the land areas to be taken over for permanent and temporary use, for the road to lie on, for temporary occupation while communications are being re-laid, and for overpasses and junctions:

- permanent diversion of land for road – 67.5 ha;
- permanent diversion of land for interchanges – 30.92 ha;
- permanent diversion of land for junctions – 4.9 ha;
- permanent diversion of land for transfer of 35 kV power line – 0.058 ha;
- permanent diversion of land for transfer of 10 kV power line – 0.035 ha;
- permanent diversion of land for transfer of 0.4 kV power line – 0.024 ha;
- permanent diversion of land for transfer of telephone lines – 0.2 ha;
- permanent diversion of land for transfer of water pipe – 0.125 ha;
- temporary diversion of land for the road construction period amounts to 26.5 ha for quarrying work. Land from various businesses and owners is subject to compulsory purchase for state needs. The purchase will be carried out by the SKO department of the Highways Committee, with compensation of costs and lost benefit.

Evaluation of environmental impact

Air pollution. During construction of the section of road, excavation and loading work will be carried out, with unloading of dump trucks at the receiving site, welding work,

movements of specialist equipment on the construction site and storage of fuels and lubricants. A mobile diesel generator (free-standing) to produce electricity at 200 kW/h is expected to be located at the site, and a welding set. All of this work and these items of equipment constitute sources of air pollution while construction work is going on.

The following will be released into the air:

Substance	Substance release, g/s	Substance release, t/yr
Iron (III) oxide	0.0006	0.0049
Manganese and compounds	0.0001	0.0008
Nitrogen (II) oxide	0.0288491	0.34554
Carbon (soot)	0.0083534	0.0988571
3,4-benzpyrene	0.00000020772	0.0000033
Formaldehyde	0.0019943	0.0235715
C12-19 alkanes	0.0481746	0.5782857
Nitrogen (IV) oxide	0.1775334	2.1264
Sulphur dioxide	0.0689584	0.8175
Carbon monoxide	0.1797222	2.175
Gaseous fluorine compounds	0.000026	0.0002
Inorganic dust: 70-20% silicon dioxide	0.0669	0.9175
TOTAL:	0.58121160772	7.0885576

According to a dispersion calculation, the peak pollutant concentration will not exceed maximum admissible concentration values. These emissions are proposed as maximum admissible emissions for the construction period.

An air impact assessment for the construction zone was performed by simulating the spread of emissions in the atmosphere, following the 'Methodology for the calculation of airborne concentrations of harmful substance contained in releases from businesses. RND 211.2.01-97'. To calculate releases from vehicular transport and to determine the concentration of toxic substances at a distance of 20 m from the road, we used a Gaussian distribution model of atmospheric impurities at low heights. The calculations performed for the road in the section in question at a distance of 20 m from the edge of the carriageway provided the following results:

Pollutants	Airborne pollutant concentration at 20 m from edge of carriageway, mg/m^3	Maximum admissible one-off concentration, MAC_{one}, mg/m^3	Mean daily MAC for toxic components of spent gases in the air of inhabited locations, mg/m^3
Carbon monoxide	0.06	5.0	3.0
Hydrocarbons	0.012	1.0	1.5
Oxides of nitrogen	0.006	0.085	0.04
Lead compounds	0.000032	0.0010	0.0003

The calculation shows that the traffic impact on the air does not exceed MAC values at a distance of 20 m from the nearest traffic lane. The toxins concentration contained in spent gases within the confines of the 30 m technical and reserve strip alongside the road lies within MAC levels, and these toxins will not have a harmful impact on the natural environment.

Construction-related measures to reduce atmospheric pollution near the road that are specified by the project design are based on improvements in highway design. There are fewer long inclines, visibility on horizontal and vertical curves is ensured and these curves are of greater radius, which all combines to allow high speed traffic flow and a reduction in harmful releases. The type and technical condition of the road surface also play a significant part in keeping releases low. A crescent-shaped surface profile helps to reduce dust formation on the road.

Organisational measures to protect the air from pollution include regulation of travel speed by cutting out any sharp braking and acceleration by vehicles, these being the factors

that contribute most to harmful substance release, and rational traffic flow distribution. Road signs are to be installed to eliminate frequent braking and acceleration and to ensure an even flow of traffic, thus avoiding significant air pollution. Road signs play an important part in regulating traffic, informing travellers of road conditions and rules.

Admissible limits for noise produced by vehicular traffic are set by the design at 75 dBA. Analysis of the results obtained shows that the distance from the road to the point where the health standard is met is 200 m or more without fences, and 10 m with fences, and there will be no negative impact on living conditions for the local populace.

Surface and underground water. Water pollution results from vehicle discharges falling onto road and bridge surfaces; by-products of wear to the road surface, tyres and brake linings; dust; de-icing materials; and construction and agricultural loads. When these are washed off by rain and melt water, they cause the surface run-off water to be saturated with a variety of pollutants. These pollutants include suspended substances (of mineral and organic origin in the form of suspended particles of sand, clay, silt, plankton, etc.), petroleum products (gasoline, diesel fuel, oils, heavy fuel oil), lead and chlorides. All water courses that cross the road route are temporary, apart from the R. Arys. The surface run-off is chiefly made up of snow melt, and this is only seen in wet years. Rainwater flash floods are rare event, and are not significant in volume. Temporary water courses are not fed from underground sources to any great extent.

The road's water drainage system as planned by the design consists of a number of structures and individual construction measures intended to prevent water-logging of the roadbed and to capture and divert water that gets onto the roadbed. To deal with surface run-off, the design specifies the construction of side water-diversion ditches (drainage ditches), with culverts to allow water courses and water to pass under the roadbed and prevent it stagnating near the road for any length of time, which may lead to adjacent land becoming boggy. Culverts are provided in places where the road intersects water courses, dry valleys, irrigation channels and drainage channels. Round and rectangular culverts have been used in this project design. To prevent erosion, the feed and removal runs of culverts are strengthened.

Production and consumption waste. In the process of construction and operation of the road, various types of waste will be produced. Waste requiring storage or burial is not expected to be generated during the road's construction or operation. Waste motor oils will be produced during the road's construction, along with discarded welding electrodes and solid domestic waste resulting from the presence of construction personnel.

All construction materials (sand and gravel mix, sand, road stone, soil, etc.) are 100% utilised. A technique will be used whereby temporary structures are built using gravel and stone that is subsequently removed and used in the construction of the crushed rock hard shoulder. Re-use of replaceable culvert sections is envisaged. When the strip on which the road is to be laid is being cleared, storage of timber, felling waste and uprooted stumps on the set-aside land or beyond its boundaries will not be permitted. The preparatory work plan should envisage special locations for temporary storage of waste, showing the methods and routes by which this will be transported away to be interred, processed or sold. Timber and clearance waste should be removed in the season for felling and uprooting (preferably during the winter). The road construction company should possess mobile equipment for waste collection: refuse collectors for construction and other types of waste at sites where work is proceeding; vessels and containers for materials; and sanitary booths (biological toilets). Waste categorised as secondary raw materials (ferrous metal scrap, spent welding electrodes, building waste) should, as it accumulates and at the end of construction work, be transferred as secondary raw materials to the relevant specialist firms. Solid domestic wastes, as they accumulate and at the end of construction work, are to be transferred under the terms the relevant contract for storage on solid domestic waste sites.

During the construction process, the following wastes will be produced:

Name of waste	Waste hazard level and code	Generated	Disposal, sterilisation		Siting	
			at specialist undertakings	at own undertaking	interment	temporary accumulation on construction site
Total		4.8344	4.8344	–	–	4.8344
Oily rags	Amber AC 020	0.635	0.635	–	–	0.635
Solid domestic waste	Green CO 060	4.125	4.125	–	–	4.125
Used motor oil	Amber AC 030	0.0744	0.0744	–	–	0.0744

Land resources and soils. Calculations performed for the project have established that the lead content in a strip bounding the road at a distance of 10 m from the carriageway will be between 6 and 35 mg/kg, and when protective measures are taken into account, the lead content in soil at a distance of 10 m from the edge of the carriageway will be between 3 and 16 mg/kg. At a distance of 10 m, the soil lead value does not therefore exceed maximum admissible concentrations.

According to a report of Badam State Institution for Protection of Forests and Wildlife No. 413 of 11.10.2010, an area of 11.2 ha (length 1.2 km, breadth 94 m) is to be made permanently available for the road. According to the report, 902 m^3 of bushes and trees is to be felled. Payment is to be made for the permanent loss of forest from the state forestry reserves, given the loss of forest industry. The project design specifies that areas that are temporarily occupied should be returned to a condition in which they are fit for agriculture. Land reclamation should be carried out as work proceeds or within one year of completion of work. Reclamation work is to be performed on land occupied by detour roads, construction sites beside bridges and culverts, plant parking areas and material storage sites, water supply sites, large borrow pits and approach roads to them, and temporary housing for contractors' staff. A key part of preparatory work is technical reclamation, which includes: removal of the fertile layer of vegetation; storage of this layer in a mound for subsequent use when reclamation work is undertaken; removal of construction rubbish; flattening the sides of borrow pits to 1:10; grading of the surface of disturbed land; breaking up the foundation of construction sites and detour roads (sand and gravel mix or gravel and sand mix) with transportation to a distance of up to 5 km for use in the road's crushed rock shoulders; and moving the fertile soil layer back into place. Before applying the fertile soil layer to the graded surface, deep sub-surface scarification must be carried out. This measure helps to achieve a better meld between the fertile layer being applied and the substrate soil, and also facilitates penetration of plant roots into the sub-soil layer. Agrotechnical measures are used during the biological phase of reclamation to restore fertility to the disturbed land. Grasses are to be sown to restore the fertility and structure of the soil. Use of perennial grasses is recommended for this purpose.

Conclusions

The final project design *Reconstruction of highway from Russian Federation border (Samara highway) to Shymkent. Construction of Temirlan bypass section, km 2217-2231* has been approved.

Director

Expert Sub-Section [*signature*] B. Satenov

[imprint of stamp, wording in Kazakh]

B. Tungatarova
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