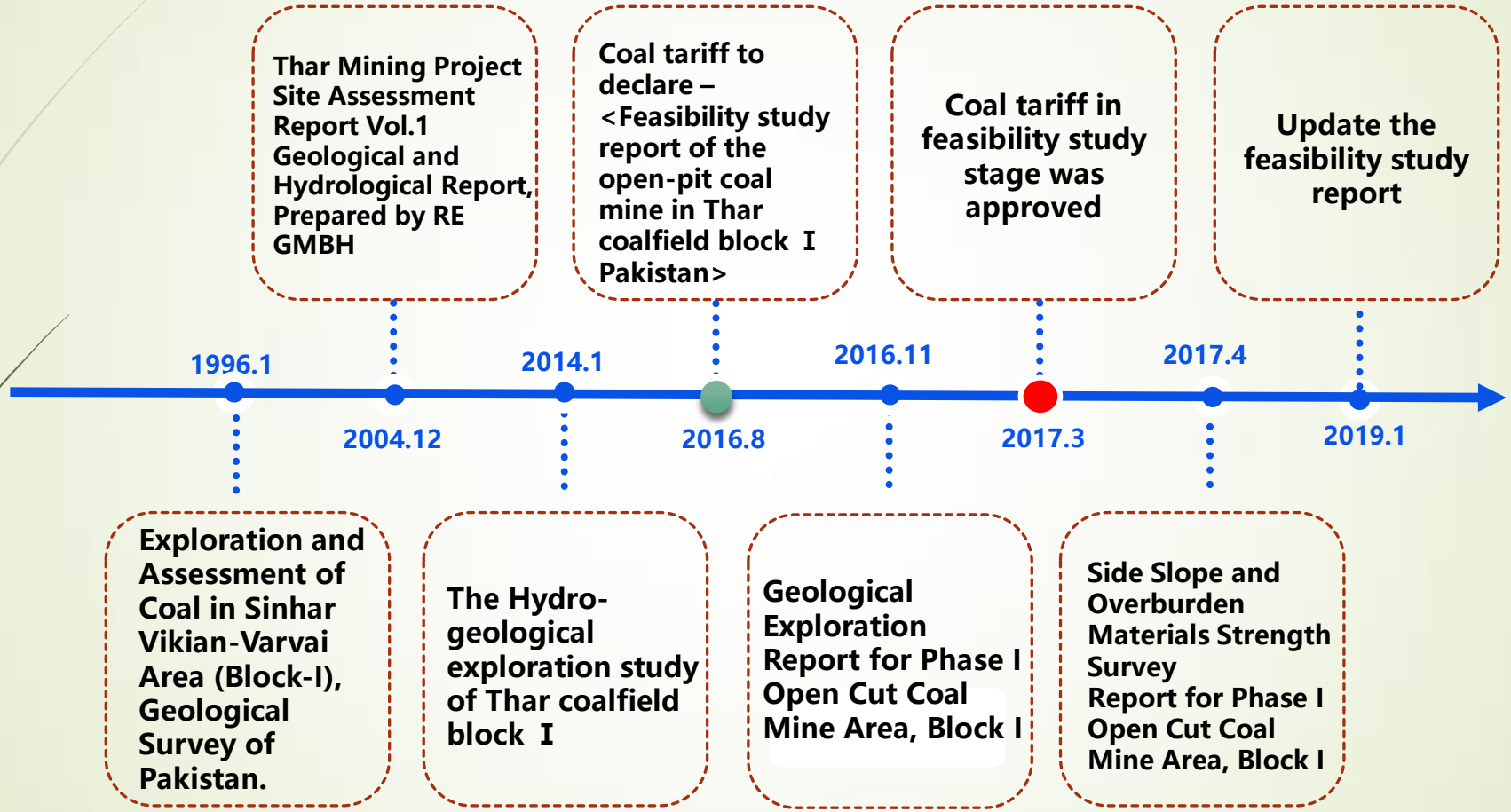
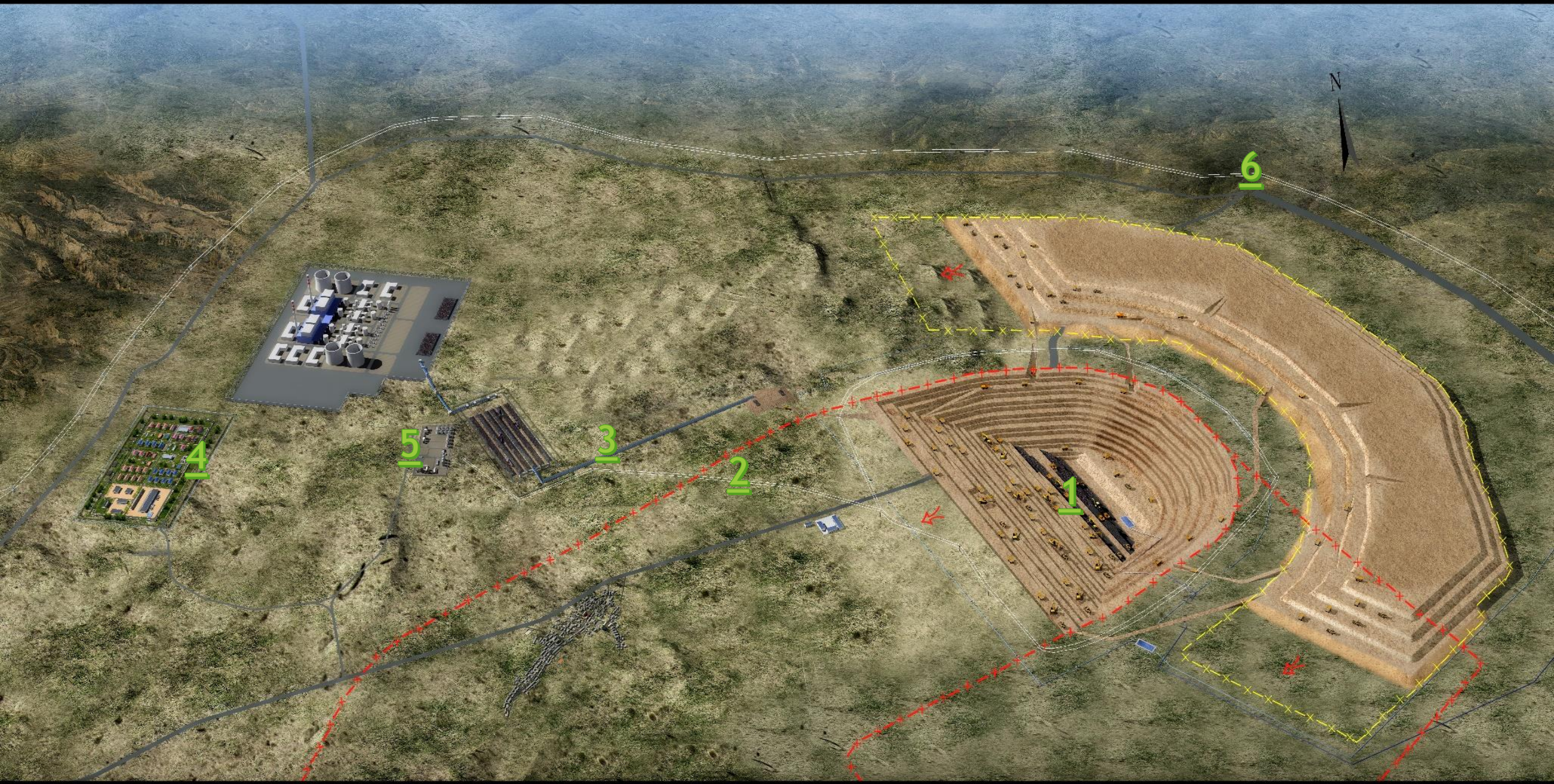
Key Features

- **Block holder:** Sino Sindh Resources (PVT.) Limited
- **Capacity:**7.8 MTPA
- **Coal Reserve :**2.6Billion Ton
- **Final slope angle :** 24°
- **Stripping Ratio:** 8.23 m³/t （Average for 30 years）
- **Construction period:** 36 Months (12 months preparation and 24 months mining construction)
- **Technology Deployment:** Stripping mining system - *Shovel /Truck Technology* ; Coal mining system - *Semi-mobile IPCC system*.
- **Operation Period:** 30 years
- **Research and Design institution**: CCTEG Shenyang Engineering Company

Technical Development Footprint



Aerial View of Thar Coalfield Block I Open-pit Coal Mine of Sino Sindh Resources (Pvt.) Ltd.



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Overburden Engineering

- **1. Coal Mine and Coal Quality Model Establishment**
- 93 boreholes basic data was collected from various exploration report to produce Coal Mine Model applied by SURPAC, furthermore 59 of 93 boreholes was applied to generate Coal Quality Model.
- The deviation result of comparation between Coal Mine Model and Geological Report is 0.56%.

Table of Comparison on Bulk Density of Coal Seam and Waste Parting

Coal seam	Amount in Geological Report (Mt)	Amount in Model (Mt)	Different Value (Mt)	Deviation	Remark
A1	3.30	3.47	0.17	5.05%	
A2	13.88	12.43	-1.45	-10.43%	
A3	26.72	26.03	-0.69	-2.58%	
B1	16.47	17.13	0.66	3.98%	
B2	36.57	36.99	0.42	1.15%	
C1	322.57	325.42	2.85	0.88%	
C2	36.49	37.12	0.63	1.71%	
Total	456.00	458.57	2.57	0.56%	

Overburden Engineering

2. Optimization for Minable Coal Mining Quantity, Stripping Quantity and Stripping Ratio in Boundary

The boundary of the open-pit mine is optimized as shown below. The recoverable quantity of raw coal in the open-pit mine has been calculated according to the new geological model.

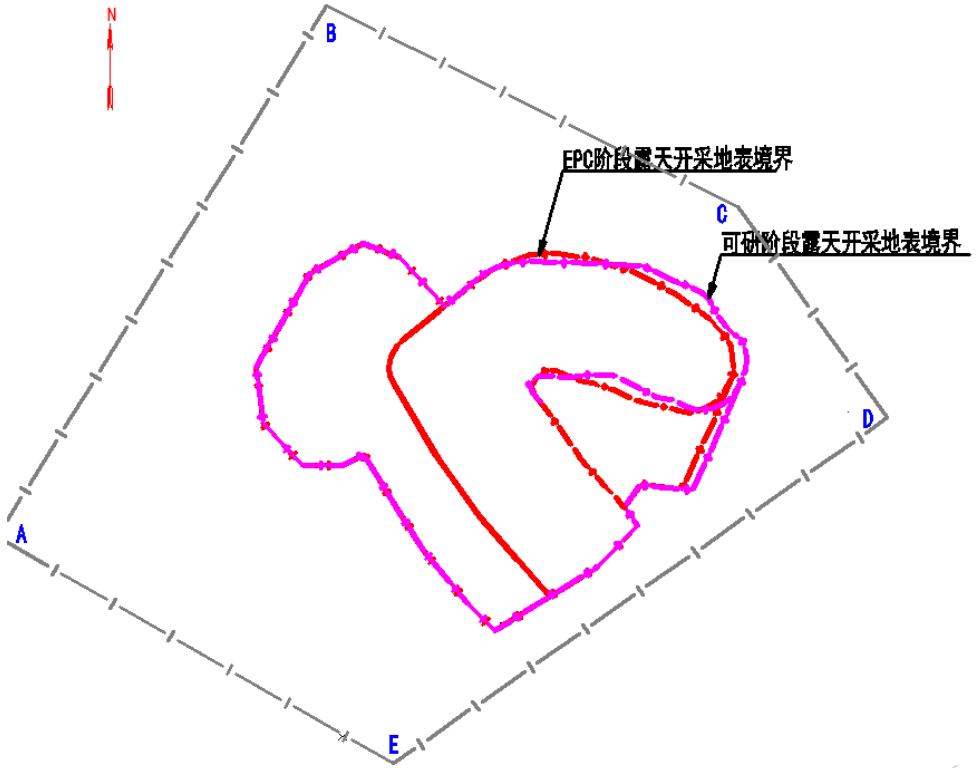

Diagram of Boundary variation of the open-pit mine

Overburden Engineering

Comparation of principle factors apply for quantity calculation during the Feasibility Study stage and EPC stage

No.	Item	Feasibility Study stage	EPC Stage	Comparison
1	Minimum thickness of selected mining	Minimum mining thickness of coal seam and waste parting 0.5m	Minimum mining thickness of coal seam and waste parting 0.5m	No deviation
2	Coal seam loss and mixing	Both the roof and floor loss 0.1m each, loss 0.2 totally, no mixing and no other loss.	Both the roof and floor loss 0.1m each, loss 0.2 totally, mixing 0.1m waste parting, and other loss in mining is about 1%.	Variation
3	When the big waste parting is selected	No loss and no mixing.	Both the roof and floor loss 0.1m each, loss 0.2 totally, mixing 0.1m waste parting.	Variation

Overburden Engineering

According to the above principle, the minable raw coal amounts to about 1,036.70 Mt, and the stripping amount could be 8,237.87Mm³ (1,038.08Mm³ if repeated stripping amount is incorporated), that is, the average stripping ratio is 7.95m³/t.

The minable raw coal in the initial mining area amounts to 458.93Mt, and the stripping amount is 3,440.22Mm³, with an average stripping ratio of 7.50m³/t.

The minable raw coal amount in 30 years of the economic evaluation period is 234.00 Mt, and the stripping amount is 1,925.50Mm³, with an average stripping ratio if 8.23m³/t. The following table shows the above results.

Item		Initial area	30 years of the economic evaluation period	Outside the Initial area	The whole mine	Remark
Minable coal amount（Mt）		458.93	234.00	577.77	1036.70	
Stripping amount (Mm³)	Sand and rocks	3360.91	1885.53	3649.06	7009.98	
	Internal stripping	79.30	39.97	110.51	189.81	
	Repeated stripping	0	0	1038.08	1038.08	
	Total	3440.22	1925.50	4797.65	8237.87	
Average stripping ratio（m³/t）		7.50	8.23	8.30	7.95	

Overburden Engineering

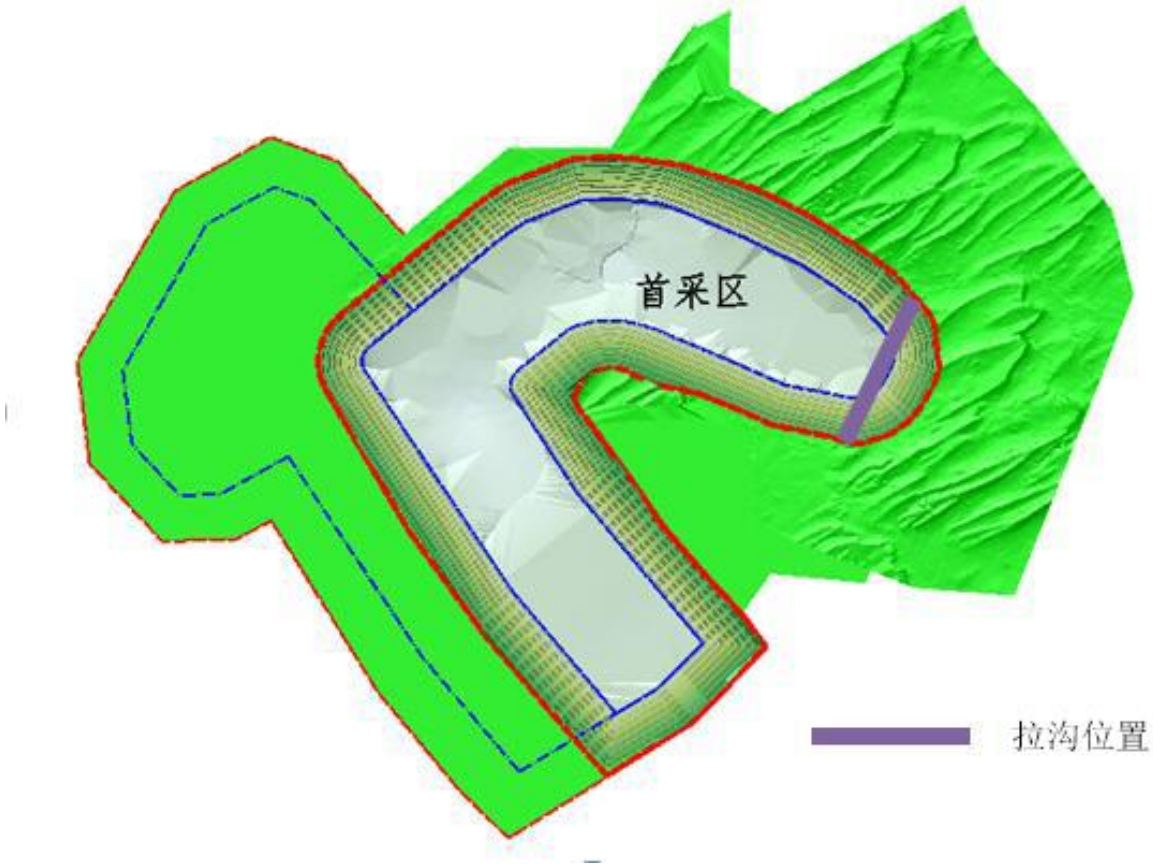

Diagram of initial boxcut location in the Initial mining area

Overburden Engineering

3. Construction and Mining

(i) The overburden volume of contract stage petition is 180.60 million BCM consisting of:

(a) 160 Million BCM overburden volume for mine construction from mining surface to reach the coal seam.

(b) An additional 20.60 million BCM overburden is for 1.15Mt coal consumption by power complex during the commissioning period prior to complex COD, and 1.30Mt coal as stockpile for power complex.

(ii) Construction Period

The total construction period of the project is 36 months, including 12 months of construction preparation period and 24 months of mine construction period.

4. Production Stripping Ratio Balance Results

According to the trend of natural stripping ratio, the coal and the overburden in the 30-year mining scope of the first mining area of the open pit mine is balanced into three phases, as shown in the table.

Overburden Engineering

Balanced Stripping Ratio

Phase	Time	Stripping Ratio (m^3/t)	Balanced Period (a)	Commercial Coal (Mt)	Total Overburden Removal Volumes (Mm^3)	Remark
Phase 1	Full Production Year 1 - 4	8.80	4	7.80	68.64	
Phase 2	Full Production Year 5 - 16	7.60	12		59.28	
Phase 3	Full Production Year 17 - 30	7.10	14		55.38	

5.Equipment Selection and Quantity (for construction period and OPEX period)

Stripping system adopts shovel/truck discontinuous mining system;
Mining System adopts Semi-mobile IPCC system.

Working hours for excavators are 5,400h/year, operation hours are 7,504h/year.

Working hours for trucks are 4,500h/year, operation hours are 6,325h/year.

Overburden Engineering

Calculating Table on Quantity of Excavators during Construction Period

Construction Year	Bucket Capacity of Hydraulic Excavator (m³)	Materials to be Excavated	Annual Mining Quantity (Mm³)	Capacity of Equipment (Mm³/a)	Quantity of Equipment (SET)		Remarks
					Calculated Value	Adopted Value	
1st year	7.0	Waste	90.10	2.38	37.86	38	
2nd year	7.0	Waste	90.50	2.38	38.03	38	
	2.0	Coal	1.83	0.45	4.06	4	

Calculating Table on Quantity of Trucks during Construction Period

Construction Year	Load (t)	Materials to be transported	Annual Transportation Volume (Mm³)	Equipment Capacity (Mm³/a)	Equipment Quantity (SET)		Remarks
					Calculated Value	Adopted Value	
1st year	60	Waste	90.10	0.275	328.18	328	
2nd year	60	Waste	90.50	0.256	353.4	354	331+23
	60	Coal	1.83	0.081	22.6	23	stripping trucks

Overburden Engineering

Calculating Table on Quantity of Excavators in Full Production Year

Bucket capacity of hydraulic excavator（m³）	Materials to be excavated	Annual bank material quantity (Mm³)	Bank Capacity of equipment (Mm³/a)	Quantity of equipment (SET)		Remarks
				Calculated value	Adopted value	
7.0m³	Waste	68.64	2.38	28.84	29	
7.0m³	Coal	4.68	2.29	2.04	2	Mining coal group C
2.0m³		1.46	0.45	3.23	4	Mining coal groups A and B

Calculating Table on Quantity of Trucks in Full Production Year

Process systems		Load（t）	Annual transportation volume（Mm³）	Capacity of equipment (Mm³/a)	Quantity of equipment		
					Calculated value	Designed value	
Discontinuous mining system	Stripping system	60	68.64	0.256	268.13	269	
Semi-continuous mining system	Thick coal seam mining system	60	4.68	0.176	26.59	27	36
	Thin coal seam mining system	60	1.46	0.162	8.96	9	

Overburden Engineering

Quantity Table of Mining, Transportation and Drainage Equipment during the Capital Construction Period and the Full Production Year

Name of equipment 设备名称		Type 型号	Unit 单位	First year of capital construction 基建第 1 年	Second year of capital construction 基建第 2 年	Full production year 达产年	Rmarks 备　注
Stripping Equipment 剥离设备	Hydraulic excavator 液压挖掘机	Bucket capacity: 7.0m³ 斗容 7.0m3 级	Set 台	38	38	29	
	Truck 自卸卡车	Load 60t 载重 60t 级	Set 台	328	331	269	Transportation of stripped waste 运输剥离物
	Wheel loader 轮式装载机	Bucket capacity: 5.0m³ 斗容 5.0m3	Set 台	8	8	8	
采煤设备 Coal mining equipmen	Hydraulic excavator 液压挖掘机	Bucket capacity: 7.0m³ 斗容 7.0m3 级	Set 台		2	2	Coal mining 采煤
	Hydraulic excavator 液压挖掘机	Bucket capacity: 2.0m³ 斗容 2.0m3 级	Set 台		4	4	Coal seam selection 煤层选采
	Truck 自卸卡车	Load 60t 载重 60t 级	Set 台		23	36	Coal transportation by stripping truck 剥离卡车运煤
	Wheel loader 轮式装载机	Bucket capacity: 5.0m³ 斗容 5.0m3	Set 台		2	2	Auxiliary excavator operation and cleaning of working face 辅助挖掘机作业及工作面清理

Overburden Engineering

Quantity Table of Mining, Transportation and Drainage Equipment during the Capital Construction Period and the Full Production Year

Name of equipment 设备名称		Type 型号	Unit 单位	First year of capital construction 基建第 1 年	Second year of capital construction 基建第 2 年	Full production year 达产年	Rmarks 备 注
Dumping equipment 排土设备	Crawler dozer 履带推土机	320Hp	Set 台	14	14	14	
辅助设备 Auxiliary equipment	Sprinkling truck 洒水车	50t	Set 台	8	8	8	Working face and road sprinkling 工作面及道路洒水
	Crawler dozer 履带推土机	320Hp	Set 台	2	2	2	Road maintenance 道路维修
	Grader 平地机	220HP	Set 台	6	6	6	Road maintenance 道路维修
	Road roller 压路机	20t	Set 台	2	2	2	Road maintenance 道路维修
	Wheel loader 轮式装载机	Bucket capacity: 5.0m³ 斗容 5.0m3	Set 台	1	1	1	Road maintenance 道路维修
	Hydraulic excavator 液压挖掘机	Bucket capacity: 1.1m³ 斗容 1.1m³ 级	Set 台	3	3	3	Excavate water ditch 挖水沟
	Hydraulic Rock breaker 液压碎石机	Bucket capacity: 1.1m³ 斗容 1.1m³ 级	Set 台	2	2	2	
	Fuel truck 加油车	Load 20t 载重 20t	Set 台	10	10	10	
	Grease vehicle 油脂车	15t	Set 台	4	4	4	

Overburden Engineering

6.Main Parameters of Dump

No.	Item	Unit	External dump		Internal dump	Remarks
			External dump along the mining boundary	External dump within the mining boundary		
1	Land area	hm^2	586.0	120.0	-	
2	Final dumping height	m	70～80	70～80	240	
3	Final stable slope angle	°	16	16	20	
4	Calculation of bulk factor		1.10	1.10	1.10	
5	Capacity of the dump	Mm^3	315.93	84.46	-	
6	Planned dumping volume (bank)	Mm^3	261.10	69.80	1610.94	
7	Discount factor of the dump volume		1.10	1.10	-	

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DEWATERING ENGINEERING

1. Groundwater Control

(i) By calculation, the water inflow result of each aquifer via big well method and corridor method is 135,150m^3/d, while that via numerical method is 142,520m^3/d. Finally, the value of 142,520m^3/d is selected.

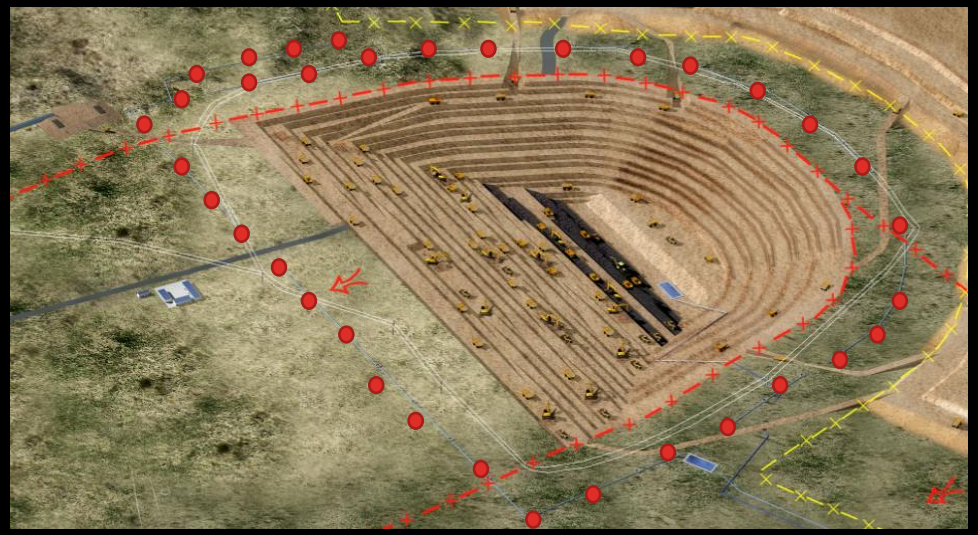
(ii) In order to reduce the water pressure of aquifer, this design adopts the joint dewatering scheme of precipitation hole and panel drainage ditch.

(iii) According to the location in the full production year, 50 precipitation holes were set up, of which 4 are test holes. The diameter of the drill hole is 650mm. DN400 casing pipes and filters are adopted. Gravels will be backfilled in the ring-shaped clearance of the drillhole wall and the casing pipes. It is suggested to adopt GFRP (Glass Fiber Reinforced Plastic) pipe for casing pipe. The filter adopts the glass fiber reinforced plastics wire winding filter.

DEWATERING ENGINEERING

(iv) Two main drainage pipelines are included in this project. The first one is along the north end slope of the excavation site - the working slope - the south end slope to the transfer pool. The second one is along the non-working slope - the south end slope to the transfer pool. The drainage pipe material is glass fiber reinforced plastic pipes with diameters ranging from DN 300 to DN 800.

(v) The drained water is discharged from the main drain to the transfer pool, then transported the power plant for reuse. The production water of open-pit mine adopts part of the drainage water. The remaining drainage water is discharged to the final drainage point with outward discharge pipeline.



DEWATERING ENGINEERING

2. Drainage Outward Discharge System

(i) According to the prediction, the maximum amount of drainage water is 142,520m^3/d, the maximum amount of groundwater seepage is 14,252m^3/d, and the normal rainfall runoff is 3,327m^3/d. In consideration of factors such as circulating cooling water, production water and the water discharge amount of 118,229 m^3/d after the power plant completion, the smaller area during the initial construction stage, low rainfall and seepage**, the drainage outward system is designed** according to the maximum drainage amount, that is, 142,520 m^3/d (6000 m^3/h), which gives priority to the economic feasibility. If the amount of drainage water is large, temporary measures such as near-field drainage can be taken.

(ii) The total length of the drainage pipeline is about 35.0 km, and the 3.0 km of start section consists of two DN800s. The pipelines are all polyethylene composite pipes with a nominal pressure of 1.0 Mpa, electrothermal fusion sleeve connection, and a design discharge velocity of 1.92 m/s. The head loss from the pipeline to the highest point is 9.22 m (local head loss is 10%, λ= 0.011), the level elevation of the pumping station is 53.0, the highest elevation is 85.0, and the lowest water level of the absorbing well is -5.0m. The minimum thickness of covering soil is 1.20m.

Back

COAL TRANSPORTATION

- In the mining field, coal is excavated by hydraulic excavator with bucket capacity of 7m³ and carried to the semi-mobile crushing station by dump truck with carrying capacity of 60t. Then the ROM coal is crushed into pea coal ≤300mm and carried to No.1 transfer station through No.102 belt conveyor and No.103 belt conveyor. Then they are fed to No.111 or 121 or 131 belt conveyor and stacked or reclaimed through the bucket wheel stacker-reclaimer arranged on the above mentioned belt conveyors, then transported to the power plant through No.151/152 belt conveyor.

- Two coal storage yards are designed for the requirement of coal blending function. One is set before the primary crushing station with a capacity of 6-day production of the mine, the other is a product coal storage yard set on the south side of the power plant with a capacity of 24-day production.

- The capacity of product coal storage yard is 570kt, which is a strip-type storage yard with cantilever bucket wheel stacker-reclaimer.

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Mine Service Facilities

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Public Auxiliary Facilities

1.Power Supply and Distribution

During construction period and production period, the entire open pit mine will solely rely on heavy oil generating sets as the power supply. To ensure the reliability of power supply, 10kV high-voltage heavy oil generating sets are adopted as the power supply. Construction power is provided by the diesel generator.

- The calculation summary of the open-pit mine is as follows:
- Active power: 18,209 kW；
- Reactive power: 8,868 kvar ；
- Apparent power: 20,253 kVA ；
- Power factor: 0.90；
- Annual power consumption: 9032.65×10^4 kW·h ；
- Annual heavy oil consumption: 19872 t；
- Annual lubricating oil consumption: 90 t.

Public Auxiliary Facilities

2.Water Supply and Drainage

The open-pit mine adopts a water supply system of different quality, which is divided into domestic water supply system and production water supply system. The total water consumption is 3,630.11m^3/d, of which the domestic water consumption is 893.39m^3/d and the production water consumption is 2,736.72m^3/d.

3. Air conditioning

According to the cooling load and indoor layout of each building, a multi-line central air conditioning system and a split air conditioner are separately installed.

The conveying refrigerant of the multi-connected air-conditioning system is R410A and the conveying pipe material is made of copper pipe; the fresh air system pipe adopts glass-magnesium composite air pipe (including insulation layer).

Back

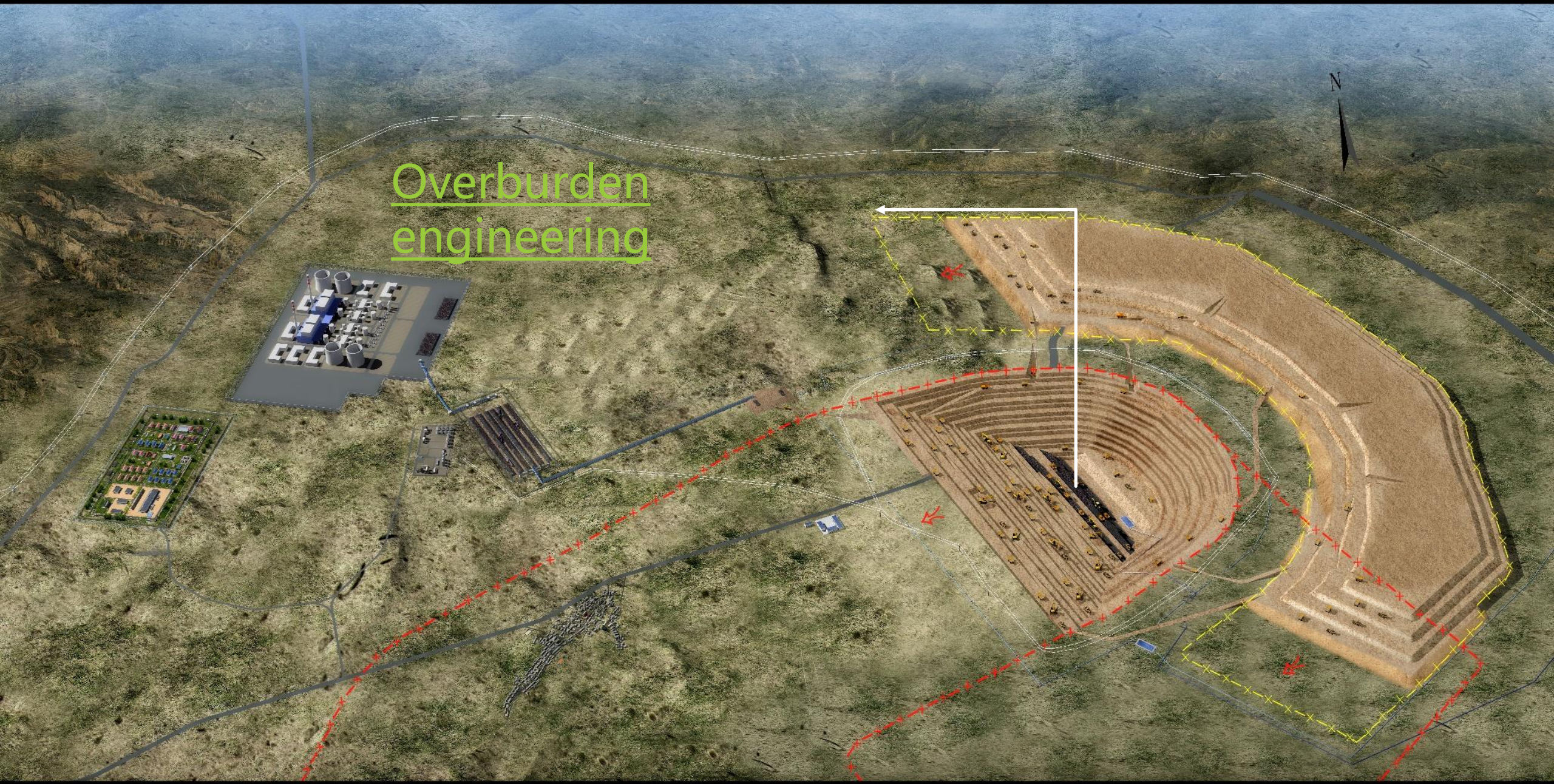
Re-routing

1. A local road (road pavement is bituminous concrete with a width of 6m) passes through the initial mining area and external dump of the open-pit mine. For the convenience of safety production and passage of local residents, the existing road will be re-routed.
2. Meanwhile, the high voltage line and the water pipeline project in initial mining area will be re-routed with the road together.

Back

Thank You!

Aerial View of Thar Coalfield Block I Open-pit Coal Mine of Sino Sindh Resources (Pvt.) Ltd.



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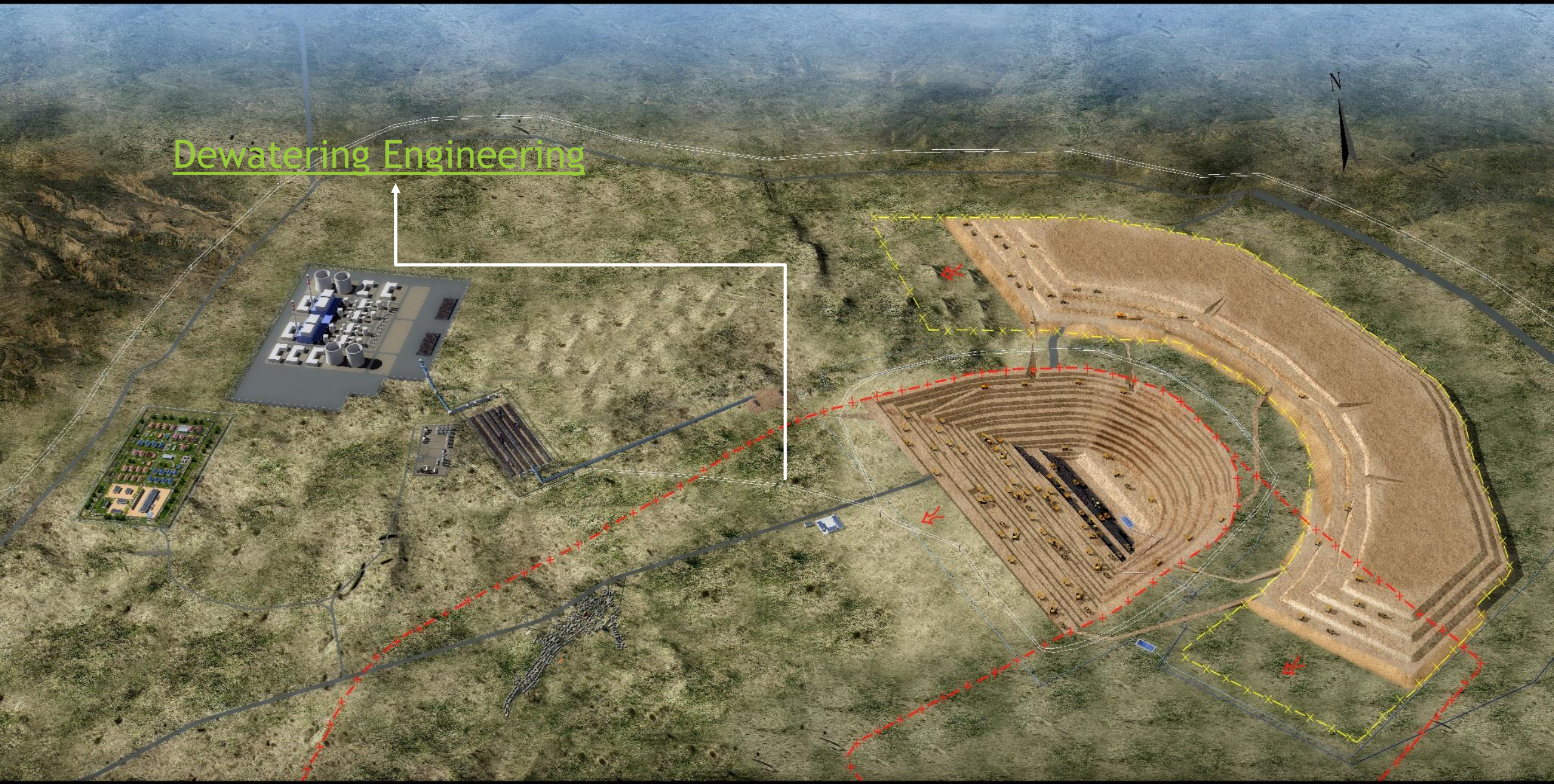
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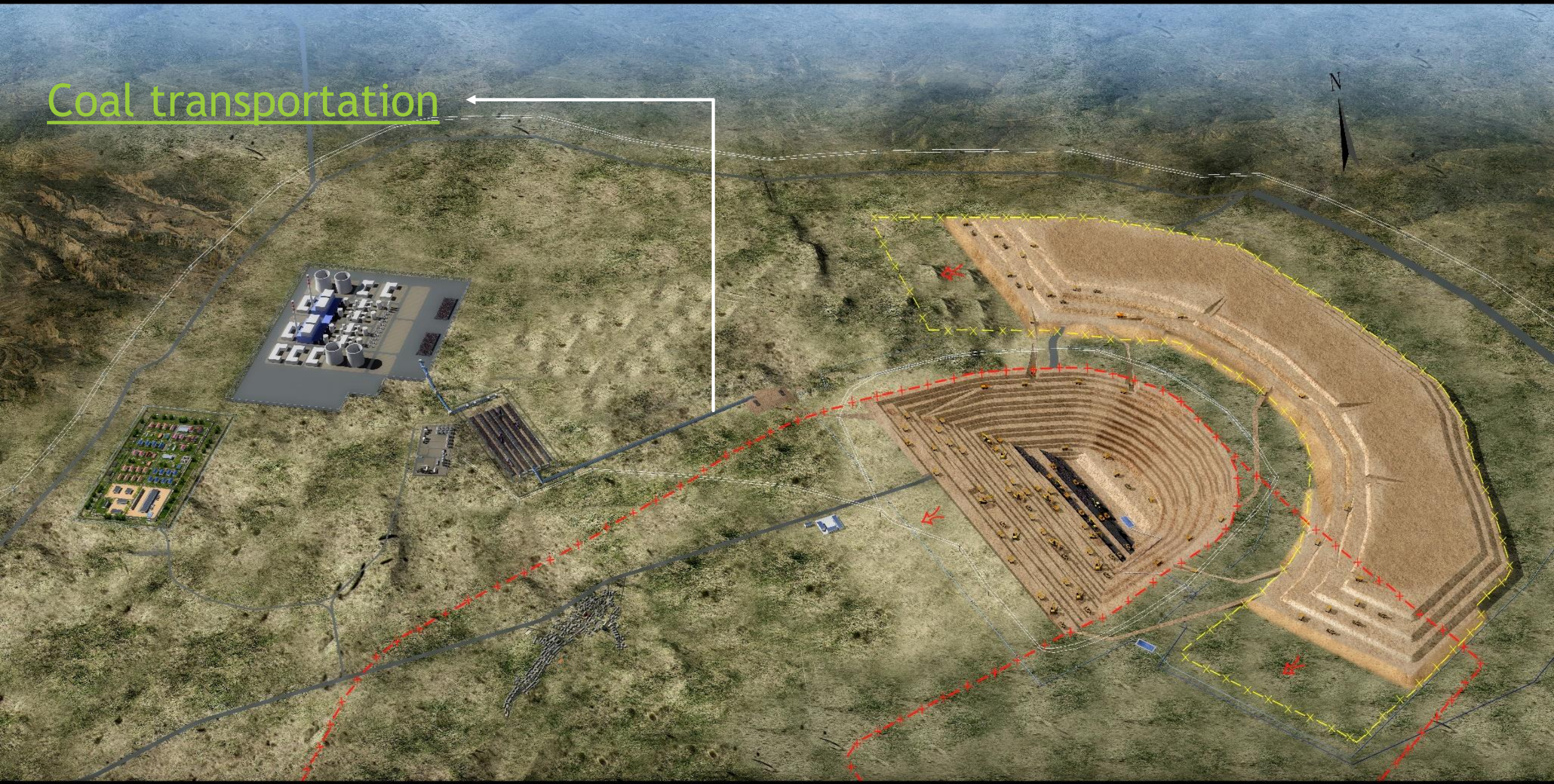
Coal transportation
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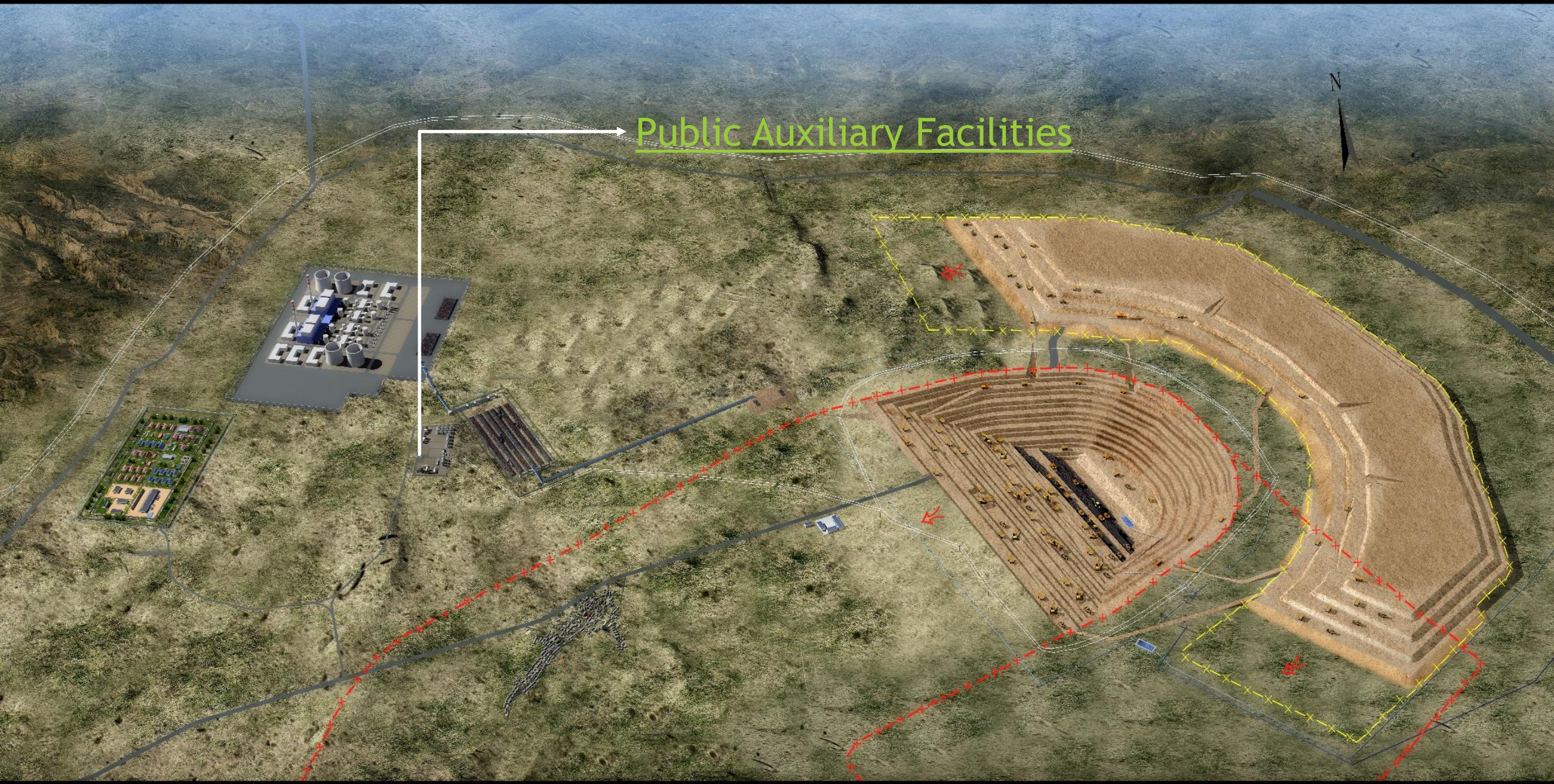

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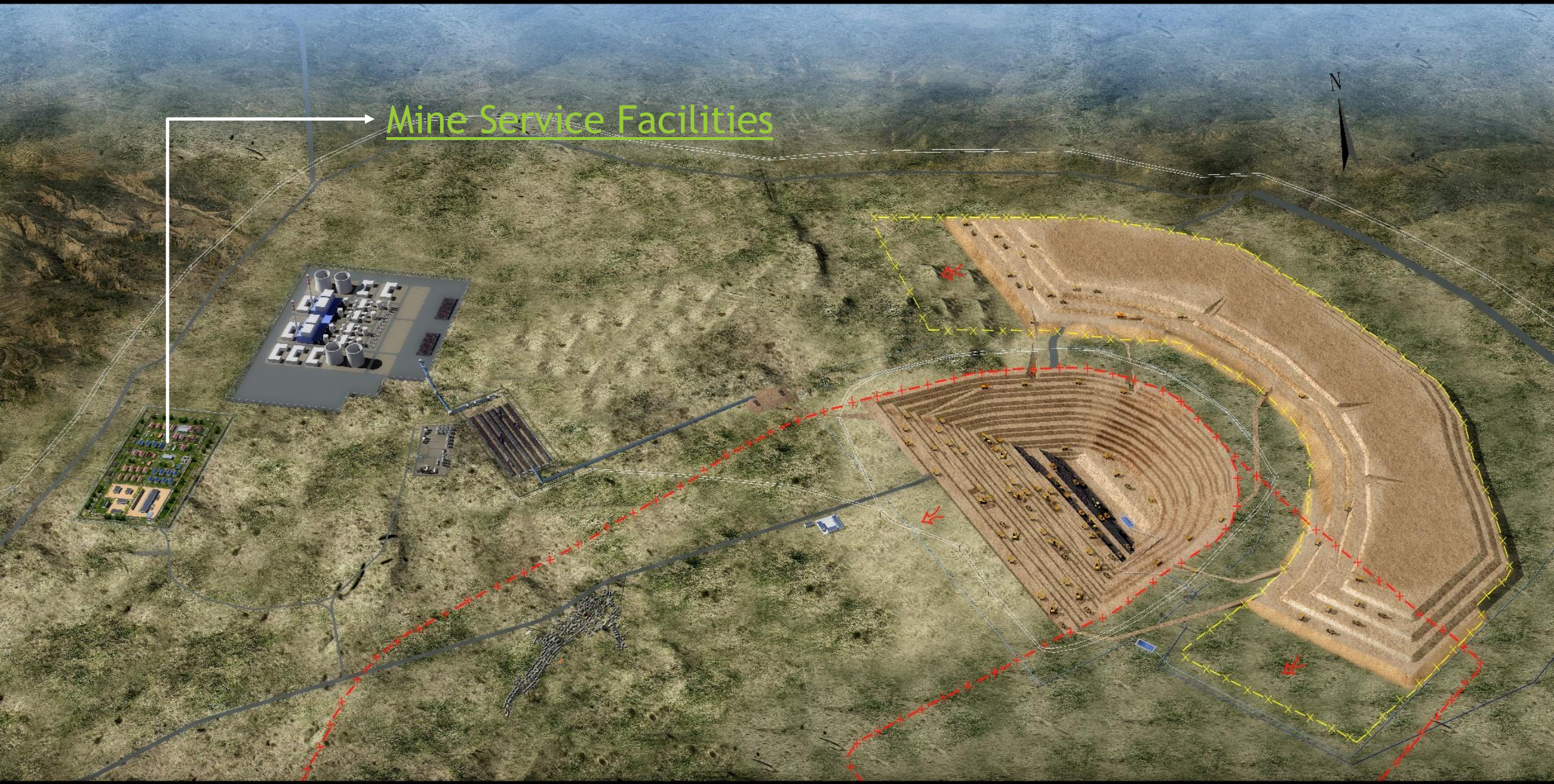

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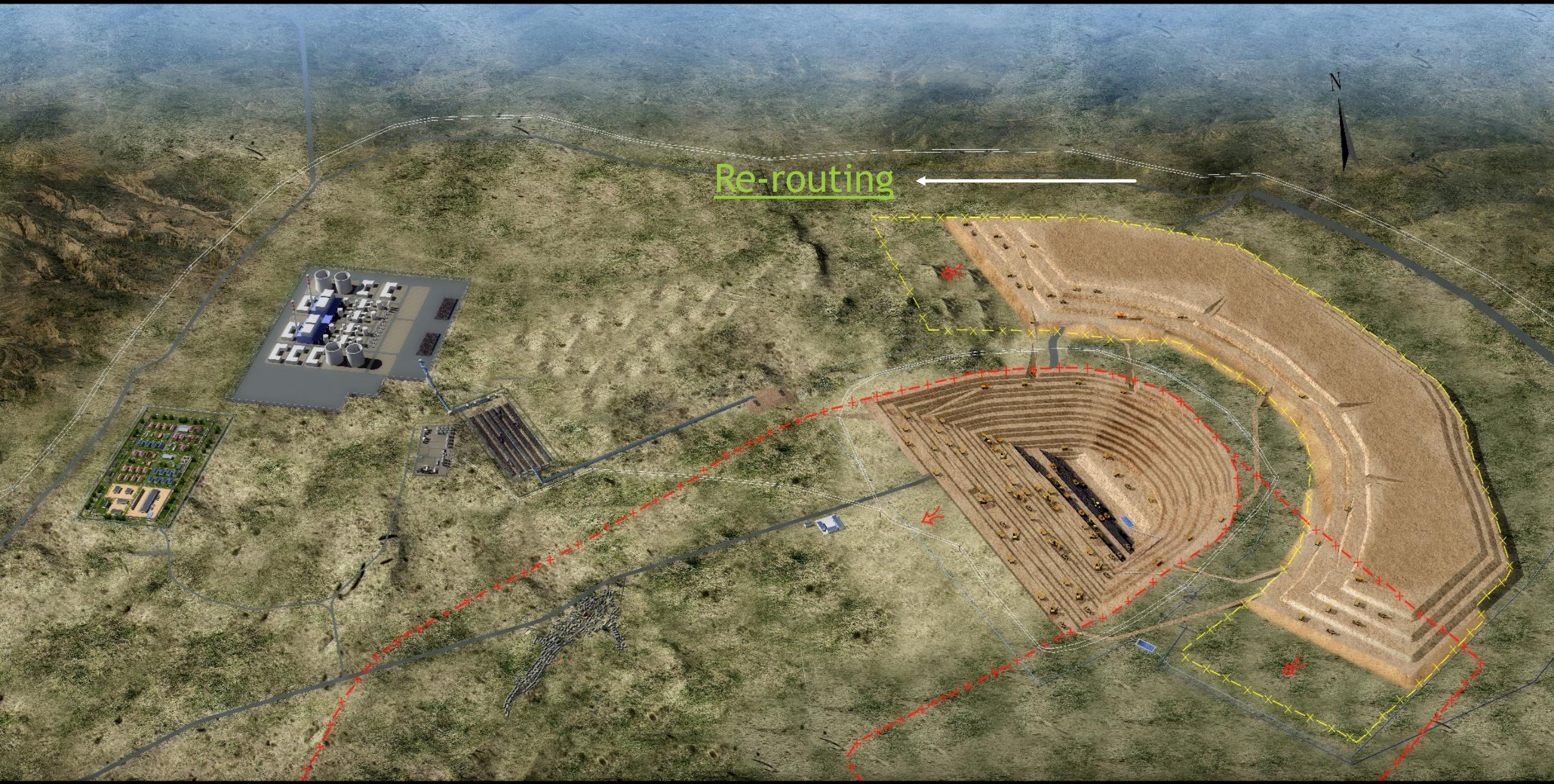

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