Antarctic Treaty Consultative Meeting (ATCM) to be held from 12-23 June 2006 in Edinburgh, UK. The draft CEE will be considered by the Committee for Environmental Protection (CEP).

Following the XXIX ATCM, Belspo will prepare the final CEE. After circulation to and approval by the three Belgian Federal Ministries involved, the Belgian Government will submit the final CEE to the XXX ATCM in June 2007.

1.5. Permits, applications etc.

Belgian activities in Antarctica are regulated by Belgian law implementing the Protocol of the Antarctic Treaty on the protection of the environment (Belgian law of 19 May 2005). It contains provisions on permit requests, regulations regarding the protection of indigenous fauna and flora, the elimination and management of waste, Specially Protected Areas and the prevention of marine pollution. It describes general obligations in case of environmental emergency situations.

Belgian law states that no Antarctic activity by Belgian citizens can take place without a written permit, except in the case of scientific activities authorised by another Treaty Party. The permit can only be delivered if the activity conforms to the provisions of the Environmental Protocol.

The Belgian Federal Ministry of Environment oversees the execution and follow up of Belgian law implementing the Protocol. It sets permit conditions, reviews environmental impacts of the authorised activity and may impose additional obligations and conditions.

The Ministry has permitted the two site survey visits "Belare 2004" and "Belare 2005" in the Sør Rondane region in the framework of the preparations for the construction of the Belgian Antarctic research station. End of Mission Reports including the impact on the environment of the visits were transmitted to the Federal Ministry of Environment 6 weeks after the expedition.

The draft CEE report was approved in January 2006 by the Belgian Federal Ministry of Environment.

1.6. Legislation, standards and guidelines

The Antarctic Treaty (1959), which came into force in 1961, has been developed by the adoption of measures, resolutions, decisions and the negotiation of further international agreements. It is known collectively as the Antarctic Treaty System and includes the Convention for the Conservation of Antarctic Seals (CCAS 1972), the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR 1980) and the Protocol on Environmental Protection to the Antarctic Treaty (Environmental Protocol, 1991).

The Environmental Protocol sets out environmental principles, procedures and obligations for the comprehensive protection of the Antarctic environment and its dependent and associated ecosystems. Belgium ratified the Environmental Protocol in May 1995 and the law implementing the Protocol of the Antarctic Treaty on the protection of the environment was published in the Belgian Official Journal on 19 May 2005.

Additional relevant laws, in line with the sustainability philosophy of the project, include international environmental agreements such as the Convention on Biological Diversity (1993) and the Kyoto Protocol on Climate Change (2005). Ship and aircraft operations fall under a number of international and national regulations including the Convention on International Civil Aviation (Chicago Convention) and the International Convention for the Prevention of Marine Pollution from Ships (MARPOL 73/78). Ships and aircraft will be fully certified in their country of registration.

Relevant resolutions will be followed including Resolution 2 (2004) on Guidelines for the Operation of Aircraft near Concentrations of Birds in Antarctica. Documents and guidelines produced within the Antarctic Treaty System by COMNAP have been used in the preparation of this document. These include guidelines on monitoring and on the preparation of environmental impact assessments (COMNAP, 2005a and b).

1.7. Project management structure

The Belgian government commissioned the International Polar Foundation (IPF-www.polarfoundation.org) to coordinate the design and construction phases of the new Belgian research station between 2005 and 2007, under the supervision of the Federal Ministry of Foreign Affairs and Science Policy. The IPF was also commissioned to find the necessary private funding for the concept and building phase.

The use of sustainable technology as the primary energy source, without compromising functionality, comfort or safety demands, implies an integrated design methodology similar to the one used in applied technology projects (cfr. industry & space). The project management has been structured according to this method.

In the first phase of the project an extensive analysis of Antarctic construction history, including the latest projects that will emerge during the IPY, was conducted. A technology survey identified new and proven technologies appropriate for the project. The outcome of these studies, lessons learned and proven solutions were integrated in the requirements and specifications of the new station.

On the conceptual design level a verification method with four major lines of approach (environment, human factors including safety, technology and cost) is used to evaluate and steer all conceptual decision making. All prime project partners work together from the start of the iterative design process thereby guaranteeing that the different fields of interest are taken care of in a homogeneous way.

The construction and inauguration of the station is foreseen in 2007-2008, on the occasion of the fourth "International Polar Year" (IPY), at the same time being the 50^{th} anniversary of the construction of the former Roi Baudouin base (1957-1959).

Once the station is in place, Belspo will be in charge of management and maintenance of the station and the follow-up of station activities.

2. DESCRIPTION OF THE PROPOSED ACTIVITY

2.1. Location

The new station will be built in Dronning Maud Land, at the foot of the Sør Rondane Mountains. It will be situated 173 km inland from the former Roi Baudouin base, Breid Bay (1958-1967) and 55 km from the former (1986-1992) Japanese Asuka station (**Fig. 1.1 and 1.2**). The nearest stations will be the Japanese Syowa station (684 km) and the Russian Novolazarevskaya station (431 km).

The proposed construction site is situated approximately 1 km north of Utsteinen Nunatak, on a small relatively flat exposed granite ridge (71°57'S 023°20'E). The Ridge - oriented in a north-south direction - is 700 m long, approximately 16 m wide and protrudes 20 m above the surrounding snow surface.

Utsteinen Nunatak is a few kilometres north of the Sør Rondane Mountains. This granite rock consists of two peaks with maximum elevation of 1564 m a.s.l. Around the Nunatak there are some blue ice fields and some surface lakes, which are frozen at the beginning of summer. The SE side of Utsteinen has a large wind scoop.

The construction site is also situated in the exit area of the Gunnestadbreen, one of the major outlet glaciers of the Sør Rondane, giving access to the inland Plateau (Japanese Dome Fuji Station: 765 km; German Heinz Kohnen Station: 807 km).

Once the station is operational, station personnel and scientists will use the DROMLAN air link to access the station and the Sør Rondane region and to bring in small items of equipment. The annual re-provisioning of the station will take place via ship unloading at Breid Bay and overland tractor transport via Romnaesfjellet.

Monitoring research will take place in the vicinity of the station and field research will be carried out at a maximum distance of 200 km from the station, the limit for logistic support. Within this radius one can visit the whole mountain range, up to the polar plateau (Nansenisen) and down the inland slope to Breid Bay (the grounding line and the ice shelf of the continental margin).

2.2. Site selection

2.2.1 Utsteinen selection

Belgian research activities in Antarctica started with the installation of a research station during the IGY in 1957. At that time, the Roi Baudouin base (1958-1967) was situated at the coast in Breid Bay (Eastern Dronning Maud Land) on the ice shelf. Large accumulation rates and ice shelf motion made the construction of a new base necessary in 1964. This second station was eventually closed in 1967. Research activities were concentrated on the coastal zone, but also on the Sør Rondane Mountains, that were extensively studied during that period.

The interest in the area was revived two decades later by the Japanese who, in 1986, installed Asuka Station at the foot of the Sør Rondane Mountains, 173 km inland from the Roi Baudouin base. This station was also built on the snow surface and due to high accumulation rates and strong katabatic winds the base was only active for a period of 6 years before it had to be closed. The strong katabatic winds were coming from major outlet glaciers in the eastern part of the Sør Rondane Mountains. Mean wind speed at Asuka was 12 m/s, creating a constant snow drift, even in summer. At that time, research was primarily focussed on the area near the station and the nearby Sør Rondane Mountains.

Renewed interest in the area, relatively far away from any other research station in Antarctica, revived the idea of a new research station within proximity of the Sør Rondane Mountains. However, in view of the short operational period associated with the Roi Baudouin base and Asuka station, a sustainable solution was sought, i.e. to have a construction on bedrock and not on a snow surface so that it would last longer. Furthermore, the area should be protected from strong katabatic winds. However, from a sustainability point of view, the use of alternative energy as a major power source was preferred. Therefore, the site should have relatively low wind speeds (at least lower than Asuka), but preferably constant and from a more or less constant direction.

It was clear from the beginning that the western part of the Sør Rondane mountain range would be the most suitable area as it is more protected from the fierce katabatic winds and offers an easy and safe access to the polar plateau via Gunnestadbreen, one of the many outlet glaciers through the mountain range.

Prior to the Belare 2004 site survey a number of potential sites were selected within the western sector of the Sør Rondane mountains on the basis of terrain knowledge, satellite imagery, topographic maps and aerial photographs collected by the Japanese Antarctic Research Expedition and on the basis of a number of characteristics, such as accessibility (both by small aircraft and overland traverse), presence of water (either abundance of snow or the presence of supra-glacial lakes), exposed and flat bedrock to enable a stable construction (and not on frozen regolith), protection from katabatic winds.

Utsteinen was found to be a likely candidate. The immediate surroundings of the Nunatak itself are not suited to build a station due to difficult accessibility and a large wind scoop. However geologic field work demonstrated the existence of a small ridge north of this Nunatak that was relatively flat and consisted of exposed granitic bedrock.

Fig. 2.1: View of Utsteinen ridge from Utsteinen Nunatak. Picture looking to the North. The small dots to the left of the ridge are the Belare 2004 expedition camp.

Fig. 2.2: Close-up view of the Utsteinen Ridge and Utsteinen Nunatak in the back.
Picture is looking to the South.

During the site survey the Utsteinen site was found to be particularly favourable because of the following features:

- **Site stability**: the site itself is relatively flat, consisting of weathered granite (no moraine deposits). There is no wind scoop;

- **Local accessibility**: the rock itself protrudes only a few meters above the snow surface and is therefore easily accessible by vehicles. The surrounding area is relatively flat and consists of soft snow; good conditions for small aircraft operations.

- **Global access**: because of its northern position compared to the mountain range, its is closer to any other access route from the coast and Asuka Station, and in the proximity of potential landing sites for bigger aircraft (blue ice fields);

- **Water**: the presence of soft snow guarantees a large supply of water;

- **Wind**: the site receives significantly less wind than the central or eastern part of the Sør Rondane or Asuka Station. The wind direction is constant, although more wind variability might have been expected in such a protected area; the constant direction is an important factor with respect to the use of wind energy as a power source.

- **Access to the Sør Rondane region**: the site lies within the Sør Rondane Mountains and only 5 km from Gunnestadbreen, a major outlet glacier of the Sør Rondane that offers easy and safe access to the polar plateau.

The Utsteinen Ridge has been chosen as the site for the new station because it meets the requirements of the proposed research activities, site conditions and environmental and safety considerations.

An overview of the other potential sites surveyed during the Belare 2004 expedition is given in **Section 3.2.**

2.2.2 Construction site selection

Consistent with the philosophy of the project, solutions are preferred that make best use of the available terrain conditions therefore minimizing impact on the environment during construction (and removal) of the station. The ridge was subdivided in 3 sections: Northern, Middle and Southern:

- **The Northern section** (furthest away from the Nunatak) is more exposed to the wind and has a less favourable orientation versus the prevailing wind. For anchoring, the terrain conditions are similar to the Southern section.

- **The middle section** is the lowest part of the ridge. Only few rock outcrops rise above the surrounding snow. Due to its low position the wind speed in this area is lower compared with the other sections, but the area accumulates more snow. Anchoring conditions are uncertain and the geological characteristics of the ridge are less favourable (highly eroded area). The ridge geometry at the east side (steep slope) would result in very deep sub-surface anchoring points.

- **The Southern section** of the ridge has similar terrain conditions as the Northern section but it has a better alignment versus the prevailing wind (approximately 90°) and is in general more protected against the wind.

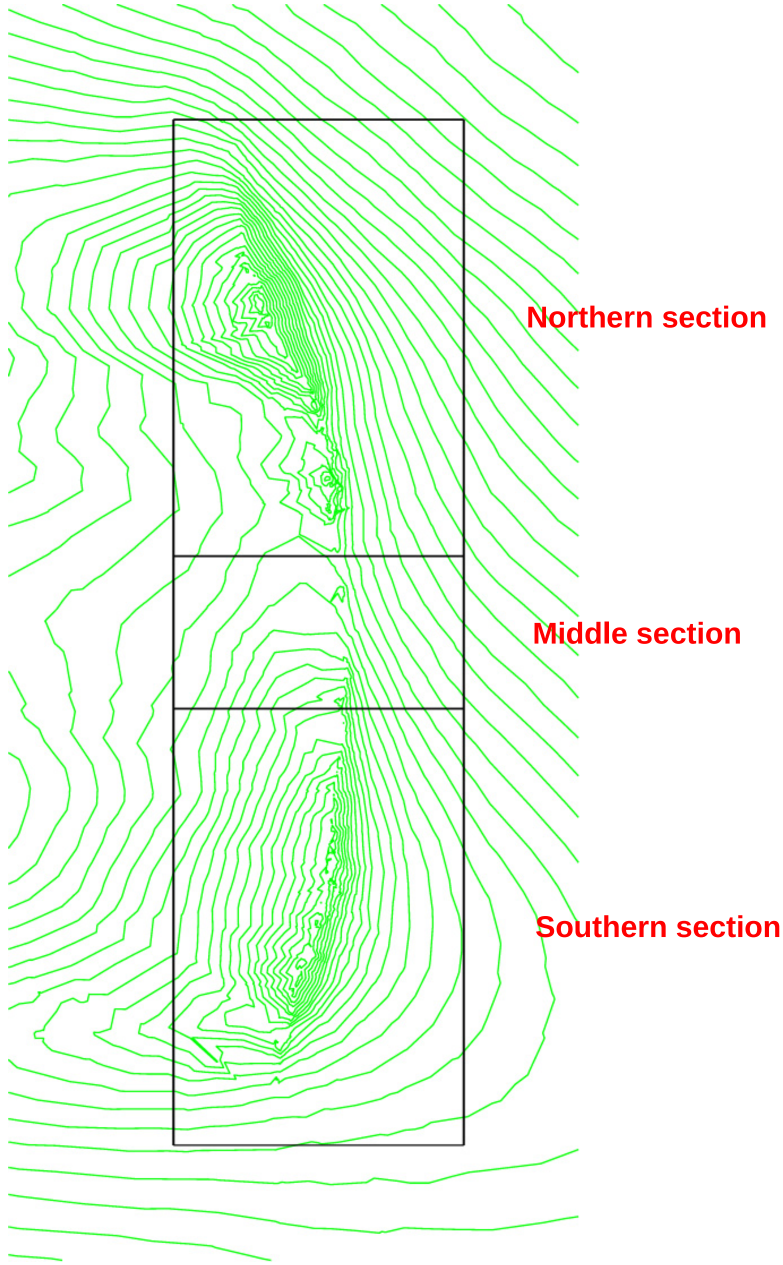

Fig. 2.3: Overview of the different ridge sections (Northern, Middle and Southern section)
(contour interval of 1 m)

Taking into account the parameters mentioned above the decision was taken to focus the survey on the Southern section of the ridge.

A number of possible station areas were identified in the Southern section, which was therefore divided from North to South into 3 sectors (01-03) of 100 m each. All sectors have good anchoring conditions, with sector 03 being slightly less favourable due to its "mixed character": while sectors 01 and 02 consist mainly of big bedrock granite slabs, sector 03 has more permafrost patches and loose material. Sector 02 is best aligned to the prevailing wind direction, has the lowest wind speed and best accessibility due to the regular shaped lee-side and less steep snow surface.

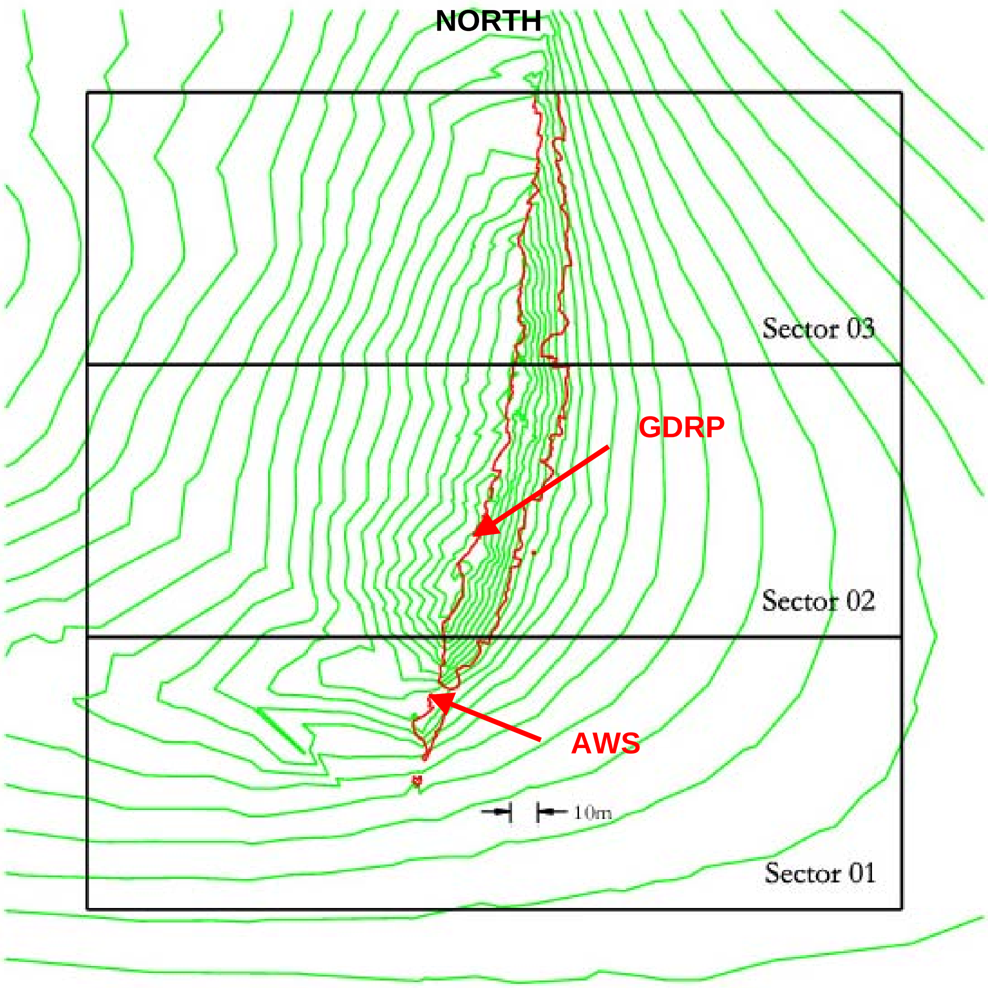

Fig. 2.4: Overview of different ridge sectors in the Southern section.
Ridge building integration study area: sectors 01 to 03 (contour interval of 1 m).
(GDRP = Geodetic Reference Point); (AWS = Automatic Weather Station)

The Northern half of Sector 02 was selected as the preferred station area; it is the best compromise between the major influential parameters:

- Good alignment versus the prevailing wind direction (best available incoming airflow characteristics)
- Wind speedup is less extreme than alternative positions.
- Excellent snow-clearing characteristics will prevent snow accumulation on the building
- Good anchoring conditions with a majority of anchoring points directly on the granite bedrock
- Anchoring points are easily accessible and in the snow-free area (sufficiently big)
- Installing (and removal) of the anchoring points will have minimum impact on the terrain.

2.3. Principal characteristics of the proposed activity

The activities covered by the draft CEE are:

- construction, operation and maintenance of the new Belgian research station,
- building and operation of the temporary camp required during the construction phase,

- transport and movement of cargo and personnel to the station site south of 60°S.

Note that the DROMLAN air-link has not been included in the evaluation and that regarding scientific activities, each scientific project will be subjected to EIA before being allowed to progress.

2.3.1. General specifications of the station

The project consists of the construction, operation and maintenance of the new Belgian station at the Utsteinen Ridge as a station for scientific research and monitoring.

The construction of the station is planned in the austral summer of 2007-2008. In this period the station will be built, system acceptance test will be performed and finally it will be handed over to the Belgian Science Office at the end of the season.

Characteristics of the station:

- Austral summer station: open from November to February.
- Full-year monitoring and remote sensing capability.
- The station is designed for optimal use by 12 people accommodated in the main building.
- The use of a station "extension" will make it possible to accommodate another 8 to 18 people. This extension consists of heated shelters used for sleeping only.
- The station's facilities (kitchen, the sanitary installations, offices ...) are designed to cope with the larger occupation as mentioned above.
- Expected design life: 25 years minimum.
- Accommodation (living, technical, research, storage): 800 m^2.
- There will be laboratory facilities as well as mobile units to be used for field work
- The station has a hybrid design: the main building is above the ground-level and anchored into snow-free rock area. The adjacent garage/storage building is mainly constructed under the surrounding snow surface. Both buildings are inter-connected by a weather protected corridor.
- The activities (construction, operation and decommissioning) will comply with the requirements of the Environmental Protocol. The environmental impact will be minimal.
- The system design of the station is developed based on sustainable technology and high energy efficiency. Nevertheless safety, health, comfort, functionality and cost are equally important design drivers.
- The facilities will use renewable energy as the primary energy source thereby minimising the use of fossil fuels.
- The station will have a comprehensive energy management regime.
- The amount of fuel to be transported to the station will be mainly for vehicles only having a positive effect on logistic operations.
- To assure a constant energy supply 2 back-up generators will be installed.
- The station will have a comprehensive waste management regime.
- The waste treatment will include the treatment of grey and black water and recycling capability for non-potable water applications.
- By design the station has extended upgrade capability. It will be easy to integrate new state of the art technologies. The station will be upgradeable to a full year station with minimal effort.
- The station has been designed for low maintenance.
- Recycling and lifetime maintenance strategies will reduce the running costs.
- The design and layout of the facilities will minimise snow management.
- The building will be designed for easy repair and damage control; a risk contingency plan will be developed.
- The manual handling and multiple handling of all stores and equipment will be minimised across all operations, including annual relief, normal operation and eventual decommissioning of the facilities.