2. TECHNICAL DESCRIPTION OF THE PROPOSED PROJECT

In order to be able to adequately provide in the growing peak-time electricity demand and to optimise existing electricity generation infrastructure, Eskom proposes to construct a Pumped Storage Scheme in the Steelpoort area. A pumped storage scheme utilises surplus electricity generation capacity on the Eskom system during off-peak hours to pump water from the lower to the upper reservoir and releases this water again during peak load hours to generate electricity. A pumped storage scheme thus relieves the need for other peaking plants such as gas fired turbines to meet peak loads and also relieves the need for the switching off of coal fired generation during periods of low power system load. This practice allows for a more efficient operation of coal-fired power stations. A pumped storage scheme thus provides a method of “storing” energy.

2.1. The Proposed Pumped Storage Scheme

The proposed PSS will consist of two dams/reservoirs (an upper and lower dam), interconnected by an underground tunnel system (waterways) with pump turbine units (powerhouse complex) with a potential generation capacity of approximately 1520 MW. In addition to this, the scheme will also have access and site roads (temporary and permanent), two construction villages, two communication masts that will each be approximately 45m high (one mast will be at the upper reservoir and the other mast at the lower reservoir) and other associated infrastructure. These components are indicated diagrammatically in Figures 2.1 to 2.4 and described in more detail in the following sub-sections:

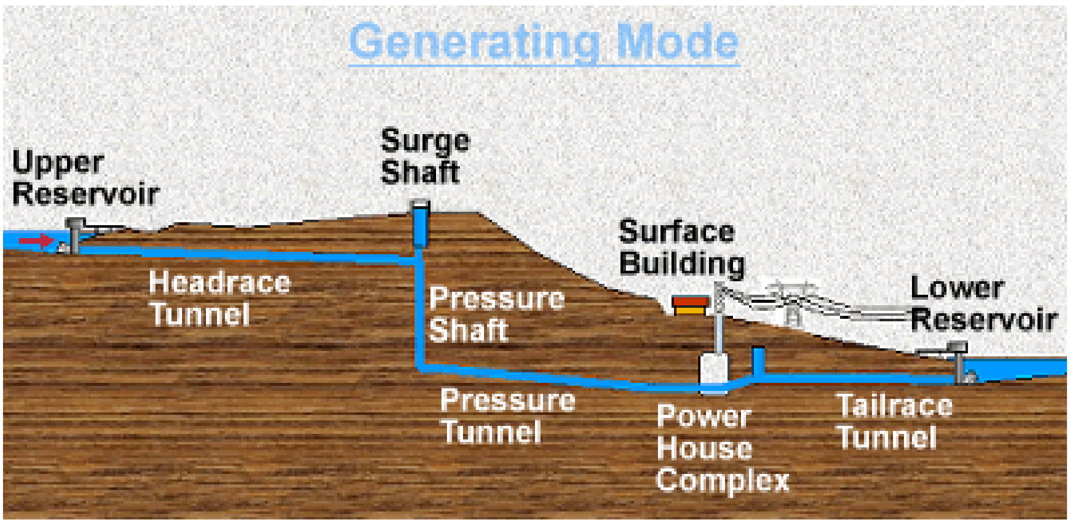

Figure 2.1: Schematic showing a longitudinal view of the components of a pumped storage scheme

Figure 2.2 illustrates the general layout of a typical Pumped Storage Scheme. The diagram is referenced to the Drakensberg PSS, but provides an idea of the typical layout of such a scheme. The detailed layout and design specifications for the proposed SPSS will only be determined at a later stage.

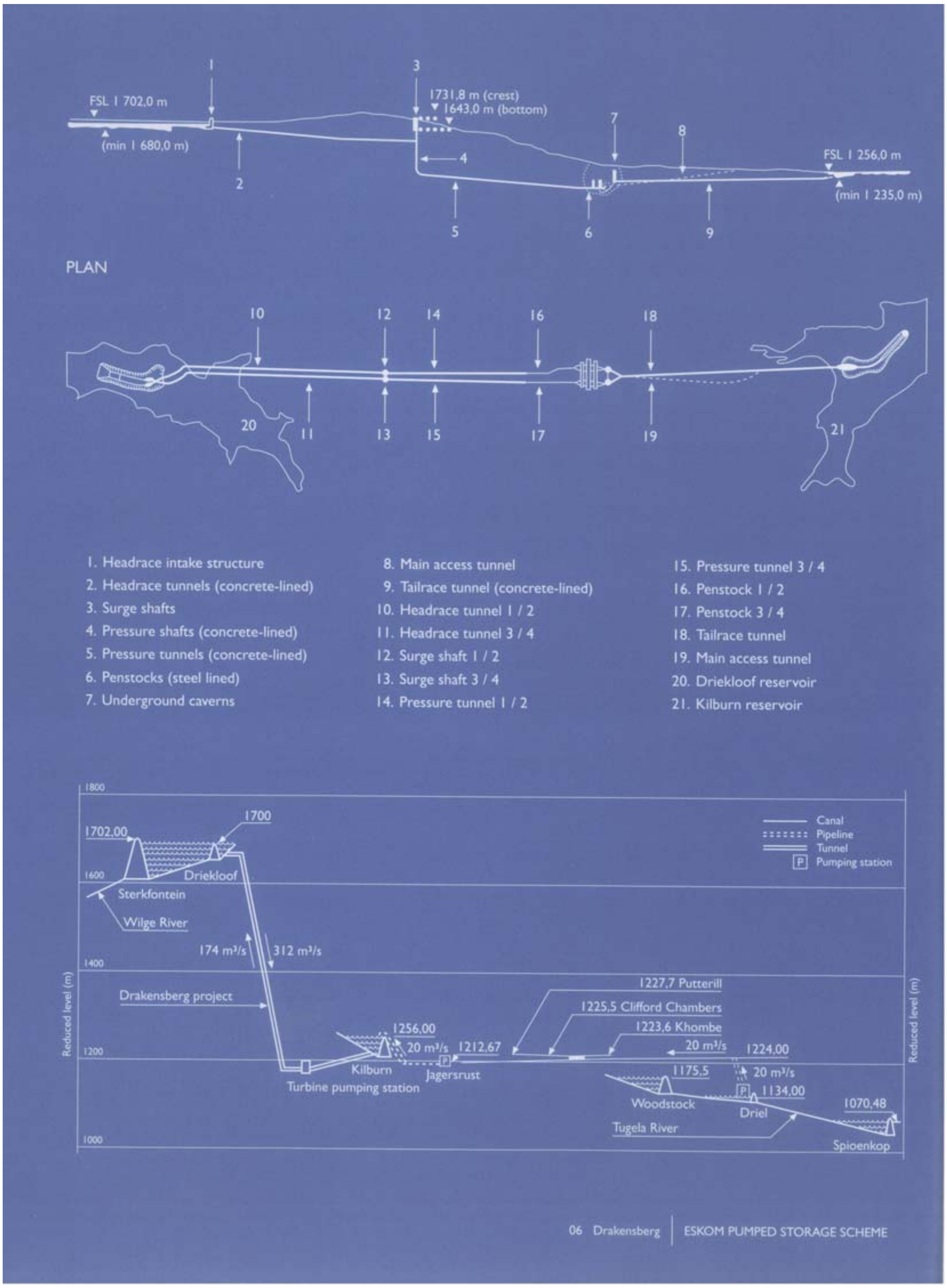

Figure 2.2: General layout and longitudinal section of the Drakensberg Pumped Storage Scheme (source: *Drakensberg Pumped Storage Scheme*, Eskom Generation, 2003) to provide an illustration of the *typical* layout for a PSS.

2.1.1. Reservoirs

The upper reservoir is likely to be a Concrete Faced Rockfill Dam (CFRD) and the lower reservoir will be an Earthfill Embankment Dam, each of which will be capable of storing approximately 16 million cubic meters of water (though the lower reservoir is proposed to be slightly larger than the upper one). The downstream faces of the dam walls are likely to be grassed or vegetated in order to reduce visual impacts.

The upper reservoir is an artificial rockfill dam with a spillway[1] that is sized to accommodate a discharge that can be created by over-pumping. The pumping flow rate has been assumed to be equal to 75 % of the generating flow rate.

The distance between normal water level and the top of a structure that impounds or restrains water, for instance a dam, is known as “freeboard”.

2.1.2. Intake and Outfall Structures

- The invert levels of the intake and outfall structure will be located at a level twice the tunnel diameter below the minimum draw-down level (MDL) in the reservoir.
- These structures are each to be provided with an intake gate for emergency closures and stop-logs for maintenance purposes.
- The intake structure is expected to be integrated into the upper dam.

2.1.3. Underground Tunnel Systems (Waterways)

The upper and lower reservoirs are to be linked by means of underground tunnel systems (waterways) (Fig. 2.3 and 2.4). It is anticipated that concrete linings will be used for all the waterways, except for certain sections where steel linings are provided.

[1] Spillway: A structure designed for controlled discharge of flood water

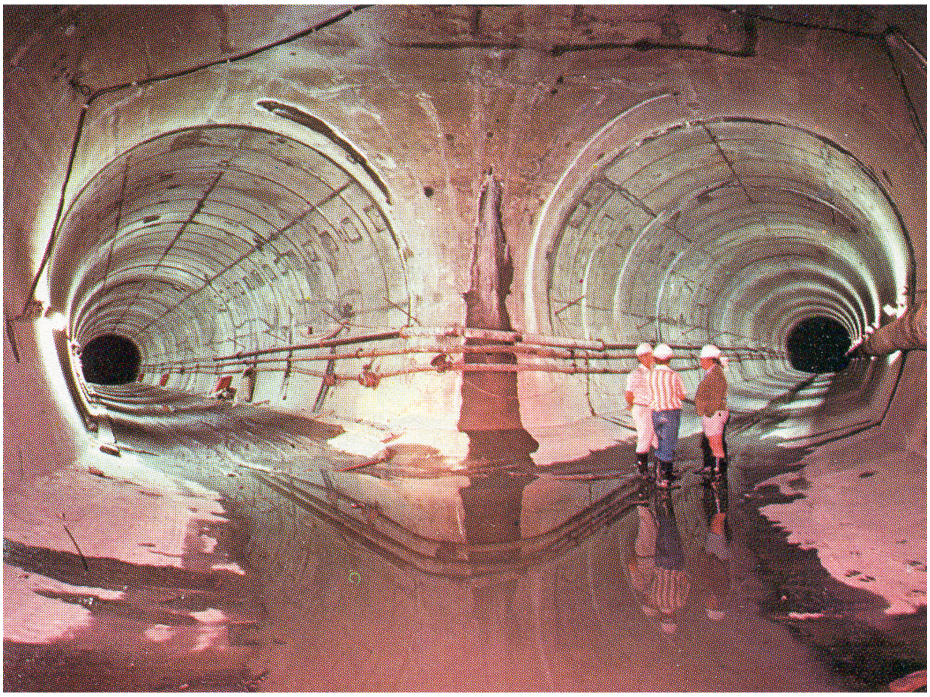

Figure 2.3: Underground tunnel system (waterways) of a typical PSS (source: Eskom)

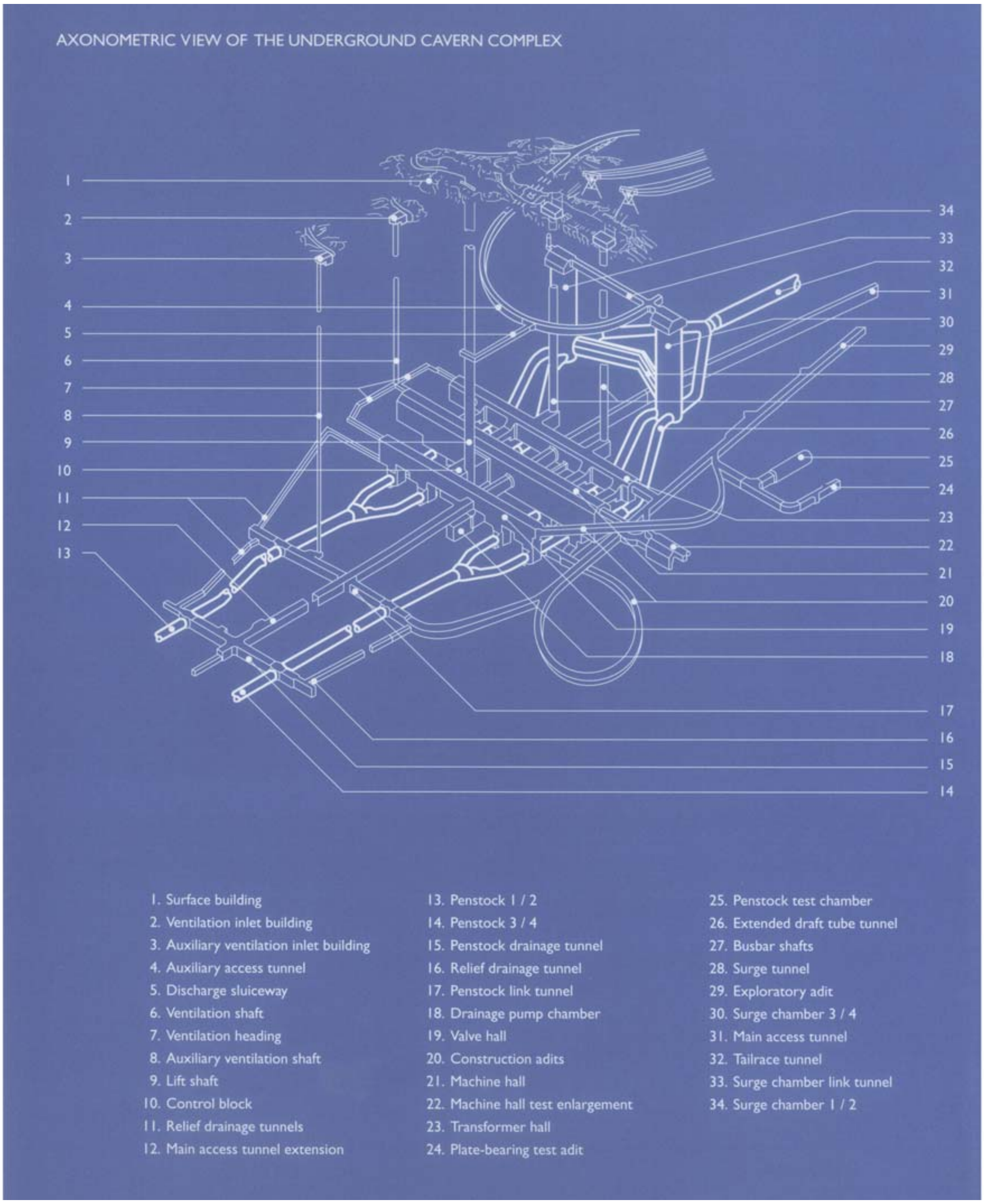

Figure 2.4: Isometric view of a typical underground cavern complex (source: *Drakensberg Pumped Storage Scheme*, Eskom Generation, 2003)

2.1.4. Power House Complex

The underground power house complex would consist principally of two parallel caverns: the *machine hall* and the *transformer hall*.

Initial estimates of the overall equipment dimensions for the various options did not suggest any significant differences among the options. Therefore, the same cavern dimensions were used for all options.

The control block, designed in 4 levels, would be situated between the machine and transformer halls, and would be flanked by a busbar tunnel on each side.

The Supplementary Feasibility Study has revisited the installed capacity of 1000MW (3x334MW) as was initially proposed in the November 2000 Feasibility Study. The new installed capacity is currently proposed to be 1520MW (4x380MW).

2.1.5. Power house complex access

Access to the underground powerhouse complex would be via various access tunnels and construction tunnels, based on the layout.

2.1.6. Access and Site Roads

The final routing of the road network for both the construction and operational phases will be dependent on the final location of the two reservoir sites. In essence there are to be four types of roads that will be required during the construction and operational phases:

- Temporary access roads (during construction)
- Temporary site roads (during construction)
- Permanent access roads
- Permanent site roads

Please refer to Chapter 6 for the specialist traffic impact assessment, as well as an assessment of the anticipated impacts of the construction and operational phase roads. Furthermore, refer to Chapter 6 and 7 for the other specialist studies.

2.1.7. Construction Villages

It is anticipated that two construction villages will be established, *viz.* one near the lower reservoir and the other near the upper reservoir. Alternatives to establishment of the construction at the lower site will be to use the construction village to be constructed for the De Hoop Dam (recently authorized by the Minister of Environmental Affairs and Tourism) by the Department of Water Affairs and Forestry (DWAF), which could become available prior to the commencement of construction of the pumped storage scheme; or to provide housing at the town of Roosenekal

2.1.8 Communication Mast

It is anticipated that two communication masts, each approximately 45m in height will also be constructed as part of the pumped storage scheme infrastructure. One communication mast will be at the upper reservoir and the other mast will be situated at the lower reservoir. Potential impacts associated with the construction of the communication masts will be incorporated into the visual impact assessment, social impact assessment, tourism impact assessment and the GIS mapping aspect undertaken during the EIA phase of the project. The various aspects being considered for further investigation in the EIA phase of the project, may recommend the broad area in which the communication masts could be located, in order to minimize the associated impacts.