Australian Government

Australian Antarctic Treaty Inspections January/February 2020

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Report of Inspections under Article VII of the Antarctic Treaty and Article 14 of the Protocol on Environment Protection to the Antarctic Treaty

Jang Bogo Station (Republic of Korea)

Inexpressible Island facility (People's Republic of China)

Gondwana Station (Germany)

Taishan Camp (People's Republic of China)

Molodezhnaya Station (Russian Federation)

Mount Vechernyaya - Mountain Evening (Republic of Belarus)

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1. Introduction

1.1. Executive Summary

Between 5 January and 2 February 2020 a team of four Australian observers conducted inspections of six Antarctic stations, in accordance with the provisions of Article VII of the Antarctic Treaty (Treaty) and Article 14 of the Protocol on Environmental Protection to the Antarctic Treaty (Protocol):

- Jang Bogo Station (Republic of Korea), 5 January 2020
- Inexpressible Island facility (China), 5 January 2020
- Gondwana Station (Germany), 7 January 2020
- Taishan Camp (China), 17 January 2020
- Molodezhnaya Station (Russian Federation), 25 January – 2 February 2020
- Mountain Evening Station (Belarus), 27 January 2020

The inspections of Jang Bogo Station, Inexpressible Island facility, Taishan Camp, and Mountain Evening Station were the first inspections conducted of these facilities. The inspection of Molodezhnaya Station was the first on-ground inspection since 1983.

The inspection team was warmly welcomed at all locations, and was provided with full access to all areas, and responses to all queries. All facilities and activities observed were in compliance with the provisions of the Treaty, including with respect to peaceful use and non-militarisation. In conducting the inspections the observer team was guided in part by the inspection checklists adopted under Resolution 3 (2010).

Facilities and activities observed were in general compliance with the provisions of the Protocol, although some opportunities for improvements to operational practices were identified.

The inspection team was pleased to observe innovative approaches to design, operations, efficiency and environmental performance.

At Jang Bogo Station the inspection team noted the significant operational monitoring and automation technologies, use of renewable power generation, science support capabilities, and innovation and high standards in waste management. The construction and operation of the station, and mitigation measures for impacts identified in the environmental assessment process, adhere closely to the final CEE prepared by Korea.

China's Inexpressible Island facility, intended to support activities associated with the development of China's planned year-round station, is compact and well fitted-out. The facility is still undergoing completion, with a number of systems yet to be installed and commissioned. The inspection team understands the current focus of effort to be on completing the existing temporary facility and gathering more detailed information to support decisions about the precise location of the planned year-round station buildings and associated infrastructure.

Gondwana Station has a small environmental footprint, and the buildings and associated infrastructure are in good condition. The station surrounds are free of modification, debris, spills, or other obvious impacts. Since the previous inspection (by Australia in 2011), the station has been modernised, with energy efficiency and renewable energy generation measures evident.

The design of Taishan Camp and its support systems are innovative, and the camp has a small environmental footprint. The inspection team regarded the commitment to renewable energy and battery storage, and planned wastewater treatment systems, as particularly notable. When all planned systems and installations are completed, Taishan will be an effective and comfortable facility for support of China's activities.

Molodezhnaya Station is an extensive complex of buildings, infrastructure, scientific installations, storages and associated materials, many of which are not utilised for the current operations at the station. Environmental issues associated with ongoing deterioration of unused station infrastructure, contaminants, storage of materials including potentially hazardous substances, and wastes were regarded as a concern by the inspection team. As noted in reports of previous inspections by Australia and other Parties, there are significant environmental issues associated with older stations. Reducing the risk of further environmental impacts associated with these facilities poses very substantial logistical and environmental management challenges for many Parties. These issues were evident in the case of Molodezhnaya Station, and in the view of the inspection team, addressing them should be regarded as a priority.

The inspection team members were impressed with the high standard of design and construction of Belarus's Mount Vechernyaya Station, its small footprint and minimal landscape modification, the commitment to efficient energy and water usage, and commitment to scientific research. The inspection team noted that Belarus's plans to commence winter operations are well advanced. The construction and operation of the station, and mitigation measures for impacts identified in the environmental assessment process, adhere closely to the final CEE prepared by Belarus.

This was the tenth inspection program undertaken by Australia since the entry into force of the Treaty in 1961, and the sixth by Australia since the entry into force of the Protocol in 1998. Australia is strongly committed to the inspection provisions of the Treaty and the Protocol. Australia first conducted inspections in 1964, and had most recently conducted inspections in 2016.

In accordance with Article 14(4) of the Protocol, copies of the reports were provided to the Republic of Korea, China, Germany, the Russian Federation and Belarus for comment. Details of comments received are included in this report for each facility inspected.

1.2. Background

Article VII of the Antarctic Treaty (the Treaty) provides that each Consultative Party has the right to designate observers to undertake inspections in Antarctica. Observers have complete freedom of access at any time to any and all areas in Antarctica, including stations, installations and equipment, and all ships and aircraft at points of discharging or embarking cargoes or personnel in Antarctica. The provision for inspection is a key element of the Treaty

and is designed to promote the objectives of the Treaty and ensure observance of its provisions.

Article 14 of the Protocol on Environmental Protection to the Antarctic Treaty (the Protocol) also provides for the conduct of inspections, consistent with Article VII of the Treaty, to promote protection of the Antarctic environment and ensure compliance with the Protocol. The Protocol requires that reports of inspections are sent to the Parties whose facilities are subject to inspection and that, after those Parties have been given the opportunity to comment, the report and any comments on it are circulated to all Parties and the Committee on Environmental Protection, considered at the next Antarctic Treaty Consultative Meeting, and then made publicly available.

1.3. Inspection team and itinerary

The Australian inspection team conducted inspections in the period from 5 January to 2 February 2020. The inspection team comprised:

- Mr Kim Ellis, Director, Australian Antarctic Division (Inspection Team Leader)
- Mr Justin Whyatt, Legal Adviser, Department of Foreign Affairs and Trade
- Dr Phillip Tracey, Policy Adviser, Australian Antarctic Division
- Mr Christian Gallagher, Field Leader, Australian Antarctic Division

Inspection team, Gondwana Station

In accordance with Article VII of the Treaty, and consistent with Decision 2 (2019) of the Antarctic Treaty Consultative Meeting, the Parties were notified of the appointment of observers, via the Secretariat of the Antarctic Treaty in ATS Circular 27/2019 (20 December 2019). The activities of the inspection team in Antarctica were subject to prior environmental impact assessment, and an authorisation in accordance with sections 12E and 12F of Australia's *Antarctic Treaty (Environment Protection) Act 1980* which implements the obligations of the Protocol in Australia's domestic law.

The inspection team travelled to Antarctica on a United States Antarctic Program (USAP) flight from Christchurch to McMurdo on 2 January 2020, as part of a broader *quid pro quo* logistics sharing arrangement between the Australian Antarctic Division (AAD) and the USAP. The USAP kindly provided accommodation for the team's transit, and deployed the team to Italy's Enigma Lake Skiway near Mario Zucchelli Station on a USAP twin otter flight on 4 January 2020.

Accommodation, local area transport, and helicopter transport for the conduct of inspections in the Terra Nova Bay region was kindly provided by the Italian National Antarctic Program. Jang Bogo Station (Republic of Korea) was inspected on the morning of 5 January. Inexpressible Island Facility (China) was inspected on the afternoon of 5 January 2020.

Gondwana Station (Germany) was inspected on 7 January 2020. The team visited the site of Italy's gravel runway under construction at Boulder Clay near Mario Zucchelli Station on 6 January 2020.

AAD's Basler BT67 ski-equipped aircraft and three aircrew met the team at Mario Zucchelli Station, using the Browning Pass Skiway. The team flew to Australia's Casey Station on 14 January, for an overnight stay, and on to Australia's Davis Station on 15 January.

The team flew from Davis Station to China's Taishan Camp for an inspection visit on 17 January. The team returned to Davis Station the same day.

The team travelled via Australia's Mawson Station, and on 25 January continued to Molodezhnaya Station (Russian Federation).

The Russian Antarctic Expedition kindly provided accommodation for the team and aircrew, and ground transport to and from the skiway. Inspection activity at Molodezhnaya spanned the period 25 January to 2 February, with weather delays contributing to a longer than planned visit. AAD's Basler BT67 remained at the Molodezhnaya skiway for the duration of the stay.

An inspection of Belarus' Mount Vechernyaya Station was carried out on 27 January. Oversnow transport to and from Molodezhnaya Station was kindly provided by the Belarusian Antarctic program.

The team returned from Molodezhnaya Station to Davis Station on 3 February, and following weather delays, onwards from Davis Station to Casey Station on 15 February as part of the AAD's scheduled passenger movements, then departed Antarctica on a scheduled Australian Antarctic program C17 flight from Wilkins Aerodrome to Hobart on 27 February.

In addition to the inspections, the Australian officials visited Scott Base on Ross Island on 3 January, and made official visits in the Larsemann Hills area on 23 January, to China's Zhongshan Station, Russia's Progress Station, and India's Bharati Station.

1.4. Acknowledgements

Australia is grateful to the Italian National Antarctic Program and personnel of Mario Zucchelli Station, the Russian Antarctic Expedition and personnel of Molodezhnaya Station, and the United States Antarctic Program and personnel of McMurdo Station, for logistic support and the generous hospitality provided to the inspection team.

The inspection team would also like to thank personnel at all other stations visited, as well as the pilots and air crew of the Australian, United States, and Italian national programs, for their companionship, professional skills, and valuable assistance. Particular gratitude is extended to the team operating AAD's Basler BT67.

2. Jang Bogo Station, Republic of Korea: 5 January 2020

2.1. Summary

Jang Bogo is a relatively new station, with high quality facilities. The inspection team noted the station's significant operational monitoring and automation technologies, use of renewable power generation, science support capabilities, and high standards of waste management including use of innovative approaches.

The inspection team members were impressed with the design and construction features, including those intended to reduce or mitigate environmental impacts, resulting in a relatively small footprint and limited landscape modification. The station environs were free from debris, and items stored outside were well secured. Equipment, including critical systems, was maintained to a very high standard. The station has significant science support capabilities for station and field science programs.

Environmental practices were of a high standard. Station personnel showed good awareness of the requirements of the Treaty and Protocol, including requirements for permits for entry of ASPAs, and environmental authorisations. The construction and operation of the station and mitigation measures for impacts identified in the environmental assessment process, adhere closely to the final CEE prepared by the Republic of Korea.

The station and activities observed were, in the view of the inspection team, consistent with the fundamental obligations of the Treaty with respect to peaceful use and non-militarisation, and with the provisions of the Environmental Protocol.

Jang Bogo Station has not previously been inspected. Members of an Australian inspection team visited the proposed station site in 2011, and considered the site to be an appropriate location for a station in terms of accessibility and environmental features.

2.2. General information

Jang Bogo Station is located at 74°37.4'S, 164°12.0'E in Terra Nova Bay, Northern Victoria Land, in the Ross Sea region of Antarctica. The year-round station was inaugurated in 2014, and is operated by the Korea Polar Research Institute (KOPRI), under the Ministry of Oceans and Fisheries of the Republic of Korea.

The station is located close to the coast on the ice-free Cape Möbius in Gerlache Inlet, bounded by the Campbell Glacier to the north, and by Mount Browning and the Northern Foothills to the west. Gondwana Station (Germany) is located around 2km away. Italy's Mario Zucchelli Station is located around 7km southwest across Gerlache Inlet, and China's facility on the site of its proposed year round station on the southern end of Inexpressible Island is some 35 km to the south. The location provides access routes to the glaciers of Northern Victoria Land and ultimately the inland plateau.

At ATCM XXXIII in 2010 the Republic of Korea announced plans to establish a new year-round research station in the Terra Nova Bay region (ATCMXXXIII/IP54). A draft Comprehensive Environmental Evaluation (CEE) for the proposed construction and operation of Jang Bogo Station was considered by ATCM XXXIV in Buenos Aires, 2011 (see ATCM XXXIV/WP42 and IP19). The Republic of Korea prepared and circulated a final CEE in April 2012, and advised the Parties of its decision to proceed to proceed with the construction. Details of the final CEE were also provided to ATCM XXXV in Hobart in 2012.

2.3. Inspection visit

The inspection team visited Jang Bogo on the morning of 5 January 2020. The team was met by the Station Leader Dr Tae Jin Choi and key station personnel. The team was warmly welcomed on station and was able to freely access all buildings and areas requested. Information in response to all of the team's enquiries was provided. Dr Choi provided a comprehensive presentation on the station and its operations. The team then inspected the station complex, in the company of the station leader and key station technical and operational personnel. The team inspected areas of the main building including the operations/control room, science laboratories, public spaces, mess, kitchen, recreational/exercise areas, briefing room, medical suite, accommodation, fire control and response arrangements, offices, and the greenhouse. Separated buildings including the services building (generators, water production, wastewater treatment, waste management); garages/workshops; and warehouses were inspected.

The team also examined the general station area and external infrastructure, including fuel storages (permanent tank and Isotainers), site services, bunded drum storages, automated balloon launch facility, helipads and helicopter refuelling, traverse vehicles and sleds, plant and vehicles.

In conducting the visit the team had reference to the final CEE for the construction and operation of the station, including the description of the station and its operations, and the mitigation measures outlined for its ongoing operation.

The information contained below is based on first hand observations of the inspection team as well as information provided by the station leader and expeditioners/officials.

2.4. Observations

2.4.1. Station operations

Station personnel advised that the station is functioning effectively and as planned. The station capacity is around 65, with up to 80 accommodated for short periods. No military personnel are used in support of the station's activities. The station leader advised that there are no current plans for extensions or changes to the station.

The inspection team noted in particular the integrated operations room, which caters for observation of the station and surrounds, operational coordination, radio and communications, flight following, personnel tracking (via personal tracking beacons), and monitoring of station functions through a comprehensive building control system. The inspection team was also briefed on emergency procedures and shown response manuals for incident management.

Photo: Integrated operations room

Systems monitoring through the operations room includes fuel tank levels, power generation, and water systems. A closed circuit television system with 47 cameras assists with fire monitoring, safety and operations control.

The inspection team noted that inland traverse activity, using heavy tractor trains to support ice core science is a major emphasis of the operational program. The inspection team

observed traverse vehicles and sleds, and was shown the intended traverse route. The station leader advised that traverse operations had occurred from late October to early December.

The station is supported by the KOPRI vessel ARAON, which makes 2 to 3 visits per year. Cargo is unloaded onto sea ice for transport to station, or transported via barges to a concrete pier. A minimal network of roads and routes services the station area.

Logistic cooperation with Italy, New Zealand and the United States also supports activities at Jang Bogo, with some material transported using Italian ship support, air transport of personnel on Italian Antarctic program flights, and via New Zealand and US Antarctic program flights through McMurdo Station. The station operates up to 4 helicopters from October to March. Two helicopters are stored in a garage/hanger area over winter, to permit early and late season operations. The station operates a range of vehicles which were observed to be in good order.

Photo: Traverse sleds

2.4.2. Construction

The station includes 16 buildings covering 4661m2, centred on a primary four-story building of three wings, elevated from the ground on piers. The building designs are intended to reduce snow accumulation, and the inspection team noted the absence of snow banks, drifts and blizzard tails. The buildings were in very good condition, and appeared to be well designed and maintained. The inspection team noted the very considerable investment involved in establishing a year round station of this scale and quality. The inspection team regarded the station to be of an innovative and modern design, incorporating many unique

design features, which is well suited to year round operations and support of Antarctic science and field activities.

The primary building includes an operations/control room, science laboratories, public spaces, mess, kitchen, a briefing room, medical suite, accommodation, gymnasium, offices, and a greenhouse. The building is spacious and provides a high standard of living and working.

Other buildings, including the powerhouse, warehouses and garages, emergency power and living buildings, and a meteorological building, are arranged in a radial pattern around the main building. Other infrastructure includes a dock close to the station with a nearby complex of buildings, fuel storages, wind power generators, scientific aerial installation and a walk-up research/observation tower. Site services racks between buildings were inspected, and were well designed and maintained, in good condition, and protected from inadvertent vehicle damage.

Photo: Jang Bogo station complex

The station supplements stored food with an internal greenhouse facility in the primary building, which can provide up to 5kg of vegetables per week. This innovative feature provides a backdrop of greenery and light with a pleasing ambience (behind glass in a controlled environment) in the main living areas. The team was briefed on the management access control arrangements for the facility. No issues with non-native species have been encountered.

Photo: Greenhouse in main building

2.4.3. Science activities

The team was advised that there is a high level of demand from scientists for access to the station. In the winter period around one third of the station population are scientists, with a higher proportion in summer. The team was provided with a briefing on the science activities supported by the station, and toured the science wing of the main building. Areas of focus include life sciences, geology and meteorite research, geophysics (supported by a geophysics observatory), atmospheric science (supported by atmospheric chemistry, boundary layer, and radiosonde observatories), meteorology, upper atmosphere and space science (supported by a space weather observatory), and oceanography.

Photo: Science laboratory

The inspection team examined the laboratories for atmospheric and meteorological research, geology and meteorites work, and life sciences / biology. Good laboratory waste management practices were observed, and chemical spill kits were noted. The inspection team was also able to see the automated balloon launch facility, adjacent to the meteorological building. In addition to science facilities directly associated with the station, the station provides logistic support for field science, with helicopter and traverse support, including in support of a planned deep ice coring project on the plateau.

Photo: Automated balloon launching facility

2.5. Environmental management

Based on briefings, observation and documents sighted, the inspection team assessed that the station is being operated with close attention to the Protocol and to general environmental performance, and that personnel were aware of obligations and requirements. In briefing the inspection team, the station leader described pre-departure expeditioner training, which includes one week on safety, and one week on environmental issues. The station leader noted that there are 5 Antarctic Specially Protected Areas within 400km, and advised that around 10 permits had been issued last year for ASPA entry. The inspection team was provided with information monitoring of indicators for environmental and ecological contamination from station operations. KOPRI has produced environmental monitoring reports since 2015 which are publicly available, and the inspection team were shown a copy of one.

The inspection team had reference to the mitigation measures outlined in the ROK's final CEE for the construction and operation of the station, and where possible sought to verify these during the inspection.

Station personnel showed good awareness of the requirements of the Treaty and Protocol, including requirements for permits for entry of ASPAs, and environmental authorisations.

2.5.1. Waste management

Waste collection and separation systems were observed in all relevant areas of the station, and waste recycling stations were in use in public areas.

Photo: Recycling station

The team observed the collection system for kitchen scraps and food waste, and was advised that food waste was around 60-70l per day in summer and 70l per week in winter. In the services building, the team saw a food waste dehydrator in operation, in which food wastes

are heated for 19 hours at 190°C, to remove moisture and minimise the volume of solids for removal from Antarctica. The system appeared to be operating effectively, and solid residues were observed to be ash-like particles. A waste compactor unit for baling other wastes was also in use. No outside/uncovered storage of waste was observed.

Photo: Food waste dehydrator

2.5.2. Water management

The services building includes a reverse osmosis desalination system for the station, which is capable of producing 20 tons per day. The intake for saltwater was observed close to the pier. The team was advised that brine from the reverse osmosis process is discharged to sea close to the pier, as is treated wastewater. Storage tanks for fresh water, as well as for firefighting were observed. A snow melter was also observed. Water production systems were in very good order.

Photo: Reverse osmosis desalination equipment

The inspection team observed the wastewater treatment plant in operation in the services building, and it appeared to be maintained in very good order. The system involves 9 stages, and can treat 20 tons per day. Treated wastewater was drawn from the end stage of the system and shown to the team, and it was clear in appearance and odour free. This is discharged to the sea.

Photo: Wastewater treatment plant

2.5.3. Energy management

The station is powered by a combination of diesel power generators and renewable energy (solar photovoltaic and wind power). A combined heat and power system is in place to capture and use waste heat from generators for water and building heating.

The inspection team toured energy generation and management systems in the services building. Three 275kw generator sets were in operation, and appeared to be in very good condition. There were no signs of any fuel spills or seepages. The inspection team observed a large solar panel installation on the northern side of the services building, and two inverters inside. Station personnel advised that the installed solar capacity was 45kWh. Three wind generator towers were seen, with integrated braces (rather than guy wires), each with multiple vertical turbines. The station leader informed the inspection team that around 25% of the station's energy was provided by solar power. The inspection team was advised that wind energy production had been less than anticipated due to low wind speeds and intermittency. Kitchen cookers were operated with bottled gas.

Photo: Solar array on services building

Photo: Vertical axis wind turbines

2.5.4. Fuel handling and storage

No signs of fuel spills or leaks were observed. The station fuel infrastructure appears to be of a high standard of design and maintenance, and in good condition. Nine large storage tanks were observed, 6 close to the station powerhouse, and 3 close to the pier. Bulk fuel storage was in double skinned tanks with concrete bunding. Station personnel advised that fuel transfer from ship to shore is via barges using Isotainers.

Bunds were well sealed. Fuel lines were well constructed, designed to avoid vehicle damage, and insulated. Station personnel advised that 500 tonnes of fuel is in bulk fuel storage. Isotainer fuel tanks are used for aviation fuel, with 100 tonnes maintained. An isotainer with aviation fuel, on a trailer, was observed near a refuelling/workshop helipad.

Photo: Bulk fuel storage

Smaller fuel tanks, including in garage areas, also had concrete bunds. Spill kits were in place. The station control room provides live information on fuel systems and storages to allow monitoring. The inspection team was shown a copy of the station's fuel spill contingency plan, in the Station Leader's office.

2.6. Provision of the report to Korea for comment

- A report of the inspection was provided to Korea for comment, in accordance with Article 14(4) of the Protocol on Environmental Protection to the Antarctic Treaty.
- Korea provided some minor editorial comments and corrections, which have been incorporated in the text of the report.

3. Inexpressible Island facility, People's Republic of China: 5 January 2020

3.1. Summary

Inexpressible Island is a small temporary facility, intended to support the development of China's planned year-round station on Inexpressible Island. The containerised buildings are compact and well fitted-out, providing a comfortable and modern facility. The facility is still undergoing completion, with a number of systems yet to be installed and commissioned. The inspection team was impressed by the quality of the facility given the short period that it has been under construction.

Following discussions with the station leader, the inspection team understands the current focus of effort to be on completing the existing temporary facility and gathering more detailed information to support decisions about the precise location of the planned year-round station buildings and associated infrastructure.

The station and activities observed were, in the view of the inspection team, consistent with the fundamental obligations of the Treaty with respect to peaceful use and non-militarisation.

This was the first inspection activity undertaken of the facility.

3.2. General Information

China plans to construct a year-round station on Inexpressible Island at the site of the temporary facility at 74°55′S, 163°42′E. The island is located in Terra Nova Bay in Northern Victoria land, and has extensive ice free coastal areas. The south-eastern coast of the island is open to the sea ice and waters of Terra Nova Bay, while the west coast adjoins the Nansen Ice Shelf. China's temporary station is located on a rock and gravel coastal terrace in a small

embayment on the south-east coast, beside a ridge and headland. The location is approximately 29 km from Italy's Mario Zucchelli station and about 38km from Korea's Jang Bogo station.

China circulated a first draft CEE for the proposed construction and operation of the station in January 2014, which was considered by the CEP and ACTM. China circulated a revised draft CEE in January 2018. In that draft, China advised parties it had further assessed the possible impacts on a coastal penguin colony, and changed the location of the proposed station to a site a further 2km south, placing it some 3.5km from the southern boundary of the colony.

According to the revised draft CEE, the proposed year-round station will include central accommodation buildings, research facilities, and maintenance and operation facilities, with a building area of 5500m². The station life will be 25 years. When completed it will accommodate up to 80 personnel in the summer and 30 over winter.

China has not yet submitted a final CEE for proposed station. When the draft CEE for the proposed new station was considered at the 2018 ATCM, China advised that a separate environmental assessment had been prepared for the transportation of vehicles and other equipment (including containers) to the site. As far as the inspection team could determine, construction of the new station is yet to begin. In the interim, China has constructed an operating summer facility at the site. This report covers the existing facility.

3.3. Inspection visit

The inspection team visited the facility on Sunday 5 January. The team was warmly welcomed at the station and was provided with access to all areas requested, and responses to all questions. Upon arrival, the station leader and station expeditioners met with the inspection team and provided information about the operation of the facility and key activities being undertaken. The inspection team then undertook a tour of the facility.

The information contained below is based on first hand observations of the inspection team as well as information provided by the station leader and expeditioners/officials.

3.4. Observations

3.4.1. Station operations

At the time of the inspection, the station team had been on site for around five days. The intention was for operations to continue for several weeks, before departure in early February. There were 21 Chinese expeditioners on-site: six scientists, 10 personnel for logistics and operations, and five personnel conducting site-related research.

Personnel and equipment are transported to the station via ship (this year, the Chinese icebreaker Xue Long). Equipment and personnel are offloaded by barge and helicopters.

Some heavy machinery was located on-site, which had been engaged in snow and ice clearing, preparation of the wharf, container and equipment movement, and some track and site preparations, including on the hill behind the station, for a wind turbine and installation of solar panels.

Crew from China's icebreaker *Xue Long* had recently visited Italy's Mario Zucchelli station but there had otherwise been limited engagement with the Italian Antarctic program. There had been some engagement with ROK's Jang Bogo station on weather services.

Photo: Inspection team with Station personnel

3.4.2. Construction

The facility was constructed over a period of approximately three weeks in 2017-2018. It consists of a main building, with modular, containerised design, and associated containers with services including power generation, water production, kitchen, toilet and waste, fuel, and storage. A number of systems and buildings are not yet complete or commissioned. The buildings are new and in good condition, as are the service containers. The main building sits above a levelled gravel road which runs down to a rock and ice platform used as a wharf.

Photo: Main building, and containers housing power generators

The team inspected the main building, with accommodation, offices, and a mess and kitchen (the kitchen was not yet in operation). Containers with generators; fuel; toilet facilities; water treatment (reverse osmosis) equipment; and a containerised temporary kitchen were also examined. Storage containers with construction equipment, wastes, and other general materials were noted.

Photo: Storage containers opposite main building

3.4.3. Science activities

The inspection team was advised that, in the current season, activity at the station included research science relating to the nearby penguin colony, geology, and the origins of the island. In addition, applied science was underway, related to the site and proposed year-round station, to support decisions regarding its construction.

There was no international scientific collaboration at the site, given the nature and scale of facilities and their recent construction. China's revised draft CEE notes the potential for future science collaboration associated with its proposed year-round station.

3.4.4. Waste management

The inspection team observed a container in which general waste was well secured. The collection of food waste in 210 litre drums adjacent to the temporary kitchen facility was also seen. The team was advised that all waste is returned to China via ship.

Photo: Temporary kitchen with kitchen waste drums

Photo: Waste storage container

3.4.5. Water management

A separate water treatment container for a reverse osmosis system is in place, for fresh water production. Water lines run from the shore to this container, and then on through a culvert under the road area to the area of the main building. A reverse osmosis system is in the process of being installed and tested. In the interim the station is supplied with bottled water.

Photo: Reverse osmosis system

A containerised toilet facility provided tank storage underneath a raised toilet room, for the collection of human wastes for removal from Antarctica.

Photo: Toilet facility

3.4.6. Energy management

Two diesel generators (one operating while the other acts as an alternate) are located in a container next to the main building.

Photo: Diesel generator

A single wind-turbine is located on the hill behind the station. The inspection team was advised that this was being tested, and has not yet been integrated into the facility's systems. The team observed site works on the hill above the facility, and was advised that work was underway to install solar panels for power generation.

Photo: Wind turbine installation

3.4.7. Fuel storage and handling

Two 20,000 litre single-skinned isotainer fuel tanks are located close to the generator container. These connect to the generators by a rubber fuel hose run over the ground. A spill kit was located near the fuel tanks. There was no evidence of fuel spillage on-site. The inspection team noted that the current fuel handling arrangements appear to be temporary in nature. Nonetheless, the use of rubber fuel lines in vulnerable locations and single skinned containers poses increased risk of fuel spills. As the facility is further developed, attention to enhanced fuel infrastructure, systems and procedures, including secondary containment would be warranted.

Photo: Fuel tanks

3.5. Provision of the report to China for comment

- A report of the inspection was provided to China for comment, in accordance with Article 14(4) of the Protocol on Environmental Protection to the Antarctic Treaty. China provided no comments.

4. Gondwana Station, Germany: 7 January 2020

Photo: Gondwana Station main building with 2016 extensions and modernisation

4.1. Summary

Gondwana Station is a small seasonal complex on Gerlache Inlet in Terra Nova Bay, operated by the Federal Institute for Geosciences and Natural Resources as a logistic base for field parties. The inspection team conducted an external examination of the station, which was unoccupied for the season. The buildings and associated infrastructure are in good condition and the station surrounds are free of modification, debris, spills, or other obvious impacts. Since the previous inspection (by Australia in 2011), the station has been modernised, with the addition of a service building, installation of renewable energy / solar heating systems, and removal of pipelines.

The inspection team members regarded the station as a good example of a relatively low impact small seasonal facility, with a small footprint, that could be readily removed and rehabilitated when no longer needed or at end of life. The team was impressed by the modernisation of the station, including the use of renewable energy and heating systems, and by the removal, without leaving obvious trace, of previous infrastructure such as water pipelines.

The inspection team identified no breaches of obligations under the Antarctic Treaty or the Environmental Protocol.

4.2. General information

Gondwana Station is located at 74°38'S, 164°13'E, close to the coast on the ice-free Cape Möbius in Gerlache Inlet, Terra Nova Bay, Northern Victoria Land, in the Ross Sea region of Antarctica. The cape is bounded by the Campbell Glacier to the north, and by Mount Browning and the Northern Foothills to the west. Jang Bogo Station (ROK) is located approximately 2km away. Italy's Mario Zucchelli Station is located approximately 6km away across Gerlache Bay. The station is serviced by ship or fixed wing aircraft using the sea ice

runway and skiways. There is ready access to other ice free areas, nearby stations, and field sites over sea ice, snow and land surfaces. Helicopters are also used.

Germany established the first building on the site in 1983 and upgraded the facility to a summer station in 1988/89. The station was modernised further in 2016. The station is operated by the Federal Institute for Geosciences and Natural Resources as a logistic base for field parties, and is active only in some summer seasons.

Gondwana Station was previously inspected by Australia in 2011, and by the United States in 1988/89. The observations made by the inspection team below have been compared where appropriate with those of Australia's previous inspection.

4.3. Observations

The inspection team visited the station on 7 January 2020. Prior to the inspection activity, Germany advised Australia that Gondwana Station would be unoccupied at the time of the inspection visit, and that buildings were locked. The inspection was limited to the exterior of the station as a result. The inspection team was able to examine aspects of the modernisation and extension completed in 2016.

The station is located on a coastal gravel terrace on gently sloped terrain. The area was snow free at the time of the inspection.

The station consists of a main building constructed from container units, elevated on timber footings, which includes a workshop, food store, kitchen, mess and sanitary rooms, a radio room, a lounge and rooms for scientific programs. Storage facilities and a separated elevated fiberglass hut are adjacent to the main building. Tents are used for sleeping quarters. The station can support up to 30 people.

The inspection team examined the exterior of the buildings, external systems and equipment, and viewed some interior equipment through windows. All buildings appeared to be of a high quality, and were intact and well secured.

Following the 2016 modernisation, a new services and ablutions building adjoins the main building. A nearby separate power generation and energy distribution building has replaced a previous building, on the same site. The main building has been renovated and painted, and a small deck has been added. A small plywood sauna building has been constructed close to the main building, overlooking Gerlache Inlet.

Photo: Power and energy management building

Photo: External fuel tank on power building, and drums on spill containment pallet

The 2016 modernisation also included systems for power generation and renewable energy distribution, waste management, waste water and sewage treatment systems, and desalination. Photovoltaic panels are mounted on the new building units, and an energy management and distribution unit was observed in the power building. Small generators were also observed in the power building. Solar thermal air heating (9 vertically mounted panels which incorporate thermal collectors and small solar powered air fans) is also in place.

Photo: Solar thermal air heating panels on main building

An external toilet hut, identified in Australia's previous inspection report, is no longer at the site. Two water pipelines from the station to bays on either side of the headland have been removed, with no obvious signs of their presence remaining.

Photo: Sauna facility overlooking Gerlache Inlet

A small external tank on the power building adjacent to the generators, likely for generator fuel, was in in good condition. Seven 200 litre drums were secured nearby, on a spill containment pallet.

Some equipment, including a small conveyor, possibly to assist with snow melting, and a small wheel mounted stainless water or wastewater tank unit, was well secured near the buildings.

Building and other materials were stored under and around the buildings, and were well secured, either tied down or weighted with rocks.

The surrounding environment was free from any debris, loose materials, or signs of contamination or spills.

A few Adélie penguins were observed on the ice below the sauna building. Skuas were present in the rocky outcrops immediately south and east of the station buildings. No other wildlife was seen.

Photo: Stored materials secured with rocks

4.4. Provision of the report to Germany for comment

- A report of the inspection was provided to Germany for comment, in accordance with Article 14(4) of the Protocol on Environmental Protection to the Antarctic Treaty. Germany provided no comments.

5. Taishan Camp, People's Republic of China: 17 January 2020

Photo: Taishan main building

5.1. Summary

Taishan Camp is a relatively new seasonal facility, located on the inland plateau in Princess Elizabeth Land, East Antarctica. The inspection team noted that the design of the station and its support systems are innovative, and the camp has a small environmental footprint. A number of systems and installations are yet to be completed.

The inspection team regarded the commitment to renewable energy and battery storage, and planned wastewater treatment systems, as particularly notable. When fully commissioned, these will be examples of best-practice for such facilities. Like other stations in similar locations, the development and operation of Taishan Camp is resource intensive, and poses a range of challenges associated with the climate, accumulation, altitude, distance from other facilities, and building on snow. When all planned systems and installations are completed, Taishan will be an effective and comfortable facility for support of China's activities.

The team noted that it will be important to ensure that fuel storages, valves, and lines are of a high standard, and can be monitored and serviced given the challenges of managing fuel infrastructure for diesel generation in the undersnow facility. Additional containment for fuel storages and infrastructure could be considered.

The inspection team noted that management of snow accumulation over time may pose challenges for operations, with significant snow build up evident around the buildings and installations.

The station and activities observed were, in the view of the inspection team, consistent with the fundamental obligations of the Treaty with respect to peaceful use and non-militarisation.

The inspection team appreciated the warm reception provided by the station leader and his team.

This was the first inspection undertaken of Taishan Camp.

5.2. General Information

China's Taishan Camp is an inland seasonal (summer) station, located at 73°51″S, 76°58'E, on the polar plateau at 2620m elevation. It is around 520km inland from the Larsemann Hills on the coast of Princess Elizabeth Land in East Antarctica. The station was established in February 2014. It is operated by the Chinese Arctic and Antarctic Administration / Polar Research Institute of China.

China provided information to ATCM XXXVI (Brussels, 2013) with details of its plans for the facility, along with an Initial Environmental Evaluation (IEE). A primary purpose of the camp is to provide terrestrial and aerial relay support to China's activities at Kunlun station (located at Dome A, approximately 715 km further inland), and activities in the Grove Mountains. Taishan Camp lies on the traverse route between Zhongshan Station in the Larsemann Hills and Kunlun Station. It was also envisaged that Taishan could provide emergency rescue protection for inland research activities in East Antarctica, and support scientific activities including glaciology, meteorology, geophysics and aviation remote sensing in the East Antarctic ice sheet.

5.3. Inspection visit

The inspection team arrived at the Taishan skiway on Friday 17 January, travelling by AAD's ski-equipped Basler BT-67 aircraft. They met with the Station Leader (Mr Yao) and officials/expeditioners from CHINARE. Upon arrival, the station leader provided information about the operation of the facility and key activities being undertaken. The inspection team then undertook a tour with the station leader, who provided access to all areas of the buildings and outside installations.

The inspection team was warmly welcomed on station, and was freely able to access all buildings and areas requested. Information in response to all of the team's enquiries was provided. The information contained below is based on first hand observations of the inspection team as well as information provided by the station leader and expeditioners/officials.

5.4. Observations

5.4.1. Station operations

The station had opened for the season on 15 December 2019, with the arrival of the traverse train/mobile camp from Zhongshan Station. Operations were expected to continue until 8 February 2020. There were 17 expeditioners on-site, including a station leader, one doctor, one chef, four mechanics, four staff for engineering and construction, five scientists, and a field safety officer. The inspection team was advised that Taishan Camp was operating as

envisaged, noting that commissioning of the camp infrastructure and systems was yet to be completed, including completion of renewable power and waste-water systems.

The traverse vehicles remain at Taishan and form part of the camp complex during the summer operation, located close to the station building. These consist of traverse sleds with living, power generation, heavy transport, fuel transport, toilet, and sustainment equipment.

In addition to oversnow traverse, a skiway supports fixed-wing aircraft access for personnel and supplies. China's Basler BT-67 had made two flights that season, at the time of the inspection. A range of tracked vehicles to support traverse and station operations were on site (PistenBully and Caterpillar Challenger) at the time of the inspection.

The camp is winterised and powered down outside the summer operating season. Plans are in place to install power management infrastructure (drawing on renewables and diesel generation) to support remotely managed / automated scientific observations while the camp is unoccupied.

Elements of the station systems were yet to be commissioned, and there was a focus on completion of works and testing and commissioning of some systems. The inspection team were advised that the current expedition team was the first to utilise the main building for sleeping and cooking. Sewerage and wastewater treatment, renewable energy systems, fire control, are in the process of being completed.

Taishan communications are through Zhongshan station. Satellite phone, and Openport data link are available.

There is no international scientific or logistic collaboration at the site, and the inspection team noted that the location and scale of the station, and its intended functions mean that opportunities for collaboration may be limited.

5.4.2. Construction

The station comprises two main areas: a main building, with adjoining underground facilities; and a second mobile site made up primarily of traverse infrastructure. The station can accommodate approximately 20 personnel over summer.

Photo: Main buildings and renewable energy generation. The undersnow building is located between the building and the wind turbines.

The main building was constructed in 2014. It is an elevated multi-story building with a 12-sided design, based on raised piles to minimise snow drift accumulation. The building is fixed and not designed to be progressively raised. It has a central mess and communal area surrounded by accommodation, kitchen, bathroom and medical rooms. To support operations, a system of closed-circuit cameras is used to monitor interior spaces and facilities, with video feeds displayed in the main building mess / living area.

Photo: Central mess

A lower level of the main building houses some services, including fire control, power inverters, and water management equipment. The loft area consists of a smaller space, which is intended for science equipment, and is presently not used.

Photo: Lower level of main building

An undersnow facility is adjacent to the main building, with an entry stairwell approximately 30 metres from the main building. The station leader advised that construction of this second phase of the camp was completed during the 2018-19 season, after it was determined that additional space for environmental and energy services was necessary. The building is a prefabricated container facility, in two rows of containers with a central corridor. It houses equipment including generators, inverters and integration equipment for photovoltaic and wind power renewables, battery storage, water treatment, and waste heat recovery.

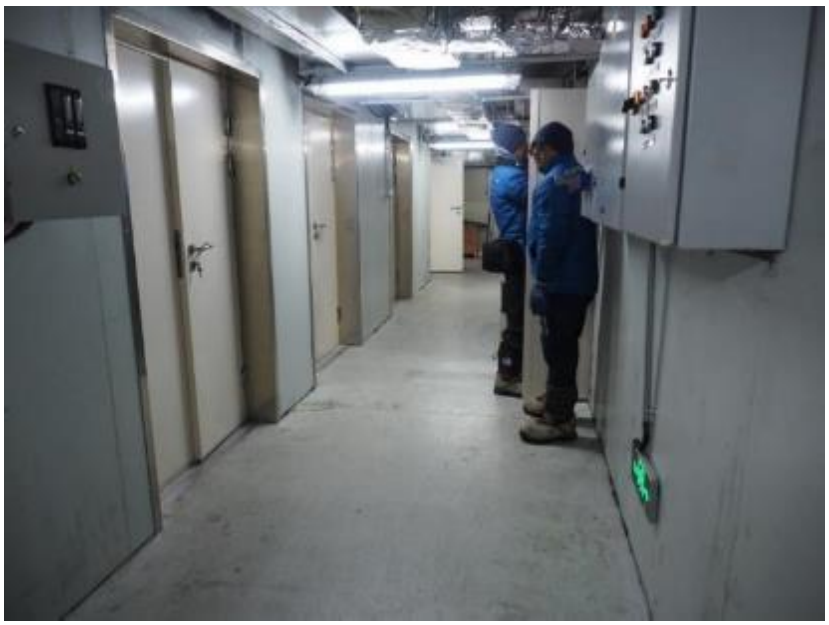

Photo: Central corridor of undersnow facility

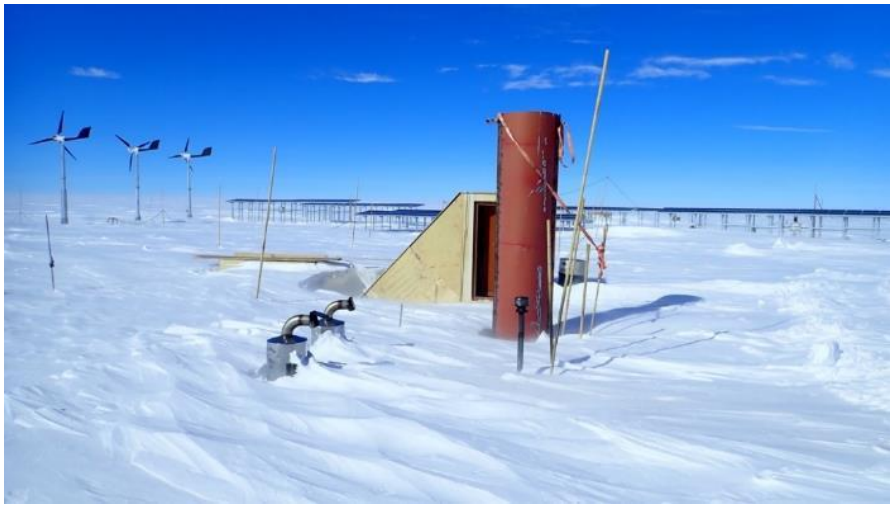

Photo: Entry to undersnow facility, with generator exhausts and air intake

In addition to these buildings, a self-contained mobile camp, consisting of traverse sleds with living, power generation, heavy transport, fuel transport, toilet, and sustainment equipment are located close to the station building. These serve the dual purposes of transporting personnel and equipment to Taishan, as well as acting as part of the camp while occupied.

Photo: Mobile site with traverse infrastructure

Management of snow accumulation over time may pose challenges for operations. The inspection team noted relatively high rates of snow accumulation in the station area, with accumulation around the main camp building, and over the undersnow building, and significant snow drifts and 'blizzard tails' accumulating near vehicles and equipment.

5.4.3. Science activities

The inspection team was briefed on science activities undertaken at the station, and spoke with scientists. The inspection included science containers and equipment at the station.

The camp supports research in the fields of auroral and space observations, upper atmosphere observations, glaciology, and detection of low earth orbit debris. The inspection team was advised that the renewable energy facilities allowed automated observations by deep space observatory equipment through the winter period. The team was advised that while China's Kunlun Station is better suited to deep space observation and glaciology research (including deep ice core drilling), Taishan Camp is more accessible, and complementary observations can be more readily supported there.

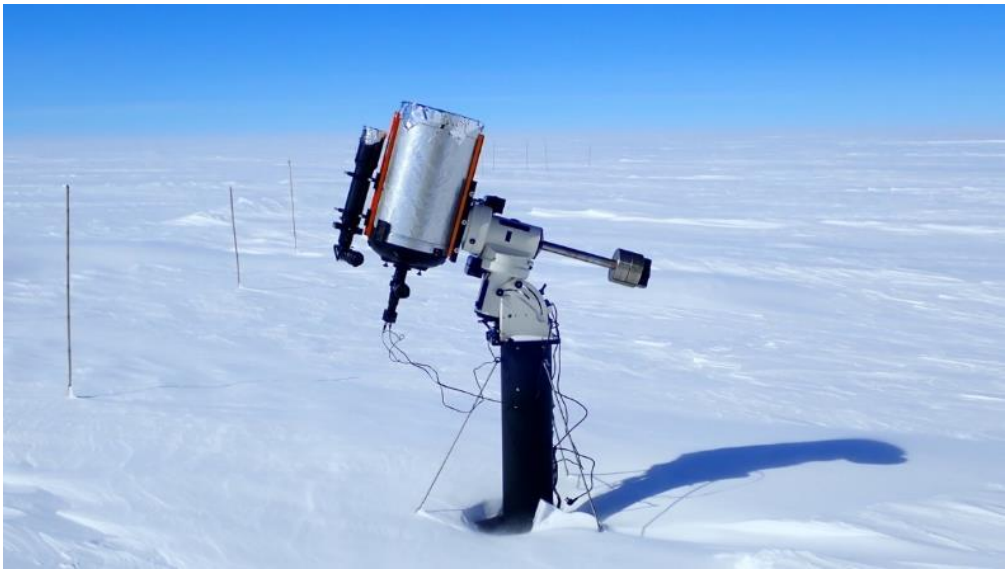

Photo: Optical telescope used for space observation

Scientists had recently completed an ice penetrating radar survey to better understand ice sheet layering in the area (in a 3km grid survey). An ice penetrating radar system mounted on a remotely piloted aircraft (electric multi-rotor) had also been successfully deployed at Taishan.

5.5. Environmental management

Station personnel exhibited a good awareness of environmental requirements. The station team showed the inspection team copies of standard operating procedures and manuals in Chinese, and noted that environmental management plans and response plans were accessible online and also available at Zhongshan and on China's Antarctic ships. The inspection team was advised that expedition team members undertook training in environmental matters in China and aboard China's Antarctic ships on route to station.

5.5.1. Waste management

All wastes are removed from the site via traverse to Zhongshan station. The inspection team observed waste separation and recycling stations, including battery receptacles. Food and kitchen waste was contained in bags and stored for return Zhongshan for treatment and return to China. The station leader advised that excess building materials from the construction phases are being returned progressively to Zhongshan Station by traverse.

Photo: Recycling station

5.5.2. Water management

A snow melter is in place in the undersnow building, but is not yet in service. The station is currently supplied with bottled water. Shower and ablutions facilities are in the main building, adjacent to the sleeping and living areas.

Human wastes are disposed of using incinerating toilets installed in the main building. A toilet system with tanks, as part of the traverse / mobile camp infrastructure, is used for containment and return of toilet waste to Zhongshan Station. Grey water was contained in empty fuel drums for return to Zhongshan.

A wastewater treatment system, for filtration and purification of grey water, with the resultant water to be used for showering and washing, was in place but yet to be commissioned. The primary filtration units were observed in the undersnow building. The inspection team was advised that the system is in a testing phase.

5.5.3. Energy management

The inspection team was impressed with the significant commitment to using renewable power. While these systems are currently being tested and are yet to be integrated for station usage, it is planned that they will deliver more power capacity than the station currently uses.

The station requires approximately 36kW when occupied. Four wind turbines (of 5kW each) with UV protected carbon fibre blades are in place and operating, although associated electrical systems are yet to be commissioned to bring this capacity online. These turbines were designed following a testing phases using two smaller turbines which remain in place.

Eight rows of solar panels (total of 40kW) are also installed. The solar panels utilise a double sided design which allows solar energy to be collected from direct sunlight as well as reflection from the snow. As part of the renewable energy system, 110kW of battery storage is available.

Photo: Wind turbines and solar panel array

In addition to the renewable power sources, two diesel generators are located in the undersnow building. The inspection team noted the importance of careful management of risks associated with exhaust gases from generators, particularly in an enclosed and below ground-level space. The station team advised that a carbon monoxide alarm system is planned for installation, and that risks would be further reduced through the primary reliance on renewable energy. Back-up generators are located at the mobile site as part of the traverse train.

The inspection team was advised that a containerised power integration unit was planned to be installed (drawing on renewables and diesel generation) to support remotely managed and automated scientific observations while the camp is unoccupied.

5.5.4. Fuel management

Fuel systems observed were in good condition, and there was no evidence of fuel spillage on-site. The planned use of renewable power sources will reduce the volumes of fuel to be transported and managed. Fuel is transported to the camp via the traverse.

Fuel storage and transfer systems for the generator sets operating in the undersnow building were not evident to the inspection team, as the facility is entirely snow covered. A feeder tank and generator fuel lines were observed inside the undersnow building. The inspection team noted that fuel lines from the feeder tank to the generators appeared to be of galvanised pipe, with welded joints and fixtures, rather than purpose-designed fuel lines and fittings. In the view of the inspection team this may increase the risk of fuel spills and fire hazards.

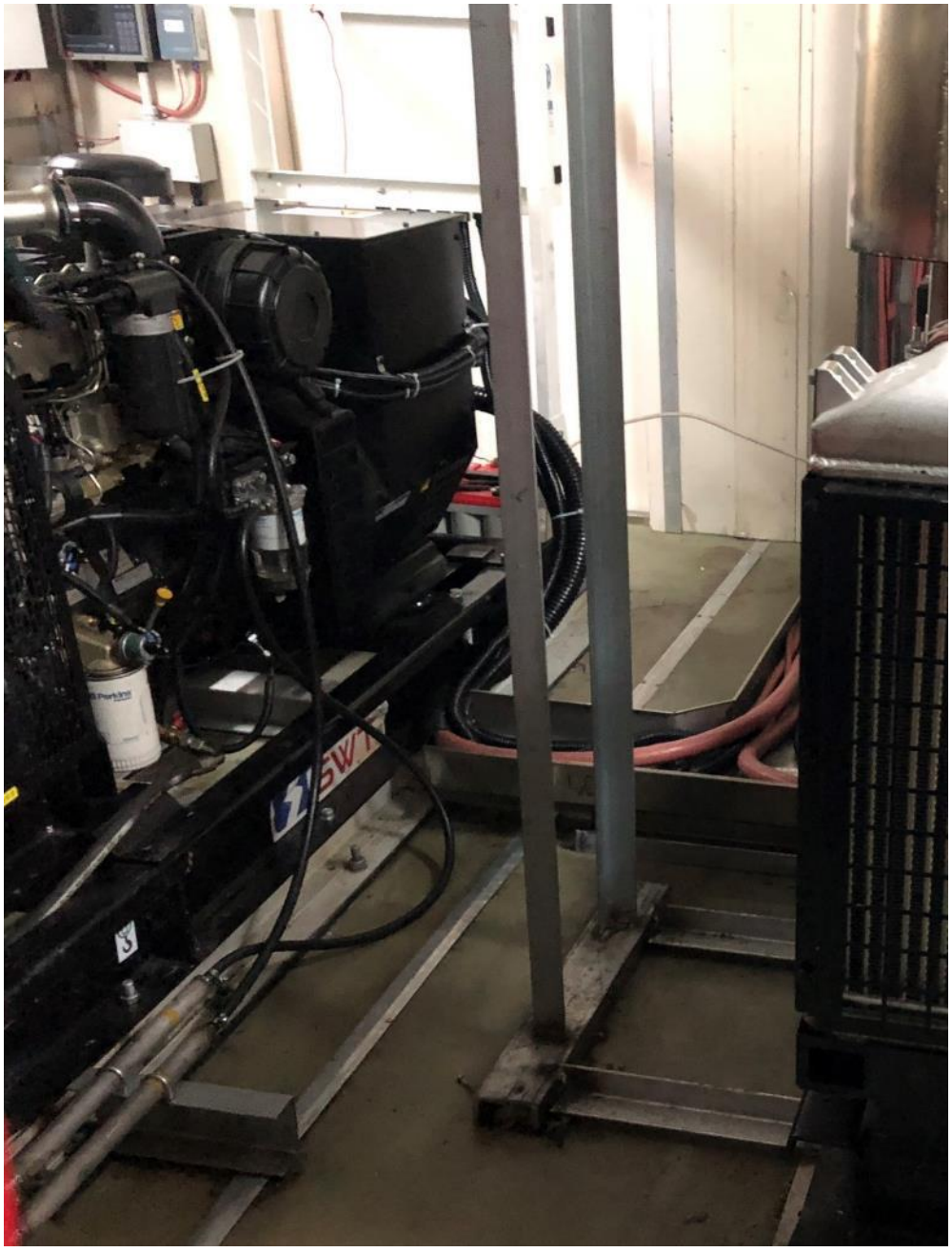

Photo: Generator sets and fuel lines

The inspection team also notes that monitoring and maintenance of fuel infrastructure will be challenging given the environmental conditions and challenges with accessing external (but snow covered) pipework and fittings. The inspection team did not observe spill kits or secondary containment for the feeder tank, pipework and fittings. Significant challenges may be encountered in fuel recovery should there be a leak or spill, and loss to the ice and snow environment underlying the undersnow facility would be likely in the event of an incident.

5.6. Provision of the report to China for comment

- A report of the inspection was provided to China for comment, in accordance with Article 14(4) of the Protocol on Environmental Protection to the Antarctic Treaty. China provided no comments.

6. Molodezhnaya Station, Russian Federation: 25 January - 2 February 2020

Photo: Part of Molodezhnaya Station area

6.1. Summary

Molodezhnaya Station is an extensive complex of buildings, infrastructure, scientific installations, storages and associated materials. Much of this is unused and in a poor state of repair, and wastes are evident.

In the view of the inspection team, it will be a very substantial challenge to clean up wastes, contaminants, equipment and infrastructure, and/or repair and re-use suitable buildings and equipment. Removal, remediation, repair or re-use of the station to reduce the risk of further environmental impacts would represent a very considerable logistic and environmental management challenge, but should be regarded as a priority.

The inspection confirms and expands upon the findings made during Australia's aerial observation of the station in 2010, reported to ATCM XXXIV in Buenos Aires in 2011. Environmental issues associated with ongoing deterioration of station infrastructure, contaminants, storage of materials including potentially hazardous substances, and wastes remain a concern.

The small seasonal operation at Molodezhnaya is conducted by an experienced team, and was professional and effective. One of the purposes of the seasonal operation is the stabilisation of buildings and infrastructure to avoid deterioration, and the removal of materials from the unused portions of Molodezhnaya. The inspection team noted the very significant scale of this task. While the seasonal team is highly skilled and competent, the

operation of the seasonal station and skiway in themselves are significant tasks for a small team. A much greater level of resourcing would be required to make meaningful progress on clean-up work.

The inspection team considered that a useful starting point for a future comprehensive clean-up activity would be a full inventory and assessment of materials and contaminants, drawing on guidance for site assessment provided in the CEP's Antarctic Clean-Up Manual.

The station and activities observed were, in the view of the inspection team, consistent with the obligations of the Treaty with respect to peaceful use and non-militarisation. Some seasonal operational practices would benefit from additional support to improve the environmental performance of current operations.

6.2. General information

Molodezhnaya Station is in the Thala Hills, on the western coast of Enderby Land, East Antarctica, at 67°40'S, 45°51'E. The station is situated on a large coastal exposure of parallel ice-free rocky ridges, separated by snow and ice-filled valleys and large lakes, adjacent to the inland plateau. The station was established in 1962, and was the largest Antarctic station of the former USSR. An associated year-round camp, Verchernyaya, on a separate ice-free outcrop some 22km away, supported a compressed snow intercontinental runway.

The station is an extensive complex of buildings, infrastructure, scientific installations, and equipment, extending over a large area (around 4km by 3km). The majority of the station infrastructure is unused.

The station was temporarily closed in 1990. Since 2006 a small seasonal team has operated intermittently using around six buildings, including kitchen/mess/operations, powerhouse/bathhouse, accommodation, warehousing, and mechanical services. The purposes of the current seasonal operations include dismantling and/or stabilising buildings and infrastructure, conducting clean-up activities, and supporting intracontinental aviation operations, including flights between Dronning Maud Land and stations in the Larsemann Hills.

The last inspection of Molodezhnaya Station was by Australia (aerial observation) in 2010. On-ground inspections were conducted by the United States in 1983 and 1967.

6.3. Inspection visit

The inspection team arrived at the Molodezhnaya skiway on 25 January, by AAD's ski-equipped Basler BT-67, and was met by the station leader Dmitry Serov.

The visit of the inspection team was facilitated by the Russian Antarctic Expedition, which kindly provided skiway access, ground transport to and from the skiway, and food and accommodation. Communications were facilitated using electronic translation software. The inspection team was warmly welcomed and provided with access to all requested areas and responses to all questions.

The team inspected the station over a number of days, departing after weather delays on 3 February. The inspection had a particular focus on the legacy environmental issues associated with the extensive former station, given its size and complexity.

The team inspected the unused portions of the station, and was able to access many areas and buildings. Some areas were not safe, including buildings with large melt pools surrounding their footings, buildings in poor repair, or where access was impeded by unsafe terrain. Some buildings and rooms were secured.

Ongoing summer operations were also observed by the team.

The information below is based on first hand observations of the inspection team as well as information provided by the station leader and expeditioners.

6.4. Observations

6.4.1. Unused station

Molodezhnaya Station consists of buildings, fuel storages, site services, a former skiway, vehicles and aircraft, waste deposits, stored materials, and scientific installations such as antenna arrays and a research rocket launch complex.

Photo: Part of Molodezhnaya Station area

Photo: Part of Molodezhnaya Station area

Photo: Part of Molodezhnaya Station area

Photo: Part of Molodezhnaya Station area

The inspection team observed around 60 buildings, 15 large fuel storage tanks (each estimated to be larger than 1 million litres), extensive site services, multiple antenna arrays, a complex of buildings and infrastructure associated with the launch and tracking of research sounding rockets, disused skiway buildings and equipment, fuel drums, packing cases and stored equipment, a water pipeline, heavy plant, vehicles including Il-14 aircraft, tracked carriers, trucks, mobile installations, and wastes.

Photo: Research rocket complex - assembly gantry and building

Photo: Research rocket complex - assembly building

In addition to the primary Molodezhnaya Station, the inspection team was able to observe some of the buildings, infrastructure and other materials at Mount Verchernyaya, around 22km away, from the former year-round station that supported a compressed snow intercontinental runway used for flights from Mozambique.

The majority of the Molodezhnaya station infrastructure is unused and much is damaged by the elements. Deterioration of buildings, equipment, and stored materials is ongoing, with large quantities of degraded or loose materials observed to have been released to the environment. The further release and distribution by wind and water of such materials is, in the view of the inspection team, likely to continue.

Materials were present on the large majority of the rock exposures in the station area, including buildings, infrastructure, equipment, materials and/or wastes. Parts of the station area are snow and ice covered. In some of these areas, materials were observed to be covered and embedded.

Photo: Disused aircraft and vehicle

A wide variety of buildings were observed, including scientific and technical, observatory, radar, antenna and communications, rocket launch and assembly, operations, mechanical and plant, power generation, living/mess/kitchen, offices, accommodation, recreation, and office buildings. Many buildings are of a modular construction, elevated on steel scaffold, with integrated water and waste tanks. Some buildings and other infrastructure are on concrete footings, and some are mobile or temporary. Many buildings are fully or partially destroyed by wind, subject to snow and ice accumulation/ingress, or flooded by melt pools, and one science observatory building had been destroyed by fire.

Photo: Melt pond around building with inundated drums

Photo: Buildings with damaged materials

The inspection team was able to enter some intact buildings, and noted that most contained substantial volumes of material including scientific, technical and operational equipment, tools and plant, furniture, living materials, and sundry items, much of which appeared obsolete and in disrepair. Many buildings contained soils and dessicated plant materials from cultivation in window boxes.

Around 15 very large fuel storages, each estimated to be larger than one million litres, were observed in the station area. Around 12 of these are located close to the former skiway. Some tanks could be approached by the inspection team, and appeared to be empty. It was not possible to assess whether residual fuel or sludge was present. Most tanks were not accessible for safety reasons. One large storage close to the shoreline had ruptured and collapsed in relatively recent years. The inspection team was informed that this was the result of a flash flood from a large lake upstream that had been blocked by an ice dam. The damaged tank could be seen to contain heavy oil-sludge in its base, and the surrounding rock and sediment was contaminated with hydrocarbons.

Photo: Damaged large fuel storage

Extensive external infrastructure was also observed, much in poor repair, including a network of elevated site services on steel poles, cables and pipework, a water pipeline between a large lake and the sea, a walkway/gantry associated with research rocket assembly, and many large antennas and arrays.

Photo: Antenna array

Photo: Remains of antenna array

Photo: Remains of antenna array

Photo: Water pipeline with deteriorated and liberated insulation

Considerable volumes of discarded materials, vehicles, infrastructure and waste were evident. The inspection team observed many areas contaminated by fuel and other substances. Other contaminants and potential sources of contaminants were observed, including electronic equipment, transformers, batteries, plastics and insulators, and general wastes, both discarded and contained, and in many cases in a state of deterioration. Many buildings appeared to have former waste disposal areas nearby, in some cases where materials had been burned. Ash and debris from an incinerator site was also observed.

Photo: Deteriorating building

Photo: Deteriorating building and discarded waste

Photo: Remnants of open burning of waste

6.4.2. Current seasonal operations

Seasonal operations utilise around six of the existing station buildings, including kitchen/mess/operations, powerhouse/bathhouse, accommodation, warehousing, and mechanical services.

The seasonal station complement was seven people – a station leader, three drivers/operators, two diesel mechanics, and a cook. The team members were highly experienced and effective in the wide range of roles required for operating safely with a small team. No scientists were present at the time of the inspection visit.

Personnel and cargo are transported to the station via ship, with helicopter transfers to the station. Some fixed-wing aviation support is also used. The station operates a skiway on the plateau some 7km from the station, with an office/refuge sled, communications and meteorological facilities, and drummed fuel. Tracked vehicles and two skidoos are used for personnel transport and cargo handling. Snow and ice routes were well marked and available as GPS tracks.

The inspection team noted in particular that the preparation and management of the skiway and associated services was of a high standard.

A power house with three generator sets and workshops and storages was inspected. Fuel is transported from a bulk storage, in 200l drums on a sled. The powerhouse, generators and fuel system were observed to be good condition.

Photo: Seasonal operation powerhouse

Fresh water is sourced from a large melt lake above the station. Buildings in use by the seasonal operation had fresh water tanks, as well as holding tanks for sewage and waste water. The inspection team was advised that these tanks are decanted into a tanker and contents disposed of into the sea. Some waste water from ablutions and laundry was observed to be discharged onto ice free land.

Fuel for the seasonal operation is transported by helicopter in an aviation bulk fuel tank and pumped into an elevated storage tank. Drums for transport to the power house and vehicles are fuelled from this tank. The storage tank, hoses, nozzles and pipework were observed to be in a relatively poor condition, and there was no secondary containment. There appeared to be extensive fuel contamination in the sediments and on rock surrounding the storage. In the view of the inspection team an upgraded bulk fuel storage and associated pipework would be beneficial, as would attention to fuel handling systems.

Photo: Seasonal operation fuel storage

6.5. Provision of the report to the Russian Federation for comment

- A report of the inspection was provided to the Russian Federation for comment, in accordance with Article 14(4) of the Protocol on Environmental Protection to the Antarctic Treaty. The Russian Federation provided no comments.

7. Mount Vechernyaya (Mountain Evening) Station, Republic of Belarus: 27 January 2020

7.1. Summary

Mount Vechernyaya Station is a newly established facility in the Thala Hills, Enderby Land, the construction and operation of which was the subject of a Comprehensive Environmental Evaluation in 2014. The station was operating on a seasonal basis at the time of the inspection. Year-round operations are planned to commence from February 2021.

The inspection team members were impressed with the high standard of design and construction of the station, its small footprint and minimal landscape modification, the commitment to efficient energy and water usage, and commitment to scientific research. Belarus's adaptive re-use of unused buildings from former activities at the site, and its clean-up work in cooperation with the Russian Federation is also notable. The construction and operation of the station, and mitigation measures for impacts identified in the environmental assessment process, adhere closely to the final CEE prepared by Belarus. The inspection team noted that Belarus's plans to commence winter operations are well advanced.

The station and activities observed were, in the view of the inspection team, consistent with the fundamental obligations of the Treaty with respect to peaceful use and non-militarisation. The inspection team notes that the installation and commissioning of the anticipated fuel and wastewater infrastructure will assist in ensuring best practice and full compliance with relevant provisions of the Environmental Protocol.

This was the first inspection undertaken of Mount Vechernyaya Station.

7.2. General information

Mount Vechernyaya Station was established in 2015. It currently operates as a seasonal station, and is partway through a phased construction process, with the intention to commence year round operations from February 2021. It is located on a coastal ice-free area in the Thala Hills, Enderby Land, East Antarctica, at 67°35'S, 46°09'18"E. Mount Vechernyaya Station is located in the area of a former year-round field base of the Soviet Antarctic Expedition. Russia's Molodezhnaya Station is located 20km to the west.

At ATCM XXXVI in 2013, Belarus announced plans to establish a new year-round research station (ATCM XXXVI /IP56). A draft Comprehensive Environmental Evaluation (CEE) for the proposed *Construction and Operation of the Belarusian Antarctic Research Station at Mount Vechernyaya, Enderby Land*, was made available in 2014 by Belarus, and was considered by CEP XVII and ATCM XXXVII in Brasilia in 2014. Belarus circulated a final CEE in April 2015, and advised the Parties of its decision to proceed to proceed with the construction (ATS Circular No. 26 / 2015). Details of the final CEE were provided to ATCM XXXVIII (Sofia, 2015) in ATCM XXXVIII IP 39.

The Station is operated by the Belarusian Antarctic Expedition, part of the National Academy of Sciences of Belarus.

7.3. Inspection visit

The inspection team visited Mount Vechernyaya on 27 January 2020. The team was met by the head of the expedition Aleksei Gaidashov, and expedition personnel, who provided information on the station and its operations. The team then toured the station in the company of the head of the expedition and other personnel. The inspection team was warmly welcomed, and was freely able to access all buildings and areas requested. Information in response to the team's enquiries was provided. Comprehensive information about the station in the form of a filled-out ATCM inspection *Checklist A: Antarctic stations and subsidiary installations* was provided to the team.

In conducting the visit the team had reference to the final CEE for the construction and operation of the station, including the description of the station and its operations, and the mitigation measures outlined for its ongoing operation, noting that some systems were yet to be installed and commissioned, as per the schedule of construction outlined in the CEE.

The information contained below is based on first hand observations of the inspection team as well as information provided by the head of the expedition and expeditioners.

7.4. Observations

7.4.1. Station operations

The current operation is seasonal. The head of the expedition advised that year-round operation of the station is planned to commence from February 2021 consistent with Belarus's advice to the ATCM. Information was provided to the inspection team regarding the planned delivery of remaining containerised building modules and other equipment, including new fuel storages. The inspection team noted that Belarus's plans to commence winter operations appear to be on track, given the degree of completion of the station, the

high standard of current buildings and equipment, and the well-developed technical and operational capabilities of the station and the expedition.

The station capacity is currently eight people. Seven people were present for the 2019-20 season.

The Russian Antarctic Expedition provides transport and logistics support on contractual terms. Personnel and cargo are transported via ship with helicopter transfers to the station. Belarus also commonly utilises aviation support through the DROMLAN framework. Fixed wing aircraft access is via Russia's Molodezhnaya skiway. A clear rock surface in the station area is used as a temporary helipad for resupply operations. The station operates snowmobiles, an Apache Crawler ATV, and an enclosed-cab tracked amphibious vehicle (BOBR). The station has direct oversnow access to the plateau, with a route to Molodezhnaya Station and Molodezhnaya skiway. No roads or tracks were evident on ice-free ground.

The inspection team were shown the station operations, communications and weather information facilities in the control and communications module. Satellite (BGAN, FLEET, Iridium and Inmarsat C) and radio (HF and VHF) communications are available. A VSAT installation is underway, to provide data services.

Photo: VSAT data satellite installation in progress

7.4.2. Construction

The inspection team regarded the modular and efficient design of the station as a good example of a modern facility. The station is being constructed in phases. It currently consists of newer buildings and re-purposed buildings from the previous year-round Soviet Antarctic Expedition field base.

At the new site, two main new buildings are in place, with support facilities nearby. The buildings are composed of prefabricated containerised sections installed on elevated platforms. The platforms are supported by adjustable legs with small base plates bolted to

bedrock. All of the new facilities in place are fully commissioned. The inspection team was advised that they are operating effectively, and observations supported this.

Photo: Main buildings

The operations building houses control and communications functions, an office, services and living section. The accommodation and science module, operating with five of eight container sections in place, provides living areas, laboratory space, a technological section, domestic, and sanitary functions. The remaining three container sections for this module will be delivered at the end of the 2019/20 season and commissioned the following season. They will include medical facilities, science facilities and additional living spaces.

Photo: Operations building – control and communications, accommodation

Photo: Accommodation and science module

Support facilities are around the main buildings. These include five separate diesel power generation and distribution containers on adjustable legs (2x100 kVA, one 60 kVA, and one 20kVA, and an electricity distribution container), and a container with a backup 6 kVA diesel generator. There is a container for garaging and maintenance of skidoos, and a refrigerator container. A platform with a satellite antenna and dome is under construction. Three storage containers are located at the station, for equipment and vehicles over winter, and for collection and storage of solid wastes.

The station is located in the area of a former year-round field base of the Soviet Antarctic Expedition, which supported the operation of a compressed snow intercontinental runway until 1991. Newly installed buildings are some 500m from remaining older structures. The Belarusian Antarctic Expedition has renovated some of these buildings for re-use.

A former residential building (modular cylindrical construction) has been renovated and now contains living, kitchen / mess, ablutions, residential premises, offices, and medical facilities. Another building is partially repaired, and currently houses a biological laboratory space, and will also be used for warehousing and a sports recreation space. Other buildings are used for equipment storage. A small building has been repaired and is used as a living space.

Photo: Re-purposed modular building - accommodation, kitchen and mess facilities

7.4.3. Science activities

Three scientists were present at the station at the time of the inspection, working in the fields of atmospheric physics, hydrometeorology, and biology/ecology. When year round operations commence, around 5-7 scientists will be present for summer and 3-4 scientists will winter.

The inspection team observed the laboratory spaces at the station and met with science personnel. Laboratories were observed for biology/ecology, atmospheric physics, and hydrometeorology. The inspection team was provided with information about the instruments available and scientific programs. Observational instruments are in place in the station area, including for ground-level ozone and total ozone measurement, albedo/spectrometery (for ground truthing remote sensing data), atmospheric aerosols, UV radiation, meteorology including an Automatic Weather Station, and geophysics. A Lidar is planned to be installed in the next season. A regular program of ecological monitoring is conducted, including water quality analysis, and samples of water, snow, sediment, and rocks are collected for analysis in Belarus by the National Academy of Sciences. The station conducts meteorological observations, and studies of the water balance and thermal regime of lakes in the ice free area. Biological laboratory equipment, and LED biostations for hydroponics are in place.

Photo: Radiometric monitoring station for atmospheric aerosol

Photo: Spectroradiometry instruments

7.5. Environmental management

Based on discussions and information provided, and documents sighted, the inspection team assessed that the station is being operated with close attention to the Protocol and to general environmental performance. Personnel were aware of obligations and requirements. Relevant documents were available on the station. Details of training were provided to the inspection team, which covered environmental requirements.

The inspection team had reference to the mitigation measures outlined in Belarus' final CEE for the construction and operation of the station, and where possible sought to verify these during the inspection for inclusion in this report.

7.5.1. Ongoing clean-up of materials in the area from former Soviet Antarctic Expedition activities

The inspection team observed that considerable material associated with the Soviet Union's former year round airfield base remains in the station area and surrounds. This includes buildings, vehicles, generators and heavy equipment, cables, drums, and other waste. A significant proportion of this material appeared to have deteriorated or was otherwise unusable. The inspection team was informed that Belarus, as a former partial user of sites as part of the Soviet Antarctic expeditions, takes part in joint Belarussian-Russian clean-up work. The Belarusian Antarctic Expedition each season collects 7-10 tons of metal, solid wastes, and other equipment from the station area and surrounds, for removal via ship, in cooperation with the Russian Antarctic Expedition. The inspection team observed materials that have been collected in a helicopter sling-load container ready for removal, and additional material consolidated on elevated rock outcrops prepared for lifting.

Photo: Materials moved to rock outcrops in preparation for removal to ship

The team was also advised of intentions by Belarus and Russia to develop a long-term bilateral plan for clean-up in the area. Belarus noted that such activity would need to be subject to prior environmental assessment.

7.5.2. Waste management

Waste management on the station is covered by an official 'Instruction' which includes procedures for collection, processing, recording, storage, and disposal or removal of wastes from the Treaty Area. Waste collection and separation systems were observed in relevant areas of the station. Solid wastes were sorted into categories, bagged and stored in an enclosed container. The inspection team was advised that contained wastes were returned to the ship via helicopter. An incinerator is planned to be installed in 2021-22, as well as a press for compacting solid waste. Separate waste storage and handling for fuel and lubricants, and fuel drums was observed. The inspection team noted that drums for waste fuel and lubricants were stored in a container with a containment barrier, with sorbent materials in place for any spills.

7.5.3. Water management

Water is sourced from Lake Nizhnee, close to the station. A pump is mounted on a floating platform with a heated pipe to shore. This provides water to tanks towed by skidoo, which are then used to replenish building tanks every 8 to 10 days. The inspection team was informed that water usage is low, and observed low water-use appliances, waterless toilets, and water conservation practices.

Urine and liquid food wastes are collected in tanks, and transported to the coast for disposal. Grey water (showers, ablutions, dishwashers and washing machines) is passed through a drum-based filtration tower. The resultant filtrate is discharged onto ice-free rock, in an area which drains to the sea. The inspection team notes that this practice may not be consistent with Article 4(1) of Annex III of the Protocol, which requires that wastes shall not be disposed of onto ice-free areas or into fresh water systems.

Faecal wastes are collected in waterless toilets which encapsulate the wastes in biodegradable bags. These are stored in containers. The inspection team was advised that these are disposed of in the sea in a location where conditions exist for dilution and rapid dispersal. Although Article 5(1) of Annex III of the Protocol permits disposal of sewage into the sea, there may be questions around technical compliance with the Protocol, or environmental impact aspects of using bags in this way.

The inspection team notes that the final CEE for the station indicates that a wastewater treatment facility, for black and grey wastewater is intended, with a discharge pipeline directly into the sea.

Photo: Grey water filtration tower

7.5.4. Energy management

The station uses diesel power generators. Four generator sets of differing capacities are used according to the power consumption at the time. The generator sets were each housed in their own container, and were observed to be well maintained and in good condition. The new station modules included energy efficient lighting and other power management measures. Some photovoltaic panels were installed.

Photo: Containers housing diesel generators

7.5.5. Fuel storage and handling

The inspection team was informed that modern double-skinned isotainer fuel storages had been purchased and delivered to Capetown, for transport to the station at the end of the 2019/20 summer season, with installation planned prior to wintering operations.

No signs of fuel spills or leaks were observed, and the station personnel advised that there have been no fuel spills. There was widespread use of sorbent booms.

Currently, a single skinned steel-plate tank of 13 m3 is used to store diesel fuel. The tank is placed on a rock surface on timber baulks. No secondary containment was in place. A single welded pipe outlet with a valve at the base of the tank was connected to a pump. A small container with sorbent material was in place under this valve/outlet. Smaller empty tanks were in place beside the main tank, to provide some capacity for moving and storing fuel in the event of a problem with the main tank, although these did not have the capacity to contain the entire tank contents.

Photo: Bulk fuel tank

Photo: Fuel drum storage

Fuel is transferred from the ship to the station storage tank by helicopter using a fuel transportation tank and pumped into the station storage. Fuel is transferred periodically to tanks inside the generator containers, of 200l capacity, using rubber fuel hoses with shutoff valves and an electric pump, with hoses run out by hand.

The inspection team was advised that the tank and stop valves were inspected visually twice daily. For fuel transfers to the generator holding tanks, two appropriately trained people work together, and have communications equipment to coordinate the operation. The head of the expedition noted that fuel management and handling are consistent with COMNAP guidelines. Fuel spill containment and response materials were available and sorbent materials were in place around tanks and generator areas. Small numbers of 200l drums of other fuels were stored in the station area. Sorbent booms were in place at the base of these drums, which appeared suitable for handling small spills.

The inspection team noted that the lack of secondary containment on the main storage, and vulnerable outlet pipework posed some risk of fuel loss. This is partially mitigated by strong fuel management practices, including a simple fuel transfer infrastructure and procedure, absence of fixed pipework, and regular monitoring. Nonetheless, secondary containment of the tank, outlet, pump and attached hoses, and physical barrier protection for those elements, would enhance the fuel storage system, and reduce further the risk of spills escaping to the environment.

7.6. Provision of the report to Belarus for comment

- A report of the inspection was provided to Belarus for comment, in accordance with Article 14(4) of the Protocol on Environmental Protection to the Antarctic Treaty. Belarus provided some comments on the report in response.
- Minor editorial comments and corrections have been incorporated in the text of the report. Additional comments follow.
- Belarus commented that the station is a research infrastructure facility.
- With regard to the section of the report dealing with observations on grey water filtration and discharge of filtrate onto ice free rock, Belarus provided the following comments:
    - The filter tower is dismantled at the end of seasonal operations and transported on board the ship outside the Antarctic Treaty, and in its place is installed another drum tower with a new filter filler.
    - Perhaps, in this case, the best temporary option would be to drain the filtrate into a reservoir for further transport to the seashore and disposal directly into the sea.
- With regard to the section of the report dealing with the diesel fuel storage tank outlet, Belarus provided the following comment:
    - At the same time, the welded outlet pipe and pump is equipped with a physical barrier protection against accidental mechanical damage.
- With regard to the section of the report dealing with the capacity of available empty tanks to move and store diesel fuel from the main tank in the event of an emergency, Belarus provided the following comment:
    - In addition, at a distance of 50 m there is a storage of empty fuel barrels that, in case of an emergency leak, can also be used for moving and storing fuel in case of problems with the main tank. In total, additional fuel tanks and empty fuel barrels can accommodate the entire contents of the main tank.
- With regard to scientific equipment, Belarus provided the following additional photographs of scientific installations that were present at the time of the inspection:

Photo: Geophysical monitoring Station

Photo: Joint Belarusian-Finnish automatic hydrological station SIMBA