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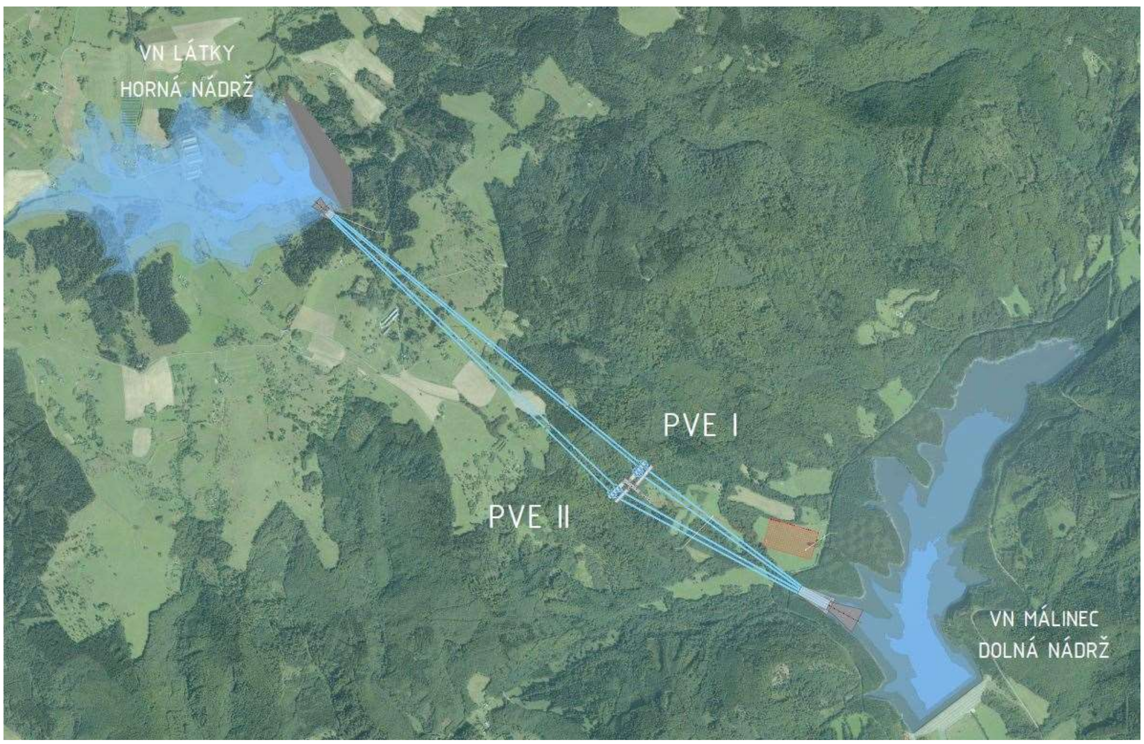
CONCEPTUAL DESIGN OF THE MÁLINEC – LÁTKY PUMPED-STORAGE HYDROELECTRIC POWER PLANT



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Contents

1. Introductory information 4
1.1. Introduction 4
1.2. Project objectives 4
1.3. Project benefits 4
1.3.1. Regulation and stabilisation of the electricity grid 4
1.3.2. Self-sufficiency 4
1.3.3. Sustainability and environmental benefits 4
1.4. Basic information 4
1.4.1. Brief description of the Málinec reservoir 4
1.4.2. Description of the area of the planned Látky reservoir 7
1.4.3. Hydrological data of the Málinec reservoir 8
1.4.4. Geological data 8
1.4.4.1. Geological and hydrogeological conditions near the Málinec reservoir (lower reservoir) 8
1.4.4.2. Geological and hydrogeological conditions near the Látky upper reservoir 9
1.4.4.3. Slopes of the Látky reservoir 9
1.4.4.4. Geological structure at the dam site 9
1.4.4.5. Permeability of the reservoir bed and banks 9
1.4.4.6. Geological structure along the route of the hydraulic circuit of the PSH plant 10
2. Conceptual technical design of the project 10
2.1. Basic components of the Málinec – Látky PSH project 10
2.2. Operating levels and volumes of the Málinec – Látky PSH plant 10
2.2.1. Látky reservoir (upper reservoir): 10
2.2.2. Málinec reservoir (lower reservoir): 10
2.3. Látky upper reservoir 11
2.3.1. Location of the Látky upper reservoir 11
2.3.2. Design parameters of the water structure 12
2.3.3. Stability of the dam, foundation, and reservoir slopes 13
2.4. Málinec lower reservoir 13
2.5. Hydraulic circuit of the pumped-storage hydroelectric plant 14
2.5.1. Basic parameters of the Málinec – Látky PSH plant: 14
2.5.2. Concept of the Málinec – Látky PSH plant 14
2.5.3. Main structures of the PSH plant and its hydraulic circuit 15
2.6. Substation 15
2.6.1. EHV substation 15

2.6.2. Power output connection 15
2.6.2.1. Connection from block transformers to the substation 15
2.6.2.2. Connection to SEPS substations 15
2.7. Induced investments 15
2.7.1. Construction of a direct abstraction point from the watercourse 16
2.7.2. Intensification of the water-treatment plant below the Málinec reservoir 16
2.7.3. Subdivision of the volume of the Málinec reservoir 16
2.7.4. Road infrastructure 16
2.7.4.1. Reconstruction of road 2715 16
2.7.4.2. Construction of a road bypassing the village of Málinec during construction works 16
2.7.5. Compensatory measures 16
2.7.5.1. Reconstruction of sewerage system and wastewater-treatment plant (Málinec) 16
2.7.5.2. Relocation of the cemetery 16
2.7.5.3. Provision of drinking water for Látky 16
2.7.5.4. Construction of sewerage and a wastewater-treatment plant for Látky 17
2.7.5.5. Wastewater management in villages within the third protection zone of the Málinec reservoir 17
2.7.5.6. Information centres 17
2.7.5.7. Construction of recreational infrastructure 17

List of abbreviations:

PSH – pumped-storage hydroelectric plant

IG – injection gallery

EG – electricity grid

RES – reservoir

SHEP – small hydroelectric plant

COS – combined operating structure

SG – service gallery

EGS – engineering geological survey

UR – upper reservoir

PZ – protection zones

EHV – extra-high voltage

1. Introductory information

1.1. Introduction

The "Málinec – Látky pumped-storage hydroelectric plant" project is based on Government Resolution of the Slovak Republic No 799/2024 of 18 December 2024 entitled "Potential for the Construction of Pumped-Storage Hydroelectric Power Plants in Slovakia". It concerns the creation of secondary hydroelectric potential at the existing Málinec reservoir through technical innovation and modernisation of the structure, by connecting it to the upper reservoir Látky near Detvianska Huta.

The investment project will comprise the construction and operation of the upper reservoir Látky, the Málinec – Látky pumped-storage hydroelectric plant, including its hydraulic circuit, and the innovation and modernisation of the existing lower reservoir Málinec.

1.2. Project objectives

To build and operate a new source for the storage of electricity and for providing flexibility to the electricity grid. It will form part of the stabilising elements of the grid, particularly as electricity generation from renewable energy sources increases and remains dependent on current meteorological conditions. The Málinec – Látky pumped-storage hydroelectric plant therefore represents a sustainable solution for a peak-load and balancing energy source. Its function is to use electricity surpluses (by pumping water into the upper reservoir) and to generate electricity during periods of shortage.

1.3. Project benefits

1.3.1. Regulation and stabilisation of the electricity grid

A pumped-storage hydroelectric plant plays a key role in grid stability, especially when generation from renewable energy sources – which are inherently variable – is high. It allows surplus electricity to be stored efficiently during periods of low demand and released during peak periods or times of increased consumption.

1.3.2. Self-sufficiency

The plant makes use of the natural potential of the Slovak Republic, significantly contributing to the development of domestic renewable energy sources and thereby reducing dependence on foreign sources such as gas and oil.

1.3.3. Sustainability and environmental benefits

A pumped-storage hydroelectric plant functions as a form of electricity "storage" and provides an environmentally responsible method of electricity generation that stabilises the electricity grid and reduces reliance on other fuels.

It produces no greenhouse-gas emissions and therefore contributes to achieving carbon-neutrality goals and mitigating climate change.

Pumped-storage systems are long-established and, at the same time, optimal technological solutions for electricity "storage" with minimal environmental impacts.

1.4. Basic information

1.4.1. Brief description of the Málinec reservoir

The Málinec reservoir began construction in 1989 and was completed in 1994. Under the criteria of the Ministry of Forestry and Water Management of the Slovak Republic, it was classified in 1984 among Category I water-management structures and equipment from the perspective of technical-safety supervision. The Málinec dam is located on the River Ipeľ at river kilometre 198.520, above the village of Málinec, in the Slovenské rudohorie region, within the Veporské vrchy and Stolické vrchy mountain units. More narrowly, it lies within the Sihlianska planina (Veporské vrchy) and Málinské vrchy (Stolické vrchy) sub-units.

The primary purpose of the Málinec reservoir is to provide drinking-water supply for the Lučenec district. The retention volume of the reservoir between elevations 345.50 and 346.50 m a.s.l. enables flood-wave transformation. An important function of the structure is the provision of the minimum residual flow (Q_{355} = 0.083 m^3/s) and the utilisation of hydroelectric potential, which is harnessed by three small hydroelectric plants ("SHEP I, II, and III"). The reservoir also supports a managed fishery.

Table 1) Málinec reservoir – basic characteristic data

Characteristic data of the Málinec reservoir		Unit
Crest elevation of the dam:	348.50	
Crest elevation of the sealing core:	347.50	
Minimum operating level:	315.00	
Maximum operating level:	345.50	m a.s.l.
Maximum retention level:	346.50	
Dam height above valley floor:	48.50	
Crest length of the dam:	684.50	m
Permanent reservoir volume (303.00–315.00 m	1,405,067 / 1,209,839*	
Total reservoir volume (303.00–346.50 m a.s.l.):	26,620,959 / 26,865,793*	
Storage volume (315.00–345.50 m a.s.l.):	23,707,953 / 24,181,878*	m3
Retention volume (345.50–346.50 m a.s.l.):	1,507,939 / 1,474,076*	
Inundated area at maximum operating level:	1,479,883 / 1,462,356*	
Inundated area at maximum retention level:	1,535,737 / 1,483,409*	m2
Catchment area	84.01	km2
Hydrological basin number	4-24-01-006	-

** survey from 2017*

The main components of the waterworks are the earthfill dam with its appurtenant structures, the combined operating structure, and the small hydroelectric plants.

The dam is a heterogeneous embankment with a central clay-core sealing structure. The stabilising section consists of rockfill (Fig. 1). The central core is tied into the foundation by a grout curtain. The interface between the core and the stabilising prisms comprises a two-layer filter and transition zones. The crest is 7.0 m wide, with a freeboard of 2.0 m above the maximum retention level. The downstream slope has a uniform gradient of 1:1.6 and is divided vertically into four berms, each 3.5 m wide and spaced 8.5–10 m apart.

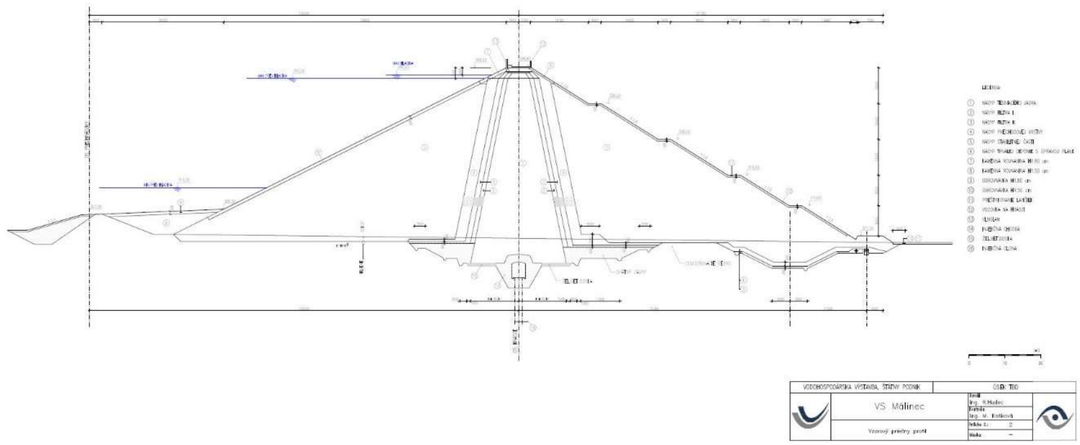

Fig. 1) Typical cross-section of the Málinec reservoir

The upstream slope has a gradient of 1:2 and no berms. A fore-dam was constructed at the upstream toe to protect the construction pit from elevated flows.
The crest and adjacent areas are reinforced. The upstream slope is lined with stone pitching 0.80 m thick, and the downstream slope with pitching 0.50 m thick. Below the crest, where the pitching rests directly on the transition layer, the upstream slope is protected by a stone facing 0.80 m thick and the downstream slope by one 0.50 m thick.
The sealing-core crest lies 1.0 m below the dam crest and 1.0 m above the maximum retention level. The maximum width of the core, at the foundation, is approximately 26 m. The contact between the sealing core and the bedrock was improved by a concrete bedding layer of an average thickness of 0.6 m, reinforced with mesh. An injection gallery is located at the foundation interface of the sealing core; its elevation was determined by the quality of the rock exposed after uncovering the foundation interface.
A two-layer filter and transition zones are situated on both sides of the sealing core. The stabilising sections of the embankment rest on gravel in the valley floor, on clay-stone debris on the left slope, and on deluvium on the right slope.
Drainage of the dam body is provided by a 10 m wide drainage system located at the downstream toe on both sides, sunk at least 1 m into weathered rock or deluvium.

The combined operating structure is a forward tower situated at the upstream toe of the dam. It contains the multi-level intakes, the bottom outlets, and the shaft spillway. The tunnel from the tower structure is divided into two levels – an upper service gallery (with intake piping) and a lower discharge gallery from the spillway. Below the dam there is an energy-dissipation basin, which continues into the channel of the River Ipeľ. The combined operating structure enables manipulation of the reservoir water level – the passage of high flows, the continuous minimum flow of the Ipeľ downstream of the reservoir Q_{355}, the abstraction of water for drinking-water purposes, and the discharge of water from the reservoir. The river channel of the Ipeľ downstream of the dam is modified along a total length of 725 m.

The safety shaft spillway serves for passing flood flows. The combined operating structure contains an ungated safety shaft spillway of an incomplete circular form, with a radius r = 8.54 m and a crest length of 42.0 m at an elevation of 345.50 m a.s.l., and a shaft diameter of 3.6 m. It passes twice the reservoir-transformed thousand-year flood flow, 2 × $Q_{1000\ red.}$ = 155.60 m^3/s, at a nappe height of 1.59 m. The shaft spillway passes through an elbow (R = 12.7 m) into a discharge tunnel of rectangular cross-section 4.5 × 4.0 m, 170 m in length, with a gradient of 1% towards the downstream side of the dam, and discharges into the energy-dissipation basin.

The grout curtain ensures the sealing of the foundation interface and the bedrock beneath the injection gallery. The curtain is three-row; the central row was injected to a depth of 20–40 m. The upstream and downstream rows were injected to a depth of 11–14 m, with the main injection works preceded by fortification grouting with boreholes up to 5 m in length along the entire length of the injection gallery.

The injection gallery was founded in sound rock. It consists of 45 mutually dilated blocks and is located on the dam axis. Block 23 contains a sump shaft for pumping seepage water. Access to the injection gallery is possible from both sides from the dam crest and, via the crossing block, from the service gallery.

The service gallery provides a connection between the injection gallery, the area below the downstream toe of the dam, and the combined operating structure.

The bottom outlets serve to ensure the minimum residual flow downstream of the reservoir, to lower the reservoir water level, or to empty the reservoir completely, as well as to flush the reservoir by releasing deposited sediments after heavy rainfall. The enlarged intake of the bottom outlets is fitted with trash racks and temporary stoplogs operated from the crest of the tower of the operating structure. The bottom outlets consist of two steel pipes, 2 × DN 1200 mm, passing through the bottom-outlet machine hall and discharging into the elbow of the shaft spillway at an elevation of 299.00 m a.s.l., at an angle of 100° from the axis of the tunnel.
The capacity of the bottom outlets depends on the reservoir level and, at maximum operating level, can reach up to Q = 2 × 19.4 m³/s.

Small hydroelectric plants:
Small hydroelectric plants were built in the machine hall and upstream of the energy-dissipation basin, utilising the available flows.

- SHEP I is situated downstream of the dam on the right-hand side of the energy-dissipation basin. Its water intake is from the bottom-outlet pipeline, and its maximum output is 40 kW.
- SHEP II is located within the combined operating structure, in the bottom-outlet machine hall on the right side. Its water intake is from the right-hand bottom-outlet pipe. The plant's maximum output is 200 kW.
- SHEP III is located downstream of the dam on a platform at the dam toe, below SHEP I. Its water intake is provided by a branch from the existing drinking-water abstraction pipeline. Its maximum output is 90 kW.

1.4.2. Description of the area of the planned Látky reservoir

The village of Látky lies on the summit plateau of the Slovenské rudohorie. It is situated in a landscape characterised by undulating terrain and dispersed settlement.
According to Geomorfologické členenie Slovenska (Mazúr, Lukniš, Atlas SSR, 1980), the area belongs to the Alpine–Himalayan system, the Carpathian subsystem, the province of the Western Carpathians, the subprovince of the Inner Western Carpathians, the Slovenské rudohorie region, within the Veporské vrchy and Stolické vrchy mountain units, specifically the Sihlianska planina and Málinské vrchy divisions. The cadastral area of Látky consists mainly of strongly dissected upland and rugged highland, dominated by the peak Bykovo (1111 m a.s.l.). Less dissected terrain is formed by granitic rocks of the Vepor crystalline complex. The wide, dissected plateaus are remnants of a late-Tertiary planation surface.
Látky is among the highest-lying villages in Slovakia. The village centre lies at 830 m a.s.l., the highest point of the cadastral area is Bykovo, and the lowest point, where the stream Smolná leaves the area, is 540 m a.s.l.

The dam site and the area of the upper reservoir will be located in the Čechánky area, which contains dispersed agricultural settlement. The area of interest falls within the third protection zone of the Málinec reservoir. The stream Smolná flows through the area and discharges into the Málinec reservoir. Within the affected area, there is an agricultural cooperative, a solar power plant, a local cemetery, a historic belfry, and scattered properties.

1.4.3. Hydrological data of the Málinec reservoir

Table 2) M – daily flows of the River Ipeľ

M (days)	30	90	180	270	330	355	364
Q (m^3/s)	2.37	1.16	0.64	0.343	0.178	0.12	0.06

Table 3) N – annual maximum flows of the River Ipeľ

N (years)	1	2	5	10	20	50	100	1000
Q (m^3/s)	15	21	30	38	45	53	62	85

The long-term average annual precipitation over the catchment is 747 mm.
Ice phenomena on the reservoir typically occur from late November to mid-March. Ice thickness may reach 0.5 m.

1.4.4. Geological data

Based on current available information and findings, no geological phenomenon is anticipated that would prevent the construction of the PSH plant. Risks must be clarified by an engineering geological and hydrogeological survey.

1.4.4.1. Geological and hydrogeological conditions near the Málinec reservoir (lower reservoir)

Palaeozoic rocks forming the bedrock occur in the area – predominantly granitoids and migmatites. These rocks exhibit varying degrees of fracturing, strength, and permeability, depending on the phase and intensity of tectonic disruption.

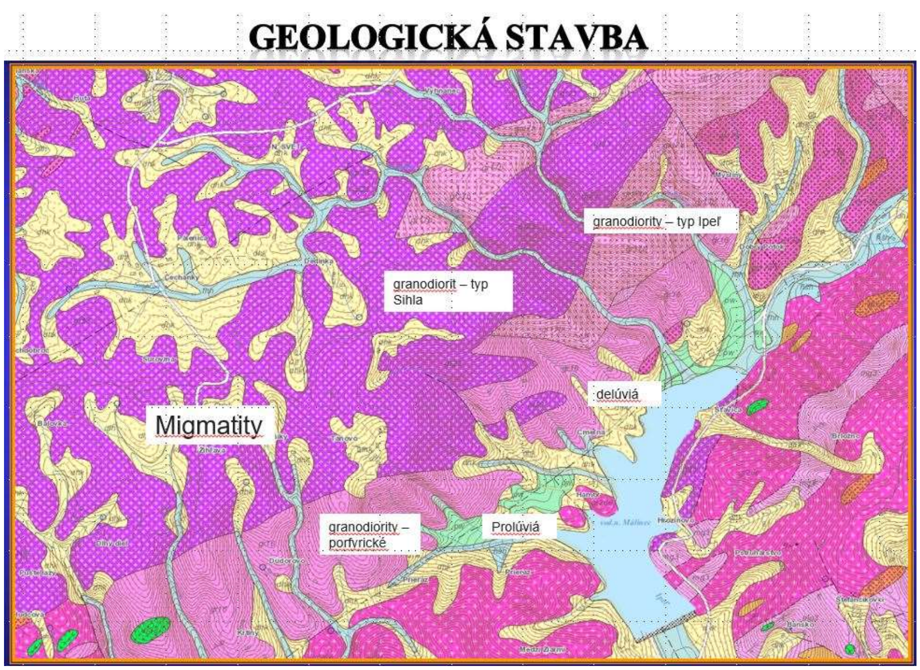

Fig. 2) Geological structure of the affected area

The rock is overlain on slopes by Quaternary eluvial–deluvial sediments of silt to clay character, with varying fragment content and a thickness of up to 14 m. At the mouths of tributaries into the valley of the River Ipeľ, proluvial sediments of alluvial cones occur.
Groundwater occurs mainly in Quaternary slope sediments. The bedrock on the left side is more permeable (granitoids), while on the right side the environment is less permeable due to mylonitisation and clay infilling of fractures.

1.4.4.2. Geological and hydrogeological conditions near the Látky upper reservoir

The assessment is based on the geological map. Palaeozoic rocks forming the bedrock occur in the area – predominantly granitoids. These rocks likely exhibit less fracturing than in the valley of the River Ipeľ. They are overlain by deluvial deposits of clay to silt character. The thickness, together with the weathered mantle, is estimated at 3–8 m. Along the course of the stream Smolná there is a narrow strip of fluvial sediments (Fig. 3).

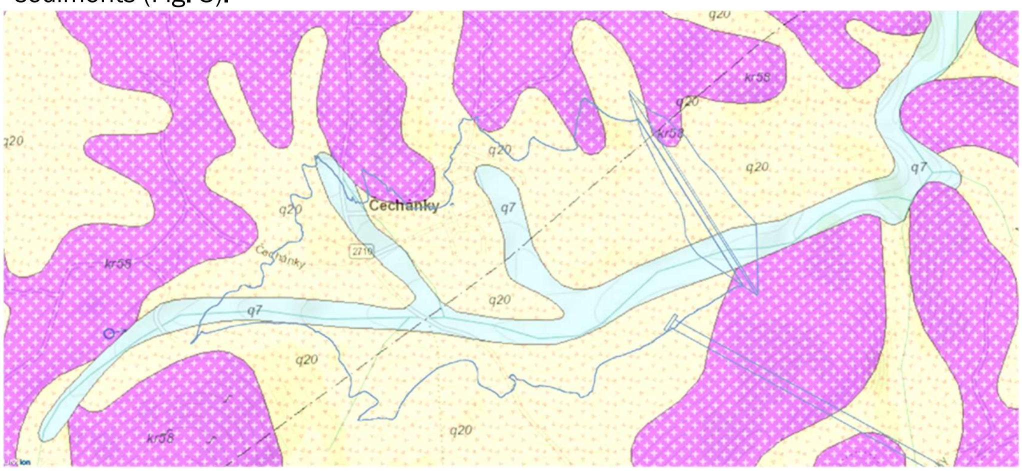

Fig. 3) Outline of inundation and dam of the Látky reservoir on the geological map. Pink indicates granitoids, yellow indicates slope sediments, and blue indicates sediments of the stream Smolná. The dashed-and-dotted line marks a tectonic fault

1.4.4.3. Slopes of the Látky reservoir

No landslides are recorded here (Atlas zosuvov – Landslide Atlas). According to lidar imagery, however, smaller-scale landslides may be present on the left slope of the reservoir.

1.4.4.4. Geological structure at the dam site

With regard to the expected geological structure, we anticipate higher compressibility (settlement) of the dam foundation and lower permeability of the sub-foundation. Permeability in the area of the stream Smolná will need to be addressed. The lateral tie-in of the dam should be constructed in weathered granodiorites.

1.4.4.5. Permeability of the reservoir bed and banks

With regard to the expected geological structure, we anticipate lower permeability of the reservoir bed and banks.

1.4.4.6. Geological structure along the route of the hydraulic circuit of the PSH plant

The structures of the hydraulic circuit of the PSH plant are envisaged as excavated in rock, consisting of granitoids and migmatites, with significant fracturing in the area of the Muráň fault.

2. Conceptual technical design of the project

2.1. Basic components of the Málinec – Látky PSH project

- Látky upper reservoir
- Málinec lower reservoir
- Machine hall and hydraulic circuit of the pumped-storage hydroelectric plant
- Substation
- 400 kV power output connection
- Induced investments

2.2. Operating levels and volumes of the Málinec – Látky PSH plant

2.2.1. Látky reservoir (upper reservoir):

- maximum water level 844.00 m a.s.l.
- maximum operating level for the PSH plant 840.00 m a.s.l.
- minimum operating level for the PSH plant 830.00 m a.s.l.
- minimum water level 815.00 m a.s.l.
- available volume for PSH operation approx. 11 million m³

The volume curve of the Látky reservoir is shown in Fig. 4.

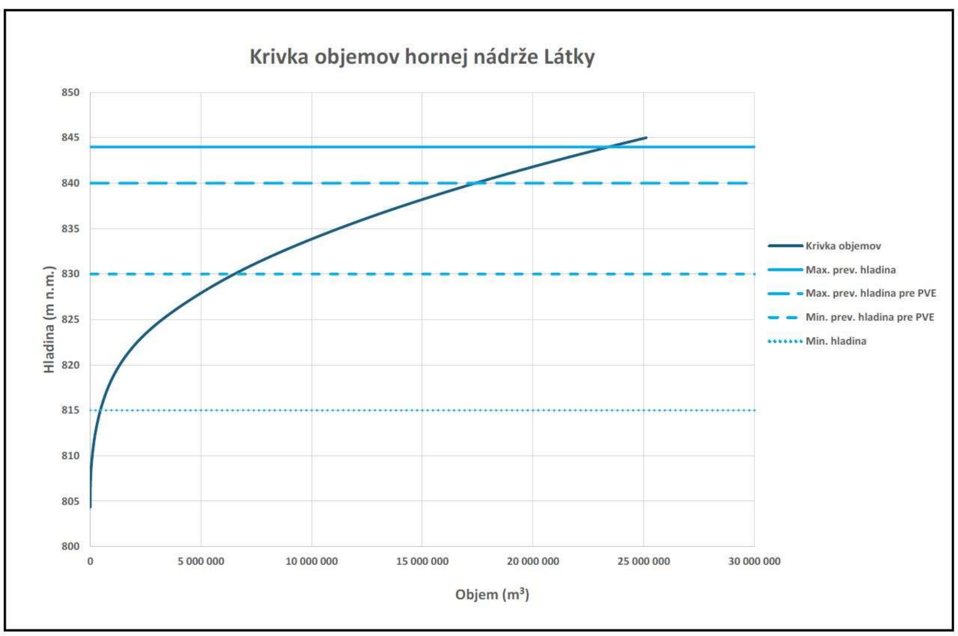

Fig.4) Volume curve of the Látky upper reservoir

2.2.2. Málinec reservoir (lower reservoir):

- maximum operating level (including for the PSH plant) 345.50 m a.s.l.
- minimum operating level for the PSH plant 330.00 m a.s.l.
- available volume for PSH operation approx. 15.9 million m³

The volume curve of the Málinec reservoir is shown in Fig. 5.

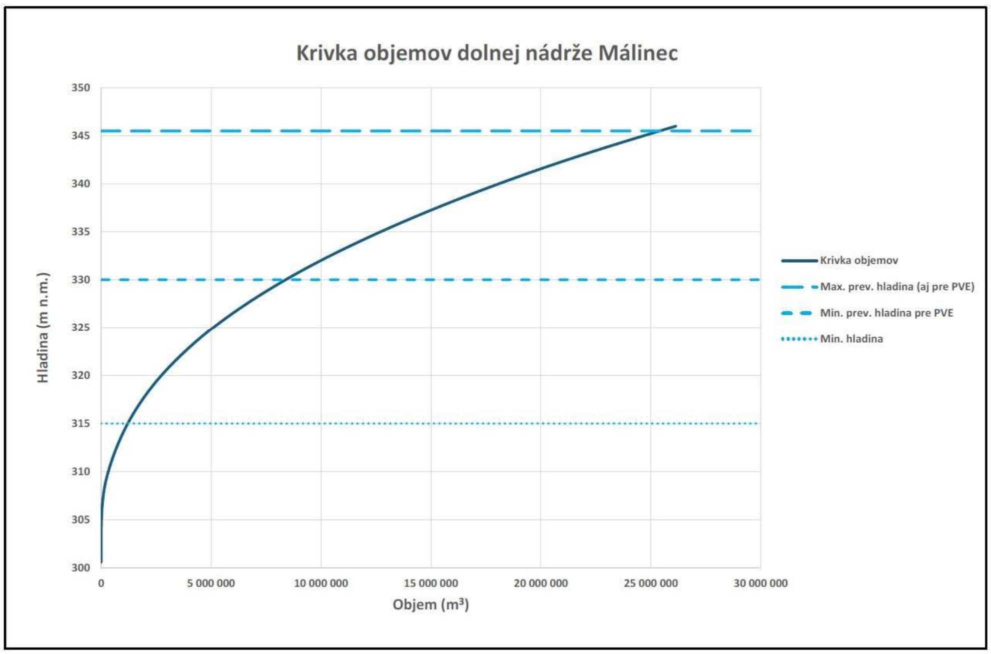

Fig. 5) Volume curve of the Málinec lower reservoir

2.3. Látky upper reservoir

2.3.1. Location of the Látky upper reservoir

The Látky upper reservoir, as part of the Málinec – Látky PSH plant, will be formed by damming the valley of the stream Smolná (approx. at rkm 6.100), a right-bank tributary of the River Ipeľ at rkm 196.900 (Fig. 6). The dam and reservoir will lie in the cadastral area of Látky, in the district of Detva, Banská Bystrica Region. The catchment area of the reservoir is 3.963 km^2.

In addition to the dam built on the stream Smolná, from which the reservoir will extend southwards, a smaller separate dam approximately 4 m high will be constructed on the south-western side of the reservoir (on the line of an existing local road), protecting the cadastral area of Detvianska Huta from water-level fluctuations above elevation 842.00 m a.s.l. (Fig. 7).

The area of the Látky upper reservoir is located on the summit plateau of the Sihlianska planina, a geomorphological sub-unit of the Veporské vrchy within the Slovenské rudohorie.

Geologically, the area forms part of the Vepor crystalline massif, characterised by granitic rocks and younger cover formations.

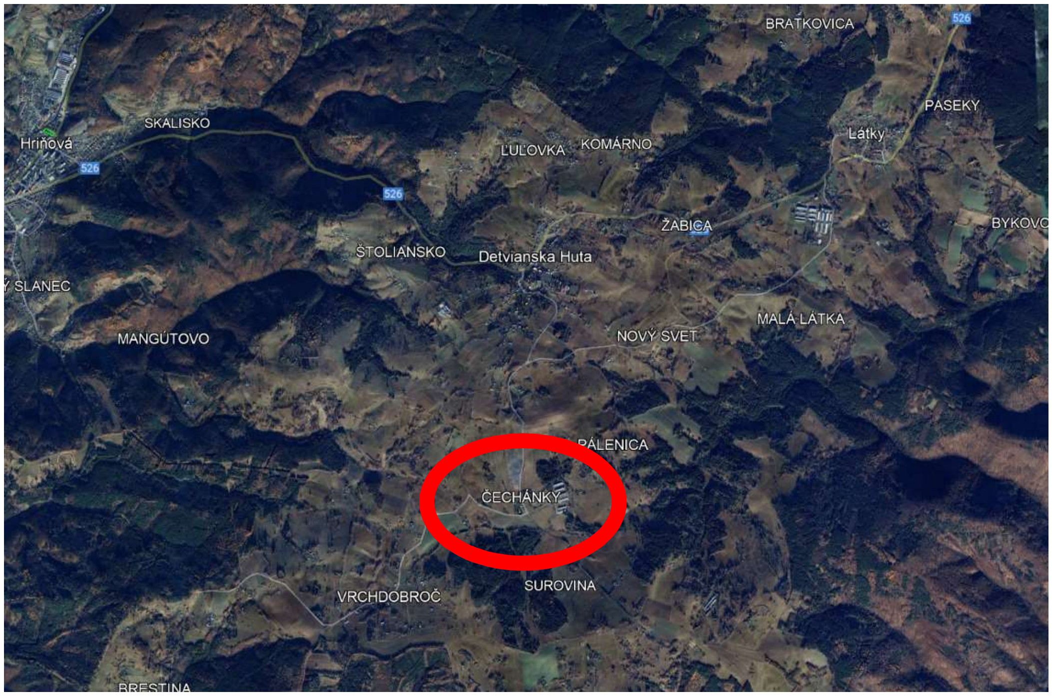

Fig. 6) Wider area of interest of the Látky upper reservoir (source: Google Earth Pro)

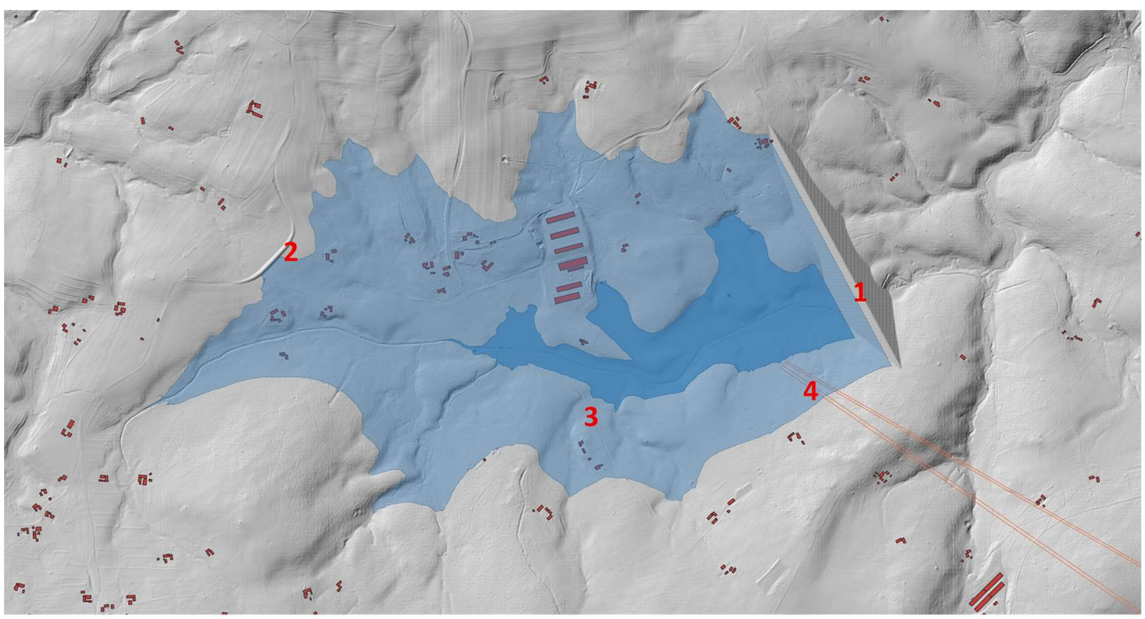

Fig. 7) Structures of the Látky upper reservoir with maximum and minimum operating levels: 1 – dam body; 2 – south-western dyke/road structure; 3 – reservoir; 4 – operating structures of the PSH plant

2.3.2. Design parameters of the water structure

At the envisaged maximum water level of 844.00 m a.s.l. and an inundated area of approx. 1.64 km^2, the total reservoir volume will be approx. 23.575 million m^3. The minimum operating level is expected to be 830.00 m a.s.l. The reservoir bed is at approx. 804.10 m a.s.l. Given the very small catchment area, no retention volume is considered.

The primary requirement in selecting the dam design is safety and the associated operational reliability. This affects a wide range of important issues, including the choice of suitable construction materials, ensuring structural and filtration stability of the dam body and its foundation, determining the bearing capacity of the foundation soil, the structure's resistance to water-level fluctuations, the availability of suitable materials for the dam body, assessment of a smooth construction sequence (correct choice of dam type and technology given the environmental conditions), landscape considerations, and economic efficiency.

The goal in selecting the appropriate dam type for the specific profile at Látky is to optimise safety, functionality, and economy, taking into account all possible risk factors, including environmental impacts. The decisive criteria for determining the dam typology are the bearing capacity of the foundation soil at the planned dam site and the assessment of the suitability of materials available from the excavation of the PSH plant penstocks, the excavation of power-house caverns, or borrow pits at feasible distances from the construction site for incorporation into the dam body.

Hydrodynamic loading arising from the PSH plant's function is a determining factor in the requirement to ensure structural and filtration stability.

A construction timeline is essential for selecting the optimal variant. Given the expected construction period of the other PSH plant structures (penstocks, underground power house), timing considerations apply.

One of the important components of the Látky upper reservoir water structure will be the safety spillway, which will prevent overtopping of the dam in the event of reservoir filling during pumping operation.

2.3.3. Stability of the dam, foundation, and reservoir slopes

The structural and filtration stability of the dam body and reservoir slopes will be ensured through appropriate design, necessary measures, and strict adherence to construction procedures for the water structure.

Sealing of the dam foundation will prevent both underflow and bypass flow in the areas of the dam tie-ins into the valley slopes.

Following assessment of wind-wave formation, bank morphology, and geological composition, the stability of the reservoir banks against wave erosion will be evaluated across the full range of operating water-level fluctuations of the Látky upper reservoir. The need for local bank protection will also be assessed.

2.4. Málinec lower reservoir

At present, based on available information and an assessment of slope stability during rapid reservoir drawdown, no works are envisaged on the existing dam body of the Málinec reservoir.

2.5. Hydraulic circuit of the pumped-storage hydroelectric plant

2.5.1. Basic parameters of the Málinec – Látky PSH plant:

- Installed capacity: 2400 MW (divided into stages)
- Head: approx. 510 m

2.5.2. Concept of the Málinec – Látky PSH plant

The Málinec – Látky PSH plant will be divided into two separate machine halls with independent hydraulic circuits, enabling staged construction and incremental installation of capacity up to a maximum of 2400 MW.

Phase 1 = PSH I with an installed capacity of 1200 MW in 2 stages:

- Stage 1: 2 × 150 MW + 1 × 300 MW
- Stage 2: 2 × 300 MW

Phase 2 = PSH II with an installed capacity of 1200 MW in 2 stages:

- Stage 3: 2 × 300 MW
- Stage 4: 2 × 300 MW

Table 4) Summary of proposed basic PSH plant parameters

installed capacity	total	2400 MW				
		PSH I (phase 1)			PSH II (phase 2)	
		1200 MW			1200 MW	
		600 MW (Stage 1)		600 MW (Stage 2)	600 MW (Stage 3)	600 MW (Stage 4)
	unit-based	2 × 150 MW	1 × 300 MW	2 × 300 MW	2 × 300 MW	2 × 300 MW
turbine flow	total	70 m^3/s	70 m^3/s	140 m^3/s	140 m^3/s	140 m^3/s
	unit-based	2 × 35 m^3/s	1 × 70 m^3/s	2 × 70 m^3/s	2 × 70 m^3/s	2 × 70 m^3/s
pump flow	total	53 m^3/s	53 m^3/s	106 m^3/s	106 m^3/s	106 m^3/s
	unit-based	2 × 26.5 m^3/s	1 × 53 m^3/s	2 × 53 m^3/s	2 × 53 m^3/s	2 × 53 m^3/s

In Phase 1, the construction of PSH I is envisaged, with a half installation of 600 MW – Stage 1 – consisting of machine units 2 × 150 MW + 1 × 300 MW, and with pre-prepared works for Stage 2, i.e. the construction of the entire PSH I machine-hall cavern, the entire transformer-cavern (provision for 4 units + a frequency converter for the 1 × 150 MW machine unit), two headrace tunnels and two draft tunnels for the full 1200 MW installation, and one main access tunnel. In Stage 1, the intention is to connect the 2 × 150 MW machine units to one headrace and draft tunnel, and the 1 × 300 MW machine unit to the second headrace and draft tunnel. Thus, after Stage 1, two bays for two 300 MW machine units will remain vacant in the machine hall, but structurally pre-prepared. The generating sets will be installed only in Stage 2.

In Phase 2, the construction of PSH II is envisaged, with a half installation of 600 MW – Stage 3 – consisting of machine units 2 × 300 MW, and with pre-prepared works for Stage 4, i.e. the construction of the entire PSH II machine-hall cavern with the full 1200 MW capacity, consisting of 4 × 300 MW machine units, the entire transformer cavern (provision for 4 units), two headrace tunnels and two draft tunnels, using/extending the main access tunnel.

PSH I and PSH II were designed for the reservoir levels given in section 2.2 so that operation would be possible even in cases where reservoir levels fall to their minimum values.

2.5.3. Main structures of the PSH plant and its hydraulic circuit

- Intake structure of the upper reservoir
- Headrace tunnel
- Surge chamber
- Pressure penstocks
- Machine hall
- Transformer cavern
- Draft tunnels
- Intake structure of the lower reservoir
- Access tunnel

Since this is a conceptual design of the Málinec – Látky pumped-storage hydroelectric plant, the following proposal sets out only the main structures with brief descriptions.

Note: The Málinec – Látky pumped-storage hydroelectric plant will in reality contain a considerably larger number of sub-structures (e.g. ventilation tunnels, cable tunnels, drainage tunnels, other mining structures, access roads, etc.). These will need to be developed in subsequent preparation phases, including the structures for the construction site installation.

2.6. Substation

2.6.1. EHV substation

The EHV substation will be shared by PSH I and PSH II. It will be built as an outdoor installation on the right valley slope. Its equipment will be constructed in stages according to installed capacity.

2.6.2. Power output connection

2.6.2.1. Connection from block transformers to the substation

The power output connection from the block transformers to the EHV substation will be shared by PSH I and PSH II.

2.6.2.2. Connection to SEPS substations

From the EHV substation built for the Málinec – Látky PSH plant, a 400 kV line will be constructed to SEPS-operated substations in Rimavská Sobota, Horná Ždaňa, and Medzibrod.
Stage 1: construction of the 400 kV line to the SEPS substation in Rimavská Sobota.
Stage 2: construction of the 400 kV line to Horná Ždaňa or Medzibrod. The method of power output connection and linking to SEPS substations will follow the findings of a system-impact study.

2.7. Induced investments

As part of the Málinec – Látky pumped-storage hydroelectric plant project, construction works will also be required as induced investments or as compensatory measures to prevent negative impacts of the planned construction.

List of anticipated induced investments:

- Construction of a direct abstraction point from the watercourse
- Intensification of the water-treatment plant below the Málinec reservoir
- Subdivision of the volume of the Málinec reservoir
- Road infrastructure

- Compensatory measures

2.7.1. Construction of a direct abstraction point from the watercourse

Investment induced by the Málinec – Látky pumped-storage hydroelectric plant will include the construction of a direct abstraction point from the River Ipeľ to provide drinking-water abstraction, as well as the construction of the necessary infrastructure linking the abstraction point with the water-treatment plant in Málinec.

2.7.2. Intensification of the water-treatment plant below the Málinec reservoir

As part of project implementation, the capacity of the existing water-treatment technology below the Málinec reservoir will be upgraded and expanded.

2.7.3. Subdivision of the volume of the Málinec reservoir

A fundamental condition of the project is to ensure the supply of drinking water for the affected area for the long-term future, taking into account the impact of changing climatic conditions. To ensure this priority, one of the solutions is the subdivision of the volume of the Málinec reservoir into two parts by means of a dividing structure, in order to obtain a storage volume of the reservoir for the purpose of supplying the population with drinking water. The technical design itself will be based on the required stored water volume according to the processed drinking-water demand balances for the area.

2.7.4. Road infrastructure

2.7.4.1. Reconstruction of road 2715

Another induced investment will be the reconstruction of road 2715, which passes around the Málinec reservoir and connects to road 526. The induced investment will involve the reconstruction of the section of road 2715 from the junction beyond the village of Málinec to the connection with road 526, running for a total length of 13.5 km. The works will also include reconstruction of oil-separator installations.

2.7.4.2. Construction of a road bypassing the village of Málinec during construction works

One induced investment will consist of the design of a road bypassing the built-up area of Málinec during the construction works of the Málinec – Látky pumped-storage hydroelectric plant. It is assumed that this will be a temporary structure.

2.7.5. Compensatory measures

2.7.5.1. Reconstruction of sewerage system and wastewater-treatment plant (Málinec)

As part of the induced investments, the sewerage network in the village of Málinec will be reconstructed and the Málinec wastewater-treatment plant will be modernised.

2.7.5.2. Relocation of the cemetery

Within the inundation area, there is an original cemetery in the Čechánky part. One induced investment will consist of the relocation of the cemetery from the inundation area and the first protection zone.

2.7.5.3. Provision of drinking water for Látky

This induced investment will consist of ensuring sufficient drinking-water supply for the village of Látky from the public water supply system.

2.7.5.4. Construction of sewerage and a wastewater-treatment plant for Látky

This induced investment will entail the construction of a sewerage system in the village of Látky, and of a wastewater-treatment plant.

It will also address the discharge of wastewater from properties in the Čechánky area, which will lie in the second or third protection zone of the water source.

2.7.5.5. Wastewater management in villages within the third protection zone of the Málinec reservoir

The scope will also include the collection and treatment of wastewater from villages and settlements located in the third protection zone, such as Ipeľský Potok, Vlčovo, Podbykovo, Nový Svet, and Pstružno.

2.7.5.6. Information centres

Induced investment will include information centres covering the construction of the Málinec – Látky pumped-storage hydroelectric plant and the affected area. These will be built for the general public, schools, and professional audiences.

2.7.5.7. Construction of recreational infrastructure

As part of the development of tourism in the affected area, the induced investments include the construction of nature trails and cycle paths in the affected municipalities, including small-scale tourist infrastructure (information boards, rest areas, and playgrounds), an observation tower, and similar facilities.