

**MINISTRY OF INVESTMENT AND DEVELOPMENT OF THE REPUBLIC
OF KAZAKHSTAN**

**Presentation of Project
“Mining and Processing of Nickel Ore of
Kempirsaisky Deposits”**

Astana, 2015

Project name

Project basics:

Subsurface user: GRK Koitas Ltd., Asia-Invest Corporation Ltd.

Main project goals: Mining and processing of silicate nickel-cobalt ores with production of bulk Ni and Co concentrate.

Total project cost: 1st stage – USD 70 M
2nd stage – USD 50 M

Project period: 2017 to 2029

Project location: Aktubinskaya Region, Republic of Kazakhstan.

Expected outcome: saleable product output in amount of USD 90 M with mining and processing of 1 000 000 tons of ore per year.



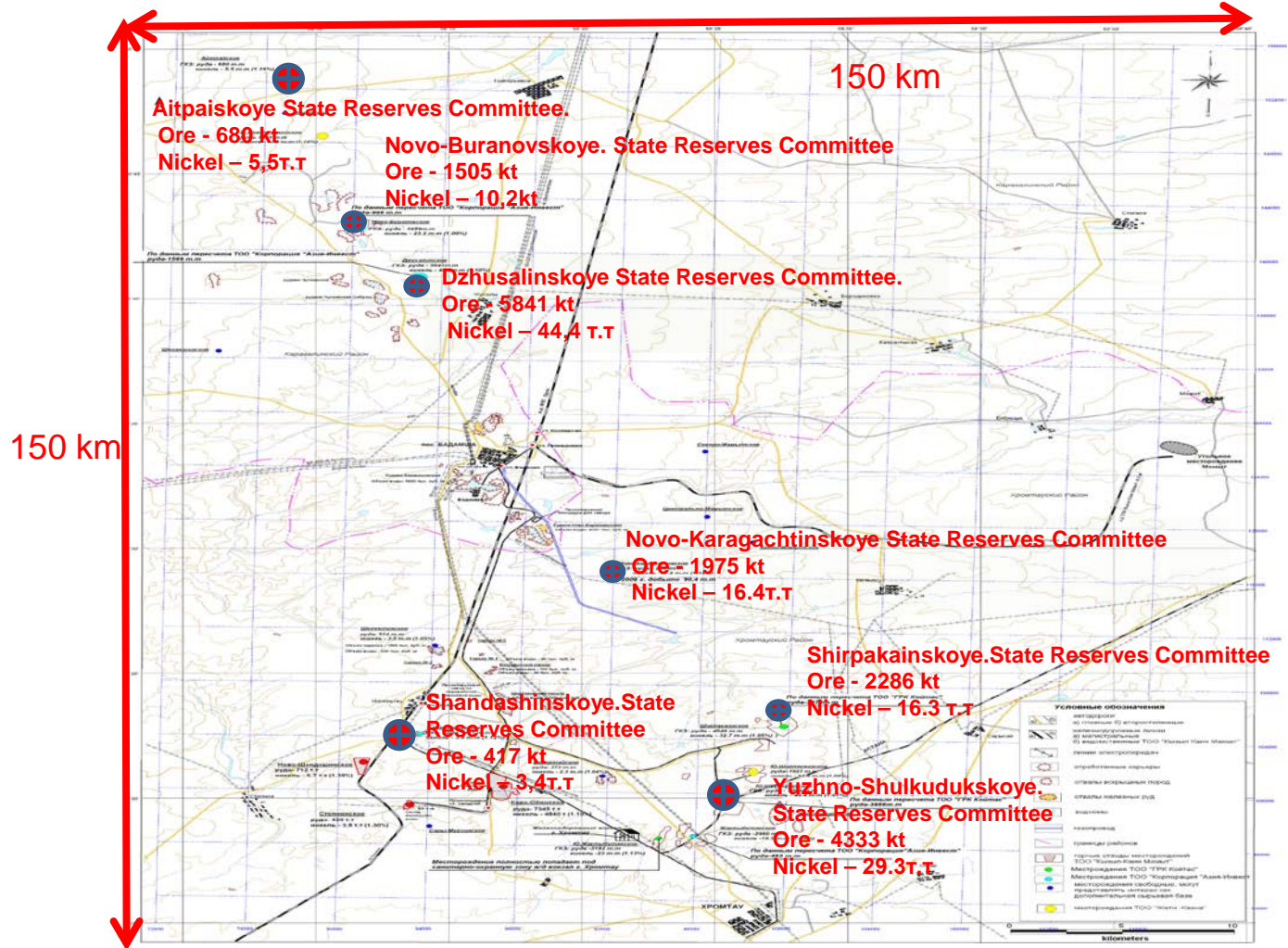
Review and main project solutions:

Approved deposit reserves:

Company name	Deposit	Contract ##	On-balance reserves, kt, <u>raw dry</u>	Metal			
				Ni, kt	Grade, %	Co, Tons	Grade, %
GRK Koitas Ltd.	Shirpakainskoye	2363 dd 21.05.2007	<u>2 286</u> 1 543	16,3	1,06	687	0,045
	Novo-Karagachtinskoye	2365 dd 21.05.2007	<u>1 975</u> 1 377	16,4	1,19	974	0,071
	Yuzhno-Shuulkudukskoye	2371 dd 21.05.2007	<u>4 333</u> 2 847	29,3	1,03	1597	0,056
Asia-Invest Corporation Ltd.	Novo-Buranovskoye	2366 dd 21.05.2007	<u>1 505</u> 975	10,2	1,05	506	0,052
	Shandashinskoye	2367 dd 21.05.2007	<u>417</u> 303	3,4	1,12	113	0,037
	Dzhusalinskoye	2368 dd 21.05.2007	<u>5 841</u> 4 007	44,4	1,11	2524	0,063
	Aitpaiskoye	2370 dd 21.05.2007	<u>680</u> 473	5,5	1,17	203	0,043
Total:			<u>17 037</u> 11 525	125,5		6 604	



Contract territory location plan



Location map



Brief Geological Characteristic of the Deposits:

Kempirsay ultrabasic massif, where silicate nickel-cobalt lateritic ore lodes allied with ancient weathering crust are located, extends in North-North-West direction for 70 km with the width of 3 to 30 km. Total area of this zone is approximately 1 100 km².

The massif is confined to the eastern part of the Or-Ileksky water divide which is the south continuation of Guberlin Mountains (the Southern Urals). The water divide represents an outshot of ancient ural metamorphic rocks – so-called Ural-Tau zone.

Geological structure of the Kempirsay massif is widely composed of loose products of serpentinites weathering crust and sand-clayey mesozoic-kainozoic sediments.

Weathering crust of massif serpentinites is of line-pattern type and is represented by the full profile in which bottom-up regular change of the following rocks occurs: leached decayed serpentinites, low-nontronitized serpentinites, ocherized nontronites and nontronitized serpentinites, ocher. The section is completed by clays and less often by mesozoic-kainozoic sands.

Thus the silicate nickel mineralization at Kempirsay massife is associated with the nontronite zone of serpentinites weathering crust: more the nontronites and nontronitized serpentinites zone and less to subzones of orcherized nontronitex and low-nontronitized serpentinites. At times payable nickel grades are noted in decayed leached serpentinites.



In fact all Kempirsaisky deposits appear as one ore field with two ore zones – Southern and Northern.

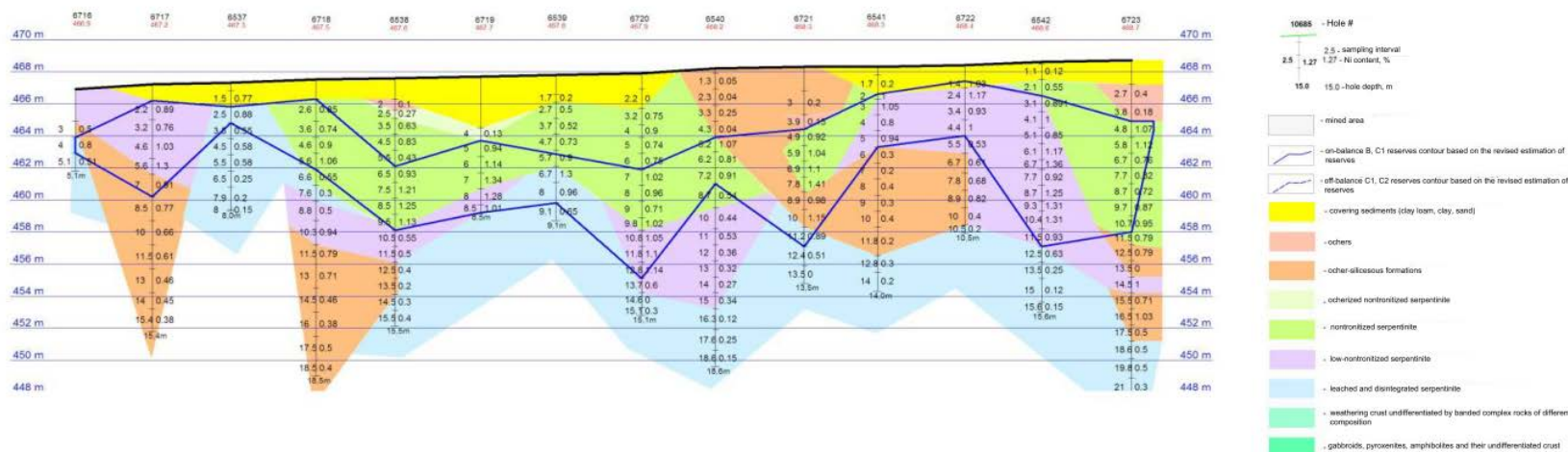
Main factors determining the position of ore bodies in space: development area and thickness of clayey products of weathering crust and their erosion level. In this regard the shape, dimensions and structure of ore bodies hinge on weathering crust morphology and nickel content.

Nickel-containing minerals:

Main – nontronite /nickel absorbent/, secondary – garnierite, nepouite, revdinskite, asbolanes, wad, etc.

Main nickel portion is associated with nontronites, cobalt in ore is associated with asbolanes and wades.

Nickel ores are shallow and mined using open-cut method. Nickel content in deposits' ore varies from 0,80 to 1,55 %, cobalt content varies from 0,036 to 0,073 % in dry sample. Natural moisture content of the deposits varies from 31,0 to 35,0 %.



Production output by years

Deposit group	Deposits	Years	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total	
Southern group of deposits	Novo-Karagachtinskoye	ore, kt	221,0	300,0	300,0	300,0	300,0	300,0	254,0							1975,0	
		overburden, thous. m3	181,2	286,2	286,2	286,2	286,2	286,2	272,2								1884,4
	Shirpakainskoye	ore, kt	197,0	393,0	393,0	393,0	393,0	393,0	124,0								2286,0
		overburden, thous. m3	1743,4	345,8	345,8	345,8	345,8	345,8	120,0								3592,4
	Yuzhno-Shuulkudukskoye	ore, kt	281,0	695,0	695,0	695,0	695,0	695,0	577,0								4333,0
		overburden, thous. m3	814,9	2015,5	2015,5	2015,5	2015,5	2015,5	1700,0								12592,4
	Shandashinskoye	ore, kt	40,0	49,0	49,0	49,0	49,0	49,0	132,0								417,0
		overburden, thous. m3	8,4	10,3	10,3	10,3	10,3	10,3	29,6								89,5
	Northern group of deposits	Novo-Buranovskoye	ore, kt								306,0	613,0	586,0				1505,0
			overburden, thous. m3								856,8	1716,4	1730,4				4303,6
Dzhusalinskoye		ore, kt								344,0	688,0	709,0	1400,0	1400,0	1300,0	5841,0	
		overburden, thous. m3								1124,9	2249,8	2318,4	1800,1	1800,1	1600,0	10893,3	
Aitpaiskoye		ore, kt								140,0	279,0	261,0				680,0	
		overburden, thous. m3								180,5	359,6	340,0				880,1	
Total for Southern group		ore, kt	739,0	1437,0	1437,0	1437,0	1437,0	1437,0	1087,0	790,0	1580,0	1556,0	1400,0	1400,0	1300,0	17037,0	
		overburden, thous. m3	2747,9	2657,8	2657,8	2657,8	2657,8	2657,8	2121,8	2162,2	4325,8	4388,8	1800,1	1800,1	1600,0	34235,7	

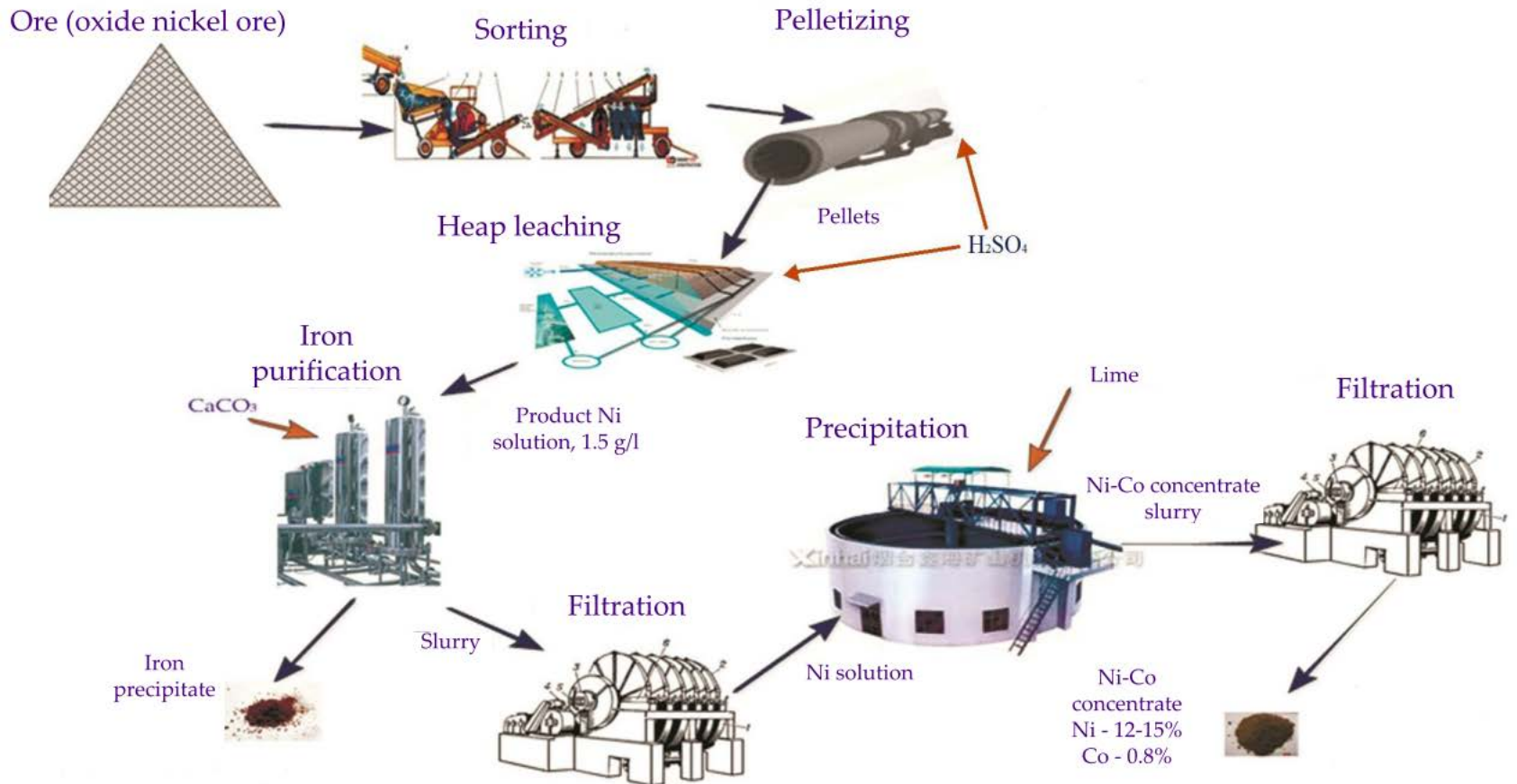


Deposit development technology and its main parameters:

- Open-cut mining with direct rock mass excavation (without drilling and blasting)
- Expected waste to ore ratio during the period of mines existence – 1:2
- Process complex of mining machinery for mining and stripping operations – heavy mining machines such as Dossan, Dressta



Ore processing flowsheet

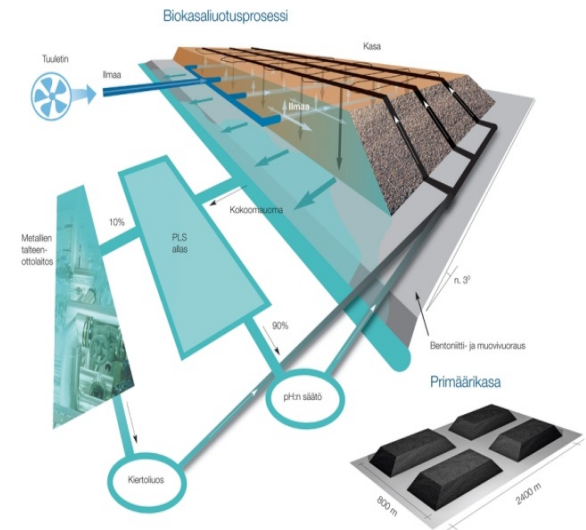


Hydrometallurgical technology of ore processing

Crushed ore is sintered. Heaps are irrigated with leaching solutions recirculating until metal concentration in them reaches the required level.

After a year of leaching the ore is removed from the primary substrate and is placed on the new substrates where the ore is released for additional metals recovery from “dead” zones. Restacking technology solution is being made as a part of the project.

In the metal recovery cycle nickel and cobalt are precipitated from solutions using lime milk. 79-82% level of nickel recovery into concentrate was achieved during the studies which indicates good technological properties.



Hydrometallurgical technology of ore processing

Stockpile substrate preparation

1. Waterproofing layer

2. Film

3. Pelletized ore

4. Aeration pipelines for stockpile blowing

5. Stacker lanes



Hydrometallurgical technology of ore processing

Restacking of primary heaps to create secondary leaching heaps



Path forward:

- There is an opportunity to expand the mining and processing undertaking to 3-5 Mtpy which would allow increasing economic performance and reducing the payback period. The expansion would be realized through addition of deposits listed as a state property.

Description	Amount of ore, kt		Content, %		Metal, kt		Note
	Raw	Dry	Ni	Co	Ni	Co	
Deposits listed as a state property (on-balance reserves)	187 455	127 470	1,02	0,054	1 297	69	Geological exploration arrangement is required
Deposits listed as a state property (off-balance reserves)	31 074	21 130	0,6	0,033	126,8	7	
Technogenic mineral formations (TMF) listed as a state property	13 468	9 158	0,66	0,044	60,6	4,1	
Total:	231 997	157 758	0,94	0,051	1484,4	80,1	



Infrastructure

Operation base of the enterprise is located in Badashma settlement of Kargalinsky District 130 km from Aktobe. The deposits are located in 2 districts – Kargalinsky and Chromtau.

The abovementioned districts have a well-developed industrial and transport-and-communication infrastructure: **highways** from Aktobe to Orsk and from Aktobe to Chromtau, **railroad** from Orsk to Nickeltau (Southern Urals Railways), Bukhara-Urals **gas pipeline**, Kenkiyak-Orsk **oil pipeline**, 110-kV **power line**. The district has a large number of mined out pits filled with ground water.

Main technical and economic figures:

• **Production:** mining and processing of 1 000 000 tons of wet Ni-Co ore per year.

• **Required investments:** USD 50 M

• **Equipment:** Mining, ore stacking, sulphuric acid storage and solutions processing.

• **IRR 15,37%, NPV USD 8 118 201**

• **Payback period:** 10,8 years. The period may be reduced by increasing the production capacity of the undertaking which requires expansion of the ore base. There is a number of promising deposits in the immediate vicinity.

• **Market outlet:** Russian nickel processing plants - Buruktalsky, Ufaleiskiy, Rezhsky, Serovsky.

• **Job creation:** 400 jobs.



Project charter

Subsurface user: GRK Koitas Ltd., Asia-Invest Corporation Ltd.

Project goal and idea: Mining and processing of nickel-cobalt ores to produce Ni and Co concentrate.

Project period: 2017 to 2029

(including construction, operation and attenuation)

Project location: Aktubinskaya Region, Republic of Kazakhstan.

Total project cost: 1st stage – USD 70 M
2nd stage – USD 50 M

Требуемые инвестиции: 50 млн. долл. США.

Expected outcome: saleable product output in amount of USD 90 M with mining and processing of 1 000 000 tons of ore per year.

Current state: -----

IRR 15,37%, NPV USD 8 118 201

Payback period: 10,8 years. The period may be reduced to 4 years by increasing the production capacity

Production: mining and processing of 1 000 000 tons of wet Ni-Co ore per year.

•**Advantages:** Simple process, no large capital facilities.

•**Disadvantages:** low ore grade, long leaching time (180-200 days).

•**Infrastructure and resources:** Availability of well-developed infrastructure near the deposits.

Market outlet: Russian nickel processing plants - Buruktalsky, Ufaleiskiy, Rezhsky, Serovsky.

•**Job creation:** 400 jobs.