



Mining and metallurgical complex

Construction of a complex for the production of barite concentrate in Mangystau Oblast

Project description:

The project involves construction of a complex for the extraction of barite-celestine ores and their processing into barite concentrate for use as weighting agents for drilling muds. The mining of barite-celestine ores and their processing will be carried out at the North Aurtas deposit.

Product: Barite-celestine based weighting agent («BCWAs»), carbonate based weighting agent («CWA»).

Reserves (Category C1):
3,579 thousand tons

Initiator:
Chemicals trading LLC.

Location:
Mangystau district, Mangystau Oblast

Annual production capacity:

- 200 thousand tons of ore per year;
- BCWA - 186 thousand tons;
- CWA - 14 thousand tons.

Key investment indicators

Indicator	Results
Amount of investments, US\$ thousands	14,123
Project NPV, US\$ thousands	14,999
IRR, %	32.5%
EBITDA margin, %	34-41%
Payback period, years	5.0
Discounted payback period, years	6.1

Project location: Mangystau district, Mangystau Oblast



Project implementation assumptions:

Existence of a rich resource base.

The Aurtas deposit, located in Mangystau Oblast, is the largest barite ore deposit with a balance stock of 3.5 million tons of ore. Additionally, ore reserves may increase during additional geological exploration of the area during mining operations.

Advantageous location.

The geographical proximity of the Aurtas deposit to the oil and gas fields of western Kazakhstan and to the Caspian Sea and the ports of Aktau and Kuryk provides a favorable logistic advantage in the delivery of final products to both domestic and foreign consumers.

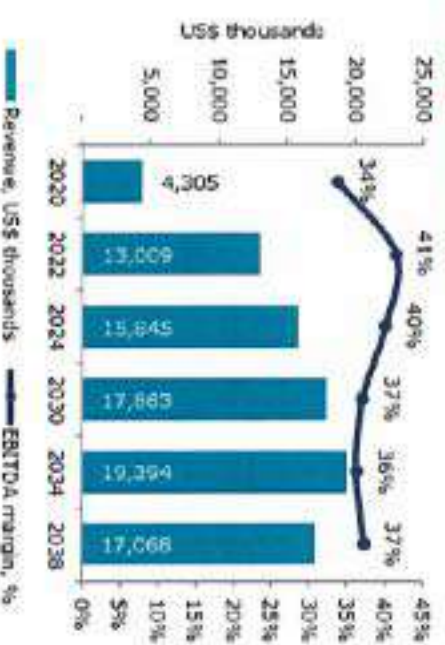
Development of the oil and gas industry of Kazakhstan.

The last four years, the volume of purchases of the entire oil and gas market in Kazakhstan has increased by an average of 20% per year. The total amount of oil services purchased in 2018 amounted to US\$ 8.26 billion, which is 15.5% more than in 2017 (US\$ 7.15 billion).

Lack of competition in foreign markets and export potential.

According to the analysis of competitors in foreign markets in Turkmenistan, Russia, Azerbaijan and Saudi Arabia, the extraction and processing of barite is insufficient or completely absent to meet domestic demand.

Project profitability

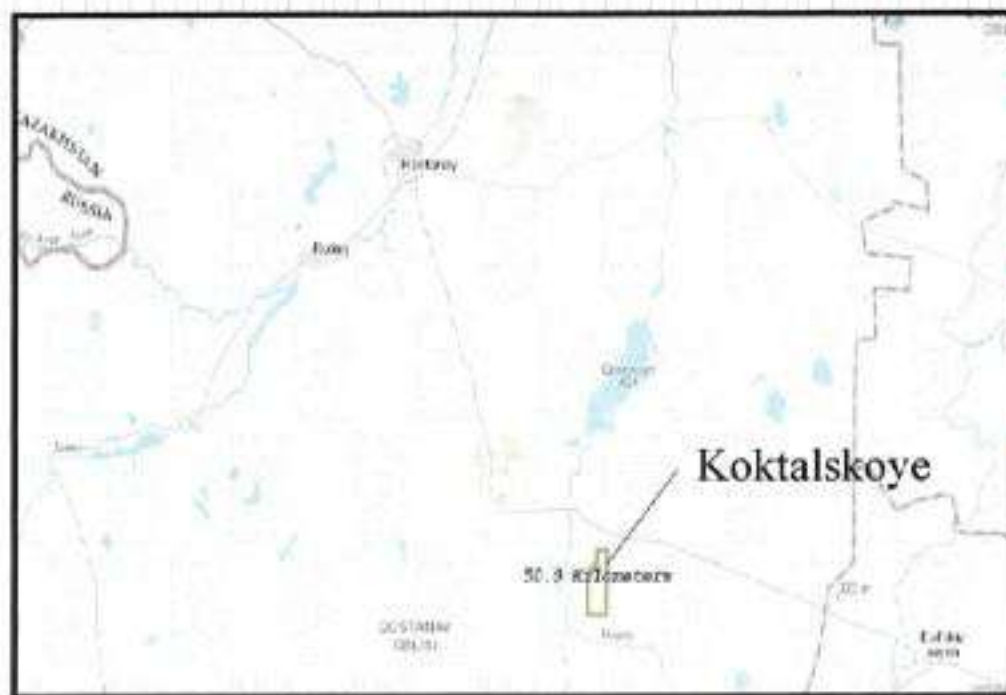


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Construction of a plant for the production of alumina with a capacity of 1 million tons per year in the Auliekol district of the Kostanay region on the raw material base of the Kuktalskoye bauxite deposit

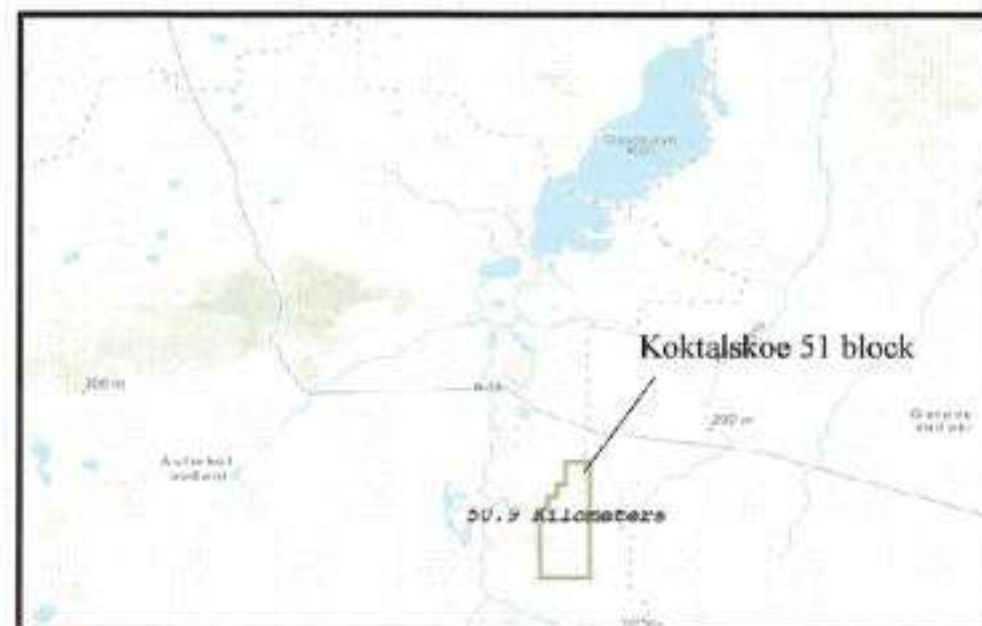


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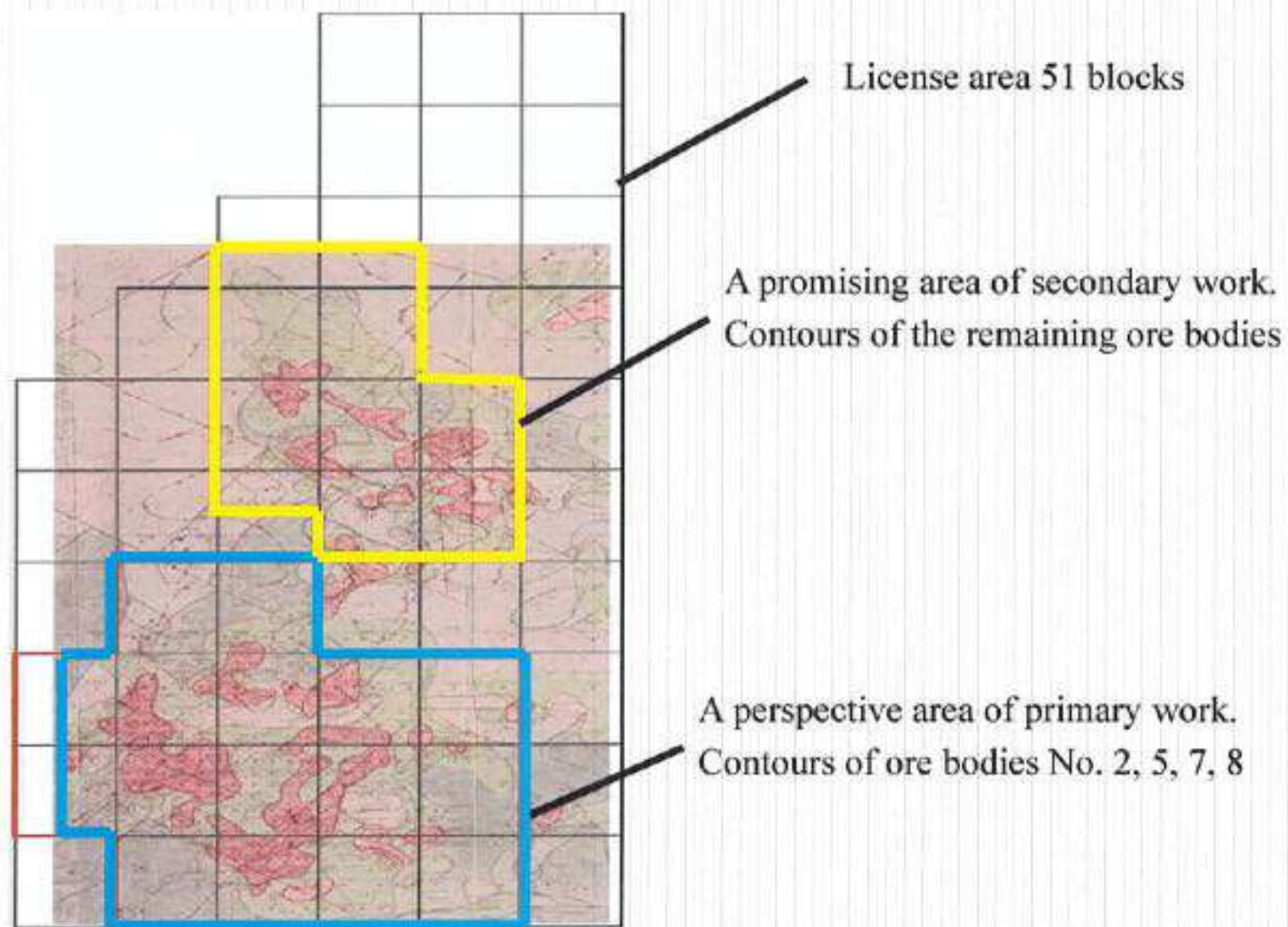


- The Koktalskoye field is located in the Auliekol district of the Kostanay region, 40 km south of the Kushmurun station;
- The nearest large settlements are the Kushmurun railway station and the regional centers of Karasu and Auliyekol;
- In the economy of the region, agriculture is of predominant importance. There are no large industrial enterprises.

- The international highway M-36 runs 5 km north of the proposed construction site and 10 km from the bauxite deposit;
- The main railway runs 15 km to the north. The railway connects the area under consideration with the industrial centers of the Urals and Kazakhstan;
- A 220 kV high-voltage power line runs 15 km to the north, with the ability to connect to power the planned plant and field.



Geological map of the Kuktalskoe deposit



Field characteristics

- The calculated bauxite reserves in the C2 category and the inferred resources in the P1 and P2 categories are taken in the following quantities: C2 - 140 million tons, P1 - 210 million tons, and P2 - 100 million tons. the total metallogenic potential of the Koktal group area is 450 million tons;;
- Currently, 48 bauxite deposits are known, mainly of laterite-sedimentary origin. The main bauxite reserves of the deposit are concentrated in ore bodies 2, 5, 21, and 8;
- The bauxite power in the wells ranges from one meter to 69.1 m, including rocky bauxite up to 30-40 m (ore bodies 2 and 5);
- The reserves of bauxite registered on the state balance sheet under category C2 are 44,888,000 tons.
- According to the subsoil use license, the area of exploration is 51 blocks (102 km²), on which there are 21 ore bodies with C2 category reserves. The most promising is the area consisting of 16 blocks (32 km²), where the main reserves of bauxite are located, calculated according to category C2.

Qualitative characteristics of bauxite

- The study of the quality and technological properties of bauxites of the Kuktalskoye deposit was carried out with the participation of specialists from VAMI (St. Petersburg) and the Complex experimental - methodical batch (KOMП) ПГО «Севказгеология».
- The result of the work carried out is to establish the proximity of the quality of bauxites of the Kuktal and Naurzum deposits, where the main alumina mineral is gibbsite (30-60%). Other alumina-bearing bauxite minerals are represented by corundum, X-ray amorphous anhydrous alumina, boehmite, and the diaspora. Silica minerals are represented by kaolinite, dickite, and quartz. The content of kaolinite + dickite ranges from the first percent to 15-20%. Bauxites are characterized by high contents of oxide iron: hematite + goethite - 20-30%, magnetite - 1-3%. High content of titanium dioxide (4-4.5%) and phosphorus pentoxide (0.3-0.6%). Titanium-bearing minerals are represented by anatase and rutile; relict ilmenite grains are often present. The average Al_2O_3 content is 40.7.
- The content of carbonates in bauxite ranges from fractions to 8-10% in sterilized varieties. Sulfur and Corg content usually amounts to 0.1-0.2%, gallium 40-60 g / t, vanadium 700-1000 g / t, chromium 400-700 g / t and more.

Table of ore bodies

№	Deposit	Ore bodies	Bauxite roof depth, m			Bauxite thickness by ore bodies, m			Bauxite reserves, category C2, mill. t.	Overburden volume, mill. m ³	Strippig ratio, m ³ /t	Average content of main components, %					$\frac{Al_2O_3}{SiO_2}$
			from	to	average	from	to	average				SiO ₂	Al ₂ O ₃	Fe ₂ O ₃	TiO ₂	CO ₂	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Koktal	2	151,6	178,5	165,6	0,6	49,1	8,4	22,859	365,7	16	7,98	38,22	25,60	4,34	1,76	4,79
		5	133,7	168,9	152,3	0,8	43,9	8,3	22,034	308,47	14	4,52	40,65	26,93	4,29	1,57	9,0

The advantage of Bayer Hydro Garnet technology

1. Reduced capital costs for plant construction by 25%;
 2. Saving reagent consumption (soda ash by 90%);
 3. Reducing the cost of conventional fuel by 35%;
 4. Significant reduction (2-3 times) of harmful environmental emissions;
 5. Possibility of producing, along with metallurgical alumina, rare metals - gallium and vanadium, environmentally friendly hydro-garnet sludge suitable for direct use in construction, as well as for cost-effective processing to obtain cast iron, cement, and titanium-containing slag.
- The technology provides for the complete utilization of ash from a plant TPP to obtain alumina and silicate products.
 - It is proposed to produce alumina according to a modular scheme (500 thousand tons of alumina per year), which ensures an efficient launch of the plant, the possibility of a phased increase in capacity and adjustments in the volume of output.
 - With the full capacity of the plant for the production of basic products, 1 million tons of metallurgical alumina, there is a possibility of creating and producing, directly at the plant, additional products from the so-called associated and main production wastes. So, the annual output of related products can be :
 - - gallium metal– 16,0 tons;
 - - vanadium pentoxide– 413 tons;
 - - hydro-garnet sludge– 1,57 million tons, from which it turns out :
 - - cast iron – 378,0 thousand tons;
 - - cement 1 000,0 thousand tons;
 - - other (20,0 % titanium oxide) in the amount of 200.0 thousand tons.

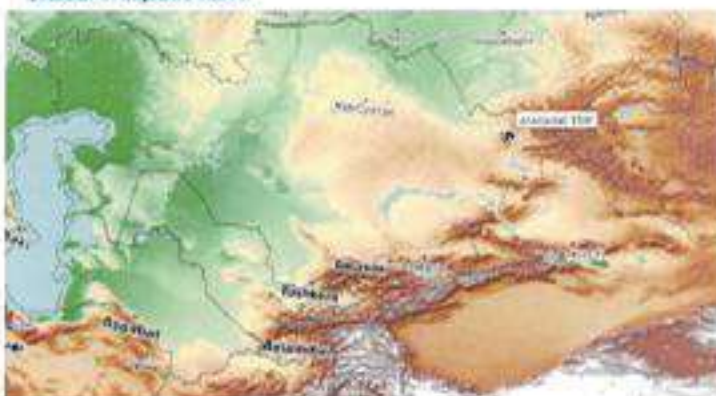
Investment project support

- In accordance with the Decree of the Akim of Kostanay region No. 91 dated March 3, 2020, "Kaganat Onimderi" LLP is a subject of industrial and innovative activity and is entitled to the following state support :
- 1. Tax preferences :
 - 1) exemption from corporate income tax for 10 years;
 - 2) exemption from land tax for 10 years;
 - 3) exemption from property tax for 8 years.
- 2. Exemption from payment of customs duties for 5 years.
- 3. Investment subsidy for 3 years. Up to 30 percent of the cost of construction and installation work and the cost of purchasing equipment are reimbursed on a gratuitous and non-refundable basis.
- 4. State in-kind grants. In-kind grants are provided in the form of land plots, structures, equipment, technology, measuring and control devices, vehicles. The maximum size of a state in-kind grant is up to 30 percent of the volume of investments in fixed assets.
- 5. Construction of engineering and communication infrastructure.
- 6. Provision of warranty obligations and loan guarantees.
- 7. Lending through financial institutions.

Exploration and development of TMF for the purpose of lithium mining



Location of implementation



Products

The intended product is lithium concentrate. Production capacity of the concentrate will be determined in the course of technical and economic evaluations.

Project

The source of lithium is the Ti-Nb dump of the Yubileyny mine (Asu-Bulak). The dump is located in East Kazakhstan Region, Republic of Kazakhstan. Linear dimensions of the dump are 3,700 m x 300 m.

Company

The initiator is Dinar Minerals Company LLP, whose main activity is exploration and production of solid minerals. The initiator holds license

No. 722-EL dated 06.08.2020 for exploration and production of solid minerals.

Market

- Lithium is one of the main elements for the production of mobile power sources.
- There is a steady growth in demand for lithium in the global market due to the growing share of electric vehicles and mobile devices with lithium batteries.

Investment attractiveness of the project:

Indicators of the investment attractiveness of the project will be examined after the completion of exploration and pre-project survey for the construction of the lithium concentrate production complex.

What is the attractiveness of the project?

- Availability of subsoil use rights for extraction. The initiator is a subsoil user with the license for production of solid minerals (license № 722-EL dated 06.08.2020)
- Development of the priority sector of the economy. The initiator's project is implemented within the framework of the State program of industrial and innovative development of RK 2020-2025, where lithium concentrate is included into the list of priority products.
- Technogenic mineral formation. The resource base of the project is the Asu-Bulak mine dump, which reduces the uncertainty and risks of not confirming the tonnage and grade as in the case of in-situ deposits.

Investment Proposal

At present the initiator is carrying out the additional study of material composition of the TMF material and technological possibilities to produce the lithium concentrate.

The investment proposal will be formed according to the results of technical and economic calculations on the basis of the data of geological exploration works and technological researches.



PRODUCTION OF BATTERY GRADE LITHIUM COMPOUNDS IN EAST KAZAKHSTAN



LOCATION

D. Serikbayev
East Kazakhstan technical
university



PRODUCT

ANNUAL PRODUCTION CAPACITY lithium carbonate with a productivity of 5 kg / day

GLOBAL DEMAND 25 THOUSAND TONS OF SPODUMENE CONCENTRATE

Valuation Metrics

REQUIRED INVESTMENT US\$3,6 MILLION

PROJECT IMPLEMENTATION PERIOD 2 YEARS



THE PROJECT

Production of lithium compounds from technogenic mineral formations (TMF) of East Kazakhstan includes: exploration and extraction works at lithium-containing tailings and deposits; hydrometallurgical production of battery grade lithium compounds by processing lithium-containing technogenic mineral formations (TMF) and ores to produce lithium carbonate with a productivity of 5 kg / day. Full research to establish exact lithium reserves in Kazakhstan has not yet been performed. Significant lithium reserves are concentrated in tailings from rare-metal fields in East Kazakhstan. There are studies confirming the possibility of obtaining lithium carbonate and hydrocarbonate from Kazakhstan's technogenic mineral formations (TMF), suitable for further production of lithium batteries.



RESERVES

In order to develop a feasibility study on costs and benefits of organizing this type of production, it is necessary to estimate reserves of technogenic mineral formations (TMF) of the Belogorskiy mining complex. In total, Belogorskiy mining complex has six sections, the total waste volume of which is 1,166,033 cubic meters. According to the available author's reports, in addition to previously mined tantalum, niobium and tin, technogenic mineral formations (TMF) of Belogorskiy mining complex contain lithium, rubidium, and cesium. Also, there are mica and ceramic raw materials. In the dump fields of Belogorskiy mining complex, the recovered resources are as following (in tons): lithium – 13466, beryllium – 14672, tantalum – 1888, niobium – 2259, tin – 15246. Ak-Kezen tailing is one of the most promising one. Reserves of tailing1 is 700 thousand tons and tailing2 is 642.9 thousand tons. Reserves were last estimated in 1997. Lithium content in technogenic mineral formations (TMF) of the Ak-Kezen tailing is 0.14%.



TECHNOLOGICAL ASPECTS

A reactor variant of sulfation of spodumene with sulfuric acid at 110 ° C was developed. The resulting lithium carbonate contained 97% of the basic substance. The classical bicarbonate refining of technical lithium carbonate was tested with the production of lithium carbonate with a basic substance content of 99%. When creating a process flow diagram (PFD) for lithium hydrometallurgy, a PFD for the hydrometallurgical production of beryllium hydroxide and its processing into ammonium fluoroberyllate used at Ulba Metallurgical Plant JSC can be taken as a basis. In the 1990s this PFD was successfully tested for processing 23 tons of spodumene concentrate of Belogorskiy mining complex, which gave 115 kg of lithium carbonate and 65 kg of lithium fluoride.



INVESTMENT OPPORTUNITY

The team of D. Serikbayev East Kazakhstan technical university conducted several studies and has been working on attracting partners for the project implementation.



Creeda
Corporation

DEVELOPMENT OF AKHMETKINO LITHIUM DEPOSIT

RESERVES *

	Average content g/t	C1	C2	off-balance
Ore, thousand tons		3027,4	554,3	1095,7
Tantalum oxide, tons	76	229,1	45,1	51,1
Tin, tons	120	363,6	51,7	78,3
Beryllium oxide, tons	510	1546,8	280,4	447,9
Lithium oxide, tons	7690	23284,7	3057,6	7328,8
Columbium pentoxide, tons	110	321,7	56,7	94,9
Muscovite, th. tons	4,17	126,2	23,7	35,0
Feldspar, th.t.	53,9	1631,6	320,6	602,7
Quartz, th.t	27,7	837,8	155,7	288

* CAZ (Kazakhstan state-approved)

LOCATION



PRODUCT

ANNUAL PRODUCTION CAPACITY	31 500 TONS OF LiOH
GLOBAL DEMAND	25 THOUSAND TONS OF SPODUMENE CONCENTRATE



THE PROJECT

Akhmetkino pegmatite lithium deposit was discovered in 1953 and is represented by rare earth pegmatites. Intensive exploration and research were carried out in 1982-1987. Main minerals: lithium and tantalum. Associated minerals: tin, beryllium, mica, quartz, feldspar. Mining method is underground.



THE COMPANY

"CREADA Corporation" LLP holds a combined production and exploration license. Exploration license No.195-EL dated July 22 2019 for 6 years and renewal for 10 years. The Mining permit is dated Feb 3, 2021 for 26 years. "CREADA CORPORATION" LLP is the official owner of a complete declassified package of geological information on the Akhmetkino deposit. Geological exploration and desktop works were carried out in the period 1982-1987. Geological information includes all the necessary topographic bases, drawings, plans and sections for all types of veins.



THE MARKET

The global market for lithium is projected to grow at 1.9% CAGR to \$5 billion by 2028 driven by a rapid expansion of the market for car batteries — the major source of demand for lithium in the coming decade. Some of the largest consumers of lithium among battery manufacturers are LG Chemical (Korea), Panasonic (Japan), Samsung SDI (Korea), CATL (China), Tesla (United States), BYD (China). Asia-Pacific is the largest market, accounting for over 80% of global production and consumption of lithium oxide.



REASONS FOR ENGAGEMENT

Developed infrastructure of the area, railways and roads; Qualified personnel in East Kazakhstan, which is a mining region; Close access to electricity and water; Applicability of existing mining and processing technologies; Kazakhstani company's own funds for launching the Project in terms of exploration, calculation and increase of reserves, including JORC; Export potential and foreign currency income; Proximity to the main consumer (China); State support (tax holidays and other investment preferences).



INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.



INVEST KAZAKHSTAN
FOR YOUR SUCCESS AND OUR FUTURE



DEVELOPMENT OF NOVO-AKHMIROVSKOYE LITHIUM DEPOSIT

RESERVES

Geological reserves of C2 category (2017)

Minerals	Ore reserves, th. tons	Average grade %	Metal reserves, th. tons
Lithium oxide	10 113,05	0,321	32,465
Tin, tons		0,037	3,766

Approved reserves of C2 category in the contour of the project open pit (2017)

Lithium oxide		0,33	22,217
Tin, tons	6 732,5	0,04	2,692

Inferred reserves of P1 category

Minerals	Ore reserves, th. tons	Average grade %	Metal reserves, th. tons
Lithium oxide	11 466,15	0,106	12,162
Tin, tons		0,011	1,309

LOCATION

Novo-Akhmirovskoye



PRODUCT

ANNUAL PRODUCTION CAPACITY
GLOBAL DEMAND

n.a.

25 THOUSAND TONS OF
SPODUMENE CONCENTRATE



THE PROJECT

The project involves development of a unique nonpegmatite lithium-bearing Novo-Akhmirovskoe deposit in the East Kazakhstan region. Mining method is open-pit. The granites of the Novo-Akhmirovsky stock, being the deep equivalent of ongonites in terms of material composition, are characterized by even more significant enrichment in ore and associated components. The main ore body of PT-1 is confined directly to the intrusion of aplite-like granites. The length of ore body 1 is 106.5 m in cut-off grade of 0.3%. A total of 5 ore bodies have been identified. Ore bodies 2-5 are confined to silty-sandstone rock mass. The length of ore bodies 2-5 is 72.8 m, 160.6 m, 32.0 m, 48.5 m, respectively. The content of tin is 0.01-0.05%, lithium dioxide is 0.05-0.052%.



THE COMPANY

"CREADA Corporation" LLP is a subsoil user and holds exploration license for Novo-Akhmirovskoe deposit.



THE MARKET

The global market for lithium is projected to grow at 1.9% CAGR to \$5 billion by 2028 driven by a rapid expansion of the market for car batteries — the major source of demand for lithium in the coming decade. Some of the largest consumers of lithium among battery manufacturers are LG Chemical (Korea), Panasonic (Japan), Samsung SDI (Korea), CATL (China), Tesla (United States), BYD (China). Asia-Pacific is the largest market, accounting for over 80% of global production and consumption of lithium oxide.



REASONS FOR ENGAGEMENT

In 1995-1997, Geo-T LLP, at the request of UMP JSC, conducted preliminary exploration of the Novo-Akhmirovsky intrusive with the calculation of reserves in category C2 and predicted resources of P1. In 2015-2017 Semey Service Company LLP at the state request by MD Vostkaznedra conducted prospecting and evaluation works at the Novo-Akhmirovskoye deposit.

Associated component reserves: rubidium Rb₂O - 11.5 th. tons (average content - 0.114%), cesium Cs₂O - 1.5 th. tons (average content - 0.015%), beryllium BeO - 606.78 tons (average content - 0.006%), niobium Nb₂O₅ - 101.13 tons (average content - 0.001%), tantalum Ta₂O₅ - 101.13 tons (average content - 0.001%), tungsten WO₃ - 1.2 thousand tons (average content - 0.012%).



INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.



INVEST KAZAKHSTAN
FORWARD TOGETHER



Mining complex in East Kazakhstan region

Investment opportunity

August 2022



Investment highlights

Investment highlights



Existing facilities in good condition

- » Due to the modernization program held in 2007 all the facilities of the factory were renewed and all equipment including mechanisms, infrastructure and supportive facilities are in good conditions
- » Since the Target is an already established mining complex, no major capital expenditures are required (estimated CAPEX required is only 6.5 mln USD)



Well-developed infrastructure and environment with rich flora and fauna

- » The factory is a city-forming entity that is the only large workplace for the nearby town settlement that is 1 km away. This provides both well-developed technical and social infrastructure around the complex
- » The area around the mining complex is located in a lovely natural area with a lake and diverse flora and fauna



Good financial potential of the project

- » Given the current mining potentials of reserves and pricing outlook for the minerals, the project is believed to have appealing long-term financial prospective
- » The scope of business is considered as a priority sector for Kazakhstan' economy, which gives an opportunity to use state business support program (subsidies, privileged financing etc.)



Completed research and exploration works

- » All necessary geological exploration works on the area of the tailings were held recently and results of reserves and concentration studies are ready
- » The report on geological exploration works held in 1984 by soviet scholars are available with detailed structure of the ore



Processing highly-demanded and useful materials

- » The components that are concentrated in the tailings (lithium materials, mica material and quartz feldspar material) are essential materials for the production of accumulators, welding electrodes and porcelain and faience products

Estimated CAPEX



USD 6.5 mln

2 years
investment period

- » The CAPEX amount is estimated based on modernization required to be carried out and additional equipment that needs to be purchased to make the tailings processing possible

Enrichment factory	Tailings dam	Other
1) Repair and restoration works on the factory USD 2.5 mln	1) Equipment for the tailing dam USD 800 thousand	1) Ecological objects installment/purchase USD 50 thousand
2) New equipment purchase USD 2.2 mln		2) Infrastructure objects establishment USD 93 thousand
		3) Purchase of computers and other equipment USD 865 thousand

Mineral reserves: Tailings and mineral deposits

Estimated reserves of the Tailings dam

Block	Classification	Reserves		Li ₂ O		Nb ₂ O ₅		SnO ₂		Ta ₂ O ₅		BeO	
		m ³	t	Gr/t	t	Gr/t	t	Gr/t	t	Gr/t	t	Gr/t	t
Tailing dam №1 (Block 1)	C1	1,086,614	2,825,196	1,386	3,917	31	89	47	133	13	38	292	825
Tailing dam №2 (Block 2)	C1	1,291,107	3,356,878	1,931	6,482	31	105	44	148	19	66	305	1,025
Total	C1	2,377,721	6,182,074	1,682	10,399	31	194	45	281	17	104	299	1,850

Proven Reserves Category



The tailings are recommended to be classified as C1, since they simultaneously meet the following requirements:

- 1) the dimensions and characteristic shapes of the mineral bodies, the main features of the conditions of their occurrence and internal structure were clarified, the variability and possible discontinuity of the mineral bodies were assessed;
- 2) the contour of the stocks of minerals was determined in accordance with the requirements of industrial condition based on the results of testing explorations, taking into account the data of geophysical and geochemical studies and geologically substantiated extrapolation

Estimated reserves of mineral deposits (tons)

	Ore	Li ₂ O	Nb ₂ O ₅	SnO ₂	Ta ₂ O ₅	BeO
B category reserves	587,900	179	45.5	365	74	377
C1 category reserves	8,320,500	12,714	556	5,267	914	5,371
C2 category reserves	3,236,700	2,955	744	2,500	230	2,458
Total reserves	12,125,100	15,848	1,347	8,123	1,218	8,205

Compound name	Definition
Li_2O	Lithium oxide
Nb_2O_5	Niobium oxide
SnO_2	Tin oxide
Ta_2O_5	Tantalum pentoxide
BeO	Beryllium oxide

PRACTICAL USES OF THE MATERIALS

- Production of special glass, enamel, protecting coatings, accumulators and electrodes
- Production of fire-resistant materials, details for aviation, spaceships, electronic devices and capacitors
- Primarily used in metallurgy for alloys and production of metal products, foil. Also has vast use for coating of different details
- Production of complex and thin-walled items, constructions in chemical industry, biological plates and prothesis
- Primarily used as a supportive element in alloys with other metals to create more stable and durable materials

Next steps

Next steps and communication

- » The purpose of this investment teaser is to understand the preliminary interest of potential interested parties.
- » If interested, please contact KPMG at the email and addresses listed on this page.
- » We would be happy to discuss this investment opportunity with you.

<p>KPMG</p> <p>Dias Kalazhanov, CFA</p> <p>Partner, Deal Advisory</p> <p>DKalazhanov@kpmg.kz</p> <p>KPMG 180 Dostyk Ave., Almaty Kazakhstan, 050015</p>	<p>KPMG</p> <p>Vladimir Polyakov</p> <p>Associate Director, Deal Advisory</p> <p>VPolyakov@kpmg.kz</p> <p>KPMG 180 Dostyk Ave., Almaty Kazakhstan, 050015</p>	<p>KPMG</p> <p>Orynbassar Torekulov</p> <p>Associate, Deal Advisory</p> <p>otorekulov@kpmg.kz</p> <p>KPMG 180 Dostyk Ave., Almaty Kazakhstan, 050015</p>
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Construction of a mining and metallurgical complex on Besshokly Square in the Karaganda region

Project overview:

This investment project (hereinafter referred to as the "project") provides for the construction of a mining and metallurgical complex at the Besshokly field.

Project goals: development of a group of deposits on Besshokly Square, creation of an effective integrated business for the extraction and processing of copper-molybdenum ore.

Initiator: Ulmus Fund B.V.

Production process: open pit mining; ore processing at the processing plant and production of copper-molybdenum concentrate; processing of concentrate at a smelter to produce copper and molybdenum.

Products: copper and molybdenum

Production capacity:
10 mln tons of ore per year

Key investment indicators

Indicator	Results
Amount of investments, US\$ thousands	210,000
Project NPV, US\$ thousands	116,747
IRR, %	21.2%
EBITDA margin, %	14-26%
Payback period, years	8.5
Discounted payback period, years	11.7

Project location: Besshokly square, Karagandy oblast



Project implementation assumptions:

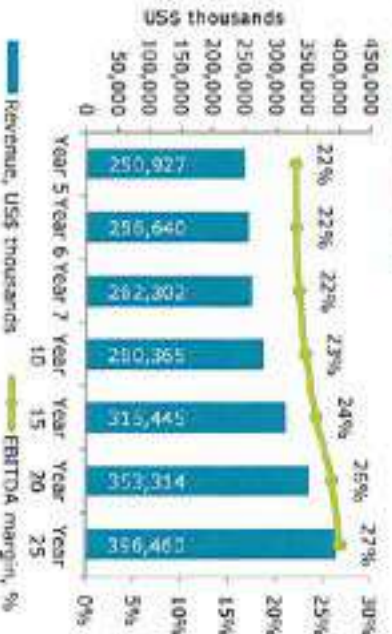
Large reserves of copper. Kazakhstan takes the 8th place in the world in copper reserves with a share of 4.7% of world reserves (37 million tons).

High demand. Copper plays a significant role in modern infrastructure, generation and transmission of electricity, in the production of industrial equipment and electrical appliances. According to the forecasts of the International Copper Study Group, the annual growth in demand for refined copper will be 2% in 2019 and 1.5% in 2020.

Price stabilization. According to Bloomberg, the price of refined copper is expected to increase with its subsequent stabilization in the medium term: 2019 - 6038.5 USD, 2023 - 6087 USD per ton.

Molybdenum price increase. Despite a significant drop in molybdenum prices from 2013 (24,889 USD) to 2015 (11,625 USD), according to the London Metal Exchange (LME) index, the price of molybdenum began to rise steadily to 24.9 thousand USD in 2018 (CAGR for 2015-2018 - 29%).

Project profitability



Field reserves by JORC (2012)

Field	Ore, mln tons	Copper, tns	Cu, %
East Besshokly			
Measured	9.64	74.58	0.77
Indicated	19.09	116.93	0.61
South Besshokly			
Measured	44.36	164.52	0.37
Indicated	147.32	527.03	0.36
Kalindyshokly			
Measured	-	-	-
Indicated	37.87	143.52	0.38



Mining and metallurgy complex

Deloitte.



Construction of a hydrometallurgical plant for the production of cathode nickel and cobalt

Product

Annual capacity:

- Cathode nickel – 6,220 tonnes;
- Cathode cobalt – 250 tonnes;

Project investment attractiveness:

Investments – US\$ 99,935 thousand
NPV – US\$ 53 773 thousand
IRR – 28.0%
Payback period – 5.0 years

Project

The project provides for the construction of a hydrometallurgical plant for the production of cathode nickel and cobalt on the basis of the large Belogorskoye deposit. The company intends export up to 100% of its products, mainly to China.

Company

The project initiator is Belogorskoye LLP, whose core activity is mining of other non-ferrous metal ores. The initiator has license No. 326-EL dated 1 October 2019 for the exploration of solid minerals at the Belogorskoye deposit until 26 November 2025 (four blocks: M-44-91- (10v-5a-17, 18, 22, 23).

Market

- Over the last 5 years, China has been the world's leader in nickel consumption. At the end of 2021, the volume reached 1,682 thousand tonnes, which is 59% of the world indicator. Nickel consumption in China continuously increased from 1.2 million tonnes in 2017 to 1.7 million tonnes in 2021 at a CAGR of 9.2%.
- The target market (China) is the world leader (about 50%) in stainless steel production consuming 1.2 million tonnes of nickel (2021) and production of batteries for electric vehicles, with nickel consumption of 277 thousand tonnes.
- Global cobalt consumption increased from 128 thousand tonnes in 2017 to 175 thousand tonnes in 2021, at a CAGR of 8.1%. Demand for cobalt is expected to grow further steadily due to the global transition to electric vehicles and is projected to approach 317 thousand tonnes in 2026.

What is the project's attractiveness?

- **Subsoil use right for exploration.** The initiator is a subsoil user with a license for the exploration of solid minerals (nickel and cobalt) at the Belogorskoye deposit No. 326-EL dated 1 October 2019.
- **Estimation of deposit reserves.** Belogorskoye is one of the richest nickel-cobalt deposits in Central Asia. The reserves were recognized in Kazakhstan's state balance sheet in 2019. The deposit has 48 thousand tonnes of approved nickel reserves in C2 category. The balance reserves and non-commercial reserves of the deposit exceed 80 thousand tonnes of nickel and 3 thousand tonnes of cobalt.
- **Geographic location.** The project has an advantageous location in terms of geographical proximity to China, the largest consumer of metals.

Investment proposal

The Project requires investment of US\$ 99,935 thousand, of which:

- 70% (US\$ 69,954 thousand) – debt financing subject to collateral;
- 30% (US\$ 29,980 thousand) – investor participation.

The proposed financing structure and state support measures are indicative. The final financing structure and Project interests will be determined based on the results of negotiations with the investor.

Project profitability



Project location



KAZAKH INVEST. investment proposal
July 2022



Mining and smelting industry Extraction and processing of nickel-cobalt ore deposit Bogetkol

Project Description

This investment project provides for the extraction and processing of nickel-cobalt ores from the Bogetkol deposit in the Aktobe region (the "Project").

Project goals:

- Development of the resource base of Sary Arka Mining Company LLP, creation of an effective integrated business for the extraction and processing of cobalt/nickel ores and the sale of final products in the domestic market and abroad;
- obtaining high-quality, export-oriented, competitive products through rational and effective field development using advanced proven technologies.

Project Initiator

Mining company "Sary Arka" LLP

Production

- Nickel concentrate;
- Cobalt concentrate.

Annual production capacity:

Nickel – from 4,508 to 9,125 tons, Cobalt – from 281 to 580 tons.

Key Investment Indicators

Indicators	Results
Investment amount, thous. USD	574,743
Project NPV, thous. USD	384,347
IRR, %	35.5%
EBITDA margin, %	58.61%
Payback period, years	4.2
Discounted payback period, years	4.9

Project location:

Aytekebi district, Aktobe region



Market prerequisites:

Rising prices for nickel and cobalt. According to forecasts by Bloomberg analysts, the average nickel price in 2019 will increase by 27% and amount to US\$ 13,550 per ton, and for the period 2019 – 2022, the average annual price will increase yearly by 9% and rise to US\$ 15,900 per ton by 2027.

Export potential. The country's domestic demand for cobalt and nickel is low, so it is possible to cover it with excess. nickel-cobalt ore reserves in Kazakhstan allow the export of this mineral in significant quantities to China, South Korea, Russia, Japan and Ukraine. China is the main importer of nickel, nickel concentrates, cobalt ores and cobalt concentrates.

In-situ recovery (ISR) method of mining with sulphurous acid leaching: The extracted productive solution (which contain nickel and cobalt ores) then goes to the processing plant. Received productive solution further goes through the following stages:

- Nickel/cobalt extraction from pregnant solutions by ion exchange;
- Eluate neutralization;
- Nickel/cobalt sulphate purification and recovery;
- Tailings neutralisation, storage and evaporation.



Field Reserves

Category	min tonnes	%Ni	%Co	Ni, thous. tonnes	Co, thous. tonnes
Inside Tenement					
Indicated	36.01	0.68	0.037	243,366	13,221
Inferred	1.76	0.68	0.039	11,985	682
Outside Tenement					
Indicated	1.11	0.71	0.041	7,855	454
Inferred	0.39	0.55	0.045	2,140	173
Total					
Indicated	37.12	0.68	0.037	251,221	13,675
Inferred	2.15	0.66	0.040	14,126	855

Cobalt-nickel ores mining and processing at the Gornostayevskoye deposit

Description of the Project

This investment project provides for the creation in the East Kazakhstan region of a metallurgical complex for the processing of cobalt-nickel ores to produce nickel and cobalt

Project goals:

- creation of a metallurgical complex on the basis of an innovative renovation of an industrial enterprise, ensuring the efficient use of natural resources and improving the quality of products;
- production of high-quality products that meet international standards to enter the international market.

Production capacity:

- nickel - 5,000 tonnes per year, with a subsequent increase to 10,000 tonnes per year;
- cobalt - 365 tonnes per year, with a subsequent increase to 730 tonnes per year.

Initiator: SAT & Company JSC

Key investment indicators of the Project

Indicator	Results
Investment amount, US\$ thous.	90,277
Project NPV, US\$ thous.	275,593
IRR, %	23.2%
EBITDA yield, %	39.72%
Payback period, years	6.3
Discounted payback period, years	8.1

Project location: East Kazakhstan Region, Beskaragol district



Market conditions:

Rising prices for nickel and cobalt. Since the end of 2018, there has been a positive trend, largely related to the growth in demand for electric cars and their production, the average annual forecast growth rate of nickel prices from 2020 to 2023 is 2%.

Export potential. Reserves of Kazakhstan allow them to be exported in significant volumes to China, South Korea, Russia, Japan and Ukraine. The increase in demand for high-quality nickel is associated with ongoing raw material restructuring among steel producers in Europe. In addition, the global structural deficit in the nickel market will continue after 2020. This is due to the introduction by the Government of Indonesia of a ban on the export of nickel ore from January 2020 and the continued growth in demand for metal from manufacturers of batteries for the automotive industry.

Low competition in the domestic market. Nickel-containing ore was not processed on an industrial scale in Kazakhstan, which makes it possible to completely replace imports and expand the country's export potential.

Project profitability



Revenue, US\$ thousands — EBITDA margin, %

Field Reserves

Cut-off grade	Volume (thous. m ³)	Tonnage (kt)	Ni (%)	Metal Ni (kt)	Co (%)
Indicated					
1.3	67,851	88.2	0.57	503.4	0.039
Inferred					
	62,432	81.2	0.61	497.4	0.038



Mining and metallurgical complex cobalt-nickel ore deposit Shevchenkovskoye

Project Description

Extraction and processing of cobalt-nickel ores from Shevchenkovskoye deposit

Project Initiator

"KazCobalt" LLP, subsoil user of the deposit JSC

Geology

Production

Ferronickel

Reserves

According to 2005 estimates from Bateman Minerals and Metals Ltd., Shevchenkovskoye deposit reserves amount to 104.4 million tonnes of ore, containing on average 0.79% of nickel and 0.045% of cobalt.

Project location:

50 km to the south west of Zhetikara, Kostanay Oblast

Potential consumer markets

Kazakhstan, China

Key Investment Indicators

Indicator	Results
Project implementation period, years	46
<i>incl. investment stage, years</i>	1
<i>operational stage, years</i>	45
Amount invested, US\$ thousands	250,000
Project NPV, US\$ thousands	175,989
IRR, %	19.3%
Rate of return in terms of EBITDA, %	71%
Payback period, years	7.5
Discounted payback period, years	11.7

Project location:

Kostanay Oblast, 50 kms to the South-West from the town of Zhetikara



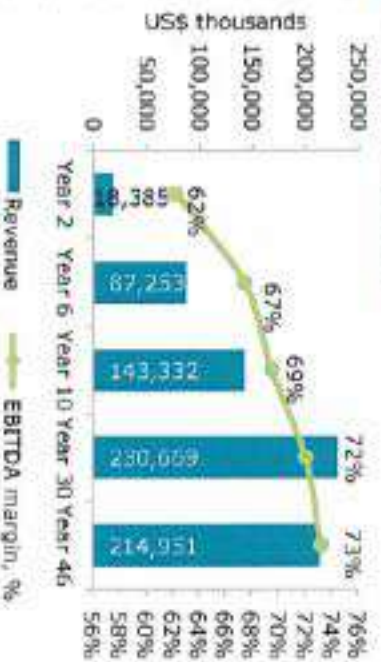
Market prerequisites:

Rising prices for metals – According to the forecasts of S&P and Capital IQ, prices for nickel will rise by 23.9%, from US\$ 12,985 per tonne in 2018 to US\$ 16,094 per tonne in 2022. Prices for cobalt will rise by 1.6% from US\$ 82,695 per tonne in 2018 to US\$ 84,018 per tonne in 2022.

Rising demand for metals – Development of industries (e.g. production of electronic devices, medical equipment and electric vehicles), that use nickel batteries, will provide long-term demand for the metal. According to WMBIS, in 2017, the deficit of refined nickel on the world market amounted to around 96 thousand tonnes. According to Palisade and Macquarie, demand for cobalt will rise by 5.1% annually within the next 5 years.

Export potential – In 2015, China consumed 65% of total world produced cobalt and nickel products. With the rapidly developing market of electronic devices and electric vehicles, China's reserves of cobalt and nickel are depleting.

Project Profitability



Ore field description

Explored reserves of C1 and C2 categories

Indicator	Amount, tonnes
Ore	104.4 million
Proven	21.4 million
Possible	83 million
Nickel	825 thousand (0.79%)
Cobalt	47 thousand (0.045%)

- Ore extraction on Shevchenkovskoye can be carried out through an open pit mining, since the depth of ore deposits reaches 40m.
- Extraction of nickel and cobalt by hydrometallurgical and electric smelting methods amounts to 90-95% for nickel and 85-90% for cobalt.



BORSYKSAI - DEVELOPMENT OF A NIOBIUM, TANTALUM AND ZIRCONIUM FIELD

RESOURCES

Resources	C1 - 12,000 t Nb ₂ O ₅ PI - 100,000 t Nb ₂ O ₅
Area	10 sq km
Subsoil use	License No. №1069 - EL dated December 14, 2020

LOCATION



THE PROJECT

The project involves exploration works at Borsyksai niobium, tantalum and zirconium field. Discovered in 1946 and explored in the 1950s.



THE COMPANY

Mining company Phoenix Mining is a private company, has the right to subsoil use at the Borsyksai deposit.



THE MARKET

The annual demand for rare-earth metals doubled to 125,000 tonnes in 15 years, and the demand is projected to reach 315,000 tonnes in 2030, driven by increasing uptake in green technologies and advancing electronics. This is creating enormous pressure on global production.



REASONS FOR ENGAGEMENT

Resource base: 22 veins were identified in the Northern section of the field, 6 of which were explored by wells to a depth of 150 meters. According to the data of 6 veins, the reserves of 12,000 tons of niobium pentoxide have been preliminarily estimated with a 0.1% -0.2% containment. Numerous veins and occurrences of niobium have been identified in the rest of the deposit, additional exploration is required. Inferred resources of the deposit are more than 100,000 tons of niobium.

Technology: according to GIREDMET data, ore extraction is satisfactory. The collective columbite-zircon product contains 21% niobium pentoxide and 30% zirconia. The total recovery according to the scheme gravity + flotation + leaching is about 55-60%.

Geology: The ore field of the Borsyksai deposit consists of alkaline syenite, associated dyke-like bodies of nepheline syenite, dykes of syenite-aplite and granosyenite-porphyry. Rare metal mineralization is associated with albized syenites, nepheline syenites, syenite-aplites, alkaline pegmatites, and rocks of weathering crusts.



INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.

**QAZGEOLOGY**

EXPLORATION OF RARE EARTH ELEMENTS AT THE AKBULAK SITE



FORECAST RESERVES

	Forecast reserves	Average content
Yttrium oxide	P1 - 67.9 thousand tons	272 g/t
Oxides of the rare earths	P1 - 281,34 thousand tons	790 g/t

LOCATION



VALUATION METRICS

REQUIRED INVESTMENT

Project
implementation period

US\$ 15 million for exploration work under the contract,
from US\$ 1 million for the first year of pilot production

6 years



THE PROJECT

The project involves exploration and pilot production at Akbulak site. Located near the Arkalyk city in Kostanay region, which is connected by rail and highways with the largest centers of the country.



THE COMPANY

National geological company Qazgeology JSC holds contract for the development of Akbulak site. The contract for subsoil use of the site was concluded in November 2018.



GEOLOGICAL EXPLORATION

Systematic study of the area began in the late 40s of the last century with its Northern part Arkalyk-Ashutau structures) in connection with prospecting and exploration geological and geophysical works on the Amangeldi group of bauxite deposits. Subsequently, the research extended to the South and East towards the Kurgasyn lead mine, capturing the Arganatinsky uplift of Northern Ural. Since the late 50s in the area revealed many anomalies of rare earths, tin, lead, zinc, gold, niobium, but objects of industrial importance is not established. In the course of geochemical searches of 1986-90 the Akbulak zone of rare earth elements was discovered, which is characterized by yttrium contents from 0.01% to 0.1%.



REASONS FOR ENGAGEMENT

The area of the Akbulak deposit is about 2 sq km. Mineralization is confined to linear weathering crusts. The power of the ore zones varies from 1.4 m to 31 m, with a total depth of the weathering crust from 10 to 50 m. The Mineral form of rare earths is xenotime, rhabdophanite, churchite and bastnesite. In addition to yttrium and rare earths (cerium, praseodymium, neodymium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium), the ores contain tin (50-200 g/t), and zirconium (150-300 g/t). The expected stripping capacity is 13 m.



INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.



QAZGEOLOGY

EXPLORATION OF RARE EARTH ELEMENTS AT THE AKKENSE DEPOSIT



FORECAST RESERVES

	Forecast reserves	Average content
Rare Earths	P1 – 86,7 thousand tons	0,04 g/t
	P3 – 4,7 thousand tons	0,113 g/t

LOCATION



VALUATION METRICS

REQUIRED INVESTMENT

Project
Implementation period

US\$ 1,4 million for exploration work under the contract,
from US\$ 1 million for the first year of pilot production

3 years



THE PROJECT

The project involves exploration and pilot production at Akkense deposit. Yttrium rare earth ore occurrence Akkense is located in Ulytau district of Karagandy region, to South East of Zhezkazgan city.



THE COMPANY

National geological company Qazgeology JSC holds contract for the development of Akbulak site. The contract for subsoil use of the site was concluded in March 2019.



GEOLOGICAL EXPLORATION AND STRUCTURE

The area is fully covered with aerial photography done by State design and survey Institute of land cadastral surveys in 1977.

In 1988-90 B.Slobodchikov and others carried out underground geological, geological exploration of the surface and prospecting for minerals on the areas covering the ore field Zhaman Aibat copper Deposit and the immediate area.

The geological structure of the region includes shales of the Proterozoic lower Paleozoic, siltstones, sandstones, limestones of the devonian and carbon and perm, overlain by a powerful cover of meso-kainazolic deposits of continental and marine (facies, mudstones, Sands).

In addition to the natural association of rare earths with yttrium, they are most often present together with cobalt, whose content varies between 0,01-0,08% and Nickel (approximately the same concentration limits).



REASONS FOR ENGAGEMENT

The REE site was discovered during the search for uranium in the 90's, after testing the core of the mapping well 17541, at a depth of 55-80 m from the surface in permeable Sands, REE were found.

Preliminary assessment of rare earth mineralization by drilling core wells in a network of 800 x 800 m allowed us to identify a promising site.

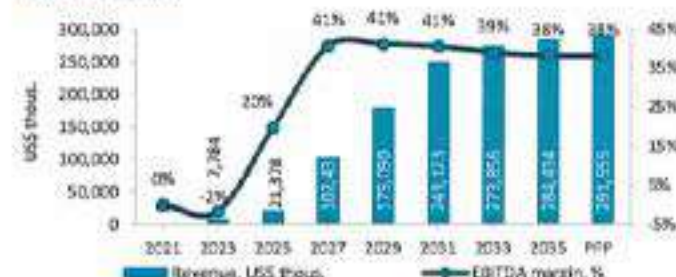


INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.



Project profitability



Location



KAZAKH INVEST. Investment proposal
December 2021

Upgrade of the Irtysh Chemical and Metallurgical Plant

Commercial products

Design capacity: 1,385 tonnes of products per year.

Investment attractiveness of the project:

Investment – US\$ 205,177 thousand

Project NPV – US\$ 79,102 thousand

IRR – 19.7%

Payback period – 9.08 years

Project description

The Project envisages the upgrade of the Irtysh Chemical and Metallurgical Plant to expand the output of products from rare earth metals. The design capacity of the plant will be 1,385 tonnes of products per year.

Company

DINATRON-KAZAKHSTAN Ltd LLP is a specially created company, part of the HOLDING "DINATRON", operating on the basis of the Irtysh chemical and metallurgical plant, leading its history of the production of rare and rare-earth metals since 1958. The goal of the company is to create a new modern complex for the production rare metals and products from them, including metallurgical facilities using forging, sheet-rolling and pipe-rolling industries.

Market

- Titanium sponge production in 2016-2020 followed a steady positive trend. The production volume increased from 170 thousand tonnes in 2016 to 210 thousand tonnes in 2020 with a CAGR of 5.4%. In 2020, China was the leader in the sector and produced 107 thousand tonnes of titanium sponge, while Kazakhstan ranked fourth with a volume of 15 thousand tonnes.
- 360ResearchReports predicts that the titanium products market will continue to show a strong positive trend through 2026 with a CAGR of 1.3%.

What is the attractiveness of the project?

Import substitution and expansion of production. Kazakhstan doesn't have enterprises for the production of high value added products from rare non-ferrous metals. The project implementation will allow for advanced processing and finished products of a high conversion rate - ingots, powder, rods, wire, pipes, shaped articles made of niobium, tantalum, zirconium, titanium and their alloys, which will further cover domestic demand for these types of products.

Developed infrastructure. The plant is located 70 km from Ust-Kamenogorsk, in Pervomay village, in a safe distance from large settlements. The plant territory is located in close proximity to the highway leading to Ust-Kamenogorsk and also has its own railway siding.

Investment proposal

The Project requires investment of US\$ 205,177 thousand, of which:

- 70% (US\$ 143,623.9 thousand) – debt financing subject to collateral;
- from 30% (US\$ 61,553.1 thousand) – investor participation.

The proposed financing structure and state support measures are indicative. The final financing structure and Project interests will be determined based on the results of negotiations with the investor.



Mining and processing of rare earth metal ores from the Kundybai deposit

Product

Annual capacity:

- Ore containing rare-earth elements – 3 million tonnes;

Project

This investment project (the "Project") envisages the development of the Kundybai rare earth element deposit. Due to the intermittent location of the four ore bodies, the deposit will be mined by three separate quarries. It is planned to use an opencast method of ore extraction.

Company

The project initiator is Kundybai Mining JSC, whose core activity is conducting geological exploration and surveys without scientific research and development. The initiator is in the process of obtaining a license for the production of solid minerals (REM) at the Kundybai deposit (four quarries with a geological allotment area of 31.2 sq. km).

Market

- China showed an average annual positive growth rate of REM production of 12.5% from 2017 (105 thousand tonnes) to 2021 (168 thousand tonnes). According to the plan of the Ministry of Natural Resources of China, quotas for mining and smelting will increase by 20% and amount to 202 thousand tonnes and 194 thousand tonnes, respectively.
- Between 2017 and 2021, the Chinese government has taken a number of measures to limit the export of raw materials containing REM to localize the production of highly processed products from REM. As a result, China increased its share in global exports of REM processed products from 50% (5.5 thousand tonnes) in 2017 to 64% (8.8 thousand tonnes) in 2021.
- The level of global mine production of REM has been continuously growing from 132 thousand tonnes in 2017 to 280 thousand tonnes in 2021, demonstrating a rapid CAGR of 20.7%.

Project investment attractiveness:

Investments – US\$ 1,439 thousand

NPV – US\$ 16,100 thousand

IRR – 28.4%

Payback period – 6.7 years

What is the project's attractiveness?

- **Estimation of deposit reserves.** The reserves were placed on the state balance sheet in 2012. Kundybai is among the richest REM deposits in Central Asia. The deposit's assets include 25 thousand tonnes of approved reserves of REM oxides in C2 category. The volume of ore reserves with an average REM content of 0.051% is 49 million tonnes.
- **Developed infrastructure.** The deposit is located 50 km southwest of Zhitikara, near which the A-23 highway of republican significance passes, and is partially connected to the city by a field road with a total length of 50-70 km. There is a railway station. There are no large settlements, protected natural and cultural objects within the boundaries of the contract territory.
- **Favorable conditions for mining.** The physical and geological properties of the ore from the Kundybai deposit make it possible to avoid drilling and blasting. Soft, dense or loose rocks are removed directly from the massif using an opencast method.

Investment proposal

The Project requires investment of US\$ 1,439 thousand, of which:

- 70% (US\$ 1,007 thousand) – debt financing subject to collateral;
- 30% (US\$ 432 thousand) – investor participation.

The proposed financing structure and state support measures are indicative. The final financing structure and Project interests will be determined based on the results of negotiations with the investor.



TALAIRYK - DEVELOPMENT OF A LARGE RARE EARTH ELEMENTS FIELD

RESOURCES

Resources	P1: 4,290 tons of Y ₂ O ₃ and 15,662 tons of rare earth oxides
	P2: 197,000 tons of rare earth oxides
Area	10 sq km
Subsoil use	License No. №1067 dated December 14, 2020

LOCATION



THE PROJECT

The project involves exploration works at Talairyk field in Kostanay region. The project contains 19,962 tonnes of Total Rare Earth Oxides (TREO), including 4,300 tonnes of yttrium oxide at average depth of 7.5 meters from surface, according to a 1994 resource model.

Geological work on the Talairyk mineralization area was carried out by the SovKazGeologiya association (1970s-1980s) and also by Kazakh Institute of Geology in 2011-2014.



THE COMPANY

Mining company Phoenix Mining is a private company, has the right to subsoil use at the Talairyk deposit.



THE MARKET

The annual demand for rare-earth metals doubled to 125,000 tonnes in 15 years, and the demand is projected to reach 315,000 tonnes in 2030, driven by increasing uptake in green technologies and advancing electronics. This is creating enormous pressure on global production.



REASONS FOR ENGAGEMENT

Resource base: the average grade of yttrium oxide is 169 g/t (ranges from 67 g/t to 3.14 kg/t) and the average grade of rare earth oxides is 617 g/t (ranges from 248 g/t to 11.3 kg/t). The thickness of the allocated deposits is on average 19.5 m. The reserves have been calculated according to the P1 category. The reserves of yttrium oxide amounted to 4,290 tons, oxides of the sum of rare earth elements - 15,662 tons. After developing a feasibility study for the site, given the existing density of the exploration network, these reserves can be converted to C1 + C2. The potential of the deposit makes it possible to estimate P2 resources at more than 197,000 tons of rare earth oxides.

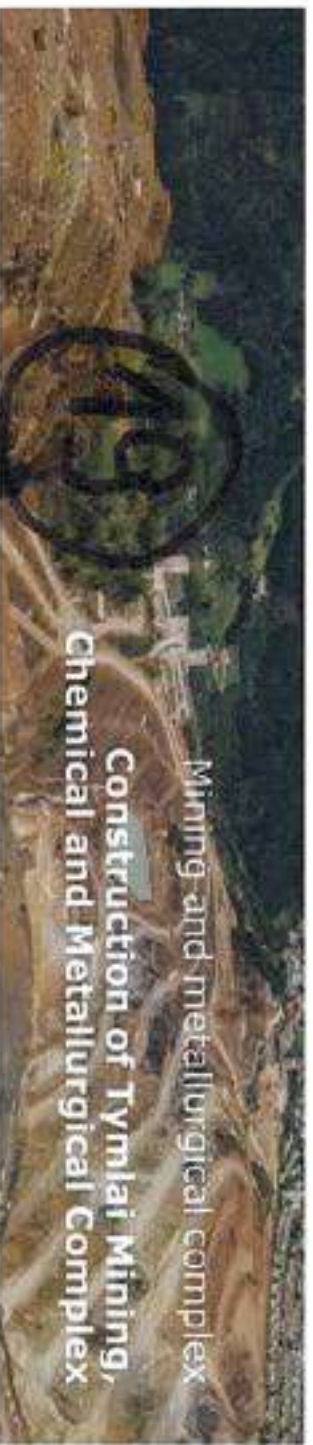
Technology: research was carried out to extract useful components from the original ore by hydrometallurgical methods on laboratory technological samples. With sulfuric acid leaching, the extraction of the sum of rare earths is 91-94%, yttrium - up to 80.5%.

Geology: Structurally, the territory of the site is located in an area that has experienced tectonomagmatic activation and corresponds to the node of the junction of the regional zone of crushing of the submeridional strike and discontinuous structures of the sublatitudinal and submeridional strike of deep deposition, which predetermine the development of quartz-feldspar metasomatism with rare metal specialization (Sn, W, Be, Ta, Nb, etc.) and linear weathering crusts. In linear zones, the thickness of the weathering crust reaches up to 100 m or more. Yttrium-rare earth mineralization is associated with linear weathering crusts developed by gneiss-granites and shales.



INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.



Mining and metallurgical complex Construction of Tymlai Mining, Chemical and Metallurgical Complex

Project overview:

Construction of a mining, chemical and metallurgical complex for the production of derivative products from processing of titanium magnetite ores. The complex consists of two production facilities: a mining and processing plant at the Tymlai ore field and a chemical and metallurgical plant in the SEZ Pavlodar.

Production volume:

1) Titanium dioxide – 601 thousand tonnes per year; 2) Special steel – 1956 thousand tonnes per year; 3) Silicon dioxide – 76 thousand tonnes per year.

Products: 1) titanium dioxide pigment; 2) special steel grades; 3) silicon dioxide;

Initiator: TENIR-Logistic LLP

Location: Zhambyl Region, Kordai District; SEZ Pavlodar

Potential customers: Kazakhstan, nearby countries

Key Investment Indicators

Indicator	Result
Project implementation period, years	29
<i>incl. investment stage, years</i>	7
<i>operating stage, years</i>	26
Investment amount, \$US thousands	2,585,904
Project NPV, \$US thousands	5,465,840
IRR, %	46.4%
EBITDA margin, %	5.7%
Payback period, years	7.5
Discounted payback period, years	8.1

Location of project implementation: Kordai district of Zhambyl region; SEZ Pavlodar

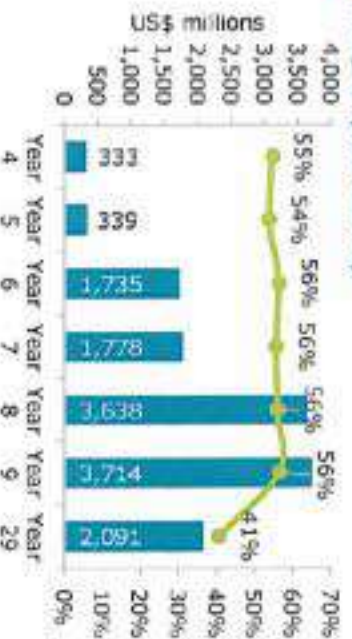


Market prerequisites:

Stable demand. High historical production growth rates and strategic importance for the further development of industries using steel and titanium dioxide as raw materials create a steady demand for the products produced within the Project.

Import substitution and export. The lack of production of titanium dioxide in Kazakhstan, and a small amount of production in the CIS, creates prospects for sales. Regarding alloyed types of steel, the volume of imports for the last 5 years were in average 828 thousand tonnes in the Russian Federation and 2,627 thousand tonnes per year in the PRC. Moreover, currently there are forward contracts for the supply of special types of steels being already signed.

Project profitability



Ore field reserves

Name of the ore deposit	Industrial reserves (mln tonnes)		Prognosed resources (mln tonnes)	
	C1	C2	P1	P2
Tymbai	226			
Sarysai	100	60	44	
Akdala (South)	70	40	20	
Akdala (North)	-	-	30	229
Astarek	-	-	10	47
Total:	396	100	104	276
Total C1+C2+P1+P2	876			



Mining and processing complex Development of the Akmayra tungsten deposit, in Karaganda Oblast

20

Project Description

This project provides for the development of the Akmayra tungsten deposit and the construction of a processing complex for tungsten ores. The project is being implemented under the management of Resources Capital Group LLP (RCG).

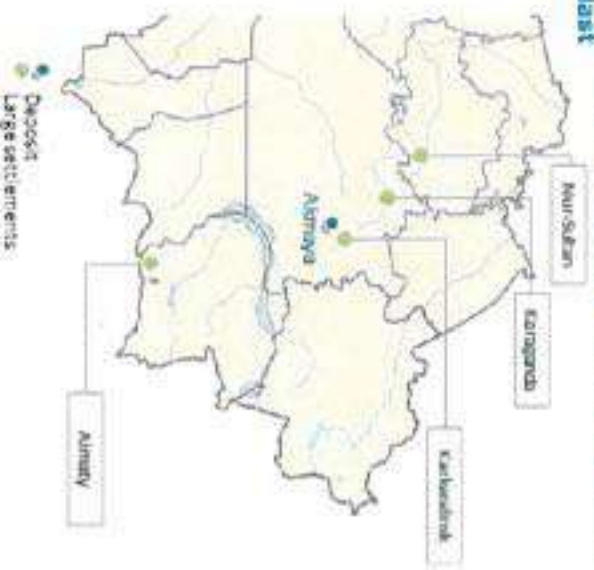
Product and production:

- Mining method - open-pit mining.
- Strip ratio - 4.8 t/t
- Specific gravity of ore: 2.64 t/m³.
- Processing Method (preliminary) - combined (gravity + flotation + smelting).
- Planned production capacity:
 - 1.0 million tons of ore per year;
 - 2 140 tons of WO₃ per year;
 - 2 600 tons of 65% WO₃ concentrate per year;
 - 345 tons of Ferrotungsten per year.
- Life of mine - 12 years.

Key investment indicators

Indicator	Result
Total investment required, US\$ '000	25 912
Equity investment required, US\$ '000	7 774
Project NPV, US\$ '000	41 565
IRR, %	52.1%
EBITDA Margin, %	55.8%
Discounted payback period, years	6,5

Project location: Shetskiy district, Karaganda Oblast



Market prerequisites

- In Y2022 the tungsten demand would be 100,7 tshd. ton that is lower then in previous years. Demand will be supported by existing production capacities and recycling. Starting from Y2023 one forecasts the demand growth at 1% p.a. and further exposure to deficit even though the new projects launches.

Tungsten supply-demand equilibrium: 2011-2029F, (t W)



- This trend is driven by a positive long-term outlook for the market balance and optimism for economic recovery and demand growth, resolution of issues between China and the United States, as well as the expected shortage of supply of tungsten in the market by Y2029.
- The APT prices have been steadily rising, even in the context of the COVID-19 pandemic, with an increase of 20% in Y2021 with the outlook for further growth.
- Although China is the dominant player with 82% share of global production, the market for concentrate producers is diversified and trade flows are multidirectional.

Works completed

- ✓ 4 verification wells were drilled to confirm reserves with further laboratory tests;
- ✓ Created geological database and ore body framework model, block model, reserves estimation on inferred category (author report);
- ✓ Optimization of open pit mining was completed.

Reserves of Akmayra deposit*

Parameter	Category	Ore, gory	WO ₃ , %	WO ₃ , t
Resources, 1952.*	B+C ₁ +C ₂	4 198	0.28	11 600
RCG estimation on 1952 data	Inferred	11 147	0.25	27 607

* Protocol of State Committee (W7437 dated 29 July 1952)

Cooperation

- Long-term off-take contract
- Financing of plant construction and launch



Project profitability



Project location



KAZAKHINVEST. Investment proposal
December 2021

Development of the Aksoran deposit

Products

Average annual capacity:

- 5,019 tonnes of tungsten in scheelite concentrate;
- 227 tonnes of molybdenum middlings.

Project investment attractiveness:

Investment – US\$ 117,868 thousand
Project NPV – US\$ 112,177 thousand
IRR – 29.4%
Payback period – 5.6 years

Project

The Project envisages the construction of a mining complex to be based on the Aksoran molybdenum-tungsten ore deposit, the largest in Kazakhstan, for the production of tungsten in scheelite concentrate and molybdenum middlings. The plan is to employ a sublevel caving method for the development of the deposit, with an end ore drawing and further ore flotation.

Company

The project initiator is Yessil-Mining LLP, whose core activities are geological exploration and survey. The Initiator holds license No. 2-MI dated 31 March 2020 for mining at the Aksoran deposit (until 2045).

Market

- According to the forecast of Chromatus Consulting, the world tungsten market is expected to show a stable growth trend from 3.27 US\$ billion in 2020 to 5.28 US\$ billion in 2028 with a CAGR of 6.35% for this period.
- Global tungsten production is on an upward trend despite the 2020 crisis caused by the COVID-19 pandemic, when production volumes increased slightly by 0.2% (84,000 tonnes) compared to 2019 (83,800 tonnes).
- According to Mordor Intelligence forecast, molybdenum consumption will increase from 247 thousand tonnes in 2020 to 303 thousand tonnes in 2025 with a CAGR of 4% for this period.

What is the project's attractiveness?

- **Reserve evaluation.** An estimate of the deposit reserves is available from the Committee of Geology based on local KAZRC standard; IORC Code compliant estimate was also made. The reserves were recognized in the State Register of Reserves in 2019. Aksoran is known to be one of the richest tungsten deposits in Central Asia.
- **Contacts with potential customers.** The Initiator received letters of interest to purchase his products from businesses located in China, Russia, Germany, Austria and Singapore.
- **Geographic position.** The Project has an advantageous location in terms of geographic proximity to China, the main consumer of tungsten.

Investment proposal

The Project requires investment of US\$ 117,868 thousand, of which:

- 50% (58,934 thousand USD) – debt financing subject to collateral;
- 20% (23,574 thousand USD) – shareholder's equity;
- from 30% (35,360 thousand USD) – investor participation.

The proposed financing structure and state support measures are indicative. The final financing structure and Project interests will be determined based on the results of negotiations with the investor.



Mining and metallurgical complex Production and processing of rare- metal ore at the Drozhilov field

Project overview:

Produce and process rare-metal ore at the Drozhilov field in Kostanai Oblast

Commercial product and production output for the entire Project period:

- lithium concentrate – 2,490 thousand tonnes (lithium – 149 thousand tonnes)
- molybdenum trioxide – 176.6 thousand tonnes (molybdenum – 118.3 thousand tonnes)
- artificial scheelite – 62.26 thousand tonnes (tungsten trioxide – 48.6 thousand tonnes)

Initiator: JV Kazakhstan-Russian Ore Company LLP has a contract in place to explore and produce molybdenum and tungsten at the Drozhilov field

Project implementation location: Kostanai Oblast, Denisov District

Potential markets: Russia, China

Key investment data

Index	Results
Project implementation period, years <i>including the investment stage, years</i>	26 1
<i>operational stage, years</i>	25
Investment, US\$ thousands	88,556
Project NPV, US\$ thousands	332,269
IRR, %	46.6%
EBITDA returns, %	30%
Payback period, years	6.6
Discounted payback period, years	7.0

Project location: Kostanai Oblast



Market assumptions:

Growing demand for rare metals. Over the next decade, global demand for tungsten is predicted to increase as its use is strongly linked to the development of the processing industry and vehicle production. Lithium consumption in battery production has increased significantly in recent years as rechargeable lithium batteries are being used more and more often in portable electronic devices and electric car batteries.

Rising metal prices. In the last three years, the lithium oxide price has increased 2.5 times due to growing demand. Average prices for molybdenum trioxide grew 20% in the same period. Prices for tungsten derivatives are currently growing. The lack of available financing and low metal content in ore limit supply and act a stimulus for further rare-metal price rises.

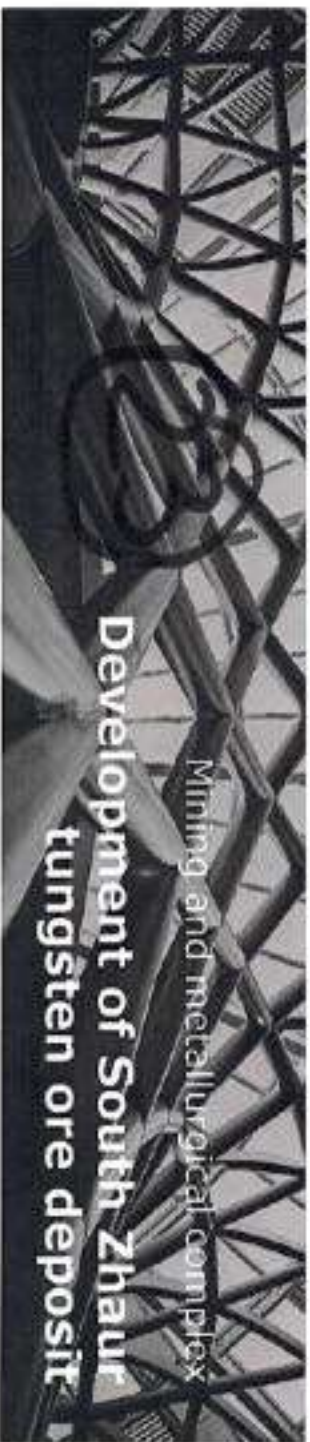
Raw materials base. Kazakhstan has the highest tungsten reserves in the world (63% of global reserves). It also has significant molybdenum and lithium reserves.

Project economics



Drozhilov field reserves

	Reserves, thousand tonnes			Content, %		
	Mo	W	Li	Mo	W	Li
Proven	140	263	64.3	0.19	0.05	
Calculated	131	78	88.3	121	0.06	0.03
Estimated	300	150	150	-	0.05	0.05



Development of South Zhaur tungsten ore deposit

Project description:

Mining and processing of rare-metal ores from South Zhaur deposit in Karaganda Oblast.

Products:

- 57% concentrate of tungsten trioxide
- 50% concentrate of molybdenum

Production process:

- Open-pit
- Sulphide-scheelite flotation, including grinding in one stage, sulphide flotation and scheelite flotation.

Maximum processing capacity:

4,000 thousand tonnes of commodity ore per annum.

Initiator: JV Sanyarka Tungsten LLP.

Location: Karaganda Oblast, Shersky district

Project implementation period: 35 years

Key investment indicators of the Project

Indicator	Results
Project implementation period, years	35
<i> Incl. Investment stage, years</i>	<i> 2</i>
<i> Operational stage, years</i>	<i> 33</i>
Investment, US\$ thousands	70,942
Project NPV, US\$ thousands	173,323
IRR, %	32.7%
EBITDA returns, %	49%
Payback period, years	5.4
Discounted payback period, years	6.7

Project location:
Karaganda Oblast



Market conditions:

Raw material base – Kazakhstan holds the 6th place in the world for its tungsten reserves of 2 million tonnes, which accounts for 63% of global reserves. Availability of significant molybdenum reserves (160 thousand tonnes) in Kazakhstan opens up a potential for reviving the molybdenum mining industry in the future.

Metal price growth – The lack of readily available financing and low metal content in the ore deposits are the main reasons for the limited supply of metal in the market, which in the future, may serve as an incentive for further price increases for tungsten and molybdenum.

Growing demand – According to the forecasts, over the next 10 years, global demand for tungsten will increase from 72,552 to 121,679 tonnes (5.3% CAGR). The development of the steel industry affects the growing demand for molybdenum. In the long term it is expected that the growth rate of demand for this metal will be equal to 3.6% per annum until 2024.

Project profitability



South Zhaur deposit reserves (JORC)

Indicator	Balance reserves by C2 category	
	Quantity, tonnes	Composition, %
Ore	122,189,700	
Tungsten trioxide	198,953	0.163
Molybdenum	13,062	0.010
Bismuth	6,408	0.005

Severnii Katpar & Verkhnee Kairaktinskoye Tungsten deposits

Investment structure

- The company is interested in finding a partner for the joint implementation of the Severnii Katpar and Verkhnee Kairaktinskoye project ("Project")
- The Company considers different partnership options, including sale up to 100% participation interest in the Project.
- A 60/40% debt/equity financing capital structure is planned for the Project

Investment opportunity

- The combined reserves of the deposit are about 1.3 million tons of WO₃ according to the GIZ standard
- The deposits can be developed by open pit mining. At the same time, the Verkhnee Kairaktinskoye deposit has a low stripping rate
- Proximity to China and Asian markets (the world's largest rare metals consumers)
- An experienced management team with an extensive background in mining sector of Kazakhstan
- The Company has stable funding from SWF 'Samruk-Kazyna' to finance Project implementation and development

Company overview

- Tau-Ken Samruk is the national operator of mining assets in Kazakhstan
- It was founded by the Government of Kazakhstan in 2009 to ensure the effective use of the country's natural resources and promote its minerals assets to local and foreign partners that have expertise in exploration, development, production, processing
- The Company is wholly owned subsidiary of SWF Samruk-Kazyna, the management holding of state assets in Kazakhstan

Cautionary note: This brochure contains certain forward-looking statements, meaning they are based on information currently available to Tau-Ken Samruk, providing no assurance to the actual results. Such forward-looking statements are based on assumptions and address future events and uncertainties. It is not possible to predict or guarantee the future performance of the Company. Actual results relating to, among other things, results of exploration, project development, reclamation and capital costs of Tau-Ken Samruk's mineral properties could differ materially from those currently anticipated in such statements for many reasons such as changes in global economic conditions and conditions in the financial markets, changes in demand and prices for minerals, litigation, legislative, environmental and other judicial, regulatory, political and competitive developments, technological and operational difficulties encountered in connection with Tau-Ken Samruk's activities and other matters. This list is not exhaustive of the factors that may affect any of Tau-Ken Samruk's forward-looking statements.

Severnii Katpar & Verkhnee Kairaktinskoye Tungsten deposits

General overview

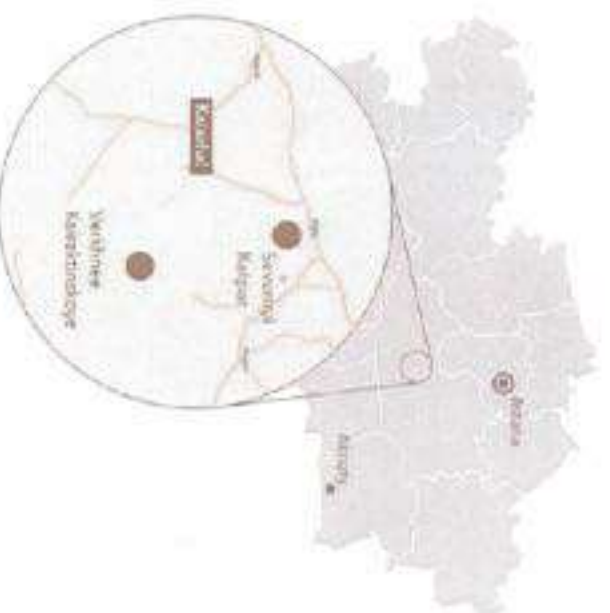
- Location: Shetsky district of Karaganda region. The distance between the deposits is 30 km along an asphalt road.

Severnii Katpar

- The deposit was discovered in 1971. Detailed exploration at the deposit was carried out from 1987 to 1993, and was resumed in 2018 for verification drilling. The reserves of the deposit were put on the state balance sheet in accordance with the State Reserves Committee in 1993 and revalued in 2020.
- Depth mineralization is up to 400 m, thickness of ore bodies varies from 10 to 370 m.
- Main mineral - scheelite in stearne and limestone.
- Key project parameters: a) LOM - 17 yrs (open pit to the depth of 380 m from the surface), b) processing capacity - 3 mln. tonnes per annum, c) stripping ratio - 1.5 tr/m³; d) production capacity - 4.2 ths. tonnes of WO3 in APT.

Verkhnee Kairaktinskoye

- Detailed exploration work has been carried out on the deposit during 1950–1982. The resources of the deposit were approved four times, the last time the resources were approved by GKZ in 2021.
- Main minerals are scheelite and wolframite.
- Key project parameters: a) LOM - 30 yrs (open pit to the depth of 380 m from the surface), b) processing capacity - 7 mln. tonnes per annum, c) stripping ratio - 0.194 tr/m³; d) production capacity - 8.2 ths. tonnes of WO3 in APT.



Approved reserves of the Severnii Katpar & Verkhnee Kairaktinskoye deposits according to the GKZ

	Unit	Severnii Katpar	Verkhnee Kairaktinskoye
Ore	Mt	Cu, Ct 47.7	A+B+C 850.5
Metal grade			
WO ₃	%	0.231	0.148
Mo	%	0.038	0.005
Bi	%	0.021	0.022
Cu	%	0.159	--
Metal quantity			
WO ₃	Kt	110.30	1 261.4
Mo	Kt	18.24	43.1
Bi	Kt	9.94	186.6
Cu	Kt	71.61	--

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Severnii Katpar & Verkhnee Kairaktinskoye Tungsten deposits

Project description

The following works have been carried out under the Project since 2015:

Severnii Katpar

- A complex of exploration works was completed, including drilling of verification (13 400 line meters) and geotechnical wells, chemical and analytical studies were carried out in 2018, and a block model of the field was updated
- The mineral resources of the deposit were assessed in accordance with the JORC code [2012] by Engineering of Mineral Resources LLC
- Industrial tests for Severnii Katpar ore were carried out at the BGIMM Institute in 2017. As a result, a technological regulation was drawn up
- A mining plan and a liquidation plan have been developed and approved by the competent authorities
- The report on groundwater reserves was approved as part of geological exploration work in terms of hydrogeology
- The development of a preliminary feasibility study (Pre-feasibility Study) of investments for the implementation of the project has been completed
- The development of a feasibility study for investments in the construction of the mining and processing plant, as well as a Feasibility Study report, including an assessment of the reserves of the deposit, reflecting the assessment of mineral resources according to the standards of the JORC Code [2012] and KAZRC, is planned to be completed in 2023

Verkhnee Kairaktinskoye

- A complex of exploration works was completed, including drilling of verification (15 000 line meters) and geotechnical wells, chemical and analytical studies were carried out in 2018, and a block model of the field was updated
- Mineral Resource assessment completed in accordance with the JORC code [2012]
- Based on the conducted hydrogeological studies, the balance reserves of groundwater of the Mashuranskoye deposit were re-evaluated
- Technological tests for preliminary separation of ore by three different methods have been completed
- A complex of engineering surveys was completed in the amount necessary to develop a feasibility study for investments in the implementation of the project at the field
- The report on groundwater reserves was approved as part of geological exploration work in terms of hydrogeology
- Completed additional technological tests for preliminary separation of ore, laboratory and enlarged tests for flotation
- Heap leaching process tests completed
- Research and development work with the development of technological regulations for the design of an enrichment plant and a hydrometallurgical plant is planned to be completed in 2022
- The development of the Feasibility Study report, which includes an assessment of the reserves of the deposit, reflecting the assessment of mineral resources according to the standards of the JORC Code [2012] and KAZRC, is planned to be completed in 2023

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DEVELOPMENT OF BALASAUSQANDIQ VANADIUM DEPOSIT

RESERVES

Category	Reserve (1000 t)	Mean grade V ₂ O ₅ [%]
B	832	1.00
C1	15,649	0.75
C2	54,366	0.74
B+C1+C2	70,847	

PROJECT PROFITABILITY



LOCATION



PRODUCT

ANNUAL PRODUCTION CAPACITY	5,600 tons/year V2O5
	22,400 tons/year V2O5
GLOBAL DEMAND	120,067 mtV



THE PROJECT

Phase 1: Mining and processing 1 Mtpa of ore. Production 5,600 tpa (to be funded from existing operations, debt, and exercise of options by strategic partner). Capex: \$100m
 Phase 2: Expansion to 4 Mtpa of ore. Production increase to 22,400 tpa (to be funded from earnings of Phase 1). Capex: \$225m



THE COMPANY

Ferro-Alloy Resources Limited (FAR) is a Guernsey registered company, formed in 2000, which is the 100% owner of Firma Balasa LLP, the holder of the rights to develop and exploit the giant Balasausqandiq vanadium deposit. FAR listed the LSE in 2019 and on the AIX in 2020. FAR has around 200 shareholders who include well-known institutions, management and individuals or family structures from the UK, Kazakhstan and several other countries. The Company is currently producing vanadium pentoxide, ferro-molybdenum and nickel concentrates, recovered from purchased concentrates and other vanadium-containing materials.



THE MARKET

Vanadium demand in 2021 was approximately 120,067 mtV with the steel production and vanadium redox flow battery (VRFB) markets accounting for 92 per cent and two per cent of the vanadium consumption, respectively. Global annual deployments of VRFBs are expected to reach approximately 32.8 GWh in 2031.



REASONS FOR ENGAGEMENT

The Balasausqandiq deposit is a very large black-shale deposit containing vanadium and valuable by-products - uranium, molybdenum, aluminium, rare earth metals and carbon; a sedimentary deposit, with a high grade of vanadium and negligible iron – a significant advantage, it is amenable to a processing method that is much lower in both capital and operating costs. By developing the Balasausqandiq deposit, FAR is to become: one of the world's largest producers of vanadium; the world's lowest cost producer of vanadium.

There is a potential to develop production of redox-vanadium batteries at the location of the plant.



INVESTMENT OPPORTUNITY

The project owner is looking for an investor and ready to consider various options of cooperation.

